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**Investigating child and adolescent sport dropout from a
bio-ecological perspective in Australian swimming:
How important is the coaching climate?**

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Declaration/statement of contribution

I, Kylie Moulds, hereby declare that the thesis entitled ‘Investigating child and adolescent sport dropout from a bio-ecological perspective in Australian swimming: How important is the coaching climate?’ is my own work and does not, to the best of my knowledge, contain material from any other source unless due acknowledgment is made. The thesis contains material that has been submitted for publication in peer-reviewed journals. The thesis was completed under the guidelines set out by The University’s Faculty of Medicine & Health, for the degree of Doctorate of Philosophy and has not been submitted for a degree or diploma at any other academic institution.

Kylie Moulds

30 June 2023

Supervisor statement

As supervisor for the candidature on which the thesis is based, I can confirm that the authorship attribution statements above are correct. The contents of the thesis have been sufficiently well presented to be examined and does not exceed the 80,000 word limit. I hereby certify that the thesis entitled ‘Investigating child and adolescent sport dropout from a bio-ecological perspective in Australian swimming: How important is the coaching climate?’, submitted by Kylie Moulds, in fulfilment of the degree of Doctor of Philosophy, is her own work and ready for examination.

Professor Stephen Cobley (BSc, MA, PhD, CPsychol, AFBPsS, ASpS2)

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‘Tempora mutantur nos et mutamur in illis.’

Holinshed’s Chronicles, 1578

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Abstract

Child and adolescent sport participation can provide a platform for young people to reach a multitude of developmental benefits, such as improved physical health, as well as psychosocial and motor skill development (Côté & Fraser-Thomas, 2007; Coakley, 2006; Camire & Trudel, 2010). In Australia, swimming is a popular sport for children and adolescents. With 1,638,460 males and females (aged 0–14 years) participating in 2022, swimming was ranked the number one participation sport (Australian Sports Commission, 2023). Given the Australian culture and the fact that swimming is considered a leisure activity that does not need to be organised, and does not require formal clubs and associations for participation, it can be expected that swimming registers consistently high participation rates (Eime et al., 2020). Yet, a significant proportion of participants will either temporarily, or permanently, dropout of child and adolescent sport within relatively short timeframes (for example, one year) at younger age groups (Eime et al., 2019).

On the presumption of dropout being a less desirable behavioural outcome, in contrast to sustained participation, the thesis initially highlights the problem of childhood and adolescent sport dropout in general, as well as in the specific context of Australian swimming. Bronfenbrenner's (1979; 2005) Bio-Ecological Development Theory, and the Process-Person-Context-Time (PPCT) model are utilised to identify the potentially multiple – and potentially interconnected – factors which may account for dropout. From the same perspective, the thesis explores and examines the coach-created motivational climate of Australian youth swimmers, and the impact on participation and dropout rates. The characteristics of more preferred coaching climates are outlined through the application of an intervention study.

Acknowledging the complexity of child and adolescent sport behaviours, the current research informs organisational and practitioner-level strategies to assist in the facilitation of long-term

athlete development and positive health behaviours. Thus, the thesis should help identify ‘when’ and ‘where’ to change/address current practice and provide an evidence base to help change an organisation cultural mindset which has historically prioritised early-age intensive training and investment (that is, selection of the few and the dropout of many). This is achieved through a variety of methodological approaches in four separate but interconnected studies.

Study 1 applies a mixed-methods systematic review to examine how child and adolescent sport dropout literature has been theoretically framed; how dropout has been defined and measured; and systematically map all influential factors examined which have (not) affected dropout. Peer-reviewed literature ($N = 69$ studies) published over four decades (1980–2021) identified within five databases was synthesised using a mixed-methods review approach. Findings identified that dropout studies have examined single or multi-sport (male and female) youth sport contexts worldwide, at different participation levels, although predominantly at the local club level. Prior studies predominantly adopted psychological-based theoretical frameworks; didn’t define dropout; assessed dropout descriptively, and often focused on the influence of psychological-based factors. Across the contexts examined, competition structures (*Process*), sex, age group (*Personal*), parental socio-demographics, and key social agents support (*Context*) were identified as consistently influential to dropout. Although not explicitly utilising the PPCT model, fifteen studies examined variables across the model, with one identifying significant independent influences from across the levels. Future research is recommended to apply more encompassing theoretical frameworks; specific dropout definitions; and advanced methods of assessment.

Study 2 examined longitudinal retention/dropout trends in Australian child and adolescent swimmers, with the influence of socio-demographics considered. Additionally, within a subsample, the influence of competition level was examined alongside existing variables.

Participants ($N = 17,161$) were female and male registered New South Wales (NSW) swimmers (10–15 years). To identify cessation trends, Kaplan-Meier survival analyses, supplemented with Cox regression were used on annual participation data spanning ten years. Procedures were repeated when examining the influence of competition level in a subsample ($N = 1822$). Kaplan-Meier analyses identified median sustained participation rates of four years (95% CI = 3.93–4.06), with 15.9% maintaining participation over 10 years. Cox regressions identified age was influential ($p < 0.001$), with a 184.9% higher hazard rate (HR) for 10 versus 15 year-olds. Residential proximity to NSW cities was influential ($p < 0.001$), with urban swimmers reporting a 24.8% higher dropout (HR) rate than rural swimmers. Sex and relative age did not influence sport cessation. In the subsample, median sustained participation was four years (95% CI = 3.7–4.2), with 27.6% maintaining ten years of participation. Level of competition was influential ($p < 0.001$), with a 60.3% higher HR associated with lower competition levels (that is, club/district versus national).

Applying theoretical perspectives, systematic review findings, and expanding on findings from Study 2, Study 3 focused on explicitly examining socio-demographic and psychosocial factors associated with participation cessation or continuation in NSW youth swimming. Data were collected by constructing and administering two questionnaires. The first questionnaire was administered to youth swimmers who had previously registered with a Swimming NSW-affiliated club and re-registered in 2020. A second questionnaire was also administered to youth swimmers who had previously registered with a Swimming NSW-affiliated club and had not registered in 2020. Both questionnaires considered socio-demographic, swimmer history, coaching climate factors and dropout or participation predictors. Data were then analysed cross sectionally and longitudinally and included descriptive assessments of association, for example, chi-squared and odds ratio.

Study 4 presents a pilot short-course coach education intervention program designed and implemented with development and advanced level Australian swimming coaches. Study objectives were to increase coaches' conceptual understanding of motivational microclimates and their consequences; increase coaches' knowledge of behavioural strategies to enhance the psychological characteristics of their coach–athlete environments and evaluate the subsequent effect of the coach education intervention on coach and athlete motivational climate ratings. The intervention was evaluated using a mixed-method, quasi-experimental within-group design. Findings provide preliminary (partial) evidence to suggest coach motivational microclimates, encompassing components of social interaction, communication, and behaviour, were positively modified via a short educational intervention. Incorporating empowering microclimate characteristics (that is, forms of coach interactions and behaviours) while concomitantly reducing disempowering-associated characteristics, could benefit youth swimmer experience. Such development should predictably assist in reducing dropout rates within child and adolescent swimming.

Collectively thesis findings highlight the importance of addressing child and adolescent sport dropout by establishing system-wide stakeholder knowledge and awareness of the problem. Because forms of coaching behaviours (coach-created motivational climates) are associated with dropout, microclimate change at a local level could be significantly beneficial to sustained participation. Implementing coach education or professional development programs targeted at improving coach-created microclimates could be a viable and cost-effective strategy. The positive immediate outcomes may be a greater likelihood of sustained sport participation, while in the longer term, an increased likelihood to accrue multiple health benefits for child and adolescent sport.

For many children, competitive sport operates as a kind of failure factory which not only effectively eliminates the 'bad ones' but also 'turns off' many of the 'good ones.'

The programmes, by their present structure and emphasis and the agents of these programmes (i.e. the coaches), often appear to work together in a kind of conspiracy to eliminate children, particularly if they are of less skill levels... Programmes and their agents seem so caught up in the winning ethic that the drop out appears to be part of the price that is being paid... in a short sighted quest for 'victory'.

Orlick, 1974, p. 25 & p. 27.

Acronyms and abbreviations

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ADHD	Attention-Deficit/Hyperactivity Disorder
AGT	Achievement-Goal Theory
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
ARIA	Accessibility and Remoteness Index of Australia
ASCTA	Australian Swimming Coaches and Teachers Association
BMI	Body Mass Index
CAR	Coach–Athlete Relationship
CASD	Child and Adolescent Sport Dropout
CASD-SC	Child and Adolescent Sport Dropout – Study Checklist
CI	Confidence Intervals
EDMCQ	Empowering and Disempowering Motivational Climate Questionnaire
EDMCQ-C	Empowering and Disempowering Motivational Climate Questionnaire – Coach
HMIEM	Hierarchical Model of Intrinsic and Extrinsic Motivation
HR	Hazard Rate
ID	Identification
IRSAD	Index of Relative Socio-economic Advantage and Disadvantage
MANOVA	Multivariate Analysis of Variance
MCSYS	Motivational Climate Scale for Youth Sports
MMAT	Mixed Methods Appraisal Tool
NSW	New South Wales
OR	Odds Ratios
PAPA	Promoting Adolescent Physical Activity project
PMCSQ-2	Perceived Motivational Climate in Sport Questionnaire – 2
PPCT	Process-Person-Context-Time

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta Analyses
RAEs	Relative Age Effects
SAL	Swimming Australia Limited
SD	Standard Deviation
SDT	Self-Determination Theory
SEIFA	Socio-Economic Indices for Areas
SNSW	Swimming New South Wales
WHO	World Health Organization

Chapter 1: Introduction

1.1. Thesis background – health rationale

Within developed countries, physical inactivity and obesity during childhood and adolescence (i.e., 5–18 years; World Health Organization [WHO], 2020) signify short- and longer-term health concerns (Ng et al., 2014). According to the WHO (2021), physical inactivity in childhood and adolescence refers to less than 60 minutes of daily moderate to vigorous intense activity, while obesity refers to a body mass index (BMI) greater than 30kg/m². In the short term, child and adolescent obesity has been associated with compromised fundamental motor skill development (for example, locomotor, object control and stability skills; Han et al., 2018; Tompsett et al., 2017) and physical health (for example, less favourable cardiometabolic risk profiles; Chastin et al., 2015). In the longer term, child and adolescent obesity has been associated with negative health trajectories into adulthood, including greater risks of multiple physiological conditions such as type II diabetes (Morrison et al., 2010), cardiovascular disease (Ajala, 2017; Tirosh et al., 2011) and multiple forms of cancer (Ahlgren et al., 2004; Biro & Wein, 2010).

Comparable to obesity, mental health conditions or disorders are also a significant public health issue, given the disproportionate rates of suicide, depression and anxiety among children and adolescents compared to adult population groups (WHO, 2005). The WHO (2022) characterises a mental disorder as a ‘clinically significant disturbance in an individual’s cognition, emotional regulation, or behaviour, usually associated with distress or impairment in important areas of functioning’ (paragraph 1). Further, approximately half of all mental health conditions reportedly emerge before the end of adolescence (Purcell et al., 2023). Previous research has identified an association between physical inactivity and poor mental health indicators (for example, self-esteem; Suchert et al., 2015; Tremblay et al., 2011), including the increased risk of being clinically diagnosed with mental health conditions (for

example, depression; Hoare et al., 2016; Liu et al., 2016); emotional/behavioural disorders (for example, anxiety and Attention-Deficit/Hyperactivity Disorder; ADHD) respectively; Cortese et al., 2015; Sanders et al., 2015); and, detrimentally affected social development, such as the quality of family and peer relationships (Iannotti et al., 2013).

Given societal health concerns within childhood and adolescence, the importance of physical activity (that is, bodily movement produced by skeletal muscles that requires energy expenditure; WHO, 2022) within community and societal organisations (for example, local schools, clubs) should be considered of paramount importance. Numerous studies have shown that children who use sport as a platform to be physically active, and who sustain engagement throughout childhood and adolescence, report multiple physical, psychological and social health benefits (for example, Eime et al., 2013; Eime et al., 2023). Sustained regular sport participation has also been associated with increased aerobic fitness (Janssen & LeBlanc, 2010), lower body fat (Ortega et al., 2008), favourable cardiovascular and metabolic disease risk profiles (Biddle et al., 2004), enhanced bone health (Smith et al., 2014) and reduced likelihoods of reporting psychological symptoms (for example, depression and anxiety; Bailey, 2006). Thus, sustained sport participation can play a significant contributory role in counteracting negative health trends, providing an avenue for positive long-term health trajectories.

Further, child and adolescent sports programs have the potential to assist in attaining multiple health benefits at critical developmental stages and consolidate lifelong exercise and health behaviours (Luepker et al., 1996; Sallis et al., 1997). To illustrate, Vella et al. (2015) conducted a longitudinal study of 4042 Australian 8–10 year-old participants in individual (for example, tennis, karate, and gymnastics) and team (for example, netball, cricket and Australian football) sports. Using questionnaire and registration data, after two years of tracking, Vella et al. (2015)

identified that sustained participation in organised sport during childhood was correlated with better social and emotional health compared with non-participation. That is, children who dropped out of sports were reported to have a greater number of poor mental health symptoms than children who maintained regular participation. However, a substantial proportion of children (for example, 33% of 10–14 year-olds) either temporarily or permanently dropout from sport before adolescence (Vella et al., 2020), reducing the likelihood of accruing physical, psychological, and social benefits. On these grounds, the thesis emphasises how child and adolescent sport dropout (CASD) should be viewed as (generally) problematic and should be addressed where possible. Consequently, identifying the potential multiple and inter-connecting factors which may account for CASD is needed. Such knowledge and understanding are required for society, more broadly, as well as sporting organisations and their practitioners, more specifically, if sporting engagement is to achieve lifelong health benefit outcomes.

1.2. Thesis background – applied rationale

In Australia, swimming is a popular sport for children and adolescents. With 1,638,460 males and females (aged between 0–14 years) participating in 2022, swimming was ranked the number one participation sport ahead of soccer for boys (703,703) and dancing for girls (391,345; Australian Sports Commission, 2023). Such sport participation data is collected from organised sports conducted outside of school hours and does not include non-organised activity such as casual play with friends (Australian Sports Commission, 2023). Given the Australian culture and the fact that swimming is considered a leisure activity, which does not need to be organised, nor requires formal clubs and associations for participation, it can be expected that swimming registers consistently high participation rates (Eime et al., 2020). Swimming Australia (SAL) has a structural pathway connecting initial participation to respective competition levels for junior to senior members. Swimming New South Wales (SNSW), a state

affiliate of SAL, implement participation and competition structures throughout NSW and the Australian Capital Territory (ACT), with a vested interest in promoting participation and competitive swimming at various representative levels (for example, club, district, region, state and national). As an organisation, SNSW indicated their concerns of child and adolescent dropout from a participation and competitive perspective. SNSW was interested in exploring what factors may be leading to disengagement. SNSW also indicated interest in examining approaches to help sustain long-term swimmer participation. Consequently, a research collaboration with The University of Sydney was initiated, with research investigation and findings intentionally targeted toward informing SNSW and broader SAL practice. Therefore, the thesis is orientated toward examining an applied context problem, albeit conducted with a broad theoretical lens and with evolving interest toward examination of the coaching context (environment) and its impact on swimmer participation.

Given thesis intentions to directly inform and achieve impact at a state level in swimming, factors (whether individual, social or ecological) identified as detrimentally affecting dropout would likely be important to target. Considered as architects at the epicentre of childhood and adolescent sport, coaches design and implement learning as well as training activities (Lyle, 2005) to facilitate inter-individual social interactions (coach–participant, peer–peer; Temple & Crane, 2016). Scaffolding engagement, coaches provide ongoing technical, tactical, and instructional feedback to support athletic learning and development. Further, coaches frequently provide social support and encouragement across activity sessions (micro-time periods) and training/competition periods (meso- and macro-cycles; Fraser-Thomas et al., 2008; Rottensteiner et al., 2013). Consequently, the social exchanges and relations of coaches and swimmers were examined, including the structure and nature of their practice/training environments – operating within a wider sport system as centrally important (although not exclusive) to CASD.

1.2.1. Child and adolescent sport dropout

According to Alfermann (2014), CASD has been challenging to define due to behavioural intricacies and the application of synonymous interchangeable terms previously used to describe either short-term temporary and/or permanent behaviour cessation (for example, ‘attrition’, ‘sport discontinuation’, ‘disengagement’ or ‘drop-off’; Butcher et al., 2002; Fraser-Thomas et al., 2016). Generally accepted and adopted for the purpose of the thesis, ‘dropout’ describes participants who have discontinued from a sport across a given assessment time period, or those who have not re-registered to participate over one or more successive seasons or annual periods (Balish et al., 2014; Crane & Temple, 2015). This definition accepts dropout may not refer to permanent withdrawal from sport(s) activities altogether (Butcher et al., 2002; Fraser-Thomas & Côté, 2016), acknowledging a potential return at a later age or stage (Lindner et al., 1991), for example, participants could be sampling different sports (Eime et al., 2015). Such differentiation is important given the likely multiple psychological, social, and environmental factors, and processes involved in dropout, temporary drop-off or transition to alternative (non-)sporting activities.

Similar to definitions, measures of CASD have varied significantly, with the majority assessing participant non-registration over one or more successive seasons or annual periods (Balish et al., 2014; Crane & Temple, 2015). In Chapter 2, a mixed-methods (empirical qualitative and quantitative research) systematic literature review from four decades (1980–2021), residing within five databases was conducted. The systematic review investigated literature specific to CASD research designs, definitions, and measures, providing an opportunity to corroborate and critically analyse issues impacting CASD. Sixty-nine studies met the inclusion criteria and examined single or multi-sport child and adolescent sport contexts worldwide, at different participation levels, although predominantly local club level. These studies used various CASD definitions and measurements with dropout assessed descriptively; predominantly adopted

psychological-based theoretical frameworks; and focused on the influence of psychological-based factors. Table 1.1, below, summarises existing dropout definitions and measures comprised during the systematic review.

Table 1.1 Definitions and measures applied within identified child and adolescent dropout studies

Author(s)	Dropout definition	Dropout measures
Barnett et al. (1992)	Any player who, by choice, was not playing baseball (in the same league) during the second assessment period (one year after baseline). Players who were still playing in other teams/leagues were not considered dropouts.	Frequencies and percentages after one year.
Burton & Martens (1986)	Any participant who had competed in wrestling the previous year and had voluntarily dropped out, even though still eligible to compete.	Percentage after one year.
Burton et al. (2011)	Defined by re-enrolment in the same club for the following year.	Percentage after one year.
Butcher et al. (2002)	Dropout types: sampler – withdrawal after one year or less in a sport; low-level participant – withdrawal after more than one year with participation at a low frequency and duration; high-level participant – withdrawal after more than one year with participation, high frequency and duration; elite – withdrawal after participation at provincial or national representation level.	Percentage based on dropout types.
Calvo et al. (2010)	Defined by the identification of athletes through club registration records, who discontinued their participation one year after baseline measures.	Percentage after one year.
Cervello et al. (2007)*	Determined when participants stopped attending training sessions and competitions during the season. Dropout was not considered due to reasons out of their control (for example, injuries, family had moved).	Total numbers after one sport season.
Deelen et al. (2018)	Defined as participants who did not renew their club membership after one year.	Percentage after one year.
Delorme & Raspaud (2009)	Participants who were registered for the previous year but did not renew their memberships for current season.	Frequencies and percentages after one year.
Delorme et al. (2010)	Determined by players who were registered with a club at baseline and had not re-registered with a club for the following season (one year later).	Frequencies and percentages after one year.
Delorme et al. (2010)	Determined by players who were registered with a club at baseline and had not re-registered with a club for the following season (one year later).	Frequencies and percentages after one year.
Delorme et al. (2011)	Determined by players who were registered with a club at baseline and had not re-registered with a club for the following season (one year later).	Frequencies and percentages after one year.
DuRant et al. (1991)	Defined by athletes who had dropped out of at least one team after a year.	Percentage after one year.

Author(s)	Dropout definition	Dropout measures
Eime et al. (2015) [^]	Determined by discontinued participation in a modified program of the same sport during a four-year period of measurement. Participants did not transition to a club sport competition in the same sport.	Measured as frequencies and percentages after four years.
Feltz & Petlichkoff (1983)	Any athlete who had competed on an interscholastic team in the last two years, was still eligible to compete, but no longer did so at the time of data collection.	Percentage after two years.
Figueiredo et al. (2009) ⁺	Determined by players who discontinued soccer after two years from baseline. It was unknown if some moved to other clubs.	Frequencies and percentages after two years.
Guillet et al. (2002)	Determined by athletes who had registered at baseline but had not re-registered for the following season (after one year).	Percentage after one year.
Hardie Murphy et al. (2017) [^]	From baseline measures (timepoint one), where participants then recalled if they dropped out of a sport in the previous five years.	Percentage at the end of a five-year period.
Hellandsig (1998)	Defined by sport discontinuation one year after initial baseline measurement.	Percentage after one year.
Imtiaz et al. (2014) [^]	Athletes who after initial registration either failed to register again or only registered once in the next six years.	Percentage after one or six years.
Jakobsson et al. (2012) [^]	Defined as those who participated in sport at age 13 but had discontinued the same sport at age 16.	Percentage after six years.
Klint & Weiss (1986)*	Dropouts were labelled ‘gymnastic leavers’ (.e.those who were previously involved in the competitive gymnastics program but had not returned to the program in the current year). Included sport transfers (.e.continued athletic involvement in other sports) and dropouts (.e.no sport continuation).	Total number of ‘gymnastic leavers’ after one year.
Larson et al. (2019)	Determined if a participant was not swimming with a different club or team after one season.	Percentage after one year.
LeBars et al. (2009) ⁺	Dropouts were those who gave up within their first two years in their training centres	Total number of dropouts within two years.
Lemez et al. (2014) ⁺	Defined as those athletes who did not participate in ice-hockey for two or more consecutive years.	Percentage over five years of player registration data.
Manz et al. (2016) [^]	Participation in organised sport at baseline, but not six years later.	Percentage after six years.

Author(s)	Dropout definition	Dropout measures
Moulds et al. (2020) ⁺	Registration at baseline, or registration at some stage, with an affiliated club, but then with two or more consecutive subsequent years of no re-registration.	Frequencies and percentages, tracked each year for a period of ten years.
Monteiro et al. (2018)	Dropout is considered by referring to the definition proposed by Cervelló (2002), where individuals finalise their explicit commitment within a specific sport practice.	Total number of dropouts at the end of each year, measured for two years.
Nache et al. (2005)	Defined by those participants who did not appear twice successively on the game forms and/or did not return for the rest of the season. Reasons such as: illness, injury, trips, possible sport sanctions or a decision of the training staff were not included the dropout definition.	Percentage at the end of one season.
Ommundsen & Vaglum (2007)	Measured after 16 months from baseline, based on the player's negative answers to all the following questions during an interview. 'Are you still a member of the club?', 'Are you still playing matches?', 'Are you still training?'. The player also had to give a 'yes' answer when finally asked if he had ceased playing organised soccer.	Percentage over a period of 16 months.
Patriksson (1988)	Determined when an individual was no longer active in a sports club.	Percentage after six and 18 months.
Pion et al. (2015) ⁺	Dropping out from competition three, four and five years after the baseline measurement.	Total number of dropouts at the end of each year, measured after three, four and five years
Prins et al. (2013)	Defined by adolescents who participated in sports at baseline but had stopped at follow-up (one year later).	Percentage after one year.
Robinson & Carron (1982)*	Defined by athletes who quit a high school football team of their own volition after preseason practices began.	Total number of dropouts at the end of one season.
Rottensteiner et al. (2013)	Referred to an athlete who had competed in football, ice hockey or basketball during the previous year and had voluntarily or mandatory (for example, injuries) terminated their participation in youth sport.	Percentage and frequency after various timepoints (.e.pre-season, start of season, end of season, off-season).
Rottensteiner et al. (2015)	Defined by athletes who at baseline participated in football, ice hockey, or basketball as determined by playing licenses but had withdrawn within the past year.	Percentage at the end of one year.
Ryska et al. (2002)	Defined by athletes who withdraw from competitive gymnastics after one year of initial registration and also remained inactive in any sport for a two year-period.	Total number of dropouts after a two-year period.

Author(s)	Dropout definition	Dropout measures
Sabo & Veliz (2016)	Participants were provided with a series of questions, relating to participation for each sport among 8th – 12th graders across all survey years. Dropout rates were then calculated by dividing the participation rate of 12th graders by 8th graders.	Dropout rates calculated: 12th grade retention rated/8th grade retention rate, and converted to percentage, .e.(1 – retention rate) * 100 = (attrition rate as a percentage)
Sarrazin et al. (2002) ⁺	Defined as the non-re-registration of an athlete for the sport of handball (21 months after initial registration at the beginning of a season), for any reason.	Total number of dropouts and percentages after a 21-month period.
Soares et al. (2020) ⁺	Defined by players who discontinued (abandoned) structured training and competitive basketball two years after initial baseline measurement.	Total number of dropouts after a two-year period.

Table notes: Studies were removed if a dropout definition ($n = 17$) or dropout measures ($n = 12$) were not accurately reported within the published study. ⁺ = Study reported dropout as absent participation for two consecutive years (seasons). [^] = Study examined dropout across an extended time period of 3–6 years. ^{*} = Study reported dropout as raw frequencies after one year.

1.3. Theoretical lens informing the thesis

A preliminary review of sport dropout literature found that two review papers (Balish et al., 2014; Crane & Temple, 2015) had previously examined the influence of individual psychological and social-ecological factors to CASD. Within these reviews, individual studies had predominantly examined personal level characteristics (that is, psychological and physical attributes), potentially leading to limited explanatory accounts of CASD. Thus, as the researchers recommended, the application of more comprehensive explanatory frameworks could help better understand how and when individual, social and contextual factors could intersect to affect dropout behavioural decisions (Balish et al., 2014; Crane & Temple, 2015). Accordingly, applying a theoretical lens which could consider and accommodate for such complexity was deemed necessary.

The application of a social-ecological theoretical lens is valuable for helping conceptualise how a potential milieu of individual, social and environmental factors, and their interactions over time (processes), may associate and help account for behaviours (dropout within sporting contexts) and subsequent longer-term developmental outcomes (for example, health indices). Hence, Bronfenbrenner's ecological systems theory (1979) and the revised Process-Person-Context-Time (PPCT; Bronfenbrenner & Morris, 1998; 2006) model were evaluated and identified as an appropriate background lens used in the thesis.

1.3.1. Bronfenbrenner's Ecological Systems Theory

Inspired by Lewin's (1936) distinguished theory of behaviour, Bronfenbrenner's (1979) original framework for an ecology of human development focuses on the behaviours of individuals within social and physical contexts. Bronfenbrenner's ecological theory holistically considers the dynamic nature of relationships, with the individual interacting within an environment considered as a series of nested structures. He argues that complex individual

behaviours (for example, child and adolescent sport development) can be understood by examining four surrounding systems: the micro-, meso-, exo- and macrosystems (Bronfenbrenner, 1985).

Bronfenbrenner then proposes how positive (functional), or negative (dysfunctional) developmental outcomes occur via frequent and sustained social exchanges within microsystem contexts. While engaging in developmental activities (for example, sport participation), Bronfenbrenner identifies the importance of relational social exchanges between individuals (for example, sport participants and coaches), with microsystems comprised of interactional relationships (for example, parent/athlete, coach/athlete) within environments where the individual is operating/behaving. Over time, continuing interactions are proposed to bi-directionally impact the psychosocially functioning individual determining potential directional development (positive or negative). As such, Bronfenbrenner's theory identifies how coach instructional and communication strategies, nonverbal behaviours, values and associated coaching microclimate features, all convey information and meaning to individual participants. Participants, and others (for example, parents, siblings), experiencing the microsystem then (sub)consciously interpret and evaluate such information. These subsequently affect psychological perceptions (for example, competency, belonging, personal valuing), behavioural decisions (for example, continued participation) and longer-term developmental directions.

The mesosystem represents the second layer of potential interactions, which may potentially affect the microsystem (for example, parent/athlete relations in other contexts may affect school/club sport participation) and the developing individual. Meanwhile, the exosystem refers to relationships and processes between factors (for example, governing body policies, sporting culture and size of the local community) in which individuals are not active

participants (for example, facilities and organisational policies). In the exosystem, other people, places and events may influence the individual development process, even if the athlete does not directly interact with those elements. For example, considering parental employment, the athlete is not part of the direct relationship between an employer and the parent; however, the athlete benefits if the parent can provide consistent financial support. The outermost or distal layer (macrosystem) refers to the overarching sociocultural patterns and belief systems of societies; the broader national socioeconomic; cultural and geographical conditions (for example, national sporting policies; societal views on sport; and climatic location), potentially affecting individual behaviour. For a diagrammatic summary see Figure 1.1.

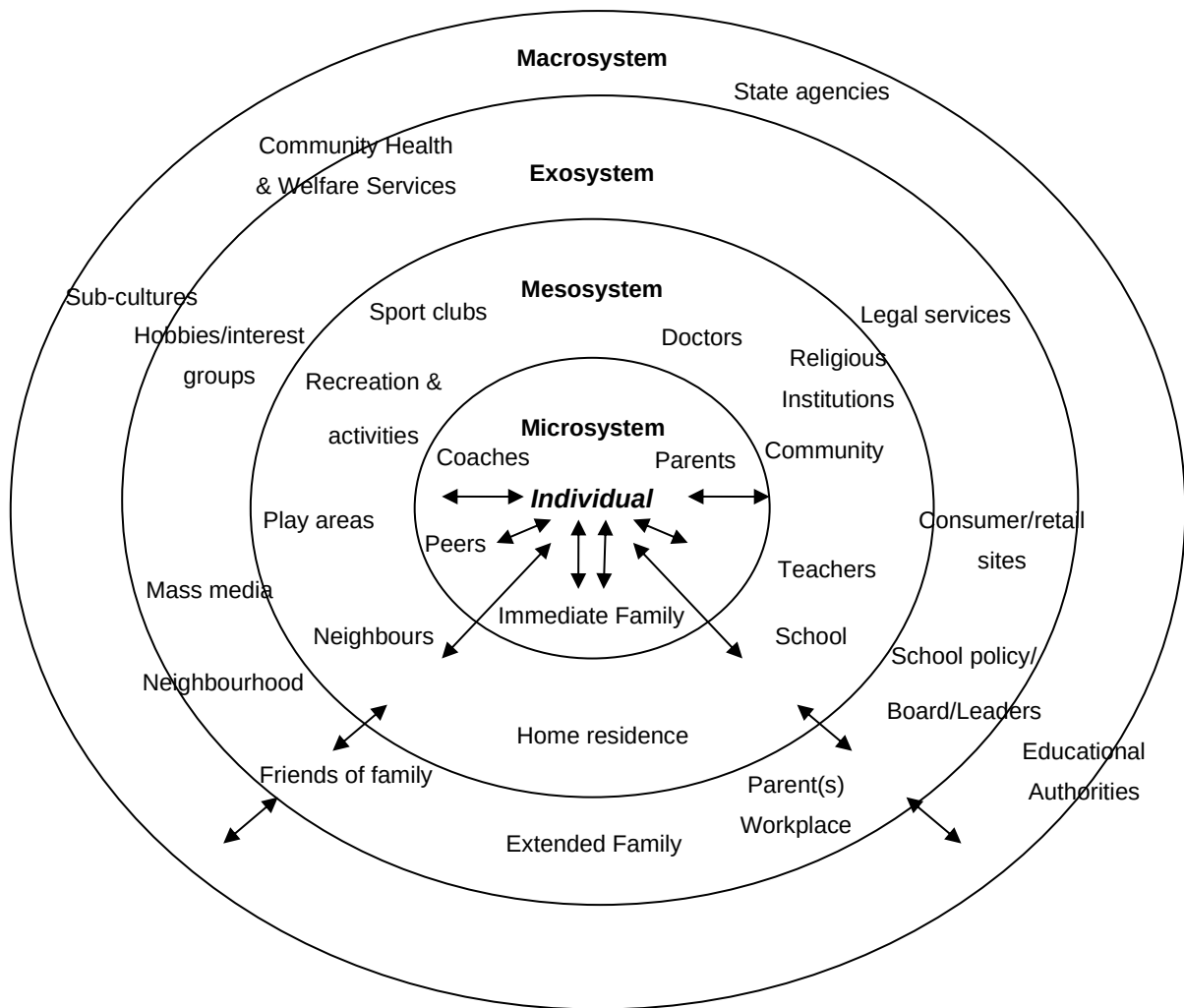


Figure 1.1 Bronfenbrenner's Ecological Systems Theory Applied to CASD

1.3.2. Process-Person-Context-Time (PPCT) model

Bronfenbrenner's (1979) initial ecological theory focused substantially on the role of social contexts (four surrounding micro-, meso-, exo- and macrosystems) in shaping individual development. Consequently, Bronfenbrenner and Morris (2005) recognised the need to evolve the theory by placing additional emphasis on proximal processes to show how interactions between process, person, context, and time could further explain the development of individuals (Tudge & Rosa, 2013). Accordingly, Bronfenbrenner and Morris (2005) set out to

further investigate individual characteristics, the settings in which individuals interact with others and spend time, and the proximal process which serve as the key ‘engines of development’ (Bronfenbrenner & Morris, 2005, p. 822). As such, the PPCT model proposes how examining characteristics at different levels of the ecosystems will provide a more comprehensive understanding of the multidimensional factors which can facilitate, hinder, or impede behaviour (including the underpinning mechanisms) at a given time point.

Within the PPCT, *Process* refers to the direct and reciprocal nature of interactions (verbal, nonverbal) over time, between the bio-psycho-socially functioning individual with others in microsystems and across tiers of the ecological system (Bronfenbrenner & Morris, 2005). *Person* refers to bio-psycho-social individual characteristics (for example, sex, age or intrinsic motivation), which can also be independently influential to development, or in this case, sport dropout behaviour. *Context* refers to the stable or fluctuating characteristics of an individual’s ecology where the individual spends a substantial proportion of time. Characteristics may relate to, for example, parent social support at home (microsystem); distance to a local sport club (mesosystem); or local sporting facility provision with the capability to access (exosystem and macrosystem characteristics; Bronfenbrenner & Morris, 2005). The final key component of the PPCT model is *Time*, which can be considered in *micro-* (for example, events within training or competition), *meso-* (for example, frequency/consistency of events over weeks or months) and *macro-* (for example, changing interactions over years of sporting involvement); with time dimensions (and events within them) also affecting subsequent behaviour. For a diagrammatic summary of the PPCT model see Figure 1.2.

The PPCT model accepts that person (for example, sex, age, experience), complex processes (for example, coach athlete interactions) or contextual dynamics (for example, parent, peer and sibling support), with influencing processes, can remain similar or change over time. By

applying the PPCT model in Chapters 2–5, the thesis examines and identifies variables which – in a given context – associate with CASD behaviour.

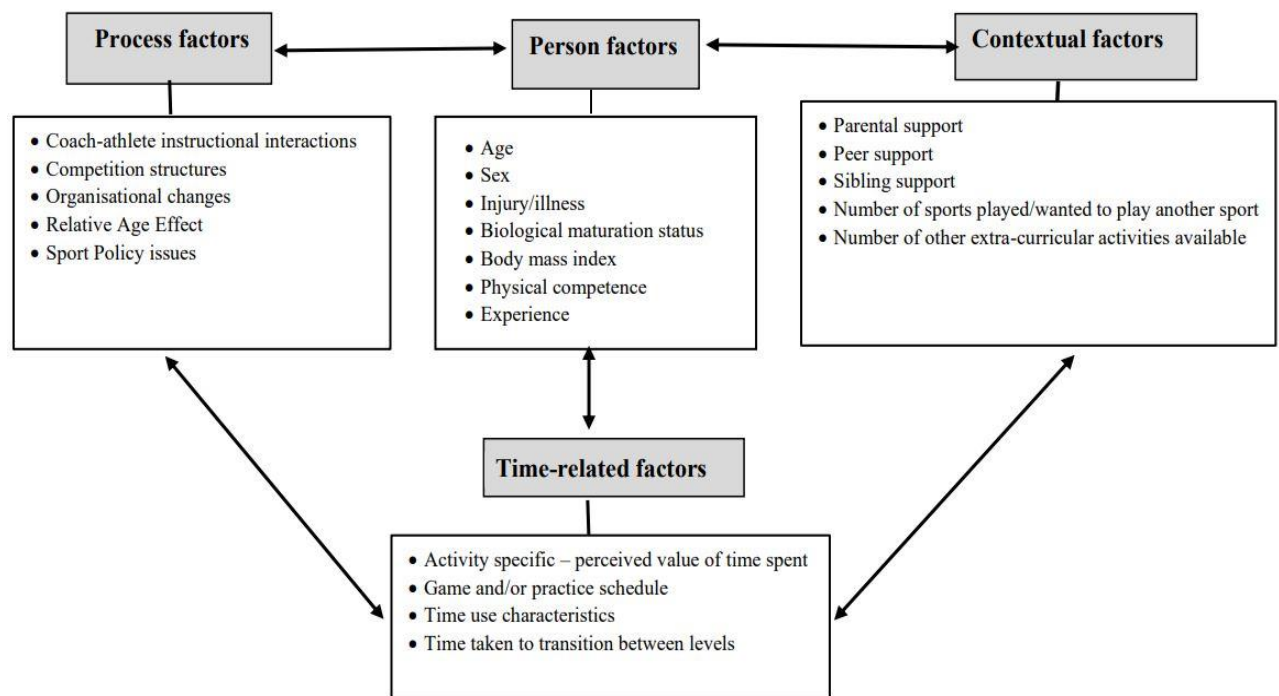


Figure 1.2 A visual summary of the PPCT model adapted to CASD

1.3.3. Achievement-Goal Theory

Achievement-Goal Theory (AGT) is one of the most widely used frameworks in motivational psychology. Originating from educational settings in the 1980s, researchers demonstrated that goal orientation was seen to have either adaptive or maladaptive outcomes, which can depend on perceived ability of the individual (Ames, 1984, 1992; Dweck, 1986; Maehr & Nicholls, 1980). For example, Dweck (1986) identifies two types of achievement goals: learning and performance goals. In the former, individuals were more concerned with increasing their competence, whereas the latter were more concerned with gaining favourable judgments from significant others about their competence. Furthermore, Dweck discovered that students who

regarded intelligence as malleable were more inclined to have learning goals, whereas students who considered intelligence as a fixed quality were more likely to have performance goals.

A significant element of Nicholls' (1984, 1989) approach with reference to consequent research in sport settings, was the endorsement of two dispositional goal orientations that individuals tend to adopt, namely, task and/or ego involved goals in achievement situations. Later research (Duda 1989; Duda & Nicholls, 1992) found that task goal orientation was associated with the belief that success stems from working hard, learning and collaboration with others, leading to personal growth and mastery. Conversely, an ego goal orientation was associated with social status, superiority and wealth, alongside the view that success comes from outperforming others. Nicholls proposed that individuals high in task orientation would have a positive belief and value structure about sport, including the causes of success in sport, its role and purpose in society, and the moral behaviours associated with such pursuits (Duda, 1992; 2001)

AGT suggests that when sporting environments are created which place emphasis on individual effort and improvement (Newton et al., 2000), the climate is more task involving. In contrast, Nicholls suggests that similar responses could also be anticipated from an individual in a state of ego orientation. However, due to an external source of control, implied predominately in ego involvement, perceptions of ability are often elusive and short lived. Thus, when perceived ability is low or ego orientated athletes are uncertain of normative success, negative and maladaptive responses can occur (Newton et al., 2000) and dysfunctional behaviours can be more widespread (for example, effort withdrawal, low persistence, avoidance of moderately challenging tasks; Harwood et al., 2015).

1.3.4. Self-Determination Theory

Proposed by Deci and Ryan (1985), Self-Determination Theory (SDT) is a macro-level theory of human motivation, developed to explain the dynamics of human need, motivation, and well-being within a social context. SDT considers the degree to which individuals can self-initiate behaviours (self-determined) and refers to the types and quality of motivation, rather than the volume. According to SDT, to change behaviours and remain motivated to maintain behaviour change, individuals need to experience three inherent psychological needs (for example, competence, autonomy and relatedness), either from interaction with another, an exchange, or from a program (for example, training program). If the need for competence, autonomy and relatedness is satisfied, intrinsic motivation is possible. Tasks are intrinsically motivating if people engage for their own sake rather than to receive some external reward or avoid external punishment (Deci & Ryan, 1985).

Deci and Ryan (1985) argue that sport is a platform where intrinsic motivation was most relevant as people engage in sports to play, have fun and feel connected. Therefore, if the sporting environment promotes a sense of autonomy, competence and relatedness, participants will report more intrinsic and higher quality forms of motivation (Amorose & Anderson-Butcher, 2007). Conversely, undertaking a behaviour for extrinsic reasons such as reward, recognition, avoidance of consequences and social evaluation, are classed as non-sustaining forms of motivation. SDT holds that if the sporting environment impacts on athlete motivation through the prevention of autonomy, competence and relatedness athletes tended to report more controlled and lower-quality forms of motivation (Pelletier et al., 2001).

1.3.5. Empowering/Disempowering framework

Unlike the one-dimensional motivational frameworks mentioned above (AGT and SDT), Duda's (2013) integrated Empowering and Disempowering framework provides a broader,

multifactorial perspective of the coach-created environment. Each AGT and SDT climate dimension is assumed to hold distinct implications for the satisfaction (or dissatisfaction) of athletes' basic psychological needs. Thus, a greater understanding of the potential impact of the coach-created motivational climate evolves when AGT and SDT environmental factors are considered together, rather than in isolation (Appleton et al., 2016).

An emerging body of research emphasises the importance of coach-created motivational climates to sustained childhood and adolescence sport participation (Appleton et al., 2016). Put another way, what coaches do, and how they do it from experience and knowledge shapes an individual's interpretation (for example, perceptions and meaning) and subsequent behaviour (for example, engagement/disengagement). An empowering motivational climate entails a combination of task-involving, autonomy-supportive and socially supportive environments. Task-involving refers to coaches implementing, encouraging and reinforcing values related to personal task effort; a work ethic toward personal skill improvement and self-betterment; as well as individual contribution toward collective (social or team) tasks. Autonomy-supportive coaching is evident when the coach takes the participants' perspective into account, encourages choice and decision-making during problem solving or learning, and recognises participant emotions or feelings (Mageau & Vallerand, 2003). Socially supportive coaching refers to a genuine interest in athlete welfare where the coach respects their athletes and does not demand respect in return (Reinboth & Duda, 2004).

In comparison, disempowering climates encompass features of ego-involving (for example, result-focused) and controlling (for example, authoritarian) instruction, social interaction patterns, and behaviours (Duda, 2013; Duda & Appleton, 2016). Ego-involving coaching often refers to differential treatment (for example, favouritism) of athletes based on (perceived) capability or present competence differences. Controlling coach behaviours can include

pressurising, coercing, intimidation and threatening behaviours during coach–athlete interactions. Such coaches may more likely use extrinsic rewards/reinforcements to manipulate participant behaviour (Bartholomew et al., 2010).

1.3.6. Integration of ecological systems and the Empowering/Disempowering framework

Bronfenbrenner’s ecological systems theory is applied throughout the thesis as a lens to understand how functional and dysfunctional behaviour occurs in the context of child and adolescent sport. Bronfenbrenner (1979) highlights the critical features of a positive (functional) relationship in overcoming the potential damage that can be caused by a miserable and ineffective (dysfunctional) environment. Accordingly, a constructive environment may not be adequate to foster emotionally positive child and adolescent development, without a warm and caring relationship. Bronfenbrenner (1979) suggests that once a relationship has been established between the developing individual and another (for example, coach or peer), a dyad is apparent. The dyadic relationship is a fundamental element in the microsystem because it helps individuals to develop broader interpersonal relationships with peers and significant others (Shelton, 2019).

The PPCT model is utilised to help guide the examination of study contexts and identify microsystem factors (dyadic relationships) that may be valuable to examine from a methodological standpoint. It also guides the understanding and explanation of data, and how influential factors are affecting CASD. Because coaches are critical (coach–athlete dyad) in child and adolescent sport microsystems, they are often responsible for implementing the structure and content of learning and training activities, over micro–macro time periods (Fraser-Thomas et al., 2008; Rottensteiner et al., 2013). Further, given their responsibility, coaches can also substantially determine the pattern and nature of social interactions and experiences (social agents).

The empowering/disempowering framework (Duda, 2013) provides sound psychometric methods to assess the psychological characteristics of child and adolescent sporting environments and the impact of the coach on such environments. These psychometric questionnaires are used throughout the thesis to evaluate the presence of psychological characteristics which may positively or negatively affect the individual from a cognitive, emotional and/or behavioural standpoint.

1.4. Thesis aims

The overall thesis aim was to examine whether CASD and retention in the context of Australian swimming could be better understood, with the identification of salient factors associated with dropout. Based on findings, a subsequent aim was to identify and implement an appropriate strategy to help improve swimmer retention. To achieve these aims, four independent studies were conducted, with sequential but inter-connected, research objectives:

- 1a. To evaluate existing dropout literature from a bio-ecological systems theory perspective and qualitatively review how prior literature has been theoretically framed (Chapter 2).
- 1b. Evaluate how dropout has previously been defined and measured and identify all factors previously investigated and identified as influential to CASD (Chapter 2).
2. To examine long-term childhood and adolescent swimming participation and dropout rates and determine if multiple factors (sex, age group, relative age, competition level, socio-demographics) were associated with dropout over time in the context of Australian swimming (Chapter 3).

3. To identify and examine whether coach-created motivational climates in the context of child and adolescent swimming were associated with participation status (current or former swimmers) in localised NSW club environments (Chapter 4).
4. Based on findings reported in Chapters 2–4, develop and evaluate the impact of a short course coach education intervention targeted at improving the coach-created motivational climate in a child and adolescent swimming context (Chapter 5).

1.5. Thesis overview

In accordance with the stipulated aims and study objectives outlined, a summary of chapter content is provided below.

Chapter 2: Child and adolescent sport dropout according to the Process-Person-Context-Time model: A systematic review

Chapter 2 is a systematic review of CASD literature. This analysis included the application of a multilevel theoretical framework to systematically review how sport dropout literature has been previously theoretically framed, defined and measured; as well as mapping all influential factors previously associated with dropout. To help improve future study methodological quality, the ‘Child and Adolescent Sport Dropout – Study Checklist (CASD-SC)’ is also presented within this chapter. This chapter was published in the *International Review of Sport and Exercise Psychology* entitled: ‘Youth sport dropout according to the Process-Person-Context-Time model: A systematic review’.

Chapter 3: Sink or Swim? A survival analysis of sport dropout in Australian child and adolescent swimmers

Chapter 3 is an original retrospective investigation examining over 17,000 male and female swimmers (10–15 years of age) in Australia. The study uniquely utilised Kaplan-Meier survival analyses with a follow-up Cox regression to assess factors impacting dropout. To the authors’

knowledge, such an approach has been utilised in the sport science literature only once before, examining youth female gymnasts (see Pion et al., 2015). Chapter 3 also investigates multiple variables (individual, social, environmental) affecting swimming dropout. Annual early age and new registrations were found to effectively mask the presence of high dropout rates suggesting a protective *topping-up effect* when actual dropout might be higher and reflecting possible concerns. This chapter was published in the *Scandinavian Journal of Medicine and Science in Sports* entitled: ‘Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers’.

Chapter 4: Coach motivational climate ratings differentiate between dropout and continuation in Australian child and adolescent swimming

Chapter 4 is an original retrospective cohort study, expanding and developing on findings from the preceding chapters. Data were collected from continuing and former child and adolescent swimmers by constructing and administering questionnaires explicitly examining socio-demographic, participation history and coach motivational climate factors associated with dropout versus continuation. The analysis included a combination of *t*-tests, odds ratios and MANOVA analyses. Cluster analyses identified three cluster types of the coach motivational climate with dropouts and continuers more likely to cluster into a disempowering and empowering coaching profile, respectively. This chapter was published in the *International Journal of Sports Science & Coaching* entitled: ‘Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming’.

Chapter 5: The effect of a pilot swimming coach educational intervention on motivational climate evaluations

Chapter 5 presents a short course coach education intervention program that was designed and implemented with development and advanced level swimming coaches in Australia. Adopting an integrated ecological systems theory and empowering/disempowering approach, the

intervention was informed by empirical literature and relevant stakeholders. It was designed to enhance coach knowledge and awareness regarding coaching climates and their impact on child and adolescent swimmers, with the overall purpose of swimming retention. The intervention was evaluated using a mixed-method, quasi experimental within-group design.

Chapter 6: Discussion and conclusion

Chapter 6 summarises the key findings presented in Chapters 2–5. In reference to the thesis aims, implications of the findings for various stakeholders are discussed, potential strengths and limitations are considered, future research directions are outlined, and final conclusions presented.

1.6. Thesis originality and significance

There are several original features presented within the thesis. First, the integration of multiple, complementing theoretical lenses provides a broader understanding of how swimming participation behaviours can be influenced by interrelated processes and characteristics (bio-psycho-social-ecological), over time. Such an approach makes theoretical contributions to the existing literature to encompass a multifaceted view of sport dropout and participation. The thesis contributes knowledge of how to understand and measure dropout behaviour through the design and implementation of the CASD-SC (see Chapter 2) to increase methodological rigour and impact of future CASD studies. The CASD-SC allows future researchers to declare dropout definition/s and measurement; theoretical framework/s; research questions; methodological design/approaches; sampling and context criteria; (non-)examined potentially influential variables; and the data-analytical approaches adopted.

Additionally, the thesis extends existing evidence by examining long-term dropout trends in a popular Australian youth sport context (swimming), which has not been examined before.

While the results confirm the associations between dropout rates and age group, competition level and city proximity, the thesis uniquely identifies correlates of *actual* sport behavioural outcomes (that is, swimming dropout versus continuation), rather than *intentions* to dropout, because the existing literature in child and adolescent swimming has failed to do so. Consequently, the thesis reveals the presence of higher dropout rates due to a protective ‘topping-up effect’, suggesting that new, early age, annual swimmer registrations mask actual dropout rates among Australian children and adolescents and minimise the extent of this problem.

Within each individual study, the thesis has applied a range of methodological approaches, research designs and data analysis techniques. These include a mixed-method systematic literature review, two empirical studies (retrospective cohort studies) and an experimental study (intervention). The thesis combined high-quality research methods (the use of validated and reliable tools) with real-world application (practical intervention). The sequential flow of chapters, each of which builds on the previous chapter’s topic and findings, culminates in an original designed and trialled, theoretically informed coach education intervention program to address CASD.

Overall, the inclusion of each study and their findings should increase knowledge of sustained childhood and adolescence sport participation behaviours, factors influencing short- and long-term health in general, as well as athlete development in local club, state and national programs. Novel findings presented in the thesis emphasise the importance of practitioners (coaches) and their interaction capabilities in determining the psychosocial effect on individuals, and their subsequent behaviour. Specifically, the thesis considers the coach-athlete social-relational skills and the impact of the coach and their creation of various motivational climates, which can influence child and adolescent participation or dropout. To the authors’ knowledge, there

are no existing studies that investigate the influence of coaching climates on the short and long-term participation of Australian swimmers from such a comprehensive standpoint.

1.7. List of publications emanating from the thesis

Journals

Chapter 2 of the thesis is published as: Moulds, K., Gallway, S., Abbott, S. & Cobley, S. (2021). Childhood and adolescence Sport Dropout According to The Process-Person-Context-Time Model: A Systematic Review. *International Review of Sport and Exercise Psychology*, 1–42, <https://doi.org/10.1080/1750984X.2021.2012817>.

Chapter 3 of the thesis is published as: Moulds, K., Abbott, S., Pion, J., Brophy-Williams, C., Heathcote, M. & Cobley, S. (2020). Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers. *Scandinavian Journal of Medicine and Science in Sports*, 30 (11), 2222–2233, <https://doi.org/10.1111/sms>

Chapter 4 of the thesis is published as: Moulds, K., Fraser, K.K., Karp, J., Kapocius, O., Heathcote, M., Appleton, P. R. & Cobley, S. (2023). Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming. *International Journal of Sports Science & Coaching*.
<https://doi.org/10.1177/17479541231174806>

Book chapters

Cobley, S. & Moulds, K. (2023). The Child and Adolescent Sport Dropout Problem: Could Modifying the Coaching Microsystem Climate Help? In *Routledge Handbook of Coaching Children in Sport*. Routledge, (pp. 260–273).

Cobley, S., Abbott, S., Moulds, K., Hogan, C. & Romann, M. (2020). Re-balancing the relative age effect scales: Meta-analytical trends, mechanisms and corrective adjustment procedures as a solution. In J. Dixon, S. Horton, L. Chittle & J. Baker (Eds). *Relative age effects in sport: International perspectives*. United States: Routledge, (pp. 136–153).

Conference presentations

Moulds, K., Galloway, S., Abbott, S. & Cobley, S. (2021). Youth sport dropout according to Bronfenbrenner's Process-Person-Context-Time (PPCT) model. *International Society of Sport Psychology (ISSP) 15th World Congress*, Taipei. 4th October.

Moulds, K., Abbott, S., Pion, J., Brophy-Williams, C., Heathcote, M. & Cobley, S. (2020). Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers. *British Psychological Division of Sport & Exercise Psychology 5 min challenge presentation*.

Moulds, K., Abbott, S., Pion, J., Brophy-Williams, C., Heathcote, M. & Cobley, S. (2020). Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers. *NASPSA Conference*. United States: Human Kinetics, Inc.

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1.8. Chapter 1 references

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Chapter 2: Child and adolescent sport dropout according to Bronfenbrenner's Process-Person-Context-Time model: A systematic review

The following original investigation has been published in the *International Review of Sport and Exercise Psychology* entitled: 'Youth sport dropout according to the Process-Person-Context-Time model: A systematic review.'

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KM, SA, and SC contributed to the conception and methods of the study. KM, SA, and SG assisted with the data collection. KM and SC contributed to the analysis and interpretation of the data. KM drafted the manuscript and all authors critically revised the manuscript.

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Author Contribution Statement

Candidate Name: Kylie Moulds

Degree Title: Doctor of Philosophy

Paper Title: Youth sport dropout according to the Process-Person-Context-Time model: A systematic review

As the research supervisor of the above candidate, I confirm that the above candidate has made the following contributions to the above paper title:

- Conception and design of the research
- Analysis and interpretation of the findings
- Writing the paper and critical appraisal of content
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Date: 30 June 2023

2.1. Abstract

Purpose: Examined from Bio-Ecological System Theory's PPCT model perspective, the aim of this study was to systematically review how child and adolescent dropout literature has been theoretically framed; how dropout has been defined and measured; and map all influential factors previously associated (or not) with dropout across and within youth sport.

Methods: Peer-reviewed literature ($N = 69$ studies) published over four decades (1980–2021) residing within five databases was synthesised using a mixed-methods systematic review approach.

Results: Existing identified studies examined single or multi-sport youth sport contexts worldwide, at different participation levels, although predominantly at the local club level. Prior studies predominantly adopted psychological-based theoretical frameworks; often did not define dropout; assessed dropout descriptively; and focused on the influence of psychological-based factors. From a PPCT perspective, competition structure, relative age (*Process*), sex, competence perception (*Personal*), parental socio-demographics, and conflicts with other activities (*Context*) were frequently identified as influential to dropout across contexts. Although not explicitly utilising the PPCT, sixteen studies examined factors across PPCT levels, with one identifying significant independent influences across the model.

Conclusion: Future research is recommended to apply more encompassing (social-ecological) theoretical frameworks; specify dropout definitions and measures; and apply more advanced analytical methods. To help improve study methodological quality, the 'Child and Adolescent dropout – Study Checklist (CASD-SC)' is presented.

Keywords: youth sport attrition, sport cessation, children, adolescence, process-person-context-time model.

2.2. Introduction

Participation in child and adolescent sporting activities can provide multiple positive physical, psychological and social benefits (Clark et al., 2015, Mountjoy et al., 2011). Positive benefits include a reduced risk of obesity, improved motor skills (Reilly & McDowell, 2003), increased competence, emotional well-being, and a reduced risk of depression (Bailey, 2006; Janssen & LeBlanc, 2010). However, research findings suggest that a substantial proportion of participants will either temporarily or permanently dropout of sport at younger ages (10 and 11 years) and within short timeframes (Armentrout & Kamphoff, 2011); thus, not accruing potential health benefits. On this basis, identifying the potential myriad of factors which independently (or interactively) influence sport behaviour can be considered important to help avoid dropout and maintain health benefitting participation.

Previously, sustained participation has referred to a maintained, or enhanced, degree of involvement in one (or more) sporting activities over more than one year (Weiss et al., 2001). In contrast, sport dropout has been more challenging to define due to behavioural intricacies (Alfermann, 2014). Often synonymous, interchangeable terms have been utilised, including ‘attrition’, ‘sport discontinuation’, ‘disengagement’ or ‘dropoff’, yet still refer to either short-term temporary to permanent behaviour cessation (Moulds et al., 2020). Generally accepted, ‘dropout’ describes participants who have discontinued from a sport across a given assessment time, or those who have not re-registered to participate over one or more successive seasons or annual periods (Balish et al., 2014; Crane & Temple, 2015). The definition accepts that dropout may not refer to permanent withdrawal from sport(s) activities altogether (Butcher et al., 2002; Fraser-Thomas & Côté, 2016), acknowledging a potential return at a later age or stage (Lindner et al., 1991). Such definitions are important, given the likely multiple psychological, social and environmental factors, and processes, involved in dropout and/or temporary drop-off.

Likewise, this justifies the need for a multifactorial, interactionist, theoretical framework which is comprehensive, yet still has flexibility to provide contextualised explanatory understanding. Thus, for present review purposes, Bronfenbrenner's fully developed ecological human development theory (1979; 2005) and accompanying Process-Person-Context-Time (PPCT) model was utilised as the guiding theoretical framework.

Bronfenbrenner (1979) originally proposed that positive (for example, psychological and physical health) or negative development (for example, CASD) occurs via interactions over time between individual characteristics and the nature of individuals within proximal microsystems (for example, home and family; Bronfenbrenner & Morris, 1998). Further, locations, spaces, resources, and their symbols, objects and meaning in meso- and exosystems located outside and beyond the home (for example, education and sport settings) can also indirectly impact youth development (Bronfenbrenner, 2005). By extension, broader cultural values, customs, regulations and policies in distal macrosystems (for example, national sport governing policies) could also be proposed as affecting the provision and nature of activities within tiers of the ecological system (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 2006).

Based on Bronfenbrenner's revised bioecological theory, Bronfenbrenner and Morris (1998; 2006) presented the Process-Person-Context-Time (PPCT) model, which has several benefits for understanding child and adolescent sport behaviour. For instance, previously, sporting dropout has predominantly been examined from arguably conceptually narrow, psychological (within person) theoretical explanations, providing valuable but potentially only partial explanatory understanding of CASD. In contrast, as a social-ecological interactive explanation, the PPCT model identifies how CASD (or participation) can be viewed as the result of an alignment of multiple factors across layers of an individual's eco-system (Bronfenbrenner & Morris, 2006) while still encompassing psychological factors and explanations. The PPCT

model identifies how factors interact across levels of the social-ecological system to affect individual psychological functioning and social interactions. As such, the model proposes how examining characteristics at different levels of the eco-systems will help give a more comprehensive understanding of the factors which facilitate, hinder or impede behaviour (and how they work; *Processes*) at a given time point or which may change over time.

Within the PPCT, *Process* refers to the direct and reciprocal nature of interactions (verbal, nonverbal) over time, between the bio-psycho-socially functioning individual with others in microsystems and across tiers of the ecological system (Bronfenbrenner & Morris, 1998). *Person* refers to bio-psycho-social individual characteristics (sex, age, intrinsic motivation) which can also be independently influential to development, or, in this case, sport dropout behaviour. *Context* refers to the stable or fluctuating characteristics of an individual's ecology where the individual spends a substantial proportion of time. Characteristics may relate to, for example, parent social support at home (microsystem); distance to a local sport club (mesosystem); or local sporting facility provision with the capability to access (exosystem and macrosystem characteristics; Bronfenbrenner & Morris, 1998). Finally, *Time* can be considered in *micro-* (for example, events within training or competition), *meso-* (for example, frequency/consistency of events over weeks or months) and *macro-* (for example, changing interactions over years of sporting involvement); with time dimensions (and events within them) also affecting subsequent behaviour.

Previously, isolated dropout studies and two review papers (Balish et al., 2014; Crane & Temple, 2015) have acknowledged the potential for numerous interrelating social-ecological factors as being influential to CASD. However, most studies have been conducted with a focus on *personal* level characteristics (psychological and physical attributes), potentially leading to limited explanatory accounts. By applying the PPCT model, a broader theoretical lens can be

useful to consider the multiple interconnected individual, social, contextual and process-related factors which may (or may not) impact sport behaviour generally or context specifically. The model accepts how both specific individual attributes (for example, sex, age, intrinsic motivation) or complex social dynamics (for example, parent social/financial support, economic conditions in the community) can be influential to behaviour, and help explain their relative stability, fluctuation or change over time. Thus, in comparison to psychological frameworks that assess the presence or absence of specific attribute characteristics, without acknowledging wider social and environmental interactions or influences, and which are often assumed as being relatively stable (for example, Sport Commitment model – Scanlan et al., 1993; Achievement Goal Theory – Nicholls, 1989), the PPCT model can be considered a more comprehensive meta-framework, highlighting a broader range of possible explanations for behaviour at an individual cohort level across and within sport contexts.

On this basis, the aims of this chapter were to: (1) identify how CASD had previously been theoretically framed, defined and assessed; (2) categorise and map all previously examined (influential) factors associated with CASD according to the PPCT model; (3) identify whether any previous studies had adopted a multifactorial PPCT level assessment; and (4) identify limitations as well as future research directions to improve CASD methodological study quality.

2.3. Methods

To address study aims, peer-reviewed published literature examining CASD over four decades (1980–2021) was synthesised using a mixed-methods systematic review. This review was registered to PROSPERO (Reg No: CRD42020172664) and adhered to reporting guidelines, including the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2009). All data screening procedures were performed using Covidence

systematic review management software (Covidence, 2020).

2.3.1. Data sources

Keyword searches identified articles from the entire contents of five databases: CINAHL, MEDLINE via OVID, PsycINFO (APA PsycNET), SPORTDiscus and Web of Science from 1980 until 1 January 2021. The search process was completed between December 2019 and January 2021. The population keywords were: child*¹ OR youth* OR adolescen*. The context keywords were: sport* OR organi?ed sport* OR recreational sport* OR elite sport* and keywords associated with the construct of interest were: dropout OR dropoff OR attrition OR withdrawal OR cessation OR discontinu*. Following an initial search, the authors (KM, SG, SA) removed duplicates and screened titles/abstracts. All authors then accessed full-text studies for final review eligibility, with no reported uncertainty regarding inclusion or exclusion criteria.

2.3.2. Inclusion and exclusion criteria

Studies were included if they were: (1) empirical (qualitative or quantitative) research published in a peer-reviewed journal between 1980 until January 2021 (inclusive); (2) focused on children and adolescents between mean ages of 5–19 years (inclusive); (3) explicitly stated examination of child and adolescent dropout; and (4) examined sport² contexts. All levels of sport were included (that is, recreational, club, school, regional, state, elite, national, international). Studies could be published in any language, with all but one published in

¹ An asterisk (*) is used for multiple character searching and a question mark (?) is used for single character searching.

² Sport was defined as an activity involving physical exertion, skill and/or hand–eye coordination as the primary focus of the activity, with elements of competition where rules and patterns of behaviour governing the activity exist formally through organisations (May, 2020).

English. The non-English study was published in Portuguese and translated using Google Translate.

The initial search yielded 1116 potential studies with 1047 studies excluded. For a summary of the screening and selection process see Figure 2.1. Studies were excluded for either: (1) being duplicates ($n = 414$); (2) not meeting title and abstract screening ($n = 472$); (3) not being empirical research and/or not published in a peer-reviewed journal ($n = 34$); (4) incorrect study design ($n = 26$); (5) outcome not relevant to review ($n = 26$); (6) not meeting population criteria ($n = 17$); (7) failing to report dropout in a sport context ($n = 48$); and/or (8) not examining a specific sport context ($n = 10$). Following these steps, 69 studies were identified for the final sample.

2.3.3. Data extraction

Aligning with PROSPERO and reporting guidelines, a form was developed to consistently extract key study information. Information extracted included: author(s) names, year of publication, study and journal title; participant characteristics (age, sex, nationality, type of sport and level of competition); study characteristics (study design, number of participants, data collection methods); dropout definition applied; factors associated with (or predictive of) dropout; and key summary findings (see Table 2.1). Identified studies were reviewed with standardised data extraction completed by a reviewing team (a pair from KM, SA and SG). The third team member acted as an independent referral, if there was any discrepancy on information required for extraction.

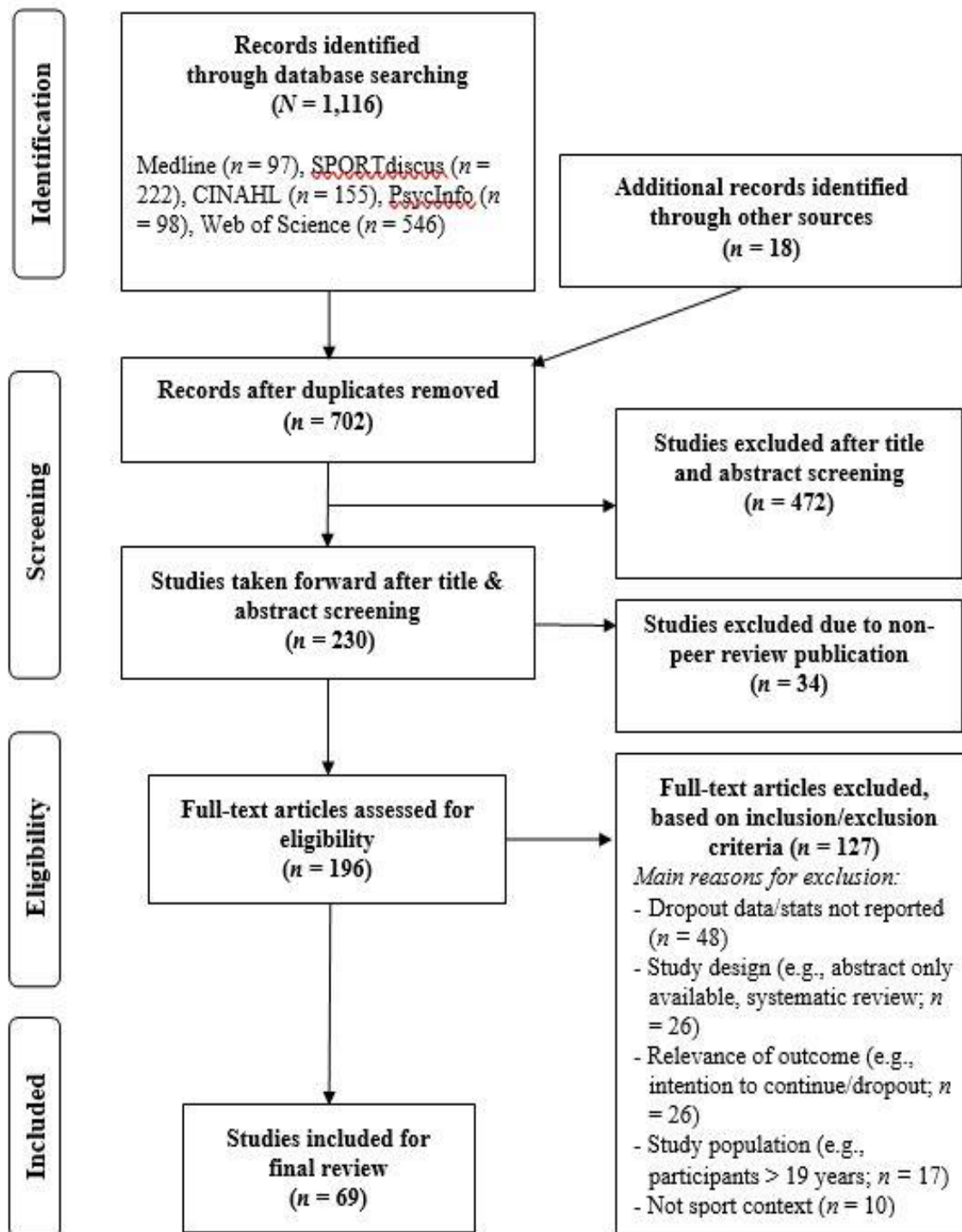


Figure 2.1 Flow diagram for screening and selection of studies according to PRISMA

Independent to standard data extraction, the variables examined within studies considered as potentially influential to CASD were extracted and categorised in alignment with the PPCT model. Variables were classified deductively (by KM and SC) as either process, person, contextual or time-related factors (see Figure 1.2). Deductive categorisation was guided by two aspects of information. First, alignment and interpretation of variables with PPCT framework definitions. Second, interpretation of how variables were applied and their purposes of use within identified studies.

2.3.4. Study quality assessment

The Mixed Methods Appraisal Tool (MMAT version 2018; Hong et al., 2018; Pluye et al., 2011) was applied to appraise study quality. The MMAT allows researchers to critically appraise the methodological quality of qualitative, quantitative, and mixed-methods studies, permitting more complex cross-method systematic reviewing (Pluye et al., 2009). The MMAT is regarded as a valid and reliable tool (Hong et al., 2018; Pace et al., 2012; Souto et al., 2015), with high inter-rater reliability (0.72 – 0.94), and has been successfully applied in prior sport and exercise psychology systematic reviews (for example, Cook et al., 2020; Gröpel & Mesagno, 2019). The MMAT contains two initial screening questions for all types of studies and five methodological criteria for five different types of study designs (qualitative studies³, randomised controlled trials, non-randomised quantitative studies, quantitative descriptive and mixed methods studies) rated on a nominal scale ('yes', 'no', 'can't tell'; Hong et al., 2018).

³ For example, methodological assessment of qualitative studies was assessed by examining the approach taken to: (1) answer the research question; (2) data collection method; (3) study findings derived from the data; (4) interpretation of results; and (5) study coherence. Comparatively, quantitative descriptive studies were methodologically assessed by examining: (1) sampling strategy; (2) representative sample; (3) appropriate measurements; (4) risk of non-response bias; and (5) statistical analysis approach (Hong et al., 2018).

Table 2.1 A summary of study characteristics of identified CASD studies

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Agnew et al. (2015)	Investigate the factors contributing to initial, sustained engagement and disengagement in Australian football.	Author-developed questionnaires and interviews (focus groups, semi-structured)	Mixed methods	<i>N</i> = 352, male (<i>n</i> = 350), female (<i>n</i> = 2), 12–18 years, level of competition = club	Australian rules football	Two critical age ranges (12–14 and 16–18 years) where disengagement with Australian football occurs. The increase in popularity of other sporting codes is a significant barrier to the retention of participants in Australian football.
Barnett et al. (1992)	Examine the impact of a Coach Effectiveness Training program on athlete attrition in little league baseball.	Washington Self-Description Questionnaire (Smoll et al., 1993); Sport Participation Questionnaire (Seefeldt et al., 1989)	Quantitative – non-randomised	<i>N</i> = 202, male (<i>n</i> = 202), <i>M</i> = 11.4 years, level of competition = competitive	Baseball	Findings suggested athlete dropout can be reduced by modifying coaching behaviours.
Boiché & Sarrazin (2009)	Investigate proximal and distal factors of sport dropout among French adolescents.	Sport Motivation Scale (Brière et al., 1995); Value Scale (Fredericks & Eccles, 2002); Intrinsic Motivation Inventory (McAuley et al., 1989); Echelle de Satisfaction de Vie (Blais et al., 1989); Passion Scale (Vallerand et al., 2003); Leadership Scale for Sports (Chelladurai & Saleh, 1978); Perceived Motivational Climate in Sport (Walling et al., 1993); Interpersonal relationship with the coach evaluation (Baard et al., 2004)	Quantitative – descriptive	<i>N</i> = 261, male (<i>n</i> = 175) female (<i>n</i> = 86), <i>M</i> = 14.6 years, level of competition = elite	Soccer, basketball, handball, rugby, skiing, judo, gymnastics, horse riding, cycling, climbing, tennis, table tennis	Findings identified a difference between proximal and distal psychological antecedents of the dropout behaviour.
Brown (1985)	Examine withdrawal from competitive sport in adolescent girls.	Author-developed questionnaire	Quantitative – descriptive	<i>N</i> = 404, female (<i>n</i> = 404), 13–18 years, level of competition = elite	Swimming	Findings identified a combination of influences from different sources can interact to influence the transition out of sport.
Burton & Martens (1986)	Assess dropout via Nicolls' (1984) perceived ability motivational model.	Author-developed questionnaire (dropout inventory)	Quantitative – descriptive	<i>N</i> = 83, 7–17 years, level of competition = club	Wrestling	Engaged athletes had higher perceived ability scores, better win–loss records, more functional attributions, more positive expectancies, and valued wrestling success more than dropouts.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Burton (1992)	Explore the viability of two motivational models and dropout – Nicolls' (1984) perceived ability model and Crandall's expectancy value model (1974).	Dropout inventory (Burton & Martens, 1986)	Quantitative – descriptive	<i>N</i> = 109, male (<i>n</i> = 109), 9–17 years, level of competition = club	Wrestling	Both models accurately discriminated between participants and dropouts, although Crandall's model was slightly more accurate. Wrestling importance, parental dropout constraints, future expectancies, parents' minimal standard and academic importance were influential variables.
Burton et al. (2011)	Test competitive engineering on sport dropout in a youth flag football league.	Author-developed survey (Flag Football Players' Post-season Survey)	Quantitative – descriptive	<i>N</i> = 47, male (<i>n</i> = 47), <i>M</i> = 8.9 years, level of competition = recreational	Flag-football	Findings provide preliminary support for competitive engineering as a promising approach to creating a competitive structure that allows young athletes to have a more positive sport experience.
Butcher et al. (2002)	Provide a description of the intent, context and timing of withdrawal from youth competitive sports and address the sport-specific versus permanent dropout question.	Author-developed questionnaire	Quantitative – descriptive	<i>N</i> = 1387, male (<i>n</i> = 721) female (<i>n</i> = 666), <i>M</i> = 15.1 years, level of competition = competitive	Volleyball, basketball, track and field, badminton, soccer, baseball, softball, ice hockey, football, swimming, gymnastics	Findings identified 'withdrawal' increased with grade level. Most significant reason for withdrawal was 'lack of enjoyment'.
Calvo et al. (2010)	Examine if sport participation is influenced by self-determined motivation and the fulfillment of basic psychological needs.	Sport Motivation Scale (Pelletier et al., 1995); Group Environment Questionnaire (Carron et al., 1985);	Quantitative – descriptive	<i>N</i> = 492, male (<i>n</i> = 492), <i>M</i> = 14.3 years, level of competition = competitive	Soccer	Sport dropout was influenced by higher levels of amotivation, external regulation, and introjected regulation and by lower satisfaction of relatedness and autonomy needs.
Cervello et al. (2007)	Examine dropout behaviour using the achievement goal theory framework.	Perception of Success Questionnaire (Roberts et al., 1998); Perception of Significant Others Sport Success Criteria Questionnaire (Escartú et al., 1999); Perceived Ability (Nicholls et al., 1990)	Quantitative – descriptive	<i>N</i> = 134, male (<i>n</i> = 90) female (<i>n</i> = 44), <i>M</i> = 15.2 years, level of competition = competitive	Track and field, tennis	Variables that directly predicted sport dropout included participant's ego orientation and perception of skill.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Cobley & Till (2017)	Examine participation (dropout) trends according to relative age in youth/early adulthood rugby league.	Retrospective analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 23943, 7–21 years, level of competition = club	Rugby league	Findings highlighted a substantial earlier loss of participation for the relatively younger across youth age groups.
Deelen et al. (2018)	Investigate time-use and physical environment characteristics on adolescent dropout from football and tennis.	Task and Ego Orientation in Sports Questionnaire (Van Yperen & Duda, 1999)	Quantitative – descriptive	<i>N</i> = 2555, male (<i>n</i> = 1556) female (<i>n</i> = 999), <i>M</i> = 16.5 years, level of competition = club	Tennis, soccer	Findings suggested time spent on sports outside the context of the sports club, and time spent on social or voluntary activities at the sports club were positively associated with sustained participation.
Delorme & Raspaud (2009)	Examine the relative age effect and dropout in shooting sports.	Retrospective analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 132538, male (<i>n</i> = 119715) female (<i>n</i> = 12,823), 11–20 years, level of competition = club	Shooting sports	Findings indicated no relative age effect for females. A relative age effect was found for 11–12 and under 11-year categories males. A significant ‘inverse’ relative age effect was found for the 15–17-year age group.
Delorme et al. (2010)	Examine the relative age effect and dropout of youth French female soccer players.	Retrospective analysis of player registration information	Quantitative -non-randomised	<i>N</i> = 57892, 8–17 years, level of competition = club	Soccer	Findings suggested dropout players are underrepresented in Quartile 1 and Quartile 2, but overrepresented in Quartile 3 and Quartile 4.
Delorme et al. (2010)	Examine the relative age effect and dropout among French youth male soccer players.	Retrospective analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 363590, 5–18 years, level of competition = club	Soccer	Findings confirmed the relative age effect can be a factor in dropout from sport.
Delorme et al. (2011)	Investigate the relative age effect and dropout of French youth male basketball players.	Retrospective analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 74645, male (<i>n</i> = 44498) female (<i>n</i> = 30147), 7–17 years, level of competition = club	Basketball	Findings confirm that the relative age effect should be taken into consideration when examining sport dropout.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
DuRant et al. (1991)	Investigate adolescent attrition from school-sports and the intention to participate in organised and non-organised sports in the future.	Author-developed questionnaire and interview	Mixed methods	$N = 1045$, $M = 16.1$ years, level of competition = school	Basketball, baseball, football, track and field, softball, soccer, tennis, golf, cheerleading, rifle	Injury was cited as the most frequent reason for attrition. Other factors included: being cut from the team, needing to get a job, inconvenient game or practice schedule, and needing more time to study.
Eime et al. (2015)	Identify longitudinal trends in modified sport participation (dropout) among children in three popular Australian sports.	Retrospective analysis of player registration information	Quantitative – non-randomised	$N = 209366$, male ($n = 133186$) female ($n = 76150$), 4–12 years, level of competition = club	Not specified	Findings revealed fewer modified sports participants with increasing age, and very few children transitioned to club competitions in the same sport within a four-year period.
Eliasson & Johansson (2020)	Analyse the disengagement process of Swedish adolescent females in Floorball.	Interviews (semi-structured)	Qualitative	$N = 12$, 12–17 years, level of competition = club	Floorball	Reasons for withdrawal included: organisational changes in sport, overall changes in young lives, changes in normative cultural and individual expectations associated with the young athlete role.
Feltz & Petlichkoff (1983)	Examine the relationship between perceived competence and length of sporting involvement in dropouts.	Perceived Competence Scale for Children (Harter, 1982); Participation Motivation (Gill et al., 1983) and Interview (structured)	Mixed methods	$N = 282$, male ($n = 132$) female ($n = 148$), $M = 16.6$ years, level of competition = school	Basketball, volleyball, softball, track and field, football, swimming, baseball, gymnastics, golf, cross-country, tennis, wrestling	Findings indicated that individuals who dropped out had lower perceptions of physical competence.
Figueiredo et al. (2009)	Compare physical capacities, sport-specific skills, and goal orientation of male youth soccer players and participation.	Task and Ego Orientation in Sport Questionnaire (Duda, 1989) and Physical Testing Protocols	Quantitative – descriptive	$N = 159$, male ($n = 159$), 11–14.9 years, level of competition = competitive club	Soccer	Findings highlighted the role of growth and maturity status, functional capacities, and sport-specific skills as factors in attrition, persistence, and development in youth soccer.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Fišer (2007)	Examine characteristics of sports career dropouts in young female athletes and their adaptation to post-sport life.	Interview (structured)	Qualitative	$N = 20$, $M = 17.9$ years, level of competition = elite	Gymnastics, rhythmic gymnastics, swimming, dance	Findings revealed the most common reasons for sports dropout: decline in motivation, injuries, poor relationships with coach or teammates, and dedication to school or education.
Fraser-Thomas et al. (2008a)	Examine youth sport dropout and prolonged engagement from a developmental perspective.	Interview (retrospective)	Qualitative	$N = 50$, male ($n = 8$), female ($n = 42$), $M = 17.6$ years, level of competition = competitive	Swimming	Findings indicated: dropouts were involved in less extra-curricular activities, less unstructured swimming play, less one-on-one coaching, more likely to have parents who were high-level athletes in their youth, more likely to be the youngest in group.
Fraser-Thomas et al. (2008b)	Understand training patterns, and roles of significant others in adolescent participation and dropout.	Interview (semi-structured)	Qualitative	$N = 20$, male ($n = 5$) female ($n = 15$), 13–16 years, level of competition = competitive	Swimming	Findings identified athletes who dropped out reported early peak performances, limited one-on-one coaching, pressure from parents, a lack of swimming peers during adolescence and sibling rivalries.
Fraser-Thomas et al. (2010)	Examine relationships between young athletes 'community size, developmental assets and sport involvement.	Surveys and Questionnaire Developmental Assets Profile (Search Institute, 2005)	Quantitative – descriptive	$N = 181$, male ($n = 55$) female ($n = 126$ females), $M = 15.6$ years, level of competition = competitive	Swimming	Community size was a significant predictor of withdrawal, suggesting community context should be given additional attention in youth sport literature.
Gardner et al. (2017)	Explore whether enjoyment and intentions to continue predicted youth sport dropout behaviour.	Sport Commitment Model (Scanlan et al., 1993); Self-Perception Profile for Children (Harter, 1985); Perceived Parental Support Scale (Van Yperen, 1995), Coach–athlete Relationships Questionnaire (Jowett & Ntoumanis, 2004); Sport Friendship Quality Scale (Weiss & Smith, 1999)	Quantitative – non-randomised	$N = 327$, male ($n = 77$) female ($n = 250$), $M = 13$ years, level of competition = competitive	Not specified	Findings identified enjoyment and intentions to continue as predictors of sport participation/dropout behaviour.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Guillet et al. (2002)	Understand dropout in French female handballers using the social exchange theory.	Sport Commitment Model (Carpenter & Coleman, 1998); Perceived Competence in Life Domains Scale (Losier et al., 1993), Perceived Autonomy Toward Life Domains Scale (Blais, 1990), Feelings of Relatedness Scale (Richer & Vallerand, 1998), Echelle des Comportements Interpersonnels (Pelletier & Otis, 2001)	Quantitative – descriptive	<i>N</i> = 488, female (<i>n</i> = 488), <i>M</i> = 17.1 years, level of competition = competitive	Handball	Findings indicated that when major participation motives were not achieved, the costs of involvement exceed the benefits. Coach and other sport leaders should aim to create a social environment that allows motives for participation.
Guzmán & Kingston (2012)	Use a self-determination model to analyse competitive sport dropout.	Psychological need satisfaction in sport (Guzmán & Luckwu, 2008); Sport Motivation Scale (Brière et al., 1995); Self-determination index (Li & Harmer, 1996)	Quantitative – non-randomised	<i>N</i> = 857, male (<i>n</i> = 857), <i>M</i> = 15.3 years, level of competition = competitive	Athletics, swimming, cycling, sailing, surfing, triathlon, skating, canoeing, artistic gymnastics, climbing, horse riding, karate, taekwondo, table tennis, tennis, fencing, judo, handball, volleyball, rugby, baseball, handball, basketball, football, indoor football, water polo, hockey	Findings indicated an inverse relationship between self-determined motivation and perceived conflict between activities. In addition, other variables (emotional) may play a specific role in predicting intention to continue engagement with sport.
Hardie Murphy et al. (2017)	Evaluate domains of physical activity in youth sport (club and school) as predictors of future/long-term physical activity and dropout.	Self-Administered Physical Activity Checklist (Sallis et al., 1996)	Quantitative – non-randomised	<i>N</i> = 873, male (<i>n</i> = 265) female (<i>n</i> = 608), 10–18 years, level of competition = club	Soccer, Gaelic football, hurling, swimming, rugby, athletics, tennis, basketball, weight training, martial arts, badminton, cross country running, adventure activities, handball, dance, camogie, horse riding, gymnastics, hockey, aerobics, baseball	Findings suggested sports participation in youth to be a predictor of future physical activity. Club sport was a slightly stronger predictor of physical activity than extracurricular sport.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Hassan et al. (2017)	Identify potential dropout reasons and risk factors of school athletes.	Author-developed questionnaire	Quantitative – descriptive	<i>N</i> = 50 male (<i>n</i> = 39) female (<i>n</i> = 11), 13–23 years, level of competition = school	Track and field	Findings identified the influence of the coach and teammates were common factors of dropout.
Hellandsig (1998)	Predict high performance and discontinuation from a range of motivational characteristics.	Sport Orientation Questionnaire (Gill & Deeter, 1988); Sensation Seeking Scale (Madsen et al., 1987); Life Orientation Test (Scheier et al., 1987); Negativism Dominance Scale (McDermott, 1988)	Quantitative – non-randomised	<i>N</i> = 230, male (<i>n</i> = 230) female (<i>n</i> = 122), 15–16 years, level of competition = competitive	Rowing, kayak, race-walking, long-distance running, cycling, swimming, cross-country, taekwondo, orienteering boxing, gymnastics, racket-sports, basketball, soccer, volleyball, handball	Findings indicated competitiveness was an important predictor for high performance. Sport discontinuation in adolescent males was best predicted by reactive and proactive negativism.
Helsen et al. (1998)	Investigate relative age on success and dropout in youth soccer.	Database analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 1745, male (<i>n</i> = 1745), 6–16 years, level of competition = elite	Soccer	Youth born in the early part of the selection year are more likely to be identified and exposed to higher levels of coaching. Players born late in the selection year tended to dropout as early as 12 years of age.
Imtiaz et al. (2014)	Examine the relationship between city size and participation/dropout patterns.	Database analysis of participation and dropout trends	Quantitative – non-randomised	<i>N</i> = 15565, male (<i>n</i> = 15565), 7–14 years, level of competition = club	Ice Hockey	Findings revealed players from larger cities were more likely to dropout, while players from smaller cities were more likely to remain engaged.
Isoard-Gauthier et al. (2016)	Examine the influence of athlete burnout profiles on playing status six years later.	Athlete Burnout Questionnaire (Isoard-Gauthier et al., 2010)	Quantitative – descriptive	<i>N</i> = 248, male (<i>n</i> = 248) female (<i>n</i> = 211), <i>M</i> = 15.44 years, level of competition = elite	Handball	Findings indicated individuals with a ‘higher burnout’ profile at Time 1 were more likely to have discontinued handball six years later.
Jakobsson et al. (2012)	Investigate club sport participation/dropout characteristics from the perspective of Bourdieu’s theoretical framework.	Author-developed questionnaire	Quantitative – non-randomised	<i>N</i> = 289, 13–16 years, level of competition = club	Not specified	Findings revealed young people who possess specific dispositions and certain assets with a preference for sport and a cultural capital sustain participation in club sports.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Jõesaar & Hein (2011)	Examine the differences in psychosocial and motivational variables between persistent and dropout athletes.	Sport Climate (Hagger et al., 2003); Peer Motivational Climate in Youth Sport (Ntoumanis & Vazou, 2005); Basic Psychological Needs in Exercise Scale (Vlachopoulos & Michailidou, 2006); Sport Motivation Scale (Pelletier, 2005)	Quantitative – non-randomised	<i>N</i> = 659, male (<i>n</i> = 429), female (<i>n</i> = 230), <i>M</i> = 12.7 years, level of competition = club	Basketball, volleyball, soccer, swimming, badminton	Findings revealed athletes who dropped out had less: competence, relatedness, autonomy, need satisfaction, less autonomy support from parents and were less intrinsically motivated.
Keathley et al. (2013)	Investigate reasons for sport continuation and withdrawal.	Interviews (semi-structured)	Qualitative	<i>N</i> = 22, male (<i>n</i> = 10) female (<i>n</i> = 12), <i>M</i> = 16 years, level of competition = competitive	Soccer	Findings suggested athletes perceived time demands to be a primary reason for discontinuation. Girls were more likely than boys to leave soccer due to negative coaching experiences.
Kirshnit et al. (1989)	Examine the sport attrition process by considering grade, gender and context.	Experience Sampling Method (Larson & Csikszentmihalyi, 1983)	Qualitative	<i>N</i> = 401, 10–15 years, level of competition = competitive	Not specified	Findings identified youth athletes stopped participating in organised sports when activities were less enjoyable. Males spent more time playing sports than females.
Klint & Weiss (1986)	Examine motives for participating in and discontinuing sport for competitive, recreational and former gymnasts.	Participation Motivation Questionnaire (Gill et al., 1983) and Interviews (structured)	Mixed methods	<i>N</i> = 106, <i>M</i> = 13.4 years, level of competition = recreational and elite	Gymnastics	Findings revealed the most important reasons for leaving gymnastics were having other things to do, injuries, not liking the pressure, not having enough fun and too time consuming.
Lagestad (2019)	Examine differences between adolescents who continue to participate in organised sport, and those who dropout from a longitudinal perspective.	Youth opinion questionnaire (Aspvik et al., 2008) and Physical Testing Protocols	Quantitative – non-randomised	<i>N</i> = 76, male (<i>n</i> = 39) female (<i>n</i> = 37), 14–19 years, level of competition = not specified	Handball, soccer, skiing, athletics, orienteering, gymnastics and martial arts	Findings suggested adolescents who dropped out of sport had a lower cardiorespiratory fitness, lower level of well-being in sport training and competition than adolescents who continue.
Larson et al. (2019)	Examine early specialisation markers to predict burnout and dropout.	Athlete burnout questionnaire (Raedeke & Smith, 2001); Intention (Alvarez et al., 2012)	Quantitative – descriptive	<i>N</i> = 137, male (<i>n</i> = 45) female (<i>n</i> = 92), 12–13 years, level of competition = competitive	Swimming	Findings revealed no evidence was found between early specialisation indicators and increased burnout or dropout.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
LeBars et al. (2009)	Examine participation/dropout variables in young judoka's in the first two years at national training centres.	Significant Others' Goal-Involving Roles in Sport (Le Bars et al., 2006); Perception of Success Questionnaire (Roberts et al, 1998); Physical Self-Perception Profile (Fox & Corbin, 1989)	Quantitative -non-randomised	<i>N</i> = 104, male (<i>n</i> = 64) female (<i>n</i> = 40), <i>M</i> = 17.9 years, level of competition = elite	Judo	Findings revealed dropouts perceived the roles of coaches, parents and peers as less task-involving.
Lemez et al. (2014)	Examine the relationship between relative age, competition levels and dropout rates of male youth ice-hockey players over a five-year period.	Database analysis of player registration information	Quantitative – non-randomised	<i>N</i> = 14325, male (<i>n</i> = 14325), 10–15 years, level of competition = competitive	Ice Hockey	Findings revealed dropout was highest among relatively younger players born in quartiles three and four, dropouts had less movement between competition levels compared to retained players.
MacCosham & Gravelle (2018)	Examine opportunities to explore leisure interests when participating in and after withdrawing from junior level ice-hockey.	Interview (semi-structured)	Qualitative	<i>N</i> = 14, male (<i>n</i> = 14), 16–22 years, level of competition = competitive	Ice Hockey	Demands associated with junior level hockey can lead to a less than optimal leisure lifestyle. After withdrawing, participants perceived their leisure lifestyle as optimal and were able to explore and develop new leisure interests.
Manz et al. (2016)	Investigate patterns of organised sport participation and dropout from childhood to adolescence.	German Health Interview and Examination Survey for Children and Adolescents (Kurth et al., 2008); Strengths & Difficulties Questionnaire (Goodman, 1997); Physical Testing Protocols & Interview	Mixed methods	<i>N</i> = 3471, male (<i>n</i> = 1766) female (<i>n</i> = 1705), <i>M</i> = 8.5 years, level of competition = club	Not specified	Findings identified more children dropped out of organised sport than commenced, and one-fifth did not participate in organised sport in any form.
Molinero et al. (2006)	Investigate the relationship to gender, type of sport, level of competition and dropout in young Spanish athletes.	Questionnaire of Reasons for Attrition (Gould et al., 1982)	Quantitative – descriptive	<i>N</i> = 561, male (<i>n</i> = 269) female (<i>n</i> = 292), <i>M</i> = 15.2 years, level of competition = club	Athletics, basketball, gymnastics, handball, karate, soccer, indoor soccer, judo, tennis, swimming, volleyball	Findings revealed 'having other things to do' was the most important reason for attrition. Other items rated important included: dislike of the coach, perception of failure or lack of team atmosphere.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Monteiro et al. (2018)	Validate the Questionnaire for Reasons of Attrition and examine differences between gender, age-group and dropout in competitive swimmers.	Questionnaire of Reasons for Attrition (Gould et al., 1982)	Quantitative – descriptive	Study 1: $N = 366$, male ($n = 200$) female ($n = 166$), $M = 15.96$ years. Study 2: $N = 1008$, male ($n = 543$) female ($n = 465$), $M = 16.26$ years, level of competition = competitive	Swimming	Findings suggested the Questionnaire for Reasons of Attrition is a valid and reliable instrument to assess dropout. ‘Had other things to do’, ‘my skills did not improve’, ‘did not like the pressure’ were the most significant reasons for dropout in competitive swimmers.
Moulds et al. (2020)	Examine long-term participation and dropout trends, considering individual, socio-demographic and competition related factors.	Database analysis of player registration information	Quantitative – non-randomised	Study 1: $N = 17161$ male ($n = 7761$) female ($n = 9400$), 10–15 years, level of competition = club. Study 2: $N = 1822$ male ($n = 811$) female ($n = 1011$) 12–15 years, level of competition = competitive	Swimming	Findings identified swimmers were dropping out at 10–11 years of age. Competition level and proximity to a major city were also associated with increased dropout rates.
Nache et al. (2005)	Examine dropout from youth soccer through the Theory of Planned Behaviour.	Author-developed questionnaire and interviews (focus groups, individual)	Mixed methods	$N = 354$, male ($n = 354$), 13–15 years, level of competition = club	Soccer	Findings revealed evidence for the application of the Theory of Planned Behaviour to prospectively distinguish between potential dropouts and sustained participants.
Ommundsen & Vaglum (2007)	Examine the psychological centrality hypothesis and psychological selectivity/discounting hypothesis within youth soccer.	Perceived competence scale for children (Harter, 1982) and Interview (structured)	Qualitative	$N = 223$, male ($n = 223$), 12–16 years, level of competition = club	Soccer	Findings revealed support for the psychological centrality hypothesis.
Patriksson (1988)	Examine reasons for dropout and the movement between different sports in various sport clubs.	Author-developed questionnaires and interviews	Quantitative – non-randomised	$N = 657$, male ($n = 496$) female ($n = 161$), 7–18 years, level of competition = club	Soccer, ice-hockey, tennis, diving, track and field, bandy and 29 sports (not stated)	Findings indicated youth commonly change sports and clubs and therefore it is important to follow dropout over an extended period of time and to look at sport as a system with a lot of ‘flows’ in both time and space.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Persson et al. (2019)	Examine the social processes involved in why youth discontinue organised sports.	Norwegian National Youth Survey (UngData, 2015)	Quantitative – descriptive	<i>N</i> = 1248, male (<i>n</i> = 538) female (<i>n</i> = 710), 13–19 years, level of competition = school	Soccer, handball, cross-country skiing	Findings revealed reasons for opting out of sports are intertwined: with the most prevalent factors being ‘lack of enjoyment’, ‘time/school pressures’ and ‘too competitive/serious’.
Pion et al. (2015)	Investigate the link between anthropometric, physical and motor characteristics assessed during talent identification and dropout in young female gymnasts.	Physical Testing Protocols	Quantitative – non-randomised	<i>N</i> = 756, female (<i>n</i> = 756), 6–9 years, level of competition = competitive	Gymnastics	Findings identified multidimensional test batteries commonly used for talent identification in young female gymnasts may also provide valuable insights into future dropout.
Prins et al. (2013)	Identify groups at risk of sport disengagement during adolescence, through the exploration of cognitive and environmental factors.	Activity Questionnaire for Adults and Adolescents (Chinapaw et al., 2009)	Quantitative – non-randomised	<i>N</i> = 357, male (<i>n</i> = 196) female (<i>n</i> = 161), <i>M</i> = 13.2 years, level of competition = club	Not specified	Findings identified female adolescents of non-Western backgrounds and those in lower educational levels were more likely to cease participation than males.
Quested et al. (2013)	Investigate the invariance of a Basic Needs Theory model predicting youth soccer player dropout across five European countries.	Health Care Climate Questionnaire (Reinboth et al., 2004), Basic Need for Autonomy (Standage et al., 2005), Need for Relatedness Scale (Richer & Vallerand, 1998); Intrinsic Motivation Inventory (McAuley, 1989)	Quantitative – descriptive	<i>N</i> = 7769, male (<i>n</i> = 6641) female (<i>n</i> = 1020), <i>M</i> = 11.56 years, level of competition = recreational	Soccer	Findings support the applicability of the Basic Needs Theory model as a framework to understand determinants of dropout in youth sport.
Robinson & Carron (1982)	Examine the relationship between sustained participation and dropout of young competitive athletes in relation to motivational and situational factors.	Sport Competition Anxiety Test (Martens, 1977), Self-Motivation Inventory (Dishman, 1980), Self-Esteem Inventory (Rosenberg, 1965), Youth Opinion (Gould & Martens, 1979), Leadership Scale for Sport (Chelladurai & Saleh, 1978), Sport Cohesiveness (Martens, 1972)	Quantitative – descriptive	<i>N</i> = 98, male (<i>n</i> = 98), 15–18 years, level of competition = school	American Football	Findings indicated a ‘continuum of involvement’ in competitive sport is directly related to systematic differences in personal attributes and perceptions of specific situational constructs.
Román et al. (2018)	Analyse the career progression and dropout rates of top 10 athletes (14–19 years) over a ten-year period.	Database analysis of national rankings	Quantitative – non-randomised	<i>N</i> = 1144, male (<i>n</i> = 594) female (<i>n</i> = 550), 14–19 years, level of competition = elite	Athletics	Findings indicate high performance in early years is not related to later success. Females showed greater dropout rates than males.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Rottensteiner et al. (2013)	Identify the main reasons for withdrawal from team sports and examine the influence of significant others.	Questionnaire of Reasons for Attrition (Gould et al., 1982)	Quantitative – descriptive	<i>N</i> = 535, male (<i>n</i> = 286), female (<i>n</i> = 249) <i>M</i> = 15.79 years, level of competition = elite	Soccer, ice-hockey, basketball	Findings revealed ‘having other things to do’ and a ‘decline in excitement’ were the most important reasons for withdrawal. Coaches and teammates influenced young athletes’ withdrawal.
Rottensteiner et al. (2015)	Examine coach–athlete relationship (CAR) and perceived coach-created motivational climate to persistence and dropout in youth sport.	Coach–athlete Relationship (Jowett & Ntoumanis, 2004); Perceived Motivational Climate Sport (Biddle et al., 1995)	Quantitative – descriptive	<i>N</i> = 2235, male (<i>n</i> = 1479) female (<i>n</i> = 756), 15–16 years, level of competition = competitive	Soccer, ice-hockey, basketball	Persistent players reported higher scores in CAR and task-climate than withdrawn players. Persistent players also represented higher competition levels, higher amount of training, and more years of involvement in sport.
Ryska et al. (2002)	Examine intrinsic and extrinsic motives and participation (dropout) status of current and former youth gymnasts.	Motives for Participating in Gymnastics Scale (Klint & Weiss, 1987)	Quantitative – descriptive	<i>N</i> = 281, <i>M</i> = 14.5 years, level of competition = competitive	Gymnastics	Age, fitness, team atmosphere, new situation, social recognition, and self-challenge differentiated athletes who continued or withdrew from competitive gymnastics.
Sabo & Veliz (2016)	Examine potential sports participation inequalities (sex, race/ethnicity, and socioeconomic status) during adolescence.	Secondary dataset analysed	Quantitative – non-randomised	<i>N</i> = 62175, age not specified (8 -12 grade), level of competition = school	Baseball, softball, basketball, cross-country, field hockey, football, gymnastics, ice hockey, lacrosse, soccer, swimming, tennis, track and field, volleyball, wrestling	Findings revealed an average attrition rate between 8th and 12th grades was approximately 32%, with field hockey, gymnastics, and volleyball generating the highest attrition rates. Sports with greater percentages of females and minorities had significantly higher attrition rates.
Salguero et al. (2003)	Examine reasons for discontinuing sport participation in competitive Spanish swimming.	Questionnaire for Reasons of Attrition (Gould et al., 1982)	Quantitative – descriptive	<i>N</i> = 66, male (<i>n</i> = 40) female (<i>n</i> = 26), <i>M</i> = 18 years, level of competition = competitive	Swimming	Most influential dropout factor was ‘having other things to do’. Other associated factors were related to lack of fun, perception of failure or low skill level.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Sarrazin et al. (2002)	Investigate youth sport dropout from the perspective of the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM) and Achievement Goal Theory (AGT).	Sport Motivation Scale (Pelletier et al., 1995); Perceived Motivational Climate in Sport Questionnaire (Biddle et al., 1995); Perceived Competence in Life Domains Scale (Losier et al., 1993), Perceived Autonomy Toward Life Domains Scale	Quantitative – non-randomised	$N = 335$, female ($n = 335$), $M = 14.07$ years, level of competition = competitive	Handball	Findings provide strong support for the Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 1997) as applied to sport dropout.
Sheridan et al. (2020)	Identify key factors implemented by the Gaelic Athletic Association (GAA) which reversed dropout rates over a six-year period.	Focus groups	Qualitative	$N = 29$, level of competition = club	Not stated	Findings examined the implementation of potential dropout solutions, which aimed to reverse a culture of valuing the outcome over the developmental process.
Soares et al. (2020)	Apply an interdisciplinary approach to examine participation and dropout trends in youth basketball.	Physical Testing Protocols, Work and Family Orientation (Helmreich et al., 1978), Deliberate Practice Motivation (de Bruin et al., 2008) & Interviews	Mixed methods	$N = 57$, male ($n=57$), 10.5–15.5 years, level of competition = competitive	Basketball	Achievement and competitiveness motivation were related to dropping out or persisting in youth basketball players. Overall, there is a need to consider the interaction between physical and behavioural characteristics.
Tobias et al. (2016)	Examine the factors which influence the discontinuation of futsal practice in youth.	Inventory of Federal de Minas Gerais University Questionnaire (adapted from Scanlon, 1998).	Quantitative – descriptive	$N = 41$, $M = 11.24$ years, level of competition = school	Futsal	Factors relating to withdrawal included: the need to do other activities and lack of interaction between other students, athletes, parents, coaches.
Vella et al. (2014)	Explore the socio-ecological determinants of participation and dropout in organised sports in Australian children.	Data obtained from the Kindergarten (K) cohort of the Longitudinal Study of Australian Children (2002).	Quantitative – non-randomised	$N = 4042$, $M = 8.25$ years, level of competition = recreational	Organised sports (not stated)	Lower household income, language spoken at home, lower parental education and, child not taken to a sporting event, were positively associated with dropout in organised sports by age 10.

Author(s) and year	Study purpose/aims	Data collection methods	Research design	Participant characteristics	Sport context examined	Summary of main findings
Walters et al. (2017)	Examine adolescents' experiences of rowing and dropout in a high school environment.	Interviews (semi-structured)	Qualitative	<i>N</i> = 8, male (<i>n</i> = 5) female (<i>n</i> = 3), 16–18 years, level of competition = competitive	Rowing	Rowing experience was negatively influenced by dissatisfaction and thwarting of basic psychological needs. Coaches and parents are significant in creating an environment that supports young athletes needs for relatedness.
Wattie et al. (2014)	Examine the influence of relative age on participation and dropout.	Analysis of a secondary data set	Quantitative – non-randomised	<i>N</i> = 3426, male (<i>n</i> = 1769) female (<i>n</i> = 1657), 11–20 years, level of competition = recreational	Gymnastics, athletics, cycling, handball, basketball, soccer	Overall influence of relative age on participation and dropout were almost non-existent with some notable exceptions for females. Important to consider social context, gender and sport type when assessing relative age and participation/dropout.

Two authors (KM and SG) completed the MMAT study quality assessment. Any rating discrepancies between authors were critically discussed and resolved via discussion with a third reviewer, who acted as a critical friend during assessment (SC). Ratings for each criterion were coded ('yes' = 1 point, 'no' or 'I can't tell' = 0 points) and converted into a percentage score (see Table 2.2). The percentage of studies meeting relevant criterion were calculated. MMAT study quality scores ranged from 20–100% ($M = 76\%$). Scores for the 10 qualitative studies ranged from 40–100% ($M = 84\%$); the 27 quantitative non-randomised studies = 60–100% ($M = 80\%$); the 25 quantitative descriptive studies = 40–100% ($M = 77\%$); while scores for the seven mixed-methods studies ranged between 20–80% ($M = 46\%$).

2.4. Results

2.4.1. Participant and context characteristics

Table 2.1 summarises study characteristics of the 69 identified studies. The pooled number of participants across studies was 1,014,768 ($M = 14,498$; range of 8–363,590), with approximately 724,683 (71%) males and 202,530 (20%) females. The sex of 87,265 participants (8%; $n = 8$ studies) was not reported. Where reported, 47 studies included both males and females, while 15 and seven studies, respectively had male or female participants only. Participants were included from ages 4–25 years, with some studies containing samples outside age inclusion criteria due to their retrospective examinations. Studies were conducted in 20 countries, with Europe ($n = 39$) and North America ($n = 19$) most prevalent. In terms of sport contexts examined, 41 studies sampled within one sport context, while 28 studies sampled across multiple sports. Of the single-sport studies, soccer ($n = 9$) and swimming ($n = 8$) were most examined. Within the multi-sport studies, a wide range of sports were assessed (for example, badminton, canoeing, climbing, fencing, hurling, lacrosse, netball, skiing, triathlon – see Table 2.1). Seven studies did not specifically disclose the sport context examined. Within sport contexts, the level of competition ranged from school-level participation ($n = 8$ studies;

age range of 8–18 years), recreational ($n = 7$; age range 7–25 years) and elite (international) level ($n = 12$; age range 6–21 years). However, examination of competitive club-based ($n = 41$; age range 4–23 years) contexts was most prevalent.

2.4.2. Study purposes and theoretical frameworks

The general purpose of all identified studies was similar in analysing frequency patterns of CASD and examining (potentially) associated factors. The theoretical frameworks and models implemented were predominately within-person psychological ($n = 11$) or social-cognitive ($n = 22$) orientated explanations. For instance, psychological frameworks previously utilised included: Achievement Goal Theory ($n = 6$; Nicholls, 1989) and the Theory of Planned Behaviour ($n = 4$; Ajzen, 1991). Social-cognitive interactionist frameworks previously utilised included, for example, the Sport Commitment Model ($n = 7$; Scanlan et al., 1993) and the Developmental Model of Sport Participation ($n = 2$; Côté et al., 2003). Only two studies (for example, Vella et al., 2014) have, to date, applied social-ecological models (Bioecological Systems Theory – Bronfenbrenner & Morris, 2005; Sport Conceptual Model of Health – Eime et al., 2013). These trends are also reflected in the examination of influential factors, with prior research assessing individual psychological (for example, motive) and biological (for example, age, sex, anthropometrics) constructs; with parallel emphasis on interpersonal relationships with significant others (for example, parents, coaches and peers) and structural (for example, competition-related and sport policy) factors. There has been lesser examination of broader environmental factors, such as travel distance to sports facilities, socio-economic status or indices, or consideration of rural versus urban locality factors (for example, Deelen et al., 2018).

Table 2.2 Identified CASD studies scored against MMAT included in the final sample

	Qualitative					Non-randomised					Quantitative descriptive					Mixed methods					Quality score	Quality %
Author(s)	1.1	1.2	1.3	1.4	1.5	3.1	3.2	3.3	3.4.	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
Agnew et al. (2016)	1	1	1	1	1	-	-	-	-	-	1	1	0	0	1	1	1	1	0	1	3	60
Barnett et al. (1992)	-	-	-	-	-	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	4	80
Boiché & Sarrazin (2009)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Brown (1985)	-	-	-	-	-	-	-	-	-	-	1	1	0	0	1	-	-	-	-	-	3	60
Burton & Martens (1986)	-	-	-	-	-	-	-	-	-	-	1	1	0	0	1	-	-	-	-	-	3	60
Burton (1992)	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	5	100
Burton et al. (2011)	-	-	-	-	-	-	-	-	-	-	1	1	0	0	0	-	-	-	-	-	2	40
Butcher et al. (2002)	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	5	100
Calvo et al. (2010)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Cervello et al. (2007)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Cobley & Till (2017)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Deelen et al. (2018)	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	5	100
Delorme & Raspaud (2009)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Delorme et al. (2010)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80

	Qualitative					Non-randomised					Quantitative descriptive					Mixed methods					Quality score	Quality %
Author(s)	1.1	1.2	1.3	1.4	1.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
Delorme et al. (2010)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Delorme et al. (2011)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
DuRant et al. (1991)	0	1	0	0	1	-	-	-	-	-	1	1	1	0	1	0	0	0	0	0	1	20
Eime et al. (2015)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Eliasson & Johansson (2020)	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	100
Feltz & Petlichkoff (1983)	1	1	0	0	1	-	-	-	-	-	1	1	1	0	1	1	0	0	0	0	1	20
Figueiredo et al. (2009)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Fiser (2007)	0	0	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	40
Fraser-Thomas et al. (2008a)	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	100
Fraser-Thomas et al. (2008b)	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	100
Fraser-Thomas et al. (2010)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Gardner et al. (2017)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Guillet et al. (2002)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Guzmán & Kingston (2012)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Hardie Murphy et al. (2017)	-	-	-	-	-	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	4	80
Hassan et al. (2017)	-	-	-	-	-	-	-	-	-	-	1	1	0	0	1	-	-	-	-	-	3	60

	Qualitative					Non-randomised					Quantitative descriptive					Mixed methods					Quality score	Quality %
Author(s)	1.1	1.2	1.3	1.4	1.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
Hellandsig (1998)	-	-	-	-	-	1	1	1	0	0	-	-	-	-	-	-	-	-	-	-	3	60
Helsen et al. (1998)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Imtiaz et al. (2014)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Isoard-Gauthier et al. (2016)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Jakobsson (2012)	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	5	100
Jõesaar & Hein (2011)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Keathley et al. (2013)	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
Kirshnit et al. (1989)	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
Klint & Weiss (1986)	1	1	1	1	1	-	-	-	-	-	1	1	1	0	1	1	1	1	0	1	4	80
Lagestad (2019)	-	-	-	-	-	1	0	1	0	1	-	-	-	-	-	-	-	-	-	-	3	60
Larson et al. (2019)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Le Bars et al. (2009)	-	-	-	-	-	1	1	0	0	1	-	-	-	-	-	-	-	-	-	-	3	60
Lemez et al. (2014)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
MacCosham & Gravelle (2018)	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
Manz et al. (2016)	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	0	1	0	1	1	3	60
Molinero et al. (2006)	-	-	-	-	-	-	-	-	-	-	0	1	1	0	1	-	-	-	-	-	3	60

	Qualitative					Non-randomised					Quantitative descriptive					Mixed methods					Quality score	Quality %
Author(s)	1.1	1.2	1.3	1.4	1.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
Monteiro et al. (2018)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Moulds et al. (2020)	-	-	-	-	-	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	4	80
Nache et al. (2005)	1	1	1	0	1	-	-	-	-	-	1	1	1	0	1	1	1	0	0	1	3	60
Ommundsen & Vaglum (1997)	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
Patriksson (1988)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Persson et al. (2019)	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	5	100
Pion et al. (2015)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Prins et al. (2013)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80
Quested et al. (2013)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Robinson & Carron (1982)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Román et al. (2018)	-	-	-	-	-	1	1	1	0	0	-	-	-	-	-	-	-	-	-	-	3	60
Rottensteiner et al. (2013)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Rottensteiner et al. (2015)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Ryska et al. (2002)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80
Sabo & Veliz (2016)	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	5	100
Salguero et al. (2003)	-	-	-	-	-	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	4	80

	Qualitative					Non-randomised					Quantitative descriptive					Mixed methods					Quality score	Quality %
Author(s)	1.1	1.2	1.3	1.4	1.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	5.4	5.5		
Sarrazin et al. (2002)	-	-	-	-	-	1	1	0	1	1	-	-	-	-	-	-	-	-	-	-	4	80
Sheridan et al. (2020)	1	1	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	80
Soares et al. (2020)	1	0	0	1	0	-	-	-	-	-	1	1	1	0	1	1	0	0	0	0	1	20
Tobias et al. (2016)	-	-	-	-	-	-	-	-	-	-	0	1	1	0	0	-	-	-	-	-	2	40
Vella et al. (2014)	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	5	100
Walters et al. (2017)	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	100
Wattie et al. (2014)	-	-	-	-	-	1	1	1	0	1	-	-	-	-	-	-	-	-	-	-	4	80

Table notes: 1 = Yes; 0 = No or insufficient information provided in the study; - = criteria not relevant to study type.

2.4.3. Research approaches

In terms of methodological approaches and research designs, identified studies utilised a range of qualitative ($n = 10$), quantitative non-randomised ($n = 27$), quantitative descriptive ($n = 25$) and mixed-method approaches ($n = 7$). Specifically, quantitative non-randomised⁴ studies included cross-sectional (for example, Imtiaz et al., 2014) or prospective longitudinal designs (for example, Eime et al., 2015). Cross-sectional studies ($n = 8$) assessed relationships between variables (for example, personal attributes) hypothesised as influential to sport dropout at specific time points. Meanwhile, prospective longitudinal studies ($n = 19$) typically examined whether dropout occurred at or within set time periods: ≤ 12 months (up to one season; $n = 2$), 13–24 months (one-two seasons; $n = 10$), 36–60 months (3–5 seasons; $n = 8$) and ≥ 72 months (≥ 5 seasons; $n = 5$), while also examining influential factors.

To assess factors influencing CASD, the majority of quantitative descriptive⁵ studies (for example, Burton et al., 2011; Molinero et al., 2006) administered a questionnaire at one time point, either the beginning, during or at the end of a season ($n = 22$). Most questionnaires focused on psychological constructs hypothetically associated with reasons for dropout or continued participation. These included 11 studies examining youth athlete perceptions of motivation (for example, Sport Motivation Scale – Pelletier, 1995; Participation Motivation Questionnaire, Gill et al., 1983). Two studies (Rottensteiner et al., 2015 & Sarrazin et al., 2002) assessed ‘motivational climates’ – referring to attributes of the sporting environment presumed to influence individual psychological (motivational, emotional) constructs – associated with participation (Duda, 2001). In contrast, most qualitative studies ($n = 6$; for example, Fraser-

⁴ Applying the Mixed Methods Appraisal Tool (MMAT version 2018; Hong et al, 2018; Pluye et al, 2011), non-randomised studies are defined as any quantitative studies estimating the effectiveness of an intervention or studying other exposures that do not use randomization to allocate units to comparison groups (that is, research designs included prospective longitudinal, cross-sectional, case-control studies).

⁵ Quantitative descriptive studies describe the existing distribution of variables without much regard to causal relationships and are generally employed for population monitoring, planning and generating hypothesis. Research methods include surveys, questionnaires and case series.

Thomas et al., 2008a) conducted semi-structured interviews, where participants reflected on their experience(s) post-dropout (occurring in six of 10 studies). Qualitative approaches allowed researchers to retrospectively understand individual experiences, processes involved and meaning of dropout within specific contexts. Whether these participants continued participation in (an) alternative sport(s), or if dropout was temporary or permanent was not specified.

Mixed-methods studies ($n = 7$) contained a combination of questionnaire/s, focus group interviews, semi-structured interviews and/or physiological (anthropometric) tests. For example, Agnew et al. (2016) used questionnaires to investigate the reasons for initial and (dis)continued participation in Australian football. Questionnaire data then informed the content of qualitative focus groups and individual interviews. Agnew et al. (2016) were then able to investigate multiple factors using interviews (for example, lack of game time, injury, progression opportunity, lack of interest, club politics), helping determine how they interacted to affect youth Australian football dropout.

2.4.4. Measuring child and adolescent dropout

Table 1.1 in Chapter 1 provides an overview of definitions and measures applied to assess CASD. Only 40 of 69 (58%) studies explicitly report both dropout definition/s and measures. Of those who did, 18 (45%) define dropout according to whether (or not) participants re-registered for a successive season in the sport context. Seven studies define dropout as absent participation for two consecutive years (seasons); five studies assess dropout across an extended period of 3–6 years. Thirty-one of the reporting studies used percentages and/or frequencies as their dropout metric, with only nine reporting raw frequency data ($n = 3$ across 1 year; $n = 6 \geq 2$ years).

2.4.5. PPCT-categorised factors associated with dropout

Across the identified studies, 90 factors were extrapolated as being tested for association with child and adolescent dropout. Figure 1.2 (see Chapter 1) provides an example of some factors according to the PPCT model, *Process* ($n = 23$), *Person* ($n = 27$), *Context* ($n = 30$) and *Time* (n

= 10). Fifty-four (77%) studies examined dropout factors situated within ≥ 2 levels of the PPCT model, while 34 (48%) examined factors in ≥ 3 levels. Based on the categorisation of variables, 16 studies were found to have investigated factors across all PPCT levels, but only Guillet et al. (2002) identifies significantly influential factors across all PPCT levels.

2.4.5.1. Process factors

Process refers to feature characteristics across PPCT levels which combine and interact to account for developmental trajectories (Bronfenbrenner & Morris, 2006). Of the 23 categorised factors, competition structures were the most studied (24 or 34%), with four studies identifying significant association with dropout. Seven subtypes of a competition structure were assessed: competition level, junior ranking, performance levels, competitiveness, game time, team selection and progression opportunities. For instance, Rottensteiner et al. (2015) examined dropout in multiple team sports (soccer, ice hockey, basketball) in Finland, identifying higher dropout rates with lower competition level involvement ($p < 0.001$, $d = 0.44$).

Coach–athlete instructional interactions⁶ emerged as the second most common factor, within 13 (18%) studies. Three studies identify a significant association between higher dropout rates and less desirable coach relationships. Using the Reasons of Attrition Questionnaire (Gould et al., 1982), Molinero et al. (2006) examined 561 Spanish participants ($n = 292$ female, $n = 269$ males; $M = 15.2$ years) who were formerly in club-level sports (that is, athletics, basketball, gymnastics, karate, swimming). They identified ‘dislike of the coach’ as significantly influential for withdrawal.

⁶ For PPCT classification, coach–athlete instructional interactions were considered a multiple set of behaviours, where the coach implements instructional strategies, interaction, and activities with an emphasis toward skill or performance improvement (that is, individual development). For instance, variables included coaching styles, technical instruction (knowledge and teaching new skills) communication style and feedback (Lyle, 2005).

The influence of relative age, referring to being chronologically older or younger within a given age group, was examined in 10 (14%) studies. Six studies examined competitive youth basketball, rugby league and soccer, reporting statistically greater probabilities of relatively younger athletes dropping out, most notable in 13–16-year age groups (for example, Cobley & Till, 2017; Helsen et al., 1998). Other consistently examined *process* factors, which had sporadic and/or no reported influence included: pressure to perform ($n = 11$ studies examined; $n = 3$ with significant associations; $n = 11: 3$), constrained teamwork (intra-team conflict; $n = 8: 0$) and sport type (for example, individual versus team; $n = 8: 0$).

2.4.5.2. *Person factors*

Person refers to bio-psycho-social characteristics of an individual (sex, age, intrinsic motivation) which can influence sport dropout behaviour. Of the 27 categorised factors, sex was examined in 27 (39%) studies. Examining different sport contexts, eight studies identify females as being significantly more likely to be associated with higher dropout rates. For example, Patriksson's (1988) quantitative examination of club sport (for example, soccer, ice-hockey, tennis, diving) in Sweden ($N = 657$; $n = 161$ female, $n = 496$ male) identify higher dropout in females (for example, 22% and 10% after six and 18 months, respectively). The reasons for dropout were also identified from questionnaires, relating to: '*other sport(s) are more fun*', and '*more time needed for study/schoolwork*'. Of the elite sample studies in swimming (for example, Salguero et al., 2003) and athletics (for example, Román et al., 2018), higher female dropout rates were associated with: '*too much pressure*', '*training was too hard*', and '*did not like to compete*'.

Competence perceptions were examined in 20 (29%) studies, with seven identifying statistical associations across a diverse range of competitive sport contexts (judo, handball, soccer, swimming and wrestling). Other consistently examined *person* (psychological) factors, which had sporadic and/or no influence included: lack of enjoyment ($n = 21: 4$), intrinsic/extrinsic motivation ($n = 13: 4$), and injury/illness ($n = 15: 3$).

2.4.5.3. Contextual factors

Contextual factors refer to the stable or fluctuating characteristics of an individual's ecology where the individual spends a substantial proportion of time (Bronfenbrenner & Morris, 2006). Of the 30 categorised factors, parental support was the most examined (20 or 28%). Four studies – examining multiple competitive sports contexts – identify how a lack of positive emotional support from key social agents (for example, parents) was associated with a higher likelihood of dropout. For instance, in a longitudinal Swedish study of local sport club participants ($N = 1976$; 13–16 years old), Jakobsson et al. (2012) identifies that when comparing those who had dropped out versus current participants, dropouts reported less parental involvement outside of the club in their sporting activity (for example, play/practice at home). Parental socio-demographics (that is, education, financial status, migrant background) were also examined in six studies. Two longitudinal studies (Manz et al., 2016; Vella et al., 2014) conducted in Germany ($N = 3471$, $n = 1705$ female, $n = 1766$ male) and Australia ($N = 4042$), tracked club-level participants for six and two years, respectively. They both identify how lower parental socio-economic status was associated with child and adolescent dropout.

Support from significant others has also been regularly examined, with peer support 18 (26%) and coach support examined in 9 (13%) studies. In Rottensteiner et al.'s (2013) study of elite team sports, statistical associations between peer support and sport dropout are identified. However, statistical associations were not found in other studies examining peer support ($n = 17$). Coach social-support⁷, referring to the perceived presence of positive, empowering and caring coach–athlete relationships (for example, Duda, 2013; Keegan et al., 2009) was examined

⁷ Alongside other forms of social support, coach social-support refers to forms of social, emotional and motivational encouragement. Related variables were classified as *context* factors, as these were not considered a set of behaviours directly associated with skill or performance improvement (that is, coaching process). Rather, their emphasis was interpreted as being more directed toward social, emotional and motivational support of the individual. For example, the creation of caring emotional, positive and fair environments was considered as forms of coach social support for PPCT classification purposes.

in nine studies, with one identifying statistical association (for example, Guillet et al., 2002). Other *contextual* factors examined, which had sporadic and/or no influence included conflicts with other sports/leisure activities ($n = 8: 3$); conflicts between sport and education/work ($n = 8: 0$); and geographic location (for example, urban versus rural, $n = 6: 2$).

2.4.5.4. Time factors

According to Bronfenbrenner and Morris (2006), *Time* is critical for human development, permitting continuity and change of multiple processes to affect the individual. We identified ten *Time*-related factors associated with dropout. One factor, which we collectively labelled as ‘time-use’ characteristics (for example, weekly time in hours spent on sports, school, work, social activities) was examined in 12 (17%) studies. Seven studies examined (what we labelled as) ‘perceived time challenges’ (that is, ‘*having other things to do*’; perceived lack of time; or competing interests). For example, using online surveys, Deelen et al. (2018) investigated ‘time-use’ and dropout in club-level youth soccer and tennis athletes ($N = 2555$, $n = 999$ female, $n = 1556$ male; $M = 16.5$ years). They identify how players who spent more time outside of tennis (in other sports), and competing social activities were more likely to dropout (95% CI = 1.04–1.31; $\chi^2(1) = 1.16$, $p < 0.011$).

Sport demands in terms of practice and/or competition extended over macro time periods was the second-most investigated time-related factor (five studies or 7%), with one study (Fraser-Thomas et al., 2008a) identifying an association with early (that is, age and stage of development) commencement of training and competition in elite Canadian swimmers to be associated with dropout ($M = 11.4$ years versus $M = 13.0$ years, $p < 0.01$). Other examined factors, but which had no statistical association, included: game and/or practice scheduling ($n = 4: 0$), sport type (short versus long duration; $n = 3: 0$) and one-on-one coaching time volume ($n = 1: 0$).

2.5. Discussion

The aims of the present review were to: (1) identify how CASD has been theoretically

conceptualised, defined and assessed; (2) map all previously examined factors associated with CASD; (3) identify previous studies which implemented a multifactorial PPCT-level assessment; and (4) identify present research limitations as well as future directions. While recognising the contribution of prior CASD reviews (Balish et al., 2014; Crane & Temple, 2015), the present review – along with accompanying findings and identified future directions/implications (see below) – extends present knowledge and understanding in several ways. For instance, this review intentionally addressed prior recommendations to consider and integrate a meta-theoretical framework (for example, Balish et al., 2014) integrating the role of social-environmental factors alongside intrapersonal, interpersonal and structural level explanations of behaviour (dropout). The present review also expanded on and updated literature coverage, with 32 additional studies identified and included (studies published between 2015–2021). This review applied the MMAT, permitting inclusion and equitable assessment of quantitative, qualitative and mixed-methods studies in the research topic area; approaches which, under the PPCT framework, are deemed beneficial to understanding behaviour. Further, the present review targeted aims which have not previously been considered or critically discussed. For instance, how dropout has been measured and statistically analysed; the systematic mapping of all previously examined factors associated with CASD; and identifying studies which have implemented a multifactorial assessment while not explicitly aligning to a social-ecological theoretical framework (examined factors across the PPCT model). Finally, based on the above, the present review findings help identify novel future directions and strategies to improve study quality (for example, the development of the Child and Adolescent Dropout – Study Checklist – CASD-SC; see Table 2.3) and help continue the effort to address the problem of child and adolescent dropout. The following subsections now discusses findings according to study aims, with limitations and future directions collated under **Aim 4.**

Aim 1. Like the evolution of other sport and exercise psychology fields, the theoretical

frameworks utilised in child and adolescent dropout – along with their underlying assumptions – have evolved over time. Earlier studies orientated toward the assessment of psychological attitudes or motivational constructs (16% of studies) have by default focused on narrow psychological-based explanations. Over time, social-cognitive (interactionist) frameworks and explanations have been incorporated (33% of studies; for example, Self-Determination Theory – Deci & Ryan, 2000). Most recently, a limited number of studies have applied broader ecological frameworks (for example, Vella et al., 2014; Moulds et al., 2020). Latter frameworks highlight how social and environmental factors (and processes) can either indirectly influence dropout via changes in individual psychology (for example, competence, enjoyment and motivational outcomes) or directly by impacting decisions or capability to participate. For instance, Bronfenbrenner’s PPCT model does not deny, nor negate, the importance of within-person psychological characteristics, but does help highlight how dropout may occur via alternative processes. As review findings demonstrate, dropout may occur via interaction – for example, with *process* (competition structures) contexts; *social-contextual* (low parent support and socio-economic status), and *time-related* factors (competing interests/commitments). Therefore, existing – and alternative – social-ecological frameworks may provide greater, and more intricate, explanatory benefit.

Related to dropout definitions and measurement, findings identified only 58% ($n = 40$; see Table 1.1 in Chapter 1) of studies reported explicit information on both aspects, with dropout reported as annual percentages and/or frequencies in nine (22%) studies. Within reporting studies, 18 (45%) defined dropout according to non-registration for consecutive years, with 17% applying an absence of two consecutive years (seasons) as criteria, while 12% applied a 3–6 year criteria. These findings align with Gould (1987) and Fraser-Thomas et al. (2016) who caution how a lack of appropriate operational definitions and measurement standardisation within the literature may be obscuring the accuracy of dropout estimates and preventing adequate data comparison.

Consequently, while a single standard dropout definition across all youth sport contexts may not be achievable, addressing definition and measurement limitation is an important future direction (see **Aim 4**).

Aim 2. Based on overlaying the PPCT model across the existing literature, the identified factors emerging as being more frequently associated with dropout were: *Process* – relative age ($n = 6$), competition structure ($n = 4$), and coach–athlete instructional interactions ($n = 3$); *Person* – sex ($n = 8$), competence perception ($n = 7$) and age group ($n = 5$); *Contextual* – parental support ($n = 4$) and conflicts with other sports/leisure activities ($n = 3$); *Time* – time use related characteristics ($n = 5$). Compared to previous studies/reviews, systematic mapping of examined (and influential) factors provides a unique synthesis with accompanying benefits. Mapping helps both researchers and sport organisations consider the potential array of factors (for example, *micro* individual – *macro* organisational structures and policy) that may associate with dropout in a given context. Figure 1.2 (see Chapter 1) helps visualise and evaluate the over- and under-examination of factors within existing research to determine the potential relevance of similar (or alternative) factors to dropout. Figure 1.2 illustrates the repeated examination of several factors (for example, psychological attitude), yet studies have frequently failed to find associations, suggesting one of several possibilities. Either: there is genuinely no relationship; methodological limitations have prevented the relationship from being established; or the relationship may only be evident under contextual circumstances. As such, careful evaluation is required before determining subsequent courses of action (for example, further examination or not). Under-examination of factors is also likely, as PPCT *time*-related factors illustrate. In the few studies examining time use characteristics, such as time limitations, influences were identified. Thus, further examination of game/practice schedules, time commitments required, and coach one-to-one instructional time may be valid. As 48% (34) of studies examined the influence of three or more factors in a given context, being able to determine which factors may

(not) be consistently influential remains unresolved due to data limitations, warranting further multifactorial examination. Because sport contextual factors (for example, systems, policies, rules/regulations) also likely lead to different factors being influential to dropout, the end goal of identifying consistently influential variables across youth sport settings may also not be valid. Instead, better methodological quality and assessment of multiple factors over time within sport contexts may prove more informative. Finally, because the categorisation of factors into PPCT categories was subjective, factor categorisation (and underlying explanations) could differ, and when applying an alternative theoretical framework.

Aim 3. While only one study specifically applied the PPCT model, 15 studies were identified which did examine multiple factors across PPCT levels. Some of these studies also scored high on MMAT's study quality assessment, deployed advanced research (tracking) designs, and implemented more advanced data (or complementary) analyses. Therefore, these could be considered more encompassing and methodologically informative studies. For instance, in two complementary studies, Guillet et al. (2002) identify numerous statistically independent influences on dropout in competitive French female handball. Guillet et al. (2002) applied a social exchange theoretical (Thibaut & Kelley, 1959) perspective to their prospective (eight-month) research design, with dropout determined by non-registration for participation in consecutive years. Using structural equation modelling analyses, they identify competition structures (*process*), psychological competence, relatedness, and autonomy perception (*person*), coach support (*context*) and the number of years in practice/competition (*time*) as being significantly influential. Specifically, athletes who dropped out – relative to those continuing – did not move up in competition levels (due to non-selection); perceived themselves as less competent, autonomous, and socially connected; felt less supported by their coach and had spent less time in practice/competition.

In contrast, while applying the voluntary youth sport withdrawal model and a retrospective longitudinal analysis, Butcher et al. (2002) examined dropout over a ten-year period in multiple sports and levels (for example, school volleyball, club football) with dropout defined according to participant type (see Table 1.1). Using MANOVA and ANOVA analyses, they identify *process* (for example, pressure to perform well) and *person*-related (for example, female, injury/illness) factors as increasing the likelihood of dropout; whereas, for example, parental support (*context*) and competing interests/commitments (*time*) did not. Based on their methodological approach, Butcher et al. (2002) highlight how longitudinal designs would establish more valid over time dropout estimates while still determining the impact of other factors.

Aim 4. Given review findings and discussion of **Aims 1–3**, numerous limitations and future directions can be highlighted. Related to participants, approximately 20% of examined samples were female, suggesting a substantial underrepresentation of female participants and consideration of sex-specific dropout explanations. Existing study participants have also predominated from Europe/North America, where examining competitive club-based contexts has been overly prevalent. Thus, examining broader socio-demographic populations at more diverse youth sport participation levels (for example, grassroots – pre-elite participation) would be valuable. Further, within sport contexts, examinations of dropout rates across age groups ranges and competition levels would be empirically and practically valuable. The PPCT model suggests such consideration may help identify whether similar – or likely changing/alternative factors (and explanatory processes) – within eco-systems are accountable. PPCT model application could also help further understand how individual characteristics reciprocally intersect with youth sport contexts (Bronfenbrenner & Morris, 1998). For instance, examining how coach–athlete interaction skills or changes in sport organisational policy (or resource changes) may psychosocially impact youth sport participants could be informative (Dorsch et

al., 2020; Tudge et al., 2009). As such, future research needs to consider the complex, cumulative ways, in which multiple factors and processes combine to determine child and adolescent sport engagement. Within such analyses, (re)consideration and potential incorporation of factors or those not presently considered, could also prove informative.

From a methodological standpoint, amongst the limiting features of existing literature, a few stand out. The lack of estimated normative (or baseline) dropout rates, such as an expected annual dropout for a given sport or given age group has not been established. Similarly, estimates of abnormal dropout rates – beyond normative fluctuations – are not available, yet such data could help identify how *micro–macro* changes within or beyond sport context impact youth dropout. To address such limitations, better research designs are required. For instance, despite 56% of identified studies assessing dropout across one-two sporting seasons, only 28% of these studies deployed a prospective longitudinal design. By examining CASD over longer time periods (for example, ≥ 72 months – evident in five studies), sport context estimates of annual dropout rates (and variation) could be generated. Further, mixed-method approaches (for example, combining quantitative data tracking with stakeholder interviews) would also permit researchers (or sport organisation stakeholders) to better understand individual or collective cohort experiences. Such approaches add validity and rigor via convergence and triangulation from different data sources (Vanketesh et al, 2013). Relatedly, capturing explanations of how factors in the eco-system are interacting in a simple or complex way within individual lives to impact dropout, could be particularly insightful to inform CASD prevention and intervention (Jogulu & Pansiri, 2011).

With only 58% of studies provided clear dropout definitions and measurement, researchers are strongly encouraged to stipulate their definition and corresponding measures to help establish measurement standardisation. Eight studies did define dropout according to non-registration post one/two consecutive years; thus, such criteria could be appropriate when tracking longitudinally. Still, the caveat not to equate dropout with permanent withdrawal would apply, acknowledging

the possibility of a return to participation at a later age or life time point (Lindner et al., 1991). If studies do assess within shorter time-frames (≤ 2 years) without knowledge of temporary or longer-term withdrawal, then alternative terms (for example, ‘drop-off’ – Côté, 1999) and criteria could be applied. Such consideration may be important as dropout estimates could be affected.

Review findings also identified 73% of studies analysed dropout descriptively as annual percentages and/or frequencies, often accompanied by basic analytical approaches (for example, ANOVA, chi-square tests). That said, some studies tracked across multiple years of (re-) registration data, and utilised hazard ratios (for example, Pion et al., 2015), relative risk ratios (Manz et al., 2016), and retention rates relative to baseline norms (for example, Sabo & Veliz et al., 2016) as dropout indices. The benefits of latter measures, such as hazard rates, is their capability to determine dropout occurrence during a standardised exposure time period (Blagoev et al., 2012), while accounting for sample sizes in respective groups (for example, Hazard Ratios – Bradburn et al., 2003); and should be encouraged. In contrast, for studies conducted within shorter time frames (for example, $< 1\text{--}2$ years), where sport (re-)registration data may not be available and where absenteeism or CASD may occur (but is less frequent in shorter timeframes), being able to account for exposure time more sensitively (for example, days, number of training sessions attended) may be necessary. Therefore, CASD assessment via calculation of incidence rates, similar to sport injury incidence rate per hours of exposure (for example, 1000 hours – see Phillips, 2000), may also help improve measurement sensitivity and standardisation.

Within a multilevel, multifactorial framework where longitudinal assessment is recommended, more advanced analytical approaches will be necessary. Based on frequency data being the fundamental form of data assessment, the existing literature highlights several viable options. Survival analysis (for example, Pion et al, 2015), structural equational modelling (for example, Almagro et al., 2010; Sarrazin et al., 2016) and multiple logistic regression analyses (for example, Jakobsson et al., 2012; Prins et al., 2013) could all be appropriately utilised to estimate

dropout odds or rates, as well as assess the influence of multiple independent (or interactional) factors within specified timeframes. The adoption of more advanced analytical approaches or utilising alternatives derived from social-ecological studies in parallel research fields will help introduce analytical novelty, improve quality, as well as data comparison and evaluation.

Given the limitations and future directions listed, this chapter further considered how methodological quality could be holistically improved to increase the impact of future child and adolescent dropout studies. Consequently, ‘The CASD-SC’ (see Table 2.3) was developed to help future studies improve their methodological rigour. The CASD-SC contains 16 items, inviting researcher(s) to carefully consider each item, and document their responses as part of study planning. The CASD-SC specifically asks researchers to declare their dropout definition and measurement; the theoretical framework applied; research questions; methodological design/approach; sampling and context criteria; (non-)examined potentially influential variables; and the data-analytical approach being adopted. If successfully implemented, results could lead to more impactful studies, potentially informing targeted strategies toward reducing CASD within sport contexts/systems.

2.6. Conclusion

Framed within Bronfenbrenner’s (1979; 2005) Bio-Ecological Systems Theory, and according to the PPCT model, this study systematically reviewed four decades of peer-reviewed publications examining CASD. Overall, findings identify strengths, weaknesses, and multiple future research directions. Future research is recommended to apply more encompassing theoretical frameworks; apply longitudinal research designs; declare specific dropout definitions; and apply standardised measures of CASD to determine more accurate estimates of (ab)normal dropout rates across and within sport contexts. To help improve study methodological quality and impact, the CASD-SC was developed. From a research and sport organisational standpoint,

better examinations of dropout within sport contexts should help identify strategies/policies and interventions which could reduce CASD rates and help sustain health benefitting participation.

2.7. Chapter 2 references

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Chapters 2–3: Bridging statement

In Chapter 2, systematic review findings identified competition structure, relative age (*Process* characteristics), participant sex, competence perception (*Personal* characteristics), parental socio-demographics, and activity conflicts (*Contextual* characteristics) as consistently influential factors to CASD across examined studies. Chapter 2 also identified that prior studies failed to consistently define dropout; often assessed dropout descriptively; predominantly used psychological-based theoretical frameworks, and thus often focused on the assessment of psychological factors (alone) as impacting CASD. To address these limitations, the CASD-Study Checklist (CASD-SC) was developed. The CASD-SC was designed to improve methodological quality, improve analytical rigour, and help achieve more informative findings by encouraging item consideration and checklist completion prior to commencing a CASD-related research study.

In Chapter 3, and studies hereafter, the CASD-SC was utilised during the planning and design phases. Informed by Chapter 2 findings, the purpose of the study presented in Chapter 3 was to examine long-term participation and dropout rates and determine whether specific or multiple personal characteristics and competition-related factors influenced dropout in Australian youth swimming registration and competitive performance data. Based on data available, a retrospective cohort design was applied, and survival analyses were conducted. Table 2.3 provides summary notes from CASD-SC completion.

Table 2.3 CASD-SC completed during planning for Chapter 3

Checklist item	Answer/explanation	Addressed
Key concepts		
1. Definition(s)	<i>Dropout</i> = ≥ 2 consecutive subsequent years (seasons) where participants have not re-registered for annual involvement. <i>Dropoff</i> = Participants who return after missing a year of registration and continued, until a <i>dropout</i> state is reached.	☒
2. Measurement	Report annual percentages and/or frequencies for each age group across a given time-period (for example, ≥ 36–60 months). Apply ‘risk rating’ (for example, odds ratios and hazard ratios) analysis over specified period (for example, annual calculations – with tracking across ≥ 36–60 months).	☒
Research question(s) and theoretical framework		
3. Research question(s)/focus	To examine long-term participation and dropout rates in Australian child and adolescent swimming using survival analyses techniques. To determine whether multiple individual, socio-demographic, and competition-related factors influenced dropout in the context.	☒
	To further support swimming organisations in terms of systematic tracking and reporting of dropout data, as an indicator of ‘system healthiness’.	☒
4. Theoretical framework	To help understand the multifactorial nature of child and adolescent sport participation and dropout which may operate from individual-community-societal processes, Bronfenbrenner’s (2005) version of the bioecological model <i>Process-Person-Context-Time</i> (PPCT) will be applied.	☒
Study Methods		
5. Methodological study design and approach	Research design: Retrospective cohort study of registration and competitive performance data over five years (2014-2019).	☒
	Methodological approach: quantitative descriptive indices (for example, dropout hazard rates per year according to hypothesised influential variables).	☒
6. Participants	Registration data from approximately 20,000 male and female swimmers aged 10–15 years (inclusive) including: birthdate, sex, year of initial registration and demographic information (residential postal code, club and region).	☒
		☒

Checklist item	Answer/explanation	Addressed
Key concepts		
7. Context	The intended participants are male and female swimmers aged between 10–15 years who were registered members of a swimming club in New South Wales or the ACT, Australia. Swimmers must be registered to compete in any level of competition in New South Wales, Australia (club, region, state or national level).	☒
8. Variables	<i>Variables examined:</i> • person characteristics (for example, swimmer sex, relative age) • structural processes (for example, competition levels). Environment context (for example, socio-economic status, community size, proximity to sport context) <i>Variables not examined:</i> • social processes (for example, interpersonal coach and peer relationships; social support) • time-related (for example, scheduling and duration of competition and/or practice times) • structural processes (for example, sport organisational policy).	☒
		☒
Data-Collection, Analysis and Interpretation		
9. Data collection procedures	Retrospective dropout data to be obtained from Swimming NSW for each swimming season (12 months), reporting annual registration and non-registration over a five-year tracking period.	☒
10. Data analysis	Quantitative – Longitudinal Prospective Tracking (for example, Kaplan-Meier survival analyses with Cox regression; Pion et al., 2015)	☒
11. Hypotheses / projected findings	Based on previous research, it was hypothesised that age, sex, and competition level will be associated with sport dropout behaviour (Gardner et al., 2017). These influences were deemed unlikely to change over time (years of cohort examined). Due to limited/no prior literature, there were no other projected findings for other variables.	☒

Chapter 3: Sink or swim? A survival analysis of sport dropout in Australian child and adolescent swimmers

The following original investigation has been published in the *Scandinavian Journal of Medicine and Science in Sports* entitled: ‘Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers’.

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KM, SC and JP contributed to the conception and methods of the study. KM, SA, CBW and MH assisted with the data collection. KM, SC and JP contributed to the analysis and interpretation of the data. KM drafted the manuscript and all authors critically revised the manuscript.

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Degree Title: Doctor of Philosophy

Paper Title: Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers

As the research supervisor of the above candidate, I confirm that the above candidate has made the following contributions to the above paper title:

- Conception and design of the research
- Analysis and interpretation of the findings
- Writing the paper and critical appraisal of content
- Creation of figures

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3.1. Abstract

Purpose: To examine long-term participation and dropout rates in Australian youth swimming using survival analyses and determine whether multiple individual, socio-demographic and competition-related factors influenced dropout.

Methods: A retrospective cohort study of registration and competitive performance data was conducted. *Part 1* – Registration data from $N = 17,161$ female ($n = 9400$) and male ($n = 7761$) New South Wales (NSW) swimmers aged 10–15 years (inclusive). *Part 2* – Competition level involvement in a subsample of female ($n = 1011$) and male ($n = 811$) swimmers, aged 12–15 years, was also examined. To determine dropout rates and influential factors, Kaplan-Meier survival analyses supplemented by Cox regression were used.

Results: (1) Kaplan-Meier analyses identified median sustained participation rates of four years (95% CI = 3.93–4.06), with 15.9% maintaining participation over 10 years. Cox regressions identified age group was associated with dropout ($p < 0.001$), with a 184.9% higher hazard rate (HR) for 10 versus 15-year-olds. Residential proximity to major cities was associated with dropout ($p < 0.001$), with urban swimmers reporting a 24.8% higher HR rate than rural swimmers. Sex and relative age were not associated with dropout. (2) The subsample median sustained participation was five years (95% CI = 4.79–5.20), with 25.3% maintaining participation for ten years. Level of competition was associated ($p < 0.001$), with an 86% higher HR when considering lower competition levels (club/district versus national).

Conclusion: In a large representative sample of swimmers, survival analyses identified age group, competition level, and city proximity were associated with increased swimming dropout rates.

Keywords: sport participation, sport cessation, time to event, swimming, child and adolescent competition.

3.2. Introduction

Participation in child and adolescent sport can provide a platform for young people to attain valuable developmental outcomes, such as improved physical health, psychosocial development and the learning of motor skills (Clark et al., 2015; Mountjoy et al., 2011). Nevertheless, research findings suggest that a significant proportion of children will either temporarily dropout or permanently terminate sporting involvement within short timeframes, and before reaching adolescence (Armentrout & Kamphoff, 2011; Cobley & Till, 2017), thereby reducing the likelihood of attaining physical, psychosocial and skill benefits. With growing developmental health concerns for children and adolescents in society, such as sedentarism (Biddle et al., 2011) and obesity (Stewart, 2011) along with their immediate psychosocial (Sanders et al., 2015) and long-term consequences (for example, heightened risk of cardiovascular disease and cancer during adulthood; Falkstedt et al., 2007), child and adolescent sport withdrawal can be generally viewed as unhealthy at a societal level. As such, measuring and tracking sport participation and dropout trends is informative and important. First, specific factors that help sustain participation and reduce dropout rates can be identified. Second, as the ‘health benefits’ of sporting organisations – and their environments – can be evaluated; and third, as a combination of strategies can be identified at sport organisational and government policy levels to help maintain participation.

Sports participation can be defined as behavioural engagement in regular, continual, involvement over a given time (for example, a season or year) within either: (1) a particular sport context; or (2) multiple sports (Côté, 1999; Côté & Fraser-Thomas, 2007). Similarly, sustained participation may refer to a similar, or enhanced, degree of involvement in one or more sporting activities over more than one year (Weiss et al., 2001). In comparison, dropout or discontinuation is more challenging to define, due to behavioural complexity (Alfermann, 2014). This chapter considers ‘sport discontinuation’, swimming ‘dropoff’ or ‘dropout’, as reflecting differing degrees of

behaviour cessation, from short-term temporary to permanent, respectively. The thesis uses the term ‘dropout’ to reflect participants who have discontinued from a sport and time period of examination, but who may not have permanently withdrawn from all sport(s) altogether (Butcher et al., 2002; Fraser-Thomas & Côté, 2016); whereas swimming ‘dropoff’ may better capture the potential temporary, sampling nature of participation in junior/child and adolescent stages (Côté, 1999), acknowledging the possibility of a return to the sport at a later age or stage, though with possible continued involvement in another sport (Lindner et al., 1991).

Research suggests there are widespread, interconnecting factors, likely influencing CASD (Fraser-Thomas et al., 2016; Balish et al., 2014). Therefore, multilevel theoretical frameworks, such as Bronfenbrenner’s interdisciplinary bioecological theory (Bronfenbrenner, 1979), are appropriate to consider the potential multiple layers of factors within an individual’s micro-, meso-, exo-, macro- and chrono-systems. A key proposition of the bioecological model is that positive or negative development (for example, dropout) occurs over time via complex reciprocal interactions with, and between, individuals in proximal micro-environments (for example, home and family) who also help facilitate engagement in activities (known as the engines of development; Bronfenbrenner & Morris, 1998). Additionally, the locations, spaces, resources, as well as their symbols, objects and meaning (Bronfenbrenner, 2005) in meso- and exosystems (for example, local community schools and sport clubs) can also indirectly affect development; for example, providing more or less opportunities for activity and social interaction. Further still, wider cultural values, customs, laws, regulations, and policies in distal environments (for example, national government support for sport participation, sport governing body policies; Bronfenbrenner & Morris, 2006) also affect provision and activities within tiers of the ecological system (Bronfenbrenner, 2005).

To help understand the multifactorial nature of sport participation and dropout, which may operate from individual-community-societal processes, Bronfenbrenner’s recent version of the

bioecological model suggests that participation or dropout could be outcomes based on the understanding of four key elements: Process-Person-Context-Time (PPCT; see Chapter 1). *Process* refers to the direct interactions, and the nature of interactions over time, between the bio-psycho-socially functioning individual with others and the various tiers of the ecological system (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 1998). With references to factors examined in the present study, competition-related factors (for example, competition structures and tiers) can be considered as processes. Individuals participating in sport typically interact with competition social structures, which may or may not affect, for example, psychosocial experiences and lead to differential outcomes, depending on personal characteristics at the time. For instance, Molinero et al. (2006) investigated the dropout of 561 youth athletes ($M = 15.2$ years) who participated in various team (soccer, basketball, handball, volleyball) and individual (athletics, karate, tennis, swimming, judo) sports and found that a lack of fun and enjoyable environments were associated to dropout for lower-level sport participants, than for higher competition level athletes. Thus, illustrating how the nature of interactions between others and within various systems, can shape temporary and permanent sport dropout behaviours.

Person refers to bio-psycho-social characteristics of the individual that affect dropout (Bronfenbrenner & Morris, 2006). For example, sex (or other characteristics) can be a simultaneous catalyst for one person, and not another, based on social-cultural valuing promoted by others in certain social environments (Bronfenbrenner & Morris, 1998). In female child and adolescent sport contexts, concerns about body shape (Cockburn & Clarke, 2002) conformity to gender stereotypes (Guillet et al., 2006), pressure to perform well (Butcher et al., 2002) and intrapersonal conflicts (that is, the importance of social and group motives for females; Lindner et al., 1991) have previously been highlighted as factors associated with greater dropout. Developmental age has also been highlighted. For instance, in a large Australian study ($N = 520,102$) of seven sports (Australian rules football, basketball, cricket, hockey, lawn bowls,

netball and tennis) the peak age group for participation was 10 and 11 years, with a subsequent rapid withdrawal in age groups associated with adolescence (Eime et al., 2016). These findings may partially relate to the social popularity and promotion of organised sport via modified sports programs in Australia, and where children tend to sample sports prior to potential specialisation which may also account for higher dropout rates in adolescence (Eime et al., 2016).

Relative age, referring to being chronologically older or younger within a given age group (for example, 13–14 years), has also been consistently associated with dropout; with the relatively younger participants more likely to cease sport participation, while the relatively older ones are more likely to have performance advantages and be selected for higher competition tiers. These trends are commonly known as relative age effects (RAEs; Wattie et al., 2008). From a PPCT standpoint, relative age is interesting, because it is both a person and a process characteristic. Relative age is determined by the dates used by a sporting system to typically create annual cohorts (Wattie et al., 2008). However, based on biological developmental variability which can still occur between individuals within an annual cohort, the relatively older are more likely to benefit in terms of physical performance, social evaluation, and perceived value (Lovell et al., 2015; Smith et al., 2018). Correspondingly opposite outcomes may then lead to greater dropout in the relatively younger individuals (Cobley & Till, 2017; Cobley et al., 2014).

Contextual characteristics refer to the fixed or changing attributes of an individual's ecology where the individual spends a significant proportion of time, and which may relate to micro- (for example, home), meso- (for example, local sport club), and exosystem factors (for example, community resources (Bronfenbrenner & Morris, 1998; 2006). Geographic location (proximity to a larger city) and socio-economic status indices are examples of macro- as well as exo- and mesosystem factors that could indirectly affect CASD. Previously, higher socio-economic status has been associated with increased access and availability to facilities to promote sport participation opportunities (Estabrooks et al., 2003). In relation to disadvantaged children and

adolescents, findings have also indicated how financial, structural (for example, transport and equipment availability; Dollman & Lewis, 210) and forms of family support (Eime et al., 2013) are consistent contextual barriers to sport participation. In contrast, few studies have examined the influence of geographical location (for example, proximity to a major city) on CASD. In one exception, Dollman et al. (2012) found no differences between sustained sport participation (defined as active recreation) when comparing adolescents from Australian metropolitan (major city, inner regional) and rural (outer regional, remote) areas. Increases in sustained participation in team sports (Australian rules football, basketball, cricket, hockey and netball) in more rural locations (as measured in an Australia-wide survey) were also reported (Eime et al., 2015).

The final element in the PPCT model, is understanding *Time* (Bronfenbrenner & Morris, 2006). Time refers both to the presence and (in)stability of activities and (in)stability of interactions over time. Time includes micro-, meso-, and macro-time, with *micro-time* referring to what activities and interactions may be occurring during the time course of a specific activity (training or competition; Bronfenbrenner & Morris, 2006). Meanwhile, *meso-time* focuses on the re-occurrence of activity and/or interaction episodes at regular intervals over an extended time, such as weeks or months (common in seasonal sport). *Macro-time* refers to potential instability in interactions and activities over more prolonged periods (for example, years of sporting involvement) as part of a stable or changing broader ecosystem (Bronfenbrenner & Morris, 2006). As such, individual biological and social developmental changes may interact over time with an evolving sporting system, which, for example, may have developed a heightened emphasis on competitive performance and adversely affect sport participation. In fact, a study of youth ice-hockey players who were tracked over a five-year period identified movement across competition levels (club–national) to be associated with dropout, with 66% of players (10–15 years old) dropping out if they remained at a similar competition level (Lemez et al., 2014). In contrast, dropout was only 25% in those who progressively moved up in competition levels over

the macro-time of tracking. Such findings highlight how the potential social structures within child and adolescent sport may over time come to differentially affect individual developmental paths. Notably, with those who progress more likely to be benefitting psychologically (for example, increased self-efficacy; perceptions of competence), socially (for example, maintained or enhanced peer group networks; access to greater coaching knowledge and expertise), and physically (for example, better quality training); while those not progressing are either not equally benefitting or experiencing less-preferred outcomes over time (for example, lower perceived competence and social value) leading to dropout.

While recognising the progressive examination of CASD over the last two decades, including the analysis of numerous sport contexts (although predominantly of male participants) and identification of likely influential factors, Bronfenbrenner's ecological systems framework and PPCT elements suggests there is still much to understand and consider if the benefits of child and adolescent sport participation are to be achieved. The previous literature has been constrained by several limitations including: sample size; broad applications of dropout definitions; narrow theoretical frameworks predominantly focused on individual psychology (self-determination; Ryan & Deci, 2000); achievement goal (Nicholls, 1985); and competence motivation (Harter, 1978) – without consideration of multiple multilevel interacting social-ecological factors and cross-sectional methodological research designs. Therefore, the analyses of large, representative datasets, from a social-ecological framework, using longitudinal or retrospective designs which track sustained dropout and re-engagement using a multivariate approach could be empirically beneficial (Balish et al., 2014; Crane & Temple, 2015; Fraser-Thomas et al., 2016;).

To act on such recommendations, the examination of dropout in a popular sport context such as Australian swimming, with a large, representative dataset of longitudinal participation registrations would be helpful. Likewise, the application of survival analyses techniques to sport

dropout (Cox, 1972; Kaplan & Meier, 1958) would be beneficial. Historically, survival analysis has been used in medical research (Merrell & Shulman, 1955) as a family of techniques investigating time elapsed between two groups to assess failure, death, relapse or an intervention effect (Tabachnick & Fidell, 2007). Survival rate and hazard rates are common ways to assess whether an event has occurred. A hazard can be interpreted as an instantaneous event rate, where a higher hazard rate equals a decreased chance of survival (dropout), while a lower hazard rate equates to an increased chance of sustained participation (Johnson, 2018). To the best of my knowledge, only one study (Pion et al., 2015) has previously utilised survival analysis techniques to examine sport dropout among youth female gymnasts. This chapter examined whether several factors were associated with dropout rates over a macro-time period.

In Australia, swimming is one of the most popular sports. AusPlay (2019) estimated that 31.8–34.5% of all Australian children (1,807,000) participated in recreational and/or competitive swimming. In the state of New South Wales (NSW) in 2019, there were over 18,000 registered members aged between 8–18 years inclusive. Assessment of NSW registrations over a period of years (2014–2019 inclusive), provided a representative dataset to retrospectively examine sport dropout. Accordingly, in Part 1 the study purpose was to accurately examine long-term dropout trends using a survival analysis approach. The analysis also assessed the influence of individual and socio-demographic variables on dropout rates. In Part 2, a competitive subsample of the initial study was examined, using similar analytical procedures, to assess the influence of competition level on dropout alongside individual and socio-demographic variables. Findings could provide valuable feedback to state and national governing bodies about their swimmers, and potentially their swimmer programmes. Findings could also further help identify strategies to promote sustained engagement for health, developmental, and performance benefits.

3.3. Methods

3.3.1. Part 1: Long-term participation and dropout trends in child and adolescent swimming

3.3.1.1. Participants

Following university ethics approval (App No: 2019/695; see Appendix A), a large dataset was prepared and examined in collaboration with Swimming NSW, Australia. The dataset contained de-identified swimmer registration information of all ages and membership categories (swimmers⁸, non-swimmers⁹ and life members) from the years (2014–2019) for NSW and the Australian Capital Territory (ACT). The dataset contained identification (ID) numbers, birthdate, sex, year of initial registration and demographic information including residential postal code, club and region. All female ($n = 9400$) and male ($n = 7761$) swimmers aged between 10–15 years (inclusive) ($N = 17,161$) were tracked using ID numbers for three subsequent years to determine participation and dropout trends.

3.3.1.2. Procedures

To track participation trends, specifically, those who continued participation or dropped out, annual swimming club registrations were examined using ID numbers. The last registration entry found in the dataset determined when participation ceased. For example, swimmers were coded with ‘continue’, if they had consecutively re-registered from a previous year. This procedure continued until ID was absent for a given registration year. Dropout in the current study reflected participants who had registered at baseline, or at some stage were registered with a swimming club affiliated to Swimming NSW, but then in two or more consecutive subsequent years (Lemez et al., 2014) had not re-registered for annual involvement. To account for returning swimmers, dropoff was defined as swimmers who returned after missing a year of registration and

⁸ Swimmers are registered financial members of a club who may swim at club, region, state or national level (Swimming NSW, 2019). Swimmers must be registered to compete in any level of competition in NSW.

⁹ Non-swimmers are registered financial members of a club who do not swim, this can include parents, volunteers, officials and coaches.

continued, until a dropout state was reached.

Related to swimmer individual factors, swimmer sex, age of initial registration, age group and relative age were all coded. Swimmer relative age (reflected by annual age quartile) was determined using decimal age referenced to a standard date in the competition calendar (January 1). For example, quartiles for an 11-year-old swimmer were Q1 = 11.75–11.99 years; Q2 = 11.50–11.74; Q3 = 11.25–11.49 years, and Q4 = 11.00–11.24. Related to swimmer socio-demographic factors, residential postcodes were used to assign socio-economic geographical location coding. Socio-economic status was measured by the Australian Bureau of Statistics (ABS) Socio-Economic Indices for Areas (SEIFA) index Relative Socio-economic Advantage and Disadvantage (IRSAD). IRSAD is one of four available SEIFA indices that can be used when summarising information regarding economic and social conditions within a geographical area (Pink, 2006). To establish a measure of remoteness (or proximity to a city centre), access to services is determined using the Accessibility and Remoteness Index of Australia (ARIA). For example, compared with a city, where residents generally have unrestricted access to a wide range of goods and services, a remote area is considered to have very restricted accessibility of goods, services and opportunities for social interaction (Department of Health, 2001).

3.3.1.3. Data analysis

Initially, swimmer registration data were screened and removed if any entry errors or incomplete registrations ($n = 1802$) were identified. Descriptive statistics were generated to summarise sustained participation and dropout over time and according to assessed variables (see Tables 3.1–3.6). Kaplan-Meier survival analyses (Kaplan & Meier, 1958) provided estimated rates of dropout based on years of involvement, and according to sex, age group, relative age, socio-demographic (IRSAD) and geographical factors (proximity to a major city). Cox proportional-hazards model (Cox regression; Cox 1972) was then used to predict whether survival time was influenced by one or several covariates (that is, sex, age group, relative age, and socio-

demographic factors). Cox regression included censored data, referring to the unknown survival time (dependent variable) of those swimmers who had not experienced the event (that is, dropout) during the period of data collection (Tabachnick & Fidell, 2007). For example, swimmers who maintained participation were considered censored as they had not experienced dropout during the data collection period.

Prior to analyses, assumption checks and tests were conducted in relation to study design, data were examined, and statistical analyses applied (Tabachnick & Fidell, 2007). Assumption checks for the Kaplan-Meier study design included: existence of two mutually exclusive outcomes (that is, dropout or continued); time to event clearly defined (that is, participation time measured in years); and left-censoring avoidance (that is, time of initial registration was known). Related to data assumptions, for each covariate an assessment of potential outliers was conducted by finding $z = (Y - \bar{Y})/S$ for each covariate's lowest and highest scores, using $|z| = 3.3$ as the criterion. The distribution of potential influential factors was also scrutinised. As sample sizes were small in the *Remote* and *Very remote* categories, 'proximity to a major city' coding was collapsed into three categories (major cities, inner regional and other [containing outer regional, remote and very remote]). For all other variables, the number of categories remained similar to how the data was originally obtained.

The distribution patterns of censored participants per outcome group and covariate was checked using the Breslow (Bland & Altman, 2004) and log-rank (Breslow, 1970) test with Bonferroni corrections applied, adjusting for the number of comparisons made (for example, remoteness = three comparisons $[0.05/3]$, adjusted $p = 0.016$). Because the log-rank and Breslow tests returned similar results in analyses, as recommended in previous literature, the log-rank tests were only reported (Hosmer et al., 2008). Related to Cox regression, additional statistical analysis assumption checks were conducted, including an assessment of hazards proportionality (similar to homogeneity tests of regression in ANCOVA) by creating and testing time-dependent

variables. Multicollinearity was tested using a hierarchical regression strategy and the likelihood ratio to determine goodness of fit relative to the null (Merrell & Shulman, 1955). All statistical analyses were conducted with IBM-SPSS Statistics v. 25 (Armonk, NY, USA).

3.3.2. Part 2: Level of competition and swimmer dropout rates

3.3.2.1. Participants

From the initial sample, a subsample of female ($n = 1\,011$) and male ($n = 811$) swimmers, aged 12–15 years, was examined. The subsample data contained similar variables as the initial analysis (for example, sex, age group, relative age, socio-demographics); however, competition data were added. Specifically, based on short and long course swimming events in 2016 and 2017, swimmers who had made qualification times for the strokes (freestyle, backstroke, breaststroke and butterfly) in 100 metres events at ‘club/district’, ‘regional’, ‘state’ or ‘national’ competition levels were coded. Only 12–15-year-old swimmers were selected because national events were not available for swimmers younger than 12 years¹⁰.

3.3.2.2. Procedures

As outlined in Part 1, similar data analysis checks and analytical procedures were applied. For each participant, their fastest annual performance time, in any event, was extracted from targeted strokes in a given year (2016 or 2017) and coded according to event qualifying times. Competition level was ranked one (club/district) through to four (national). Duplicates were removed with the highest level of competition remaining irrespective of stroke.

3.3.2.3. Data analysis

As in Part 1, similar analytical procedures were applied. Following data checks, descriptive statistics were generated to summarise sustained participation and dropout over time and

¹⁰ Changes to the Australian Swimming Competition Framework included the removal of 12-year-old girls and boys from national-level events in 2018. In 2019, boys at 13 years old were also removed from national-level competition.

according to assessed variables (see Table 3.6). In the first step, Kaplan-Meier analyses tracked cumulative survival rates (that is, sustained registered participation) against years of involvement according to competition levels. Then, to determine the magnitudes of association from competition level considerate to other factors in the subsample, a follow-up Cox regression analysis quantified hazard rates (that is, heightened or lowered likelihoods of dropout).

3.4. Results

3.4.1. Part 1: Age-related and socio-demographic influences on swimming dropout

Of the 17,161 registered swimmers examined, 14,440 (84%) had dropped out with approximately 16% (censored data) still participating when data tracking was terminated (2019). Kaplan-Meier analyses identified that the median time for sustained participation prior to dropout was four years (95% CI = 3.93–4.06). Of the 7895 females and 6545 males who had dropped out, 33% and 35%, respectively had dropped out of swimming after two years. Age group (χ^2 (5) = 1909.89, $p < 0.001$), socio-economic status (χ^2 (9) = 49.86, $p < 0.001$) and proximity to a major city (χ^2 (2) = 92.73, $p < 0.001$) were identified as associated factors, while the individual factors of sex and relative age were not associated to dropout. Specific to age group, swimmers aged 10 years had a median sustained participation of three years until dropout (95% CI = 2.83–3.16), while by 15 years of age, the median estimate increased to six years (95% CI = 5.85–6.14; χ^2 (1) = 865.28, $p < 0.001$; see Figure 3.1). For socio-economic status, while IRSAD categories all had a four-year median, lower IRSAD socio-economic categories (for example, decile 3) were significantly different to the ‘most-advantaged’ IRSAD category (decile 10; χ^2 (1) = 22.88, $p < 0.001$). Related to remoteness, swimmers who resided in major cities had a median of four participation years until dropout (95% CI = 3.91–4.09), a figure less than other locations (that is, outer regional, remote, and very remote combined) whose median was five years (95% CI = 4.85–5.14; χ^2 (1) = 65.6, $p < 0.001$).

Related to Cox regression, when entering all variables into a proportional hazards model, the likelihood ratio test identified a better model fit when all variables were included [$\chi^2 (20) = 1678.143, p < 0.001$]. Results from the model identified the effect of each covariate on sustained participation, while adjusting for all others (Table 3.7). The analysis identified relationships with age group, socio-economic status, and geographical proximity to major cities, while sex and relative age were not linked to dropout. Age group was identified as the covariate with the strongest association, with a 184.9% higher hazard rate (HR) for 10-year-olds (Exp $\beta = 2.84$) versus 15 year olds ($p < 0.001$). Related to socio-economic status, statistical differences were apparent in particular categories. Lower HRs of 17% (Exp $\beta = 0.83$) and 12% (Exp $\beta = 0.88$) were identified for lower IRSAD socio-economic categories (for example, decile 3 and 4 – $p < 0.001$) when compared to the ‘most-advantaged’ IRSAD category (decile 10). Related to remoteness, swimmers who resided in major cities had a 24% higher HR (Exp $\beta = 1.24$) versus other (that is, outer regional, remote, and very remote combined) areas ($p < 0.001$).

3.4.2. Part 2: Influence of competition on swimmer dropout rates

Of the 1822 registered competitive swimmers examined in the subsample, 1361 (74%) had dropped out during tracking with approximately 25% still participating when data tracking was terminated. Kaplan-Meier analyses reported that the median sustained participation prior to dropout was five years (95% CI = 4.79–5.20). Of the 758 females and 603 males who had dropped out, 28% and 35%, respectively had dropped out of swimming after two years. Similarly, to Part 1, findings identified age group ($\chi^2 (3) = 184.71, p < 0.001$), socio-economic status ($\chi^2 (9) = 112.03, p < 0.001$) and proximity to a major city ($\chi^2 (2) = 76.66, p < 0.001$) were associated to dropout, while sex and relative age were not. Specific to Part 2, competition level ($\chi^2 (3) = 32.87, p < 0.001$), was also linked.

Swimmers competing at club/district level had a median sustained registration time until dropout of four years (95% CI = 3.68–4.31), which increased when competing at national level to a median of six years (95% CI = 5.25–6.74; $\chi^2(1) = 30.69, p < 0.01$; see Figure 3.2).

Related to Cox regression, when entering all variables into a proportional hazards model, the likelihood ratio test identified a better model fit when all variables were included [$\chi^2(21) = 316.75, p < 0.001$]. Again, results identified the effect of each covariate while adjusting for others (see Table 3.8). Competition level revealed the second strongest association, with an 86% higher HR identified in lower competition levels (that is, club/district; $\text{Exp}(\beta) = 1.86$) versus the national competition level ($p < 0.001$). The HRs for age group (12 versus 15 years old) and proximity to a NSW/ACT city (major city versus other) were 164%; ($\text{Exp} \beta = 2.64; p < 0.001$), and 61% ($\text{Exp} \beta = 1.61, p < 0.001$), respectively. For IRSAD socio-demographic categories, while descriptive disparities were apparent no categories were significantly different to decile 10 (that is, most advantage.)

Table 3.1 Frequencies of continued participation and dropout based on registration data for female ($n = 9400$) and male ($n = 7761$) NSW swimmers aged 10–15 years inclusive

Sex	Participation status		Participation time (years)										Total	
			0	1	2	3	4	5	6	7	8	9	10	
Female	Continued	<i>n</i>	34	180	230	240	231	225	140	107	77	39	2	1505
		%	0.4	1.9	2.4	2.6	2.5	2.4	1.5	1.1	0.8	0.4	0.0	16.0
	Dropout	<i>n</i>	191	1266	1182	1089	1048	975	749	601	521	235	38	7895
		%	2.0	13.5	12.6	11.6	11.1	10.4	8.0	6.4	5.5	2.5	0.4	84.0
Male	Continued	<i>n</i>	22	147	180	210	192	164	119	84	63	32	3	1216
		%	0.3	1.9	2.3	2.7	2.5	2.1	1.5	1.1	0.8	0.4	0.0	15.7
	Dropout	<i>n</i>	152	1140	1002	880	876	769	647	462	431	151	35	6545
		%	2.0	14.7	12.9	11.3	11.3	9.9	8.3	6.0	5.6	1.9	0.5	84.3

Table notes: continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; ‘0’ participation years = initial registration up to and including 0.99 years; ‘1’ participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); ‘10’ participation years = initial registration and annual re-registration up to and including 10.99 years.

Table 3.2 Frequencies of continued participation and dropout across male and female NSW swimmers according to age group

Age group	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
10 years	Continued	<i>n</i>	5	64	68	48	34	27	16	9	3	0	0	274
		%	0.4	5.4	5.7	4.0	2.8	2.3	1.3	0.8	0.3	0.0	0.0	23.0
	Dropout	<i>n</i>	29	251	220	172	119	70	38	17	3	0	0	919
		%	2.4	21.0	18.4	14.4	10.0	5.9	3.2	1.4	0.3	0	0	77.0
11 years	Continued	<i>n</i>	15	120	156	140	116	93	49	22	7	3	0	721
		%	0.4	3.2	4.2	3.7	3.1	2.5	1.3	0.6	0.2	0.1	0	19.3
	Dropout	<i>n</i>	96	785	672	491	417	282	160	87	23	6	0	3019
		%	2.6	21.0	18.0	13.1	11.1	7.5	4.3	2.3	0.6	0.2	0	80.7
12 years	Continued	<i>n</i>	13	75	98	131	140	89	55	44	20	7	0	672
		%	0.3	2.0	2.6	3.5	3.8	2.4	1.5	1.2	0.5	0.2	0.0	18.0
	Dropout	<i>n</i>	84	626	551	471	407	381	275	153	83	27	3	3061
		%	2.3	16.8	14.8	12.6	10.9	10.2	7.4	4.1	2.2	0.7	0.1	82.0
13 years	Continued	<i>n</i>	16	47	51	77	73	93	52	45	27	12	3	496
		%	0.5	1.5	1.7	2.5	2.4	3.0	1.7	1.5	0.9	0.4	0.1	16.2
	Dropout	<i>n</i>	51	376	366	378	395	348	279	182	149	33	18	2575

		Participation time (years)												
Age group	Participation status		0	1	2	3	4	5	6	7	8	9	10	Total
		%	1.7	12.2	11.9	12.3	12.9	11.3	9.1	5.9	4.9	1.1	0.6	
14 years	Continued	<i>n</i>	7	19	30	40	34	50	50	43	44	22	1	340
		%	0.3	0.8	1.3	1.8	1.5	2.2	2.2	1.9	1.9	1.0	0.0	15.0
	Dropout	<i>n</i>	37	194	191	222	256	276	282	188	152	96	27	1921
		%	1.6	8.6	8.4	9.8	11.3	12.2	12.5	8.3	6.7	4.2	1.2	85.0
15 years	Continued	<i>n</i>	0	2	7	14	26	37	37	28	39	27	1	218
		%	0.0	0.1	0.2	0.4	0.8	1.2	1.2	0.9	1.2	0.9	0.0	6.9
	Dropout	<i>n</i>	46	174	184	235	330	387	362	436	542	224	25	2945
		%	1.5	5.5	5.8	7.4	10.4	12.2	11.4	13.8	17.1	7.1	0.8	93.1

Table notes: continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; ‘0’ participation years = initial registration up to and including 0.99 years; ‘1’ participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); ‘10’ participation years = initial registration and annual re-registration up to and including 10.99 years.

Table 3.3 Frequencies of continued participation and dropout combined across male and female NSW child and adolescent swimmers according to relative age

Relative age	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Quartile 1	Continued	<i>n</i>	17	87	110	121	110	121	86	57	34	26	1	770
		%	0.4	1.9	2.4	2.6	2.4	2.6	1.8	1.2	0.7	0.6	0.0	16.5
	Dropout	<i>n</i>	75	700	583	560	566	464	360	273	210	88	13	3892
		%	1.6	15.0	12.5	12.0	12.1	10.0	7.7	5.9	4.5	1.9	0.3	83.5
Quartile 2	Continued	<i>n</i>	12	88	121	126	119	93	62	48	40	16	2	727
		%	0.3	2.0	2.8	2.9	2.7	2.1	1.4	1.1	0.9	0.4	0.0	16.6
	Dropout	<i>n</i>	99	582	545	477	455	454	368	272	275	96	23	3646
		%	2.3	13.3	12.5	10.9	10.4	10.4	8.4	6.2	6.3	2.2	0.5	83.4
Quartile 3	Continued	<i>n</i>	14	88	90	96	116	84	54	47	31	18	1	639
		%	0.3	2.1	2.1	2.3	2.7	2.0	1.3	1.1	0.7	0.4	0.0	15.0
	Dropout	<i>n</i>	82	571	535	490	465	455	355	280	262	108	22	3625
		%	1.9	13.4	12.5	11.5	10.9	10.7	8.3	6.6	6.1	2.5	0.5	85.0
Quartile 4	Continued	<i>n</i>	13	64	89	107	78	91	57	39	35	11	1	585
		%	0.3	1.7	2.3	2.8	2.0	2.4	1.5	1.0	0.9	0.3	0.0	15.1
	Dropout	<i>n</i>	87	553	521	442	438	371	313	238	205	94	15	3277
		%	2.3	14.3	13.5	11.4	11.3	9.6	8.1	6.2	5.3	2.4	0.4	84.9

Table notes: (Quartile 1 – Quartile 4) based on annual swimmer registration data. Continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; ‘0’ participation years = initial registration up to and including 0.99 years; ‘1’ participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); ‘10’ participation years = initial registration and annual re-registration up to and including 10.99 years.

Table 3.4 Frequencies of continued participation and dropout across male and female NSW child and adolescent swimmers according to socio-economic status

IRSAD	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Decile 1	Continued	<i>n</i>	3	12	17	17	14	17	5	10	5	4	3	107
		%	0.3	1.0	1.4	1.4	1.2	1.4	0.4	0.8	0.4	0.3	0.3	9.1
	Dropout	<i>n</i>	30	147	120	147	143	128	143	87	80	30	16	1071
		%	2.5	12.5	10.2	12.5	12.1	10.9	12.1	7.4	6.8	2.5	1.4	90.9
Decile 2	Continued	<i>n</i>	8	18	24	37	29	39	28	21	10	2	1	217
		%	0.5	1.2	1.5	2.4	1.9	2.5	1.8	1.4	0.6	0.1	0.1	14.0
	Dropout	<i>n</i>	34	204	216	164	173	141	160	108	92	40	5	1337
		%	2.2	13.1	13.9	10.6	11.1	9.1	10.3	6.9	5.9	2.6	0.3	86.0
Decile 3	Continued	<i>n</i>	3	33	49	40	60	47	31	26	28	9	1	327
		%	0.1	1.6	2.4	2.0	2.9	2.3	1.5	1.3	1.4	0.4	0.0	16.0
	Dropout	<i>n</i>	15	264	218	239	255	219	171	140	129	62	7	1719
		%	0.7	12.9	10.7	11.7	12.5	10.7	8.4	6.8	6.3	3.0	0.3	84.0
Decile 4	Continued	<i>n</i>	9	28	37	43	50	36	33	21	10	13	0	280
		%	0.4	1.3	1.7	2.0	2.3	1.6	1.5	1.0	0.5	0.6	0.0	12.8
	Dropout	<i>n</i>	59	275	287	260	243	240	203	143	135	49	13	1907
		%	2.7	12.6	13.1	11.9	11.1	11.0	9.3	6.5	6.2	2.2	0.6	87.2

IRSAD	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Decile 5	Continued	<i>n</i>	6	38	40	50	43	37	33	14	15	12	0	288
		%	0.3	1.6	1.7	2.1	1.8	1.6	1.4	0.6	0.6	0.5	0.0	12.1
	Dropout	<i>n</i>	75	342	295	277	276	256	200	155	131	63	19	2089
		%	3.2	14.4	12.4	11.7	11.6	10.8	8.4	6.5	5.5	2.7	0.8	87.9
Decile 6	Continued	<i>n</i>	5	30	23	35	31	26	12	10	7	11	0	190
		%	0.3	2.0	1.5	2.3	2.1	1.7	0.8	0.7	0.5	0.7	0.0	12.7
	Dropout	<i>n</i>	50	198	222	191	182	164	92	96	78	28	5	1306
		%	3.3	13.2	14.8	12.8	12.2	11.0	6.1	6.4	5.2	1.9	0.3	87.3
Decile 7	Continued	<i>n</i>	11	24	38	33	35	35	21	13	15	6	0	231
		%	0.9	2.0	3.1	2.7	2.9	2.9	1.7	1.1	1.2	0.5	0.0	19.0
	Dropout	<i>n</i>	22	162	163	118	136	125	71	80	71	33	6	987
		%	1.8	13.3	13.4	9.7	11.2	10.3	5.8	6.6	5.8	2.7	0.5	81.0
Decile 8	Continued	<i>n</i>	7	49	41	55	37	48	23	21	14	4	0	299
		%	0.4	3.1	2.6	3.5	2.4	3.1	1.5	1.3	0.9	0.3	0.0	19.1
	Dropout	<i>n</i>	36	235	192	174	163	150	120	90	81	25	1	1267
		%	2.3	15.0	12.3	11.1	10.4	9.6	7.7	5.7	5.2	1.6	0.1	80.9
Decile 9	Continued	<i>n</i>	3	39	50	64	57	56	34	23	14	4	0	344
		%	0.2	2.5	3.1	4.0	3.6	3.5	2.1	1.4	0.9	0.3	0.0	21.6

IRSAD			Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Decile 10	Dropout	<i>n</i>	9	217	201	184	174	163	112	80	75	30	1	1246
		%	0.6	13.6	12.6	11.6	10.9	10.3	7.0	5.0	4.7	1.9	0.1	78.4
	Continued	<i>n</i>	1	56	91	76	67	48	39	32	22	6	0	438
		%	0.1	2.9	4.7	3.9	3.4	2.5	2.0	1.6	1.1	0.3	0.0	22.5
	Dropout	<i>n</i>	13	362	270	215	179	158	124	84	80	26	0	1511
		%	0.7	18.6	13.9	11.0	9.2	8.1	6.4	4.3	4.1	1.3	0.0	77.5

Table notes: – as measured by the index of relative socio-economic advantage and disadvantage (IRSAD). Continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; ‘0’ participation years = initial registration up to and including 0.99 years; ‘1’ participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); ‘10’ participation years = initial registration and annual re-registration up to and including 10.99 years.

Table 3.5 Frequencies of continued participation and dropout across male and female NSW child and adolescent swimmers according to geographical location (proximity to a city centre)

ARIA	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Major cities	Continued	<i>n</i>	39	222	255	285	246	219	126	99	76	34	0	1601
		%	0.4	2.5	2.8	3.2	2.7	2.4	1.4	1.1	0.8	0.4	0.0	17.8
	Dropout	<i>n</i>	264	1286	1162	1011	920	873	681	540	450	183	41	7411
		%	2.9	14.3	12.9	11.2	10.2	9.7	7.6	6.0	5.0	2.0	0.5	82.2
Inner regional	Continued	<i>n</i>	13	67	94	104	101	98	74	38	35	18	0	642
		%	0.3	1.3	1.9	2.1	2.0	1.9	1.5	0.8	0.7	0.4	0.0	12.7
	Dropout	<i>n</i>	62	765	687	624	641	554	394	297	268	114	17	4423
		%	1.2	15.1	13.6	12.3	12.7	10.9	7.8	5.9	5.3	2.3	0.3	87.3
Other	Continued	<i>n</i>	4	38	61	61	76	72	59	54	29	19	5	478
		%	0.1	1.2	2.0	2.0	2.5	2.3	1.9	1.8	0.9	0.6	0.2	15.5
	Dropout	<i>n</i>	17	355	335	334	363	317	321	226	234	89	15	2606
		%	0.6	11.5	10.9	10.8	11.8	10.3	10.4	7.3	7.6	2.9	0.5	84.5

Table notes: – as measured by the accessibility and remoteness index of Australia (ARIA) – based on annual swimming registration data. Continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; ‘0’ participation years = initial registration up to and including 0.99 years; ‘1’ participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); ‘10’ participation years = initial registration and annual re-registration up to and including 10.99 years.

Table 3.6 Frequencies of continued participation and dropout in the subsample of male and female NSW child and adolescent swimmers according to level of competition based on annual swimmer registration data

Competition level	Participation status		Participation time (years)											Total
			0	1	2	3	4	5	6	7	8	9	10	
Club/district	Continued	<i>n</i>	22	0	0	22	22	37	27	28	22	8	2	190
		%	2.7	0.0	0.0	2.7	2.7	4.6	3.3	3.5	2.7	1.0	0.2	23.5
	Dropout	<i>n</i>	0	113	119	93	88	75	46	39	21	14	8	620
		%	0.0	14.0	14.7	11.5	10.9	9.3	5.7	4.8	2.6	1.7	1.0	76.5
Regional	Continued	<i>n</i>	11	0	0	17	11	17	9	12	7	5	2	91
		%	3.0	0.0	0.0	4.7	3.0	4.7	2.5	3.3	1.9	1.4	0.6	25.1
	Dropout	<i>n</i>	0	32	52	45	43	32	31	16	8	5	3	271
		%	0.0	8.8	14.4	12.4	11.9	8.8	8.6	4.4	2.2	1.4	0.8	74.9
State	Continued	<i>n</i>	26	0	0	4	7	12	19	12	9	5	2	96
		%	6.6	0.0	0.0	1.0	1.8	3.1	4.8	3.1	2.3	1.3	0.5	24.5
	Dropout	<i>n</i>	0	28	52	48	43	41	27	27	17	11	1	296
		%	0.0	7.1	13.3	12.2	11.0	10.5	6.9	6.9	4.3	2.8	0.3	75.5
National	Continued	<i>n</i>	11	0	0	1	6	6	16	17	18	8	1	84
		%	4.3	0.0	0.0	0.4	2.3	2.3	6.2	6.6	7.0	3.1	0.4	32.6
	Dropout	<i>n</i>	0	7	29	28	24	25	15	16	15	12	1	174
		%	0.0	2.7	11.2	10.9	9.3	9.7	5.8	6.2	5.8	4.7	0.4	67.4

Table notes: continued = consecutive years of swimming registration with a swimming club affiliated to Swimming NSW or re-registration following an absence of one year; dropout = registration at baseline, or registration at some stage, with a swimming club affiliated to Swimming NSW, but then with two or more consecutive subsequent years of no re-registration; '0' participation years = initial registration up to and including 0.99 years; '1' participation year = initial registration and one repeated re-registration up the following year (up to 1.99 years involvement); '10' participation years = initial registration and annual re-registration up to and including 10.99 years.

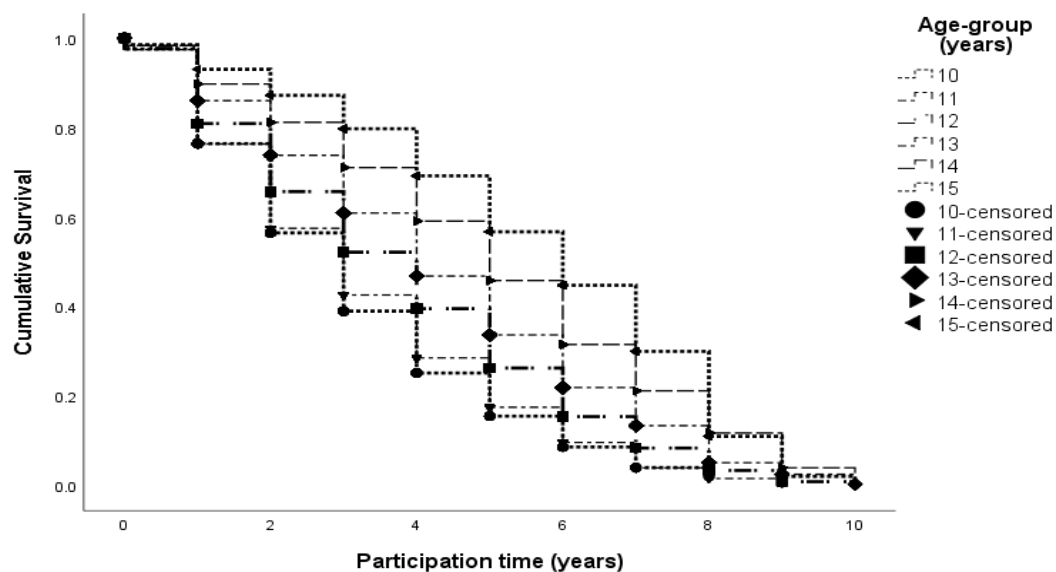


Figure 3.1 A Kaplan-Meier survival curve illustrating between group differences when considering age group as a predictor and the association with participation time (years).

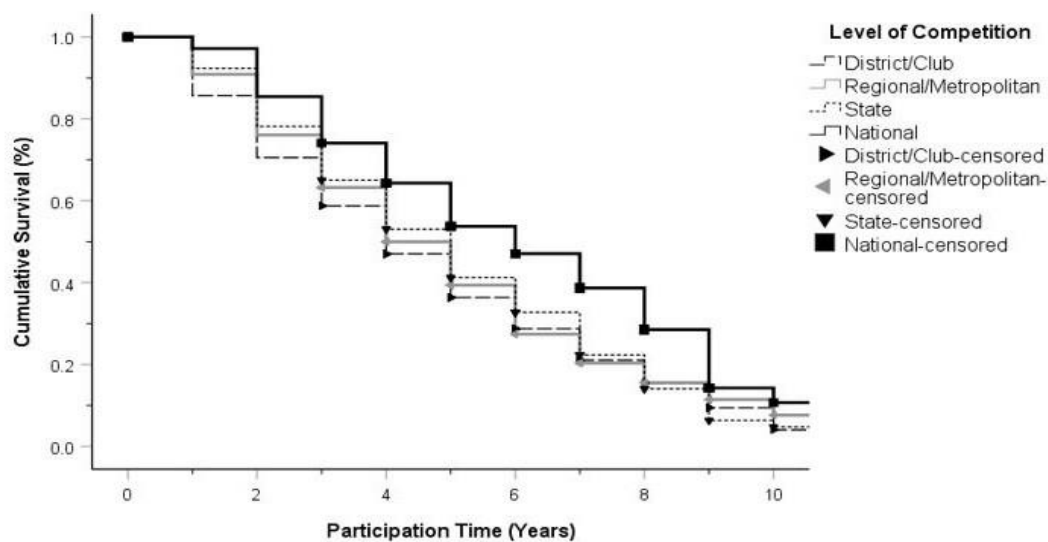


Figure 3.2 Kaplan-Meier survival curve illustrating between group differences with level of competition as a predictor of dropout (over participation years).

Table 3.7 Cox regression analysis of NSW CASD rates when examining each covariate (sex, age, relative age and socio-demographic indicators) adjusted for all others

Variables	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Sex	0.029	0.017	2.940	1	0.086	1.029	0.996	1.063
Age group (15 years)			1551.774	5	0.001			
Age group (10 years)	1.047	0.041	645.770	1	0.001	2.849	2.628	3.089
Age group (11 years)	0.925	0.027	1140.365	1	0.001	2.523	2.391	2.662
Age group (12 years)	0.669	0.027	627.451	1	0.001	1.952	1.852	2.057
Age group (13 years)	0.449	0.027	268.071	1	0.001	1.567	1.485	1.653
Age group (14 years)	0.169	0.029	32.846	1	0.001	1.184	1.118	1.255
Relative age (Q4)			27.308	3	0.001			
Relative age (Q1)	-0.118	0.025	22.678	1	0.001	0.889	0.847	0.933
Relative age (Q2)	-0.081	0.024	11.101	1	0.001	0.923	0.880	0.967
Relative age (Q3)	-0.028	0.024	1.330	1	0.249	0.973	0.928	1.020
IRSAD decile (10)			29.906	9	0.001			
IRSAD decile (1)	-0.131	0.043	9.233	1	0.002	0.877	0.806	0.955
IRSAD decile (2)	-0.107	0.043	6.352	1	0.012	0.898	0.826	0.976
IRSAD decile (3)	-0.181	0.041	19.732	1	0.001	0.834	0.770	0.904
IRSAD decile (4)	-0.121	0.038	10.142	1	0.001	0.886	0.823	0.955
IRSAD decile (5)	-0.116	0.037	9.975	1	0.002	0.890	0.828	0.957
IRSAD decile (6)	-0.035	0.039	0.803	1	0.370	0.966	0.895	1.042
IRSAD decile (7)	-0.144	0.041	12.246	1	0.001	0.866	0.799	0.939
IRSAD decile (8)	-0.086	0.038	5.048	1	0.025	0.918	0.851	0.989

Variables	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
IRSAD decile (9)	−0.109	0.038	8.085	1	0.004	0.897	0.832	0.967
ARIA (other)			107.824	2	0.001			
ARIA (major cities)	0.221	0.029	59.878	1	0.001	1.248	1.180	1.319
ARIA (inner regional)	0.267	0.026	105.445	1	0.001	1.305	1.241	1.374

Table 3.8 Cox regression analysis on NSW CASD rates when examining each covariate

Variables	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Sex	0.081	0.057	2.040	1	0.153	1.084	0.970	1.211
Age group (15 years)			123.829	3	0.001			
Age group (12 years)	0.971	0.089	118.495	1	0.001	2.640	2.217	3.145
Age group (13 years)	0.557	0.086	41.488	1	0.001	1.745	1.473	2.068
Age group (14 years)	0.447	0.091	24.009	1	0.001	1.564	1.308	1.870
Relative age (Q4)			9.090	3	0.028			
Relative age (Q1)	−0.206	0.080	6.604	1	0.010	0.814	0.696	0.952
Relative age (Q2)	−0.005	0.078	0.004	1	0.952	0.995	0.854	1.160
Relative age (Q3)	−0.095	0.078	1.461	1	0.227	0.910	0.780	1.061
Level of competition (national)			46.842	3	0.001			
Level of competition (club/district)	0.624	0.092	46.451	1	0.001	1.866	1.560	2.233

Variables	B	SE	Wald	df	Sig.	Exp(B)	95.0% CI for Exp(B)	
							Lower	Upper
Level of competition (regional)	0.433	0.100	18.741	1	0.001	1.542	1.267	1.876
Level of competition (state)	0.464	0.097	22.645	1	0.001	1.590	1.314	1.925
IRSAD decile (10)			36.841	9	0.001			
IRSAD decile (1)	−0.481	0.158	9.243	1	0.002	0.618	0.454	0.843
IRSAD decile (2)	−0.528	0.151	12.231	1	0.001	0.590	0.438	0.793
IRSAD decile (3)	−0.743	0.152	23.956	1	0.001	0.476	0.353	0.641
IRSAD decile (4)	−0.501	0.117	18.251	1	0.001	0.606	0.481	0.762
IRSAD decile (5)	−0.407	0.125	10.650	1	0.001	0.666	0.522	0.850
IRSAD decile (6)	−0.425	0.118	12.956	1	0.001	0.654	0.519	0.824
IRSAD decile (7)	−0.339	0.108	9.806	1	0.002	0.713	0.577	0.881
IRSAD decile (8)	−0.270	0.104	6.758	1	0.009	0.763	0.622	0.936
IRSAD decile (9)	−0.131	0.092	2.030	1	0.154	0.877	0.732	1.051
ARIA (other)			18.688	2	0.001			
ARIA (major cities)	0.481	0.123	15.304	1	0.001	1.618	1.271	2.059
ARIA (inner regional)	0.200	0.120	2.788	1	0.095	1.222	0.966	1.546

Table note: bs: (sex, age group, relative age, level of competition and socio-demographic indicators) adjusted for all others.

3.5. Discussion

Set within Bronfenbrenner's ecological systems framework and PPCT elements, the primary purpose of this study was to accurately examine long-term dropout trends in a popular child and

adolescent sport context, based on a large, representative, longitudinal dataset using survival analyses (Part 1). A related purpose was to determine the association of competition level alongside individual and socio-demographic variables by examining a subsample of swimmers with available competition data (Part 2). Findings identified that age group, competition level, and proximity to a major city were independent factors associated with dropout. Findings identified that younger age groups (10 and 11 years old) were at a substantially greater risk of dropout compared to older age groups (14 and 15 years). For example, of the 4066 girls and 3291 boys in the 10- and 11-year-old age group, 48% and 50%, respectively had dropped out of swimming after two years. Such figures raise concerns as to why early-age boys and girls are dropping out, who – in health terms – may not have potentially benefitted as much from swimming involvement. Findings relating to early age group dropout do align with the limited prior studies examining similar age categories in other culturally popular sports (Armentrout & Kamphoff, 2011). It is possible that multiple reasons account for present trends. Findings may reflect the different motives for initial participation, such as the cultural value placed on learning to swim for recreational and safety reasons. The access and availability of other, alternative, sporting activities may also mean that many children sample (Côté, 1999) and transition across a range of activities on a seasonal basis (summer and winter activity), common in Australian NSW communities. Additionally, the early-age nature of swimming club structure and competition could be significant, as findings from Part 2 suggest.

When examining competition level as a participation predictor, results identified swimmers competing at club/district level (the lowest level) were most at risk of dropping out. The finding does align with one prior study in competitive ice-hockey (for example, Lemez et al., 2014), where children and adolescents who moved toward a more advanced playing level received additional coaching, competitive opportunities, and therefore may have accentuated the motive to

dropout for those not selected. Coach-driven factors, including open communication styles (Fraser-Thomas et al., 2008), the creation of fun (Côté & Fraser-Thomas, 2011), empowering motivational climates (Duda, 2013), and an emphasis on athletes' personal and social growth (Wylleman & Lavallee, 2004) have also been logically implicated as influential to sustained child and adolescent participation behaviour. In the swimming context, such factors could be important, due to the individualistic nature of sport, the intense training programming and culture encouraged at young ages (Light et al., 2013) (a common feature within NSW swimming), and unfavourable times for training sessions (that is, very early or late training, due to public demand for swimming pool access).

Regarding socio-demographic predictors, results identified that residential proximity to a larger city and swimmers from a higher socio-economic status had increased risk of dropout. However, with limited parallel evidence with which to compare, it has previously been suggested that participants with higher socio-economic status were more likely, generally, to participate in sport than those from more disadvantaged areas (Eime et al., 2013). Nevertheless, the association does not necessarily apply to all types of sports (Eime et al., 2015). Comparative results from a large national dataset ($N = 21,593$) investigating links between sport participation (persons aged 15 years and above), socio-economic status and remoteness found that rural areas and more socio-economically disadvantaged areas were not predictors of dropout when examining traditional Australian sports; that is, stable participation trends could be found in remote areas when considering sports such as Australian rules football and cricket (Eime et al., 2015). The present findings reinforce the value in further investigating participation and dropout trends according to swimming club locations in different socio-economic status and geographical locations.

During the examination of NSW swimming participation data, an important observation was noted: that total annual participation numbers (and distributions) did not substantially change.

Total numbers of swimmers per age group, per year, were reasonably consistent, and thus the high frequencies of dropout were not immediately detectable. For example, in 2014, 2015 and 2016 Swimming NSW registration numbers were consistently reported at just over 18,000 members (swimmers aged between 8–18 years). The likely reason for stability in these numbers, despite knowing of dropout, relates to the new cohorts of early-age registrations. Annual early age, new registrations effectively mask the presence of high dropout rates, potentially nullifying the suggestion of low retention rates. On this basis, a protective ‘*topping-up effect*’ is occurring, when actual dropout might be reflecting possible concerns.

The strengths of the present study are associated with the large, representative dataset examined. Further, while previous studies have predominantly focused on examining CASD from psychological (motivational) perspectives, the present study – without devaluing the likely central importance of individual cognition and decision making in sport (dis)continuation – investigated the influence of multiple variables (individual, social, environmental) on swimming dropout. The study deployed a retrospective tracking design (annual registrations over time) and used a novel analysis approach not commonly adopted in the sport and physical activity literature. The more advanced study design and analytical approaches helped generate more nuanced, multifactorial knowledge and understanding, extending the existing sport dropout literature.

3.5.1. Limitations

In limitation terms, it is important to acknowledge the sensitivity of measurement, particularly when considering IRSAD and ARIA indicators. For example, residential postcodes were used to assign IRSAD and ARIA scores to each participant. However, these may not most accurately reflect the actual socio-economic status of the individual, nor reflect the local club environment. Socio-economic indicators used were applied specific to NSW and the ACT but may not be generalisable to other Australian states or other countries, where remote areas could be less

populated, and SEIFA indices may differ. A limitation of survival analysis is that it assumes the same issues affecting survival (participation) at the beginning of longitudinal tracking affect participation at the end of tracking, and that other conditions have not changed (Johnson, 2018). In this study, it cannot be discounted that survival probabilities, according to particular factors, remained similar over time (Bland & Altman, 1998). Furthermore, while this study highlighted the influence of several variables on swimming dropout, as Bronfenbrenner's ecological systems framework and PPCT elements suggest, there could be many potential unmeasured (confounding) variables within an individual's micro-, meso-, exo-, macro- and chrono-systems that may relate to dropout. Identifying such variables and assessing their impact on present estimates will be important. Likewise, complementary qualitative methods (for example, surveys and interviews) could be informative to identifying such variables, and toward ascertaining greater understanding of sport-related dropout.

3.5.2. Implications

To maximise the likely multiple benefits from sustained child and adolescent sport participation, sporting organisations could consider using similar analytical techniques to assess and track dropout trends accurately. From a swimming perspective, because swimmers as young as 10 years or less are introduced to the sport, sports systems and practitioners may need to better recognise and integrate participant development needs. Enhanced consideration of the training and competitive microclimates may be justified. While possibly 'turning against the tide' of popular, adult beliefs and preferences, a greater emphasis on fun, social, cooperative and team-orientated activities with less emphasis on inter-individual competition may be more preferential. Initiatives such as NSW's 'Swim League' – a relatively new team based aquatic event for younger age group (for example, 10 and 11-year-olds) swimmers – could be helpful in meeting the developmental needs of young swimmers. Similarly, further investigation into the coaching/club environments

within rural, regional areas could provide greater insight as the factors, and processes, helping sustain participation in these contexts.

3.6. Conclusion

Examination of long-term dropout trends of a large, representative sample of child and adolescent swimmers via the application of survival analysis techniques identified that median sustained participation prior to dropout was four years; with 48% of females and 50% of males dropping out within two years at 10 and 11 years old. Findings suggest that age group, competition level and proximity to a major city were associated with increased swimming dropout rates (higher hazard rates). Continuous new annual early age group registrations ('topping-up') may be masking visibility as to the size and scale of dropout in local level club swimming. Assuming dropout is undesirable (as framed in this study), findings highlight implications for regional and national swimming organisations in terms of systematic tracking and reporting of dropout data as an indicator of 'system healthiness'. Likewise, findings suggest that more preferred training and competitive environments may be required if sustained participation is to be achieved. However, it is acknowledged that a proportion (albeit likely small) of early age group swimmers who did 'drop off' may have intentionally done so, with interests toward sampling sporting activities. When considered this way, dropoff may not necessarily be detrimental, and may only be unhealthy when participants do not return to sport participation whatsoever. Delineating permanent dropout, temporary dropoff and intentional sampling of sporting activities will be important in future studies, and when evaluating sport systems.

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Chapters 3–4: Bridging statement

In Chapter 3, participation (re-)registration cohort data of child and adolescent swimmers across NSW, spanning (five years) was examined. Survival analysis identified age group, competition level, and residential proximity to a city as significantly associated with increased rates of dropout across annual years of re-registration. Kaplan-Meier analyses identified the median sustained re-registration as being four years, with 15.9% of swimmers (aged 10–15 years) maintaining participation over 10 years. Assuming dropout is undesirable (as framed in the thesis), findings highlight implications for regional and national swimming organisations in terms of systematic tracking and reporting of CASD data as an indicator of ‘system healthiness’. While a strength of Chapter 3 is the capability to identify generic influential factors on CASD at an epidemiological cohort level, a simultaneous weakness was the inability to identify underlying reasons or causes given the nature of the dataset.

Informed by the findings from Chapter 2 and 3, the purpose of Chapter 4 is to identify potential reasons for why NSW swimmers have high rates of CASD. Again, the CASD-SC, developed in Chapter 2 was utilised during study planning and design phases (see Table 3.9). Guided by background theoretical frameworks (see Chapter 1), the study more specifically focused on the potential association between coach-created motivational climates and CASD, implying the importance of psychological environments on individual psychology and subsequent behaviour. Leaning heavily on complex frameworks allowed the author to consider the interplay of processes, nested across environmental levels (micro-, meso-, exo- and macrosystems) which ultimately shape and inspire practitioners (e.g., coaches) to delve deeper into their own climates and make viable and cost-effective changes in the short-term. To identify the connection and provide explanatory reasoning, the study captures the experiences of both current and former swimmers in localised swimming club settings. A standard questionnaire was designed to assess

a combination of both personal and family microsystem characteristics, as well as coach-created motivational climate characteristics (coach microsystems).

Table 3.9. CASD-SC completed during planning for Chapter 4

Checklist item	Answer/explanation	Addressed
Key concepts		
1. Definition(s)	<i>Dropout</i> = ≥ 2 consecutive subsequent years (seasons) where participants have not re-registered for annual involvement. <i>Continuing</i> = ≥ 2 consecutive subsequent years (seasons) where participants have re-registered for annual involvement. For example, intended participants are swimmers aged between 10–16 years old, who have registered as ‘swimmers’ with a Swimming NSW-affiliated club during the years 2017–2019 inclusive and who either re-registered in 2020 or do not re-register (dropped out). <i>Note:</i> Swimmers are considered registered financial members of a club who may swim at club, region, state, or national level. In contrast, non-swimmers (not included in the study) are registered club members who do not swim (for example, parents, volunteers, officials and coaches).	☒
2. Measurement	The above dropout and continuing definition will be applied to measure participation status.	☒
Research question(s) and theoretical framework		
3. Research question(s)/focus	The next study will expand and develop on findings from Chapters 2 and 3 with an explicit focus on the following research questions: • What are the swimmer and swimming microclimate factors associated with dropout and sustained participation according to age and stage of swimmer development? • Does an empowering coaching climate predict sustained participation in Australian youth swimming? • Does a disempowering coaching climate predict dropout in Australian youth swimming? • What is the association between dropout and socio-demographic factors, swimming history (that is, age and experience)?	☒
		☒

Checklist item	Answer/explanation	Addressed
	What is the association between sustained participation and socio-demographic factors, swimming history (that is, age and experience)?	
4. Theoretical framework	Bronfenbrenner's Bio-ecological Human Development theory will be applied as a guiding overarching lens and the accompanying Process-Person-Context-Time (PPCT) model for methodological assessment guidance.	☒
Study methods		
5. Methodological study design and approach	Research design: cross-sectional assessment and comparison of present and former swimmers.	☒
		☒
6. Participants	Intended participants are estimated to be approximately 10% of the 3000 former or re-registered child and adolescent youth swimmers (8–18 years old). An initial target of N = 300 swimmers (for example, 150 former and 150 present swimmers).	☒
7. Context	Participants will be continuing, and former male and female swimmers aged between 8–18 years, who are currently or had been registered with a swimming club in New South Wales or the ACT, Australia.	☒

Checklist item	Answer/explanation	Addressed
8. Variables	<i>Variables examined:</i> Socio-demographic (that is, current age, age at first swimming lesson), participation history (that is, number of swimming meets per year and training hours per year), family sport participation history and coach-created (empowering/disempowering) motivational climate variables. The <i>Empowering</i> construct contains five items assessing <i>autonomy support</i> (for example, ‘My coach gave us choices and options’), three items on <i>social support</i> (for example, ‘My coach really appreciated us as people, not just as swimmers’) and nine items evaluating <i>task-involving climate</i> (for example, ‘My coach encouraged us to try new swimming skills and techniques’). The <i>Disempowering</i> construct includes seven items assessing <i>ego-involvement</i> (for example, ‘My coach yelled at us if we made mistakes’) and 10 <i>controlling</i> coach behaviour items (for example, ‘My coach paid less attention to us if we displeased him or her’).	☒
	<i>Variables not examined:</i> Social processes (for example, parent and peer relationships; social support, other motivational climates), time related (for example, scheduling and duration of competition and/or practice times), structural processes (for example, sport organisational policy), socio-economic variables.	☒
Data-collection, analysis and interpretation		
9. Data collection procedures	Data will be collected by constructing and administering two questionnaires which will explicitly examine socio-demographic and psychosocial factors associated with participation cessation or continuation in NSW youth swimming. Participants will complete the survey online. An adapted version of the Empowering and Disempowering Motivational Climate Questionnaire – Coach. The Empowering and Disempowering Motivational Climate Questionnaire (EDMCQ-C) will be used to assess the motivational climate characteristics of swimming coaches as perceived by participants.	☒

Checklist item	Answer/explanation	Addressed
10. Data analysis	A combination of quantitative analyses will be used to answer each research question. For example, to identify the associations between swimmer socio-demographic, participation history and family sport participation history variables with participation status (dropout versus continuing), descriptive analyses will be conducted (that is, independent t-tests and odds ratios will examine mean differences on socio-demographic and sport participation history data, with 95% CI used to determine effect sizes). Cluster analyses will be used to identify the potential number of clusters within coach-motivational climate ratings. Odds ratios and 95% CI will then be examined to determine the odds likelihood of coach-created climate types relating to participation status. In a final step, a MANOVA will compare participant z-scores ratings on the five EDMCQ-C subscales according to participation status (dropout versus continuation).	☑
11. Hypotheses / projected findings	Based on prior research, it was hypothesised that starting age of swimming participation (Light et al., 2013), family sport history (Fraser-Thomas et al., 2008) and coach-created microclimates would independently associate with participation status. Specifically, swimmers perceiving and rating their coaching climate as having disempowering climate features would associate with dropout; while empowering coaching climate ratings would associate with continuation.	☑

Table note: Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming.

Chapter 4: Coach-created motivational climate ratings differentiate between dropout and continuation in Australian child and adolescent swimming

The following original investigation has been published in *International Journal of Sports Science & Coaching* entitled: ‘**Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming**’.

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KM and SC contributed to the conception and methods of the study. KM, JK, OK and MH assisted with the data collection. KM, KKF, SC contributed to the analysis and interpretation of the data. KM drafted the manuscript and all authors critically revised the manuscript.

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Author contribution statement

Candidate Name: Kylie Moulds

Degree Title: Doctor of Philosophy

Paper Title: Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming

As the research supervisor of the above candidate, I confirm that the above candidate has made the following contributions to the above paper title:

- Conception and design of the research
- Analysis and interpretation of the findings
- Writing the paper and critical appraisal of content
- Creation of figures

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4.1. Abstract

Purpose: Applying Bronfenbrenner's Bio-Ecological Systems Theory and PPCT model recommendations (Bronfenbrenner & Morris, 1998), this study examined whether specific or multiple factors were associated with participation status in Australian child and adolescent swimming; a context known for high dropout rates.

Methods: Participants were continuing ($N = 99$) and former ($N = 104$) swimmers, aged 8–18 years, who competed at club-national level in New South Wales, Australia. Participants completed an online survey, examining socio-demographic, participation history and coach-created motivational climate characteristics (using the EDMCQ-C; Appleton et al., 2016). To identify influential factors, a combination of t -tests, odds ratios and MANOVA analyses were used. To confirm the presence of coach-motivational climate types and their association with participant status, cluster analyses with follow-up odds ratios were used.

Results: Except athlete age and sex, other socio-demographic, participation history and family sport history participation were not associated with dropout. Meanwhile, EDMCQ-C analyses identified three cluster types of coach-created climate (empowering, disempowering and neutral), with disempowering and empowering types, respectively, associated with dropout and continuation. The neutral climate was associated with low-to-moderate EDMCQ-C subscale scoring and was neither associated with dropout nor continuation.

Conclusion: Findings identify the influence of coach-created motivational climates and not athlete-related factors on continued Australian child and adolescent swimming participation, highlighting coaching implications.

Keywords: coach climate, coach–athlete relationships, sport cessation, sport withdrawal, youth sport withdrawal, youth sport.

4.2. Introduction

4.2.1. Child and adolescent sport participation benefits and the dropout problem

Sustained childhood and adolescent sport participation can provide a platform for favourable longer-term health trajectories, with existing evidence suggesting multiple positive physical, psychological and social developmental benefits (Eime et al., 2013). Studies indicate children who are actively involved in sporting clubs, and who maintain sporting engagement throughout adolescence, potentially consolidate lifelong health behaviours (Luepker, 1996; Sallis & Owen, 2002). Some identified benefits include increased aerobic fitness (Janssen & Leblanc, 2010) lower body fat (Ortega et al., 2008), enhanced bone health (Smith et al., 2014) and reduced likelihood of symptom presence associated with psychological conditions, such as depression and anxiety (Bailey, 2006). Therefore, community organisations (for example, sport clubs) in multiple locations (for example, public and private spaces) and sport practitioners can be viewed as important facilitators for sporting and physical activity provision. However, juxtaposed against health benefits and possibilities is the issue of early-stage dropout, where the empirical literature highlights that a high proportion of participants intentionally withdraw from child and adolescent sport settings (Eime et al., 2015; Moulds et al., 2020). For instance, in Australia, approximately 10% of children aged 8–10 years withdraw from organised sports each year, equating to approximately 250,000 children (Vella et al., 2015). Therefore, when considered from either societal health or sporting organisational/practitioner standpoints, understanding why high dropout rates are occurring and the potential factors and processes involved becomes important. Research needs to examine these components to identify how participation can be maximised and health benefits attained.

4.2.2. Social-ecological frameworks for understanding child and adolescent sport dropout

Social-ecological theoretical frameworks are valuable for helping conceptualise and understand

how a potential milieu of individual, social and environmental factors, and their interactions over time (processes), may associate or account for behaviours (dropout within sporting contexts) and longer-term developmental outcomes (for example, health indices). For these purposes, Bronfenbrenner's Bio-ecological Human Development Theory (Bronfenbrenner, 1979; 2005) was applied as a guiding overarching lens (not for theory testing purposes per se) and the accompanying Process-Person-Context-Time (PPCT) model (see Chapter 1) for methodological assessment guidance in the present study. Bronfenbrenner's theory proposes how positive (functional), or negative (dysfunctional) outcomes occur via frequent and sustained social exchanges in developmental activities, while acknowledging the potential (in)direct influences of meso- (for example, school; hobbies/recreational groups) to exosystem (for example, national sport policy; culture) factors (Eliasson & Johansson, 2020). On the capability to engage in developmental activities, Bronfenbrenner centrally proposes the heightened importance of relational social exchanges between individuals (for example, sport participants and coaches).

Within activity microsystems, continuing interactions over time are proposed to bi-directionally impact the psychosocially functioning individual (given their pre-existing characteristics) determining directional development (positive or negative). As such, the theory identifies how coach instructional and communication strategies, nonverbal behaviours, values, and other coaching microclimate features, all convey information and meaning. Participants, and others (for example, parents, siblings), experiencing microsystems then (sub)consciously interpret and evaluate such information. These subsequently affect psychological perceptions (for example, competency, belonging, personal valuing), behavioural decisions (for example, continued participation) and longer-term developmental directions (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 1998).

4.2.3. Coach-created microclimates and child and adolescent sport dropout

In alignment with Bronfenbrenner (Bronfenbrenner & Morris, 1998), coaches can be considered the nucleus of child and adolescent sport microsystems, because they are often responsible for implementing the structure and content of learning and training activities over micro–macro time periods (Fraser-Thomas et al., 2008; Rottensteiner et al., 2013). Further, given their responsibility, they can substantially determine the pattern and nature of social interactions and experiences (social agents). Thus, when occurring regularly, characteristic microsystem climate features may develop or emerge, as identified in independent sport psychology literature.

Framed within individual motivational theoretical perspectives of Achievement Goal Theory (AGT; Nicholls, 1989) and Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000), Appleton et al. (2016) refers to psychosocial environments created intentionally or unintentionally as *coach-created motivational climates*, given their impact on participant motivation. Duda (2013) previously identified two dichotomous types of coach motivational climate (*empowering* or *disempowering*), comprising five components. An *empowering climate* is characterised by coach behaviours of high task-involvement, autonomy-support, and social-support (Appleton et al., 2016; Mageau & Vallerand, 2003; Reinboth & Duda, 2004) with correspondingly low ego and participant control. In contrast, *disempowering climates* are characterised by high ego-involving (for example, result focused) and controlling (for example, authoritarian, pressuring, coercive) instructional and social interactional behaviours, with low task-involvement, autonomy, or social support (Appleton & Duda, 2016; Bartholomew et al., 2010; Duda, 2013). Previously, psychometric instruments (for example, Perceived Motivational Climate in Sport Questionnaire – 2; PMCSQ-2 Newton et al., 2000; Motivational Climate Scale for Youth Sports – MCSYS, Smith et al., 2007) have been used to identify the low–high presence of underpinning characteristics, which then determine the orientation toward a given climate (Newton et al., 2000).

Whether other types of coach-created motivational climates exist is relatively unknown. To the best of my knowledge, only one other study (Into et al., 2020) has shown the existence of additional coach-created motivational climates during their assessment of burnout symptoms in Finnish student athletes. They identified four coaching climate types: extremely disempowering, disempowering, empowering and intermediate using latent profile analysis.

Existing motivational climate studies indicate empowering climate characteristics are associated with favourable impacts on participant cognitions, affect and motivation (Fenton et al., 2017). For instance, the Promoting Adolescent Physical Activity (PAPA) project (Duda, 2013) identified that when empowering climate characteristics were successfully deployed in child and adolescent soccer settings across Europe, enjoyment and higher rates of participation were positively affected and sustained, respectively. However, within the context of dropout literature and social-ecological explanations, the association between (dis)empowering climates on actual behavioural outcomes (dropout) has not been examined, warranting further examination. More specifically, the assessment of coach-created microclimate types can help identify coach behaviours, social exchanges and psychological microclimate characteristics which may detrimentally affect child and adolescent participation in the short term and hypothetically affect longer-term (dys)functional development (see Figure 4.1 for a diagrammatic summary). To date, the existing literature has examined only motivational climate associations with the intention to dropout/continue (for example, Castillo-Jiménez et al., 2022; Fenton et al., 2017) with no consideration given to other factors occurring in parallel.

4.2.4. Study purposes

Predominantly informed by social-ecological frameworks and youth sport dropout literature, this study had two main purposes. The primary purpose was to examine whether specific or multiple factors discriminated, and thus were associated with, participation status in Australian child and

adolescent swimming; a context where high dropout rates are known but an understanding of all the factors and processes involved are not (Moulds et al., 2020). A combination of personal (age, sex), athlete microsystem (family sport history) and coach-created motivational microclimate factors were therefore assessed.

Prior evidence suggested that starting age of swimming participation (Light et al., 2013) and family sport history (Fraser-Thomas et al., 2008) would independently associate with participation status (Hypothesis 1). Given the theoretical importance of relational interactions and social exchanges within activity contexts, it was also hypothesised coach-created microclimates would associate with participation status. Specifically, swimmers perceiving and rating participation within disempowering climate features would associate with dropout, while empowering coach climates would associate with continuation (Hypothesis 2; see Figure 4.1). While examining swimmer ratings and their alignment toward coach motivational climate types, a simultaneous and unique purpose was to explore whether alternative climate types existed.

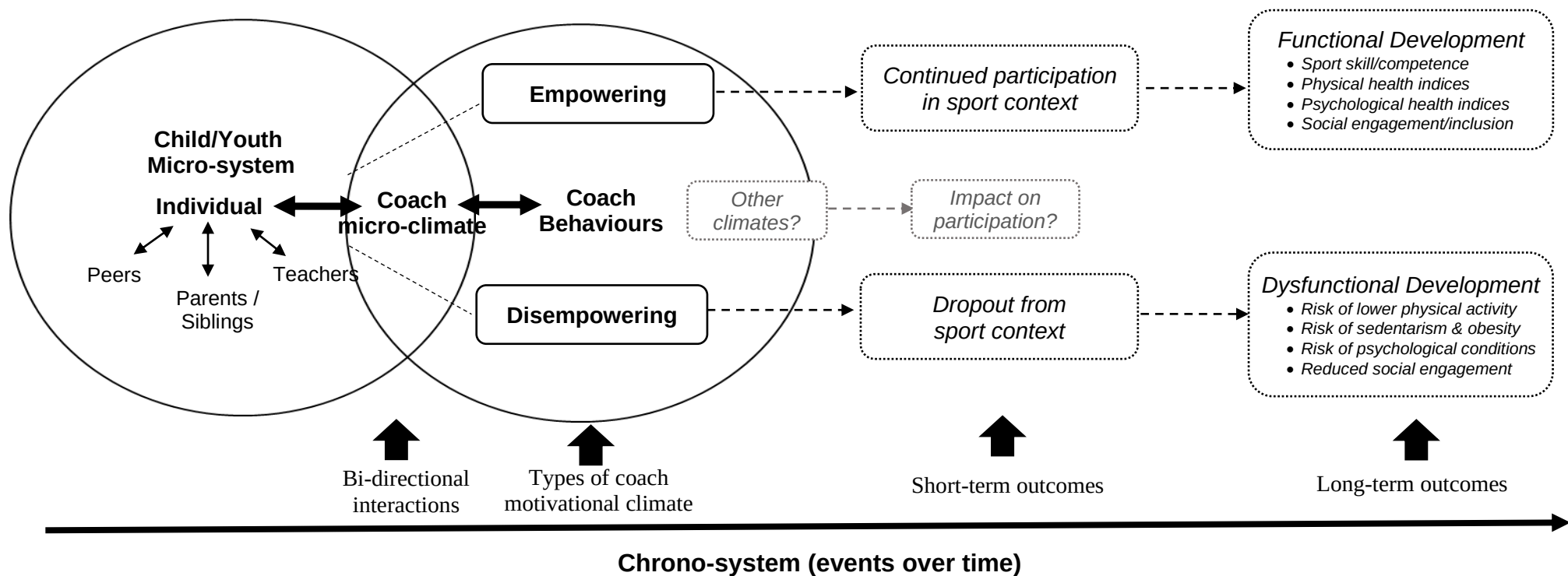


Figure notes: Solid lines and non-italics summarise social-ecological explanations of potential impact from coach motivational climates. Dotted boxes and italicised words identify hypothetical relationships with coach motivational climates on outcomes of youth sport participation and broader health development.

Figure 4.1 Visual summary of how individual interactions with coaching climates may associate with short-term (dropout) and potential long-term development outcomes.

4.3. Methods

4.3.1. Participants

Following university ethics approval (App No: 2020/682; see Appendix C), participants were 203 continuing (female $n = 45$, male $n = 54$) and former (had dropped out; female $n = 71$, male $n = 33$) swimmers aged 8–18 years ($M = 13.01$ years; $SD = 2.35$) who were (formerly) registered with Swimming New South Wales (SNSW),¹¹ Australia. Inclusion criteria stipulated for continuing swimmers to have been registered with a SNSW-affiliated club for three consecutive years (2018–2020) and who had re-registered for the 2020–21 season. Participants were permitted to compete at varying standards, ranging from club to national level. Continuing swimmers had been swimming for a mean of 8.60 years ($SD = 2.91$) and were often involved in initial ‘learn to swim’ lessons, commencing at 3.35 years ($SD = 2.51$). They competed on average at 8.73 ($SD = 8.27$) meets per year and reported 3.40 training hours per week ($SD = 1.33$). Former swimmers were those who had registered for the three consecutive years between 2018–2020 but had not re-registered in 2020–21. Former swimmers had been swimming for a mean of 10.34 years ($SD = 2.89$) and initially commenced (structured) swimming lessons at 3.70 years ($SD = 2.29$) on average. In the season prior to dropout, they were competing at 9.11 ($SD = 7.60$) meets per year on average, with 3.07 ($SD = 1.37$) training hours of involvement per week.

4.3.2. Recruitment and procedure

For continuing and former participants, an email invitation with a link to an online Research Electronic Data Capture (REDCap) survey was distributed to their parent/carer/guardians by SNSW via email. The study was also promoted on SNSW social media channels (for example, Twitter and Facebook). Participant and parent/guardian individual informed consents were obtained prior to beginning the online survey. To help ensure question understanding and response

¹¹ Swimmers are registered financial members of a club who may swim at club, region, state, or national level (Swimming NSW, 2021). Swimmers must be registered to compete in any level of competition in NSW, Australia.

accuracy, participants aged 15 years and under were encouraged to complete the survey with parental support (Cronbach, 1951). The survey took 20–25 minutes to complete.

4.3.3. Survey content

Informed by Bronfenbrenner's (1979, 2005) theoretical propositions, Bronfenbrenner and Morris (1998) consolidated the bio-ecological systems framework into the PPCT model offering a methodological approach to better understand how differential developmental outcomes (for example, dropout or continuation) may occur in a given context. In the PPCT model, to identify factors influencing individual development, they emphasised the need to understand: (1) '*process*', referring to the nature of recurrent interactions and established feature characteristics between social actors in the microsystem; (2) the '*person*', referring to understanding the biological, psychological, social and behavioural characteristics of those examined, and the potential for these factors to also influence or moderate developmental behaviours; (3) the '*context*', referring to understanding the stable or changing feature of the microsystem relative to broader historical, meso-macrosystem factors (that is, the structure and culture of provision in a given sport in a given location); and (4) '*time*', referring to assessment and understanding time-related characteristics within microsystems. These can be considered as micro- (for example, frequency, duration, and intensity of training), meso- (weekly/monthly structure of sport programs), and macro-time (for example, stable competition and training characteristics over year(s)) characteristics. Understanding *Time* characteristics are deemed important, because the effect of developmental activity engagement and social interactions on (un)expected outcomes necessitate time.

Based on PPCT model recommendations and study purposes, the REDCap survey contained three subsections. The first subsection captured potential socio-demographic and background swimming participation history (*person* and *time*). The second assessed family sport participation history (*process*). The third assessed perceptions of the coach-created motivational climate,

referring to the practices of their most recent coach (*process*). Dropout or continuation were identified and categorised at the point of participant recruitment, reflecting a developmental outcome resulting from *person-process-context* over *time* interactions.

4.3.3.1. Participant socio-demographic and swimming participation history

Participants were asked nine questions relating to age, sex and swimming participation history, including: age upon initiation of structured swimming lesson, number of hours per week at swimming training and competition, and the number of competitive meets attended during the last competition year.

4.3.3.2. Family sport history

To capture family sport participation history, decision-tree optional items adapted from Fraser-Thomas et al. (2008) were applied. Six items examined biological parent/legal guardian and sibling support (that is, who was influential during their swimming involvement participation), as well as their background in swimming participation and competition if applicable. Involvement in other broader sport participation and level of competitive involvement was also examined.

4.3.3.3. Coach-created motivational climate

An adapted version of the Empowering and Disempowering Motivational Climate Questionnaire-Coach (EDMCQ-C; Appleton et al., 2016) assessed the motivational climate characteristics of swimming coaches as perceived by participants (see Appendix J). The EDMCQ-C consists of 34 items which associate with five lower-order dimensions, aligned to two *Empowering* and *Disempowering* constructs (17 items each). The *Empowering* construct contains five items assessing *autonomy support* (for example, ‘My coach gave us choices and options’), three items on *social support* (for example, ‘My coach really appreciated us as people, not just as swimmers’) and nine items evaluating *task-involving climate* (for example, ‘My coach encouraged us to try new swimming skills and techniques’). The *Disempowering* construct includes seven items assessing *ego-involvement* (for example, ‘My coach yelled at us if we made mistakes’) and 10

controlling coach behaviour items (for example, ‘My coach paid less attention to us if we displeased him or her’). All items were rated based on considerations of what their main coach normally said or did most of the time during training and competition over the last year of involvement (the 2020–2021 season). Item responses were provided on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Previous research has identified young athletes’ scores on the EDMCQ-C as valid and reliable (Appleton et al., 2016). Cronbach’s α in the present study ranged between 0.83–0.87, suggesting a high level of internal consistency (Cronbach, 1951).

4.3.4. Data analysis

Study data were collected and managed using REDCap electronic data capture with participant identity and data remaining confidential and unknown to researchers. Data analysis occurred in NSW with support from external collaborators. Initial data screening involved the removal of participants with incomplete data in survey subsections as well as pre-data analysis checks for outliers and meeting statistical assumptions for parametric data (for example, normality).

4.3.4.1. Hypothesis 1

To identify associations between swimmer socio-demographic, participation history and family sport participation history variables with participation status (dropout versus continuing), descriptive analyses were conducted. Independent *t*-tests examined mean differences on socio-demographic (current age, age at first swimming lesson) and sport participation history data (number of swimming meets per year and training hours per year), with 95% CI used to determine effect sizes (Thompson, 2002). Because sex and family sport history variables were frequency count based, odds ratios and 95% CI were utilised for comparisons.

4.3.4.2. Hypothesis 2 and exploratory hypothesis

To address these hypotheses, several independent but interrelated steps were conducted. The first step was to conduct a cluster analysis, which is a data reduction technique designed to: (1) group similar observations in a dataset (that is, create classifications of homogenous group ratings); (2)

identify new relationships; and (3) conduct assenting analyses of previously identified groupings best fitting to data (Everitt et al., 2001; Aldenderfer & Blashfield, 1984). To identify the potential number of clusters within coach-motivational climate ratings, a hierarchical cluster analysis was utilised with a range of solutions considered (3–6 cluster). The Ward method (Ward, 1963) using squared Euclidean distances, agglomeration schedule and supporting dendrogram was deployed on standardised ratings for the five subscales to identify the best-fitting number of clusters. Following the identification of the cluster number, a K-means cluster analysis then verified the solution by examining iterations to convergence, distances between centroids of clusters and outlier checking. K-cluster ANOVA tables were used to identify variables contributing the most to the cluster solution.

Based on K-means cluster analysis findings, in a second step, odds ratios and 95% CI then examined the odds likelihood of coach-created climate types relating to participation status. In other words, whether former swimmers were more likely to cluster rate with disempowering climates, while continuing swimmers with empowering climates. In the final step and remaining aligned to the original research question, a multivariate analysis of variance (MANOVA) compared participant z-scores ratings on the five EDMCQ-C subscales according to participation status (dropout versus continuation). Prior to MANOVA, all relevant assumptions were completed while Cohen's (Cronbach, 1951) criteria were used to determine effect sizes. All statistical analyses were conducted using IBM-SPSS Statistics v. 25 (Armonk, NY, USA) with *alpha* set at 0.05.

4.4. Results

4.4.1. Hypothesis 1

When examining athlete microsystem factors, dropout swimmers were older at the time point of data collection compared with continuing swimmers. There were no other differences between dropout and continuing swimmers on participant swimming-related characteristics. In terms of

swimmer sex, male swimmers were less likely to have dropped out compared to females. No other family swimming or sport participation history was associated with participation status (see Table 4.1). Findings only partially contrasted with the initial hypothesis.

4.4.2. Hypothesis 2 and exploratory hypothesis

Hierarchical cluster analysis identified a three-cluster best-fitting solution with an even distribution of cluster members ($n_1 = 82$; $n_2 = 50$; $n_3 = 71$). In the K-means cluster analysis, the ANOVA table confirmed all five EDMCQ-C subscales significantly contributed toward the three cluster groups (all $p < 0.001$). Figure 4.2 summarises the descriptive z-scores ratings for the three cluster groups according to the five coach-created motivational climate subscales. The z-scores for each subscale clustered accordingly into the empowering and disempowering coaching climate types. Meanwhile, the third *neutral* cluster had z-scores residing marginally higher or lower than mid-point anchor ratings (3 – *neither agree nor disagree* on original EDMCQ-C scoring) across all five subscales.

Five one-way between-subjects ANOVAs identified differences between cluster ratings across each EDMCQ-C subscale: task-involving ($F(2,200) = 265.74$, $p < 0.001$), autonomy-support ($F(2,200) = 145.78$, $p < 0.001$), social-support ($F(2,200) = 248.99$, $p < 0.001$), ego-evolving ($F(2,200) = 226.99$, $p < 0.001$) and controlling ($F(2,200) = 217.79$, $p < 0.001$). Follow-up Tukey's HSD comparisons identified the empowering cluster contained coaching climates significantly higher in perceived autonomy-support, social-support, and task-involving features, along with significantly lower ego-involving and controlling coaching behaviours ($p < 0.001$) relative to the neutral and disempowering clusters. The neutral cluster contained scores rated significantly higher and lower – relative to the disempowering and empowering clusters, respectively – on perceived autonomy-support, social-support, and task-involving features ($p < 0.001$). The neutral cluster also reported consistently lower ratings on ego-involving and controlling features relative to the disempowering cluster, while remaining higher than the empowering cluster ($p < 0.001$). The

disempowering cluster was higher on ego-involving and controlling behaviours ($p < 0.001$) and consistently lower ratings on perceived autonomy-support, social-support, and task-involving subscales relative to the neutral and empowering clusters (exploratory hypothesis confirmed).

Table 4.1 Summary of participant socio-demographics, swimming training history and family microclimate sport history according to participation status

Characteristics	Dropout (N =104)		Continuers (N = 99)		t (df =201)	95% CI
	M	SD	M	SD		
Age at data collection (years)	14.0	2.2	11.9	1.9	6.90*	1.47–2.65
Age at first (structured) swimming lesson	3.7	2.2	3.3	2.5	1.20	–0.32–1.01
No. of swimming meets per year	9.1	7.6	8.7	8.2	0.34	–1.80–2.56
No. of training hours per week	3.0	1.3	3.4	1.3	–1.72	–0.70–0.48
	<i>n</i>	%	<i>n</i>	%	OR	95% CI
<i>Sex</i>						
Male	33	31.7	54	54.5	0.38*	0.21–0.68
Female	71	68.2	45	45.4		
<i>Family swimming history†</i>						
Father/male legal guardian	30	28.8	34	34.3		
Mother/female legal guardian	38	36.5	49	49.4		
Sibling	42	40.3	35	35.3		
Father versus mother					1.13	0.59–2.17
Father versus sibling					0.73	0.37–1.42
Mother versus sibling					0.64	0.34–1.19
<i>Family sport history†</i>						
Father/male legal guardian	64	61.5	56	56.5		
Mother/female legal guardian	74	71.1	72	72.7		
Sibling	39	37.5	35	35.3		
Father versus mother					1.11	0.68–1.80
Father versus sibling					1.02	0.57–1.83
Mother versus sibling					0.92	0.53–1.61

Table notes: †= ≥ 2 years of participation; CI = confidence intervals; * $p < 0.001$, participation status (dropout/continuers) was the outcome used for odds ratios.

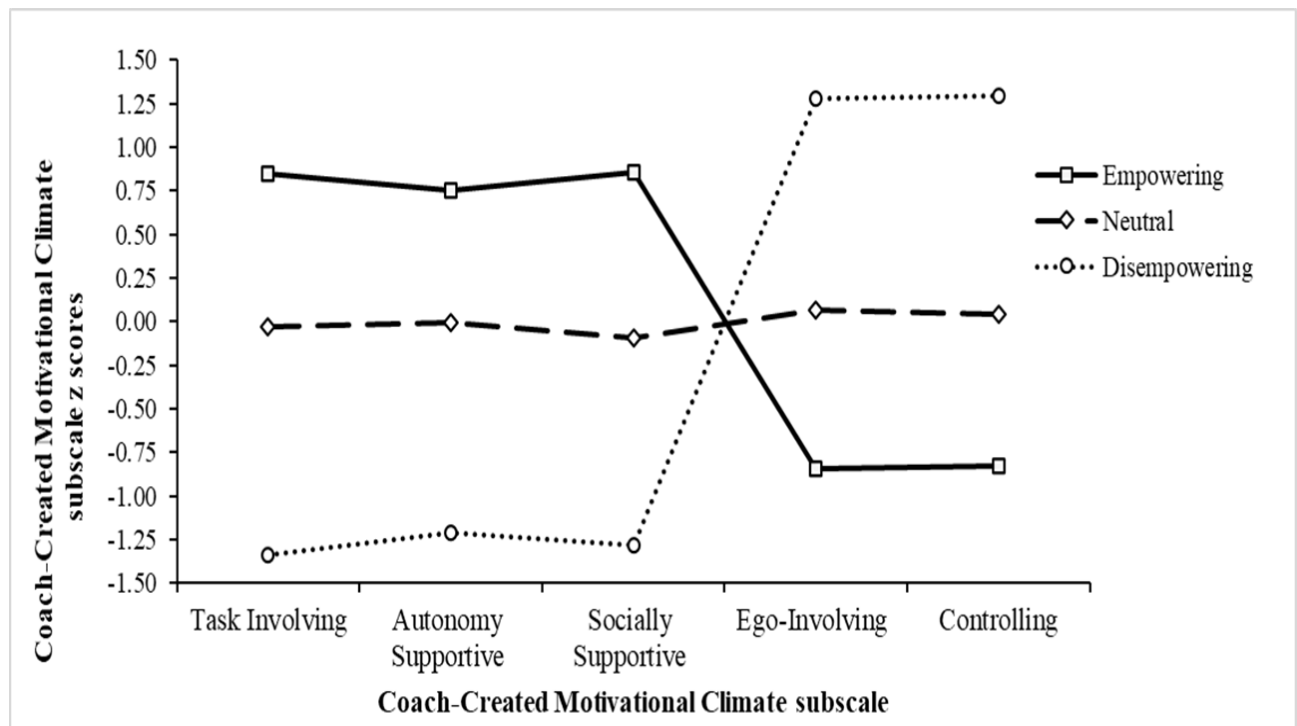


Figure 4.2 Mean z-score ratings for coach-created motivational climate subscales according to identified cluster profiles.

To examine Hypothesis 2, the neutral cluster was excluded with participation status distributions examined across empowering and disempowering clusters ($n = 134$). Chi-square identified a significant association between participation status and the two opposing clusters (empowering versus disempowering; $X^2 = 12.762$, $p < 0.001$). Dropout swimmers were more than three times as likely (OR = 3.79, 95% CI = 1.79–8.01) to associate their coach with a disempowering versus empowering climate, and were 74% (OR = 0.26, 95% CI = 0.12–0.33) less likely to have experienced an empowering versus disempowering climate.

The one-way MANOVA examining EDMCQ-C subscale ratings according to participation status identified a significant overall between-group effect (continuers versus dropouts) across all motivational climate subscales, with a large effect size ($F(5197) = 5.69$, $p < 0.001$; Wilks' $\Lambda = 0.87$; partial $\eta^2 = 0.12$). Tukey's HSD post-hoc tests showed dropout swimmers had significantly higher ratings on ego-involving ($F(1201) = 14.04$, $p < 0.001$, partial $\eta^2 = 0.06$), and controlling

($F(1201) = 8.80, p < 0.003$, partial $\eta^2 = 0.04$) subscales. Continuing swimmers provided significantly higher ratings on autonomy-support ($F(1201) = 10.54, p < 0.001$, partial $\eta^2 = 0.05$); social support ($F(1201) = 14.35, p < 0.001$, partial $\eta^2 = 0.06$) and task-involving ($F(1201) = 23.93, p < 0.001$, partial $\eta^2 = 0.10$) subscales. Differences in task-involving ratings had a large effect size (for example, $\eta^2 = 0.10$), while social support and ego-involving ratings had moderate effect sizes (see Figure 4.3 for a visual summary). Both odds ratio and MANOVA results confirm Hypothesis 2.

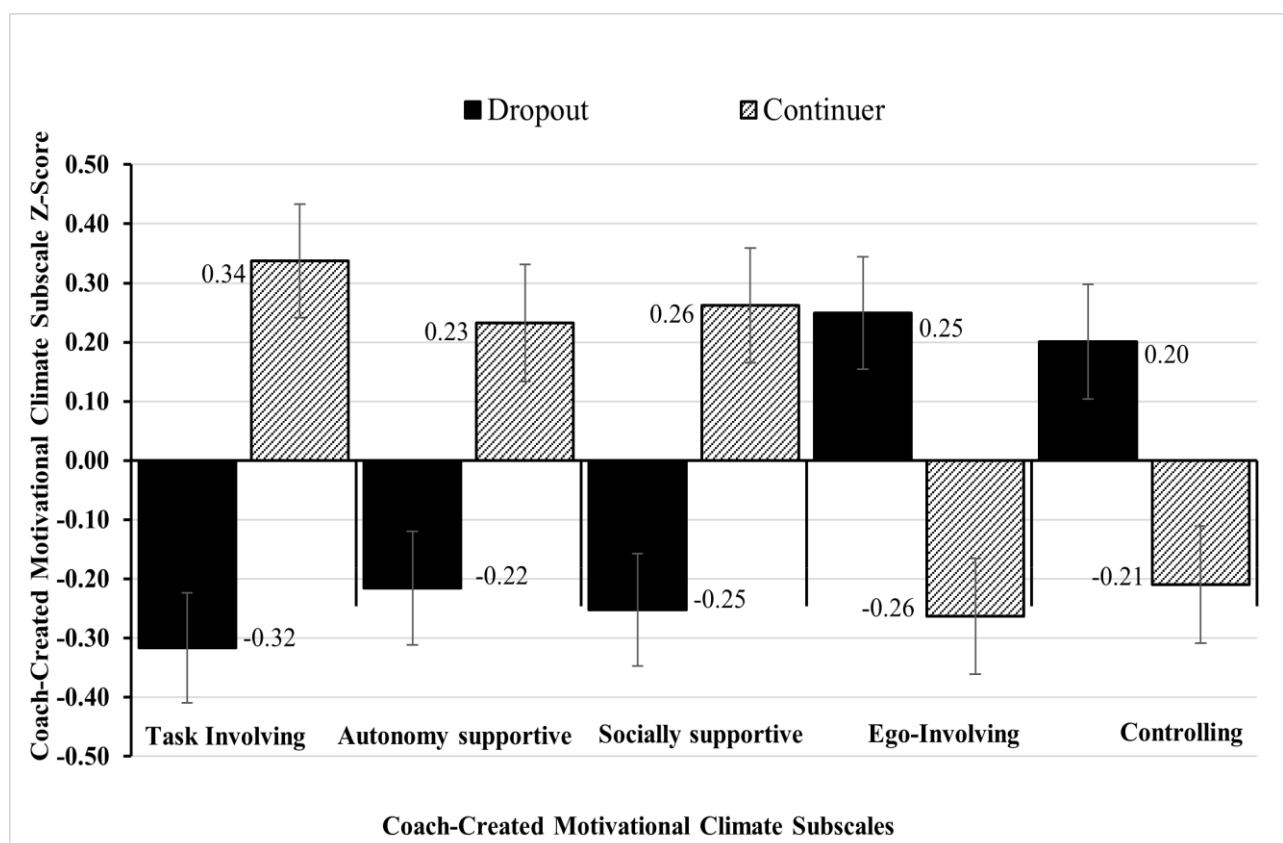


Figure 4.3 Mean z-score ratings for coach-created motivational climate subscales according to identified cluster profiles.

4.5. Discussion

Uniquely examining the simultaneous behavioural outcomes of actual dropout versus continuation (as opposed to intentions), this study assessed whether microsystem factors and coach-created microclimates affected participation status in a sample of Australian child and adolescent swimmers. Supporting Hypothesis 1, swimmers who dropped out were older and were

more likely to be female. Multiple explanations could account for the findings. For instance, increasing age could relate to specific, or a combination of processes, including changing or competing interests (Fraser-Thomas et al., 2008; Rottensteiner et al., 2015); participation and competitive structure within swimming (Moulds et al., 2020); changed meaning/purpose of swimming involvement in older age groups (Brown, 1985); and changing social relationships (coach and peer dynamics; Rottensteiner et al., 2015; Manz et al., 2016). More sex-related explanations could relate to perceived social norms and expectations (Salguero et al., 2003); prioritisation of alternative activities (for example, education; Molinero et al., 2006); changing body shape and performance regression (Hogan et al., 2022) – all of which have related to dropout.

In contrast with the hypothesis and the prior literature (Eime et al., 2015; Fraser-Thomas et al., 2008; Light et al., 2013), swimmer and family participation history factors were not associated with participation status. Here, alternative explanations may be accountable, including methodological issues of study recruitment and response bias (see Section 4.5.1 Limitations). Further, in the present study, only crude (categorical) indices of prior (family or sibling) swimming or sporting involvement were captured; thus, participation history variables may not have been accurately measured. Other scaled indices, such as measures of psychological support, reflecting parent interest or encouragement (Wuerth et al., 2004), may be worthwhile considering.

Supporting the findings of Into et al. (2020), the results also confirmed the existence of a third, neutral coaching climate. The neutral climate was neither empowering nor disempowering; did not associate with participation status; but still can be considered suboptimal. Again, several explanations could be relevant. Swimmers, for example, could be accurately identifying a sample of coaches with low-to-moderate consistency behaviours across (dis)empowering constructs. A second explanation suggests coaches may behave differently in different contexts. Indeed, coaches may utilise different social interaction strategies with athletes during training and competition contexts or according to specific situations (Smith et al., 2017). Thus, swimmers may

have rated their coaches as ‘neutral’ reflecting an overall balance, rather than being consistently high or low on (dis)empowering subscales. Within swimming, constraints (for example, ear and body immersion) could also affect instructional and communication strategies, with nonverbal behaviours – for example – more frequently utilised. Changing (lowering) ratings over time from empowering-neutral climates may also act as pre-cursors to swimming dropout.

Related to Hypothesis 2, strong relationships were identified as former swimmers were more than three times as likely to associate their coach with a disempowering climate and were 74% less likely to experience an empowering climate. These results align with Fenton et al. (2017) and Castillo-Jiménez et al. (2022) findings where empowering climates were positively related to intention to continue; while perceived incompetence, lack of autonomy and relatedness (disempowering climate) increased intention to dropout in English grassroots national soccer, netball and hockey. Our findings confirm that coach motivational climates not only associate with athletes’ intentions, but also with actual behaviour.

The present findings extend on the existing coach-created motivational climate literature (Reinboth & Duda, 2004; Appleton & Duda, 2016) and confirm the informative value of social-ecological frameworks toward understanding behaviour. While findings from the present study align with Duda’s (2013) integrated framework, the existence of a neutral coaching climate, as well as the influence of age and sex-related reasons for dropout, goes beyond the view of key active agents (coaches) affecting individual motivation. Instead, the social-ecological view considers the possibility of alternative multilayered factors, simple–complex processes (for example, individual characteristics, social interactions, context features) as affecting dropout (Moulds et al., 2022). These factors and processes (un)consciously affect psychological interpretation, coaching climate perceptions, motivation toward activity engagement and subsequent behavioural outcomes.

4.5.1. Limitations

The current study is not without limitations. The potential for recruitment and reporting bias cannot be discounted (Podsakoff et al., 2003). Participating former swimmers (and their parents) may have had genuinely more negative (disempowering) experiences and were, therefore, potentially more motivationally inclined to report on negative experiences. However, it is possible that recruited continuing swimmers may have had disproportionately positive experiences in their respective coaching climates. Thus, such recruitment or recall bias may not truly reflect the broader population, with a wider participation base along with revised study recruitment strategies recommended. Finally, social-ecological frameworks caution when externalising findings. The present factors and processes influencing dropout in the present study may (or may not) be valid at different time points, other geographical locations, or in other sports contexts.

4.5.2. Implications

Considered together, the current findings implicate the need for sport governing bodies and localised organisations (for example, regional associations, clubs) to understand the factors and motivational drivers – across PPCT levels – currently leading to child and adolescent swimmers being exposed to suboptimal psychological climates. Such organisations should help enhance conceptual knowledge of coaching climates and their impact on swimmer development via coach education. Implementing personal/peer review and self-reflection for evaluation could be valuable toward facilitating coach behaviour change and optimising climates. Certainly, coaches learning to implement behaviours, communication strategies, values and conduct aligned to an empowering climate will predictably protect against dropout. Such implementation will also increase the likelihood of child and adolescent swimmers attaining the physical, psychological, and social developmental outcomes from longer-term involvement.

Future research should continue utilising social-ecological frameworks. Further assessment of socio-demographic, social interaction, contextual and time-related characteristics will help

achieve a more comprehensive understanding of the factors and processes, leading to both (sub)optimal coaching climates and their impact on participation. The present findings suggest investigation of sport organisational structures, policies, and cultures. Contexts with an early-age performance emphasis and where coaches are evaluated on performance-associated metrics could be key ecological factors accounting for the prevalence of disempowering or neutral climates. Further research is also necessary to validate and understand neutral climate characteristics and its potential impact. Equally, research investigating the effectiveness of coaching climate interventions within context reporting high dropout rates will be informative.

4.6. Conclusion

In the context of regional Australian child and adolescent swimming, coach-created motivational microsystem climates discriminated between sport dropout and continuation behaviour. While former swimmers were older and more likely to be female, other sport background and family sport participation history were not related to dropout. Cluster analyses identified the presence of a third neutral coach-created motivational climate, with low/no orientation toward the EDMCQ-C (dis)empowering constructs. While not influential to dropout, the neutral, no-impact, suboptimal psychological climate is still concerning. Together, the findings emphasise the importance of sport systems and coach education to promote empowering climate implementation within coaching practice.

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Chapters 4–5: Bridging statement

In Chapter 4, the findings identified three cluster types of coach-created motivational climate (that is, empowering, disempowering and neutral), with disempowering and empowering types, respectively, associated with dropout and continuation. The neutral climate was associated with low-moderate EDMCQ-C subscale scoring and was neither associated with dropout nor continuation. The study findings identified the significance of coach-created motivational climates relative to athlete-related factors on (dis)continued Australian child and adolescent swimming participation. The presence of neutral climates also identifies the possibility of a non-impacting, though still suboptimal, climate when considered from a human development theory perspective. Considered together, the findings highlight the importance of coach-created social environments and their potential to impact individual experience and participation outcomes. Thus, being able to create and optimise positively impacting coaching environments can be considered valuable to CASD.

Informed by findings identified across Chapters 2–4, the main purposes of Chapter 5 are to first, investigate coach-created motivational climates from both coach and swimmer perspectives within child and adolescent swimming contexts. Second, to pilot trial and evaluate the effect of a coach education intervention, targeted at the implementation of empowering coaching climate characteristics. The short-course pilot intervention was designed and tested with development and advanced level Australian swimming coaches. A quasi-experimental research design with multiple methods was implemented to evaluate intervention effects. Quantitative data were obtained at three-time points (pre-, post-intervention and six-week follow-up), while qualitative semi-structured interviews were conducted for validation and review purposes at the post follow-up stage. Study planning and design were informed by CASD-SC completion (see Table 4.2 for summary notes).

Table 4.2 CASD-SC completed during planning for Chapter 5

Checklist item	Answer/explanation	Addressed
Key concepts		
1. Definition(s)	Dropout not assessed in this study. However, the coach-created motivational climate was assessed (that is, what coaches do and how they do it can shape an individual's interpretation and subsequent behaviour). An empowering motivational climate is defined as having a combination of task-involving, autonomy-supportive and socially supportive environments. In comparison, disempowering climates are defined by features of ego-involving (for example, result focused) and controlling (for example, authoritarian) instruction, social interaction patterns and behaviours (Duda, 2013; Duda & Appleton, 2016).	☐
2. Measurement	Dropout not measured in this study. Dependent variables measured in the quantitative aspect of the study will be the empowering and disempowering climates.	☐
Research question(s) and theoretical framework		
3. Research question(s)/focus	Study objectives were to: (1) increase coaches' conceptual knowledge and understanding of coach motivational microclimates, and their consequences, via a short-course coach education intervention; (2) increase coaches' knowledge of behavioural strategies to enhance the psychological empowering characteristics of their coach-athlete environments; (3) evaluate the effect of the intervention via coach self-report and athlete motivational climate evaluations as well as coach semi-structured interviews.	☒
		☒
4. Theoretical frameworks	Bronfenbrenner's (1979) Bio-ecological Human Development theory will be applied as well as Empowering and Disempowering coaching framework (Appleton & Duda, 2016).	☒

Study methods		
5. Methodological study design and approach	A quasi-experimental research design with multiple methods will be implemented to evaluate intervention effects on coaches' creation and intended implementation of empowering and disempowering climate features. The pilot study will include between (intervention versus control) and within groups (over time) repeated measures conducted over 12 weeks.	☒
		☒
6. Participants	<i>Coach inclusion criteria:</i> Given the research design and measures, G-Power 3.1 software indicated that for a <i>p</i>-value of 0.05 and effect size based on prior studies (for example, small-medium – Fogaca, 2019), an estimated sample size ranged between 10–15 coaches. Potential coaches will be screened via eligibility criteria. Eligibility criteria are proposed as: • accredited coaches (development and advanced level) with the Australian Swimming Coaches and Teachers Association (ASCTA) • have been coaching at their current swimming club for a minimum of 12 months • at least 18 years of age • must have internet access. <i>Swimmer inclusion criteria:</i> 8–10 swimmers per coach will also be asked to participate in the study, estimated to be approximately 200 swimmers overall. Potential athletes will be screened via the following eligibility criteria: • coach meets the coach inclusion criteria as noted above • swimmers should be between the ages of 12 and 18 as at 31/12/2022 • currently coached by their respective coaches on a regular basis (minimum 12 months).	☒
		☒

7. Context	Coaches will be development and advanced level swimming coaches who are accredited with ASCTA and meet the eligibility criteria above. Swimmers will be continuing male and female swimmers aged between 12–18 years, who are currently registered with a swimming club in New South Wales, Australia.	☒
8. Variables	<i>Variables examined:</i> Coach: socio-demographic (that is, current age, ethnicity), coaching history (that is, number of years coaching and coaching hours per year) and coach-created (empowering/disempowering) motivational climate variables. To self-assess rating features of the Coach-Created Motivational Climate, the Empowering and Disempowering Motivational Climate Questionnaire – EDMCQ; Appleton et al., 2016) will be applied. The <i>Empowering</i> construct contains five items assessing <i>autonomy support</i>, three items on <i>social support</i>, and nine items evaluating <i>task-involving climate</i>. The <i>Disempowering</i> construct includes seven items assessing <i>ego-involvement</i>, and 10 <i>controlling</i> coach behaviour items. Swimmer: socio-demographic, participation history, family sport participation history will be obtained. Swimmers will also be asked to rate perceptions of their coaching climate, using an adapted version of the Empowering and Disempowering Motivational Climate Questionnaire – Coach (EDMCQ-C). The <i>Empowering</i> construct contains five items assessing <i>autonomy support</i>, three items on <i>social support</i>, and nine items evaluating <i>task-involving climate</i>. The <i>Disempowering</i> construct includes seven items assessing <i>ego-involvement</i>, and 10 <i>controlling</i> coach behaviour items. <i>Variables not examined:</i> Social processes (for example, parent and peer relationships; social support, other motivational climates), time related (for example, scheduling and duration of competition and/or practice times), structural processes (for example, sport organisational policy), socio-economic variables.	☒
		☒

Data – collection, analysis and interpretation		
9. Data collection procedures	Background coach and swimmer information (for example, demographic information or coach/swimmer history) as well as coaches and child/adolescent swimmer ratings of coaching climates, will be collected using online questionnaires via REDCap (for example, Empowering and Disempowering Motivational Climate Questionnaire – EDMCQ; Appleton et al., 2016). Aligned with Appleton et al. (2016), data will be collected at three time points: baseline (prior to intervention; TP1), within one week of intervention completion (TP2) and then six weeks post-intervention (TP3). Semi-structured interviews (coaches only) will be conducted online following the 12-week main data collection period. Semi-structured interviews will be recorded and transcribed verbatim on Zoom.	☒
10. Data analysis	Initial data screening will involve the identification of incomplete questionnaires, numerical outliers, the examination of normality, homoscedasticity, multicollinearity and linearity. A between-within multivariate analysis of variance (MANOVA) will be applied to determine the effect of pilot intervention on the coaching climate variables. Between-groups multivariate analysis of variance (MANOVA) will also be used to identify differences between coach and swimmer perceptions of the coaching climate. Qualitative data obtained from the semi-structured interviews will be analysed using reflexive thematic analysis to better understand the coaches' narrative experience of participating in the intervention (Braun & Clarke, 2019). Following Braun and Clarke's (2006) six-step approach to thematic analysis, all verbal responses will be initially explored and then used to generate codes, identifying patterns or themes, reviewing themes, naming and defining specific themes. Thematic analysis will be conducted using NVivo (version 12).	☒
11. Hypotheses / projected findings	Swimmers of coaches who received the coach education program will report higher perceptions of an empowering climate and lower perceptions of a disempowering climate. Swimmers of coaches who did not receive the coach education program will report higher perceptions of a disempowering climate and lower perceptions of an empowering climate.	☒

Chapter 5: The effect of a pilot swimming coach educational intervention on motivational microclimate evaluations

5.1. Abstract

Objectives: Study objectives were to: (1) increase coaches' conceptual understanding of motivational microclimates and their consequences via a short-course coach education intervention; (2) increase coaches' knowledge of behavioural strategies to enhance the psychological characteristics of their coach–athlete environments; (3) evaluate the subsequent effect of the coach education intervention on coach and athlete motivational microclimate ratings.

Design: A quasi-experimental repeated-measures mixed-methods intervention was conducted over 12 weeks.

Method: A combination of literature from Bio-Ecological Human Development Theory (Bronfenbrenner, 1979) and Coach-Created Motivational Climate (Duda, 2013) were synthesised to inform intervention content. Accredited development ($N = 14$) or advanced ($N = 5$) level swimming coaches ($N = 19$, female $n = 6$, male $n = 13$) and swimmers ($N = 208$, female $n = 97$, male $n = 111$) across 10 swimming clubs participated in the online coach intervention ($n = 10$ coaches, affiliated swimmers $n = 112$) or control ($n = 9$ coaches, affiliated swimmers $n = 97$) groups. Intervention coaches participated in three $\times$ two-hour, weekly, group-based educational and interactive sessions delivered via Zoom, along with a single follow-up session. All participants initially reported demographic and participation background information, with coaches then completing the Empowering and Disempowering Motivational Climate Questionnaire (EDMCQ Appleton et al., 2016); while swimmers completed the EDMCQ-C (Appleton et al., 2016). To determine intervention effects, coaches completed the EDMCQ again at post-intervention and six-week follow-up, while swimmers (blinded to coach intervention or control allocation) completed the EDMCQ-C again at six-week follow-up. To qualitatively

evaluate the intervention, five intervention coaches completed follow-up semi-structured interviews.

Results: Statistical analyses of coach ratings showed no significant interaction effect (that is, changes in intervention group ratings over time relative to controls). However, significant interaction effects were apparent on swimmer ratings, with intervention coaches perceived to both increase empowering and decrease disempowering motivational climate features over time, relative to controls who remained unchanged. Perceived intervention benefits (for example, communication styles) and practice impact were verified within qualitative interview-derived data.

Conclusion: Findings from this novel intervention pilot study provided preliminary (partial) evidence suggesting coach motivational microclimates can be positively modified via a short-course coach education intervention. Incorporating empowering microclimate characteristics (forms of coach interactions and behaviours) while concomitantly reducing disempowering associated characteristics could benefit youth swimmer experience. Such development is predicted to assist in reducing dropout rates within youth swimming.

Keywords: bio-ecological theory, empowering motivational climate, sport dropout, youth sport, coach education.

5.2. Introduction

5.2.1. Youth sport dropout versus participation = dysfunctional versus functional development

Bronfenbrenner's (1979) original Ecological Human Development Theory focuses on the behaviours of individuals within social and physical contexts. Bronfenbrenner's theory holistically considers the dynamic nature of relationships, with the individual interacting within an environment considered as a series of nested structures. He argues that complex individual behaviours can be understood by examining four surrounding systems: the micro-, meso-, exo- and macrosystems (Bronfenbrenner, 1985). Bronfenbrenner then proposes how functional (for example, positive psychological, social, and physical health) or dysfunctional development (for example, CASD, psychological problems) outcomes occur via frequent and sustained social exchanges in developmental activities within microsystem contexts. Continuing interactions over time are proposed to bi-directionally impact the psychosocially functioning individual, determining their functional or dysfunctional development.

Ecological human development theory (1979) identifies how coach instructional and communication strategies, nonverbal behaviours, values, and other coaching factors, all convey information and meaning. Participants and other agents (for example, parents, siblings) experiencing coach-created microsystems then (sub)consciously interpret and evaluate such information. These evaluations, informed by prior and comparative experiences, subsequently affect psychological perceptions (for example, competency, belonging, personal valuing), behavioural decisions (for example, sustained participation) and potentially longer-term (dys)functional developmental outcomes (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 1998). Evaluating coach-created microsystems in youth sport contexts can help identify coach behaviours, social exchanges, and psychological microclimate characteristics, which may detrimentally affect youth participation in the short term and hypothetically affect longer-term (dys)functional development.

5.2.2. Importance of coach-created motivational climates to maintain youth sport participation

Sport psychology research suggests several coach-driven factors that are important to sustained child and adolescent sport participation, including the coach-created motivational climate (Appleton et al., 2016). Generally speaking, the motivational climate created by the coach plays an active part in promoting child and adolescent sporting capabilities, influencing the quality of sports practice and competition, as well as the overall development of well-being (Duda & Appleton, 2016). More specifically, what the coach says and does, and how they structure the environment, can shape an individual's interpretation of, and responses to, achievement-based activities (Duda, 2001).

Duda (2013) describes two dichotomously contrasting coach-created motivational climates, namely 'empowering' (optimising of participant development and participation) and 'disempowering' (dysfunctional psychological and social responses/outcomes). An *empowering climate* is characterised by coach behaviours of high task-involvement, autonomy-support, and social support (Appleton et al., 2016; Mageau & Vallerand, 2003; Reinboth & Duda, 2004) with correspondingly low ego and participant control. By contrast, *disempowering climates* are characterised by high ego-involving (for example, result focused) and controlling (for example, authoritarian, pressuring, coercive) instructional and social interactional behaviours, with low task-involvement, autonomy, or social support (Appleton & Duda, 2016; Bartholomew et al., 2010; Duda, 2013). The empowering/disempowering framework (Duda, 2013) provides a set of cognitive, emotional and/or behavioural characteristics typifying the coach-created environment, which can be assessed and evaluated.

5.2.3. Coach motivational climate interventions

Because coach-created climates convey information and meaning for participating individuals or those in close social proximity (for example, fellow practitioners, parents), logic suggests that promoting and implementing favourable empowering coaching characteristics and engraining a

stable empowering coaching microclimate would be beneficial to youth sport participation and dropout prevention. Yet, no study – to date – has specifically attempted to improve coach-created motivational climates to address CASD. The most related intervention studies previously conducted includes the Promoting Adolescent Physical Activity (PAPA) project (Duda et al., 2013; Duda, 2013; Quested et al, 2013) and isolated studies in several North American youth sport contexts.

The PAPA project (Duda et al., 2013; Duda, 2013; Quested et al, 2013) investigated the potential of youth sport to promote children's mental, emotional health, and physical activity engagement. Within the project, coach education interventions aimed to increase 'grassroots' coaches' knowledge and awareness of strategies to foster youth (males and females, aged 10–14 years) experiences, motivations, and enjoyment of sport (The PAPA project, 2023). For instance, working with French and Norwegian youth soccer coaches ($N = 18$) at grassroots level, a six-hour pre-season intervention (supplemented by a workbook and online training), educated and qualitatively examined the implementation of empowering motivational climate principles in coaching instruction and behaviours. Focus groups conducted post season with coaches revealed the intervention was particularly helpful in changing coaching behaviours (more autonomy support, involvement and structure), and implementing strategies to stimulate enjoyment and long-term participation behaviours (Larsen et al., 2015).

Similarly, in a United States community-based youth basketball program involving 37 coaches ($n = 4$ females, $n = 33$ males; $M_{age} = 45.0$, $SD = 6.17$) and $N = 216$ junior players ($n = 99$ females, $n = 117$ males; $M_{age} = 11.50$, $SD = 1.63$), Smith et al. (2007) examined the influence of a motivational climate intervention upon player athlete anxiety over the course of a 12-week basketball season. Hierarchical linear modelling analyses identified athletes in the intervention group perceived their coaches as being more mastery-involving on the MCSYS, when compared to athletes in the control group. Analyses of time differences (time point 2 – time point 1) revealed

that athletes in the control condition increased significantly in the Sport Anxiety Scale-2 (SAS-2; Smith et al., 2006).

While coach-created empowering motivational climate and associated strategies have been identified to facilitate favourable psychological outcomes in youth sport participants (that is, enjoyment, task cohesion, reduced anxiety), the premise of developing and embedding empowering instructional strategies and behaviours within coaching practice exists. Hypothetically, improving coach-created motivational climate via a coach education intervention could not only improve participant perceptions, but also impact CASD behavioural outcomes, particularly in the youth swimming context, where high CASD rates are prevalent.

5.3. Study purpose

Based on integrated definitions of Bronfenbrenner's (2005) microsystem (the immediate coach–athlete relationship) from the perspective of Duda's (2013) empowering/disempowering framework (see Chapter 1), the coach-created microclimate identifies how coach-created climates convey information and meaning for proximal (for example, coaches, athletes) and consequent participants (for example, parents, siblings), experiencing interrelated microsystems. Given the limited number of coach-created motivational climate intervention studies and the lack of data available to determine their efficacy, and the need to address CASD trends in specific youth sport contexts, the current study examined the effect of a pilot coach education intervention program within the context of NSW coaches. Building on previous studies (Moulds et al., 2020; Moulds et al., 2022; see Chapters 2–4) the present study aimed to: (1) increase coaches' conceptual knowledge and understanding of coach-created microclimates, and their consequences, via a short-course coach education intervention; (2) increase coaches' knowledge of behavioural strategies to enhance the psychological empowering characteristics of their coach–athlete environments; and (3) evaluate the effect of the intervention via coach self-report and athlete motivational climate evaluations as well as coach semi-structured interviews.

5.4. Methodology

5.4.1. Research design

A mixed-method, quasi-experimental (between-within groups), research design was implemented to develop knowledge and evaluate intervention effects on both coach self-reported and youth athlete-evaluated perceived coach-created microclimates. Empirical literature suggests mixed-method research designs are preferable and beneficial when addressing applied research questions. Further, mixed methods potentially offer greater comprehensive insight as well as the possibility of data triangulation or verification than when using quantitative or qualitative approaches alone (Kegelaers et al., 2019; Morse & Nichaus, 2009).

Therefore, this study included three timepoints (pre-intervention [TP1]; post-intervention [TP2]; and six-week follow-up [TP3]) of quantitative measure assessment (for example, EDMCQs) completed by both intervention and control group coaches. To provide independent assessment of intervention effects, youth swimmers affiliated with coaches and blinded to their coach intervention group (intervention versus control) also completed quantitative assessment (EDMCQ-C) at pre-intervention [TP1] and six-week follow-up [TP3] timepoints. A subsample of intervention group coaches ($n = 5$) also completed qualitative individual semi-structured interviews at TP3 (see Figure 5.1).

Further, qualitative approaches (for example, interviews) can help highlight how individuals make sense of their social environment via exploration and prompting for further explanatory insights into real-world problems (Creswell, 2015; Tenny et al., 2022). Thus, semi-structured interviews were utilised to examine coach underlying reasons for participation; their perceived evaluative benefits/impacts from intervention involvement; and future recommendations for improving intervention effectiveness and impact (Tenny et al., 2022).

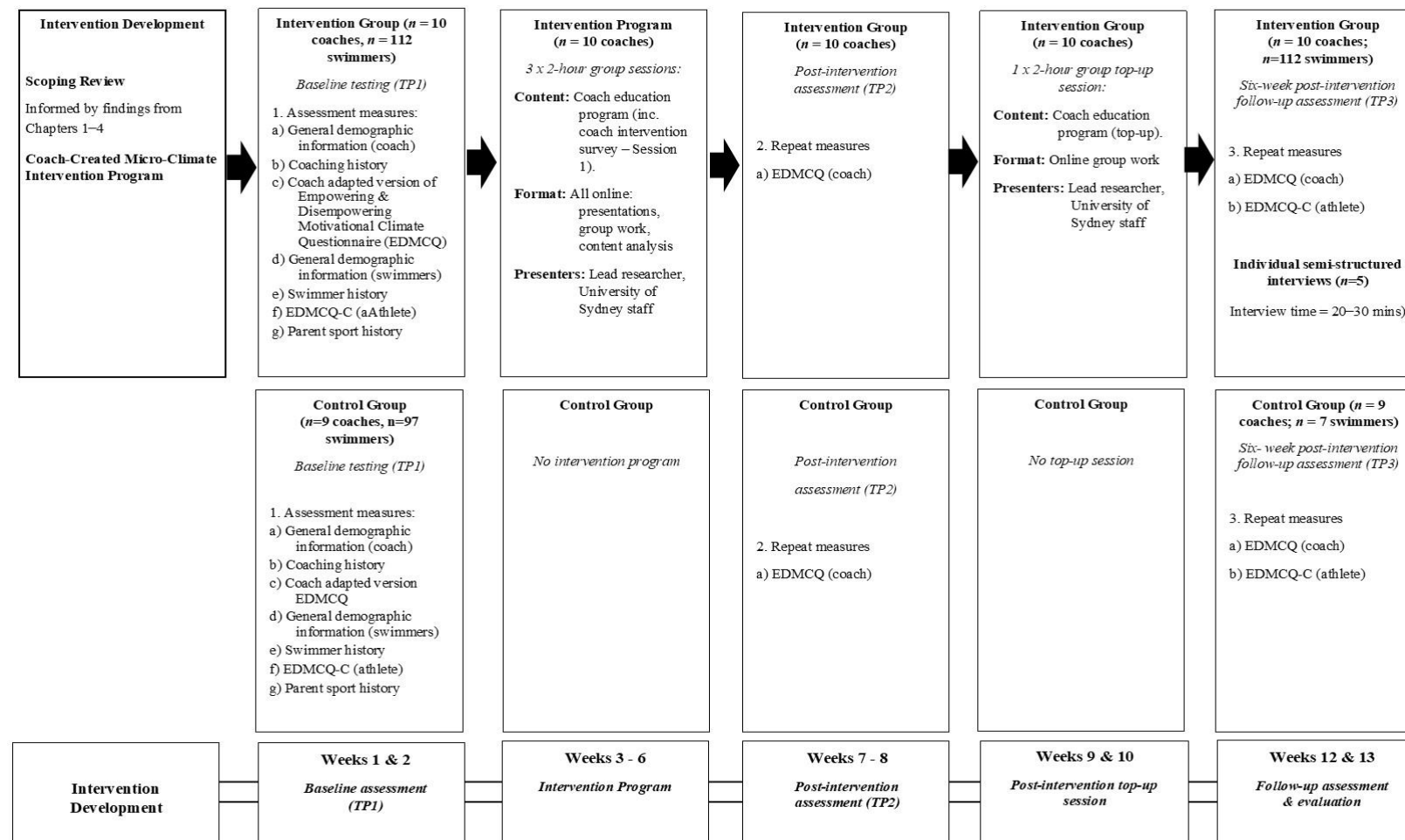


Figure 5.1 Schematic overview of the coach-created microclimate intervention study design, content, and data collection process

5.5. Participants

Following university ethics approval (App No: 2022/442; see Appendix F) and consent, participants were NSW coaches ($N = 19$, female $n = 6$, male $n = 13$) of accredited development ($N = 14$) or advanced ($N = 5$) level and swimmers ($N = 208$, female $n = 97$, male $n = 111$) from club-national level. Intervention group comprised 10 coaches ($M_{age} = 36.44$, $SD = 10.86$), with 112 correspondingly affiliated swimmers in total ($M_{age} = 13.29$, $SD = 1.55$) registered with 10 swimming clubs. The control group consisted of nine coaches ($M_{age} = 39.12$, $SD = 13.50$), with 97 correspondingly affiliated swimmers in total ($M_{age} = 13.23$, $SD = 1.55$) affiliated with nine swimming clubs. Eight to ten swimmers for each coach participated in this study.

Intervention group coaches reported involvement in swim coaching for $M = 9.7$ years ($SD = 7.75$), with an average of 27.50 hours per week ($SD = 14$) engagement, with 50.5 swimmers ($SD = 25.14$) in the last year. Affiliated swimmers working with respective coaches indicated they had been training for $M = 2.26$ years ($SD = 1.38$) with their current coach and initially commenced (structured) swimming lessons at $M = 3.18$ years ($SD = 2.41$). Swimmers were competing in 9.94 meets per year ($SD = 5.35$) on average, with approximately 10.1 weekly hours of training (pool and dry land sessions; $SD = 5.67$) occurring in the month prior to data collection commencement [TP1].

Control group coaches reported swimming coaching involvement for $M = 13.72$ years ($SD = 7.75$), for an average of 30.65 hours per week ($SD = 15.71$) with an average of 77.7 swimmers ($SD = 36.75$) across the last year. Affiliated swimmers with respective coaches indicated they had been training for $M = 2.64$ years ($SD = 1.46$) with their current coach and had commenced (structured) swimming lessons at $M = 3.30$ years ($SD = 1.66$). Swimmers were competing in 9.86 meets per year ($SD = 5.25$) on average, with 10.86 weekly hours of training (pool and dry land sessions; $SD = 4.01$) occurring in the month prior to TP1.

5.5.1. Inclusion/exclusion criteria

Coach inclusion criteria stipulated coaches had to be accredited with the Australian Swimming Coaches and Teachers Association (ASCTA) to a development or advanced level and had been coaching at their current swimming club for a minimum of 12 months. Swimmer inclusion criteria stipulated swimmers were between 10–18 years of age; were registered as a competitive swimmer with Swimming NSW; and had been working with a specific participating coach for a 12-month minimum period.

5.5.2. Sample size estimation

Given study purposes, intervention research design and measures utilised to identify intervention effects, G-Power 3.1 software was implemented to estimate coach and athlete samples likely required (Faul et al., 2007). Informed by previous intervention studies (Cupples et al., 2021; Smith et al., 2007); with an alpha level set at 0.05; a small-medium effect size targeted; three time points of data collection; and with 80% power value, the required coach sample size ranged between 38 to 44 coaches. To obtain independent evaluative ratings and similarly detect intervention effects via youth swimmers across two time points, a ratio sample approach was utilised. Guided by McLaren et al. (2015), who evaluated the effect of motivational climate and cohesion on youth soccer coaches and athletes, a 1:10 coach–swimmer sample size was targeted. The 1:10 ratio was deemed appropriate to establish an accurate, representative, evaluation of a given coaches’ micro- climate at a given time point in the study.

5.4. Recruitment and procedure

SNSW invited coach involvement through their internal and external communication channels (email, social media). Interested coaches subsequently contacted a member of the research team. Following eligibility screening, coaches were assigned to an intervention or control

group, based on the order of sign up (that is, intervention group first). The intervention group received the coach education program and completed REDCap (Research Electronic Data Capture) questionnaire content at three time points [TP1-3]. Meanwhile, control group coaches completed online questionnaire content at three points [TP1-3] (see Figure 5.1). Control group coaches were provided with an opportunity to receive the intervention following study completion.

Once coach recruitment was complete, SNSW assisted the lead researcher to contact the swimmers of participating coaches via a club representative. Swimmers were blinded to their coaches' group (intervention versus control) to minimise bias and further investigate the effectiveness of the pilot intervention (Shulz et al., 1995). Following swimmer eligibility screening, swimmers completed REDCap questionnaires at pre-intervention [TP1] and six-week post-intervention [TP3]. To help ensure item understanding within questionnaires and ensure response accuracy, participants aged 15 years and under were encouraged to complete the survey with parental support. The survey took approximately 10–15 minutes to complete. Individual data were kept confidential and participant identity was not known by researchers.

5.6. Intervention development and implementation

Informed by underpinning theoretical frameworks (Bronfenbrenner & Morris, 2008; Duda, 2013; Duda & Appleton, 2016; see Chapter 1), prior studies (Moulds et al., 2020; Moulds et al., 2022; see Chapters 2–4), and guided by prior intervention studies conducted in basketball, soccer and rugby league, respectively (Cupples et al., 2021; McLaren et al., 2015; Smith et al., 2007), an online short-course coach-created microclimate intervention was developed (see Table 5.1).

The intervention consisted of two-hour, group-based educational and interactive weekly sessions delivered via Zoom across three consecutive weeks. Three weeks post-intervention,

an additional two-hour top-up session was also conducted. The three main sessions were organised into six components (see Table 5.1). The first two sessions (components 1–4) were designed to define and provide further understanding of motivation and motivational coaching climates (empowering and disempowering climates; Appleton & Duda, 2016).

In the final session (components 5–6), the PPCT model (Bronfenbrenner & Morris, 2008; see Chapter 1) was introduced and the development of coach-created microclimate tools with specific relevance to the swimming club environment was explained. Each session contained online activities, including presentations and questioning; individual and small group discussions/tasks; and content analysis (Reeves et al., 2011). To help consolidate the accumulation of knowledge, at the start of sessions 2 and 3, a follow-up and brief reminder of previous sessions was provided. The intervention was delivered by the lead author (KM) with input from the research team and SNSW staff. All online sessions were recorded for later viewing.

Table 5.1 An overview of coach education session content within the Coach-Created Microclimate Intervention Program

Session	Topic	Session content	References	Session type	Presenter
1	Coaching climate intervention program overview. Defining motivation and motivational coaching climates (Empowering/Disempowering)	Coach climate questionnaire – setting the scene		LF	USyd staff (SC)
		Outline purpose of the program – Study 1–3 findings	Moulds et. al. (2020); Moulds et al., (2021)	LF	Lead author
		Raising awareness of the dropout challenges within NSW youth swimming	Moulds et. al. (2020); Moulds et al., (2021)	LF	Lead author
		Defining motivation and motivational coaching climates	Deci & Ryan (1985, 2000); Appleton et al., (2016)	SG	
		Introduction to Empowering and Disempowering climates	Duda (2013); Appleton & Duda (2016); Empowering Coaching (2019); Appleton (2019)	GD	
2	Building blocks for positive outcomes in sport	Building blocks for positive coaching	Empowering Coaching (2019)	GD	Lead author
		Autonomy, belonging and competence in swimming – ABCs of coaching climates	UK Coaching (2019); Appleton (2019); Appleton (2020)	LF	
		Case study: PAPA project – how to identify ABCs	Deci & Ryan (2000, 2005); Ames (1991); Nicholls (1989) Smith et al. (2017); Appleton (2020)	GD SG	
3	Creating Empowering Environments – Coaching Strategies	Creating empowering coaching climates	Duda (2013); Appleton & Duda (2016); Empowering Coaching (2018); Appleton (2019)	LF	Lead author
		Discussion: ‘What does an empowering coaching environment look like in youth swimming?’		GD	
		Empowering CLIMATE dimensions	Deci & Ryan (1985, 2000); Ames (1991); Nicholls (1989); Appleton et al., (2016)	SG	
		Evaluation group discussion: barriers to an empowering climate	Duda (2013); Empowering Coaching (2019); UK Coaching (2019)	GD, CA	
4	Creating Empowering Environments – summary	Empowering coaching climates in practice		LF	Lead author
		Evaluation group discussion: examples from own coaching sessions	Empowering Coaching (2019)	GD, CA	
5	Impact of other socio-environmental factors in youth sport	Introduction to Bronfenbrenner’s bio-ecological model and how this applies to youth sport dropout/continuation	Bronfenbrenner (1979, 2005)	LF	Lead author
		Strategies: How to apply the PPCT model to help understand youth swimmers.	Bronfenbrenner & Morris (1998)	LF, GD	
		Case studies: link between PPCT model and empowering coaching behaviours.	Bronfenbrenner & Morris (1998); Empowering Coaching (2019)	CA	
6	Long-term application of empowering climates in individual coaching scenarios	Developing holistic motivational action plans		LF, GD, CA	USyd staff (SC)
		Discussion: common barriers to continued participation in swimming		CA	Lead author
		Intervention program summary and next steps		CA, GD	
		Program evaluation			

Table notes: Sessions 2–6 started with a review of the previous session and brief discussion. Opportunities for further questions were provided post-session. Session delivery – lecture format (LF), small group discussion and presenting (SG), group discussion (GD), content analysis (CA).

5.7. Determining intervention effects

5.7.1. Coach background and coach-created motivational climate ratings

At TP1, all participating coaches completed a questionnaire containing two subsections. The first subsection captured socio-demographic as well as coaching background history. Coaches were asked questions relating to their age, sex, ethnicity, years of coaching experience, number of hours coaching per week (on average), number of swimmers coached, and coach employment status (full time, part time, casual). The second subsection assessed perceptions of their own coaching motivational climate, referring to common interactions, coaching styles, and behaviours with swimmers who they had coached in the last 12 months (2020–21 season; see Appendix M). Coaches' perceptions of their own coaching climate were examined using the EDMCQ (Appleton et al., 2016; see Appendix P).

The EDMCQ consists of 34 items which associate with five lower-order dimensions, and subsequently align to two *Empowering* and *Disempowering* constructs (17 items in each). The *Empowering* construct contains five items assessing *autonomy support* (for example, 'I give my swimmers choices and options'), three items on *social support* (for example, 'I really appreciate swimmers as people, not just as swimmers') and nine items evaluating *task-involving climate* (for example, 'I encourage swimmers to try new swimming skills and techniques'). The *Disempowering* construct includes seven items assessing *ego-involvement* (for example, 'I yell at swimmers when they make mistakes') and 10 *controlling* coach behaviour items (for example, 'I pay less attention to swimmers if they displeased me'). All items were rated based on considerations of how coaches interpreted their own coaching styles with swimmers they regularly coach over the last year. Item responses were provided on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Previous research has identified scores on the EDMCQ-C as valid and reliable (Appleton et al., 2016). Cronbach's α in the present study ranged between 0.83–0.87, suggesting a high level of internal consistency (Cohen, 2013). All questionnaires were distributed,

collected, and managed using REDCap. REDCap is a secure, web-based software platform, designed to support data capture for research studies (Harris et al., 2009).

5.7.2. Swimmer background and coach-created motivational climate ratings

At TP1, all participating swimmers – affiliated to a participating coach – completed an online questionnaire containing three subsections (see Appendix N). The first subsection captured swimmer socio-demographic and background participation history. Participants were asked to report their age; sex, age at onset of structured swimming lesson; number of hours per week (on average) at swimming training; and the number of competitive meets attended during the last competition year. The second subsection captured family sport participation history, incorporating decision-tree optional items (adapted from Fraser-Thomas et al., 2008). Items asked swimmers to report on biological parent/legal guardian and sibling support (who was most influential during their swimming involvement participation), family swimming participation history as well as broader sport participation, including level of competitive involvement. In the third subsection, swimmers provided their perceptions of the coach-created motivational climate.

An adapted version of the EDMCQ-C (Appleton et al., 2016) assessed the motivational climate characteristics of respective coaches. Like the EDMCQ for coaches, the EDMCQ-C consists of 34 items which associate with five lower-order dimensions, and which act as subcomponent to two *Empowering* and *Disempowering* constructs (17 items each). The *Empowering* construct contains five items assessing *autonomy support* (for example, ‘My coach gave us choices and options’), three items on *social support* (for example, ‘My coach really appreciated us as people, not just as swimmers’) and nine items evaluating *task-involving climate* (for example, ‘My coach encouraged us to try new swimming skills and techniques’). The *Disempowering* construct includes seven items assessing *ego-involvement* (for example, ‘My coach yelled at us if we made mistakes’) and 10 *controlling* coach behaviour items (for example, ‘My coach paid less attention to us if we displeased him or her’). All items were framed with considerations to what their coach

normally said or did, most of the time, during training and competition over the last year. Item responses were provided on a five-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Previous research has identified young athletes' scores on the EDMCQ-C as valid and reliable (Appleton et al., 2016). Cronbach's α in the present study ranged between 0.83–0.87, suggesting a high level of internal consistency (Cohen, 2013). All swimmer questionnaires were distributed, collected and managed using the REDCap platform.

5.7.3. Coach semi-structured interviews

To further evaluate and explain intervention effects (Hrycaiko & Martin, 1996), semi-structured interviews were conducted six weeks post-intervention. Interview schedules were developed based on empirical literature and piloted with two similarly qualified swimming coaches (see Appendix L). Five coaches volunteered to take part in the individual semi-structured interviews ($n = 3$ males, $n = 2$ females). Interviews were conducted via Zoom by the lead researcher (KM), recorded with coach permission, and transcribed verbatim post-interview.

The interview contained open-ended questions designed to extract thoughts, perspectives and feedback from intervention group members (for example, 'What do you remember most about the program?'; 'To what extent has your involvement in this program changed your practice and views on coaching?'). Probe and follow-up questions were used for clarification or to obtain a greater depth in responses (for example, 'When you mentioned athlete–coach relationships was an important part of the program', what did you mean?'; 'Can you tell me more about how you could implement this into your training program?'). Interviews were on average 25 minutes in duration.

5.8. Data analysis

5.8.1. Quantitative coach and swimmer questionnaire ratings

Related to both coach and swimmer questionnaire data, initially descriptive statistics were calculated. Within EDMCQ (coach self-ratings) and EDMCQ-C (swimmer ratings), subscales internal reliability was assessed using Cronbach's alpha. Both coach and swimmer questionnaire data were also screened for outlier scoring via box plot inspection with none identified. To determine intervention effects, EDMCQ and EDMCQ-C data, with dependent variables being *Empowering* and *Disempowering* subscales scores, were subjected to two independent group (intervention versus control) $\times$ time (two repeated measures for coach data; one for swimmer data), multivariate analysis of variance (MANOVAs). MANOVA analyses specifically searched for two-way interactional effects, referring to changes in intervention group-associated empowering/disempowering scores over time [TP1–TP3] relative to controls. Main effects of group (intervention versus control group differences at a given time point) or time (changes from TP1–3 within a group) were also examined and reported. Specific to coach ratings across TP1–TP3, follow-up pairwise comparisons were examined to isolate time points of subscale score change between time points.

Prior to all analyses, preliminary assumption checks for MANOVA were conducted, including tests of normality (Shapiro-Wilk; $p > 0.05$), homogeneity of variance (Levene's test of equality; $p > 0.05$), covariance matrices (Box's M test; $p < 0.001$) and Mauchly's sphericity tests, with all assumptions met. For the two independent analyses, significance testing *alpha* was set at $p < 0.05$, with partial eta squared (η^2) indicating effect sizes using Cohen's (1988) criteria (0.01–0.05 = small; 0.06–0.13 = medium; and ≥ 0.14 = large). All statistical analyses were conducted using SPSS, v. 25 (Chicago, IL, USA).

5.8.2. Qualitative interview data

To protect coach identity, participants were anonymised with a gender-neutral participant ID to protect their confidentiality, given a small swimming community. Full transcripts were then analysed using reflexive thematic analysis adhering to Braun and Clarke's (2006; 2019) six-step framework: (1) familiarising with the data (transcribing, reading/re-reading the data, noting down initial ideas); (2) generating initial codes (coding interesting features of the data in a systematic fashion, collating data relevant to each code); (3) searching for themes (collating codes into potential themes, gathering all data relevant to each potential theme); (4) reviewing themes (checking if the themes work in relation to coded extracts and entire data-set); (5) defining and naming themes (ongoing analysis refining the specifics of each theme and generation of clear names); and (6) producing the report (final opportunity for analysis, selection of vivid, compelling extract examples, final analysis of selected extracts, producing a scholarly report of the analysis). In the data familiarisation step, transcript reading, and initial one-page summaries of interview transcripts were sent to coaches for *member checking* and to provide an opportunity to challenge or correct any incorrect interpretations (Korstjens & Moser, 2018). This step helped clarify explanatory meaning and accuracy of interpretation of transcript information.

Initial themes were developed deductively based on intervention content (Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006; Strauss & Corbin, 1998) and raw data codes were identified. Defined by Braun and Clarke (2006), a theme captures an important aspect of the data in relation to the study questions, for example, 'What is the impact of a new coach education program on coaching (motivational) climates in child and adolescent swimming?' After all interviews were analysed using QSR's NVivo software (version 1.1.1). Once data were organised and coded in NVivo (all codes were classified under thematic headings), frequency count (FC) and references (R) were collated to better understand the emerging patterns. A summary table was created (see

Table 5.2) to facilitate the reflexive discussion and continue renaming themes until the consensus was reached (step 5 of Braun and Clarke's (2006, 2019) framework) and writing begun (step 6).

Table 5.2 A reflexive thematic analysis summary of coach semi-structured interviews evaluating the coach education intervention

Theme	FC (R)	Codes	FC (R)	Description	Exemplar quote
Motivations to participate	5 (16)	Networking	4 (7)	Participants sought information from other coaches. A dynamic and evolving informal coaching network, often described as a dynamic social network (Mallett et al., 2009).	‘In the past, it’s valuable being able to discuss ideas with other coaches.’ Coach_5
		Coach education	2 (4)	Professional knowledge conceptualised by a coach’s ability to know what (declarative) and how (procedural) to operate in the coaching environment (Abraham et al., 2006).	‘I didn’t have any preconceived idea of what I was coming in for, my motivation from the program was to learn [sport psychology] and contribute.’ Coach_4
		Coach development	3 (3)	Interpersonal, bidirectional relationships that are present in the coaching environment and intrapersonal knowledge of oneself (Côté & Gilbert, 2009).	‘Really, my main motivation for participating in the program was probably my situation with a swimmer because it’s really challenged me.’ Coach_5
		Share new information	1 (2)	Head coach learning new information to share it with own coaching staff.	‘I was motivated to attend so I can share any new information with my coaching staff.’ Coach_2
Benefits of participation	5 (52)	Communication styles	5 (15)	Process of sending and receiving information between the coach and the athlete.	‘Communication strategies were a big eye-opener for me in terms of, athletes are not all the same. This might work for me or for a certain individual, but it might not work for the other athletes.’ Coach_4
		Coach development	2 (13)		‘Conversations with other coaches during the program have given me a lot more conscious thought on what I’m doing and why I’m doing it.’ Coach_2
		Reassurance	4 (10)	Information covered during the program was a reminder or reinforcement of prior knowledge and current coaching behaviours (coaching practice).	‘With many years of experience, I had heard of some key concepts before but maybe I hadn’t used a strategy for a long time, so I was able to come back to it.’ Coach_3
		Coach education	4 (10)		‘I felt like there was new information which encouraged me to adapt my coaching practice and introduce some new concepts into training.’ Coach_5
		Share new information	2 (4)		‘The program really helped me to have more conversations with my assistant coaches.’ Coach_1

Theme	FC (R)	Codes	FC (R)	Description	Exemplar quote
Intervention impact – Bronfenbrenner’s bio-ecological model	5 (16)	Coach–parent interaction patterns	3 (8)	Coach–parent interactions that can influence athlete development (mesosystem of Bronfenbrenner’s bio-ecological model (1979). The importance of viewing parents as assets, coaches working or collaborating with parents (Harwood, 2011; Harwood & Knight, 2009), rather than as problems to be fixed (Bruner et al., 2020).	‘It’s important to encourage the parent/s and help educate them, to work with them rather than against.’ Coach_4
		Interrelations micro-macro systems	3 (8)	Nested systems consider the interrelations between different layers of Bronfenbrenner’s model (1979) when examining athlete development.	‘Every swimmer comes through the door with different issues going on each day, so from my perspective, I need to manage this.’ Coach_5
Intervention impact – empowering coach framework	4 (18)	Autonomy	2 (4)	Coach-created motivational climate that can optimise the what, why and how of child and adolescent athletes’ continued participation (Duda, 2013). Coach-created environment that facilitates relative choices and options for child and adolescent athletes.	‘It’s important for the coach and the group to understand empowerment, for the swimmers to feel psychologically safe enough to tell the coach how they’re feeling or how something might be affecting them.’ Coach_5
		Belonging	2 (8)	Coach-created motivational climate that facilitates a sense of connection/belonging for the athlete.	‘From a child’s perspective, little things such as a team chant go a long way to have them feel a sense of belonging within each group.’ Coach_3
		Competence	3 (4)	Coach-created motivational climate which is more task orientated with a clear focus on the process rather than the outcome.	‘When a swimmer got a personal best (PB) in training we celebrated with that swimmer, so they felt valued.’ Coach_2
Future preferences	5 (11)	Delivery	2 (2)	Program delivery mode.	‘The delivery mode could be improved, to be honest, I prefer to meet face to face.’ Coach_3
		Timing	4 (8)	The duration of each session (hours) and start/finish time	‘Being coaches we’re up early in the morning and the timing of the sessions could be better, to be scheduled directly after early morning training sessions.’ Coach_4
		Theory to practice learning	1 (1)	Commencing each session with theory and relaying this information directly into a practical environment.	‘It would be good to spend time at the pool and then afterwards have all of our club coaches sit down and go through a program like that together.’ Coach_1

Table notes: frequency count (FC), = how many coaches mentioned the theme/code; reference (R) = reference, the total number of the identified themes/codes.

To ensure trustworthiness (credibility, transferability, dependability and confirmability) of qualitative data interpretation, the following strategies were adopted (Lincoln & Guba, 1985; Korstjens & Moser, 2018). First, credibility of results was ensured through *prolonged engagement*. The interviewer (KM) engaged with data continuously via transcribing, completing summaries, analysis and conducting ongoing reflective discussion with the research team. During interviews, coaches were encouraged to support their statements with examples, and the interviewer asked follow-up questions to obtain rich explanatory meaning. Ongoing reflective discussions between the researcher team assisted with the naming and renaming of themes. Method *triangulation* was used by gathering and comparing data from across interviews, interviewer notes and interview recordings (Sim & Sharp, 1998), along with investigator triangulation (research team) involvement in the data analysis process (Korstjens & Moser, 2018). The research team addressed *transferability* and *dependability* by acting as ‘critical friends’ (Tracey, 2010) to ensure both interview content and follow-up analysis were aligned to the study purpose/aims, participants and context of investigation. *Confirmability* was completed through one-page summaries sent to participants to confirm meaning and by providing direct quotes to illustrate results.

5.9. Results

5.9.1. Compliance and adherence

Considering compliance from initial enrolment ($N = 26$), there was 70% coach retention in the intervention group. Thirty per cent ($n = 3$) withdrew after the first survey, due to time commitments, for personal reasons or preferred not to have their swimmers evaluating their coach motivational microclimate. Coach adherence to intervention sessions was high ($M = 97\%$; range/session = 90.4–100%); however, three coaches missed one session each, due to illness or competing coaching commitments. They followed up on intervention content via viewing the education session recording and completing associated activities.

5.9.2. Quantitative coach and swimmer questionnaire results

Two-way MANOVA analysis on coach EDMCQ ratings (two groups $\times$ TP1–TP3 on empowering and disempowering scores) identified no overall statistically significant interaction effect (group $\times$ time), $F(2,15) = 0.82$; $p = 0.92$; Wilks' $\Lambda = 0.98$. Further, there was no significant group effect (intervention versus control) on EDMCQ ratings, $F(4,13) = 0.56$; $p = 0.69$; Wilks' $\Lambda = 0.85$, nor significant time effect, $F(4,13) = 1.04$; $p = 0.19$; Wilks' $\Lambda = 0.64$. As visually summarised in Figures 5.2 and 5.3, overall coach ratings for both EDMCQ empowering and disempowering subscales remained similar pre to six-week post-intervention follow-up [TP1–TP3].

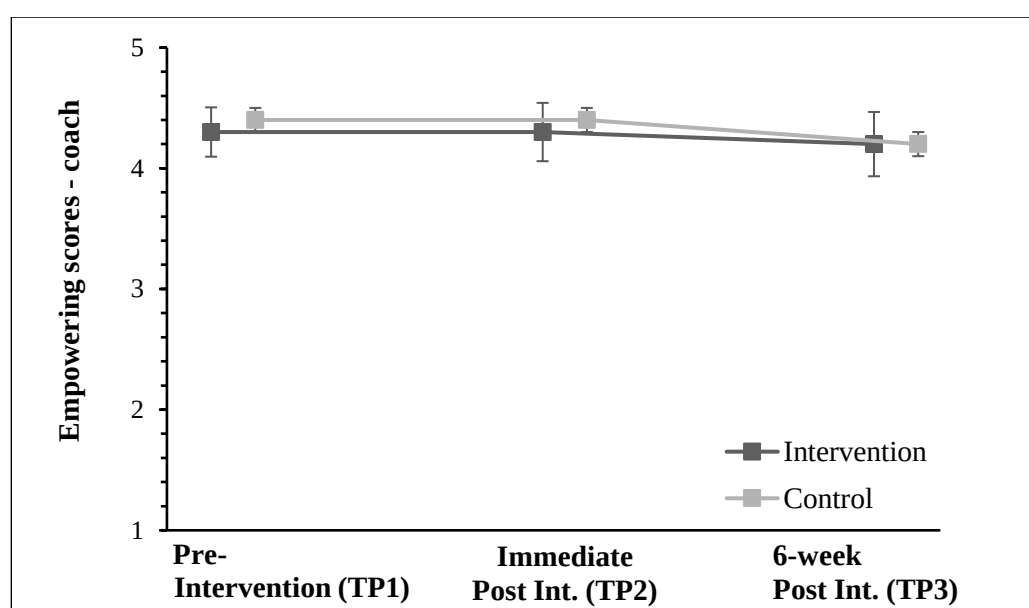


Figure 5.2 Mean (95% CI) coach self-ratings on EDMCQ empowering subscales at TP1–TP3 according to intervention and control group.

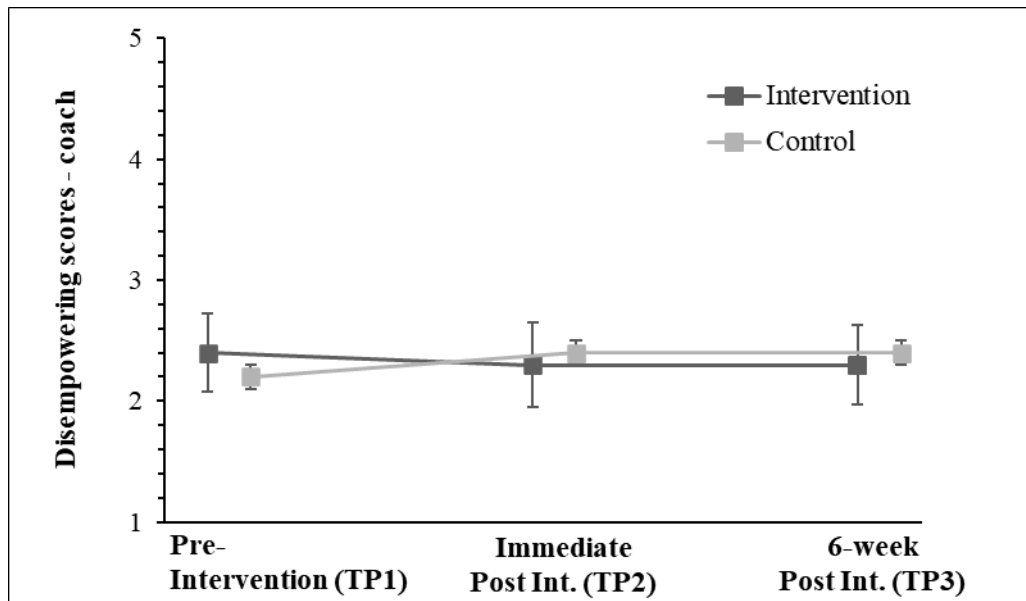


Figure 5.3 Mean (95% CI) coach self-ratings on EDMCQ disempowering subscales at TP1–TP3 according to intervention and control group.

Two-way MANOVA analysis on swimmer EDMCQ-C ratings (intervention versus control $\times$ TP1 v TP3 on empowering & disempowering ratings) identified an overall statistically significant Group $\times$ Time interaction effect across the combined dependent variables with a medium effect size, $F(2205) = 14.09$; $p < 0.005$; Wilks' $\Lambda = 0.87$; partial $\eta^2 = 0.12$. Further, a significant main time effect for empowering and disempowering subscale scores was apparent with a medium effect size, $F(1\ 205) = 48.47$, $p = .001$ partial $\eta^2 = 0.32$). More specifically, the swimmers of intervention group coaches increased their empowering subscales ratings from TP1–TP3 ($M_{diff} = -0.32$, $SE = 0.05$, $p = 0.001$). Across the same period (TP1 versus TP3), their ratings on the disempowering subscale decreased ($M_{diff} = 0.01$, $SE = 0.004$ $p = 0.001$). Findings are visually summarised in Figures 5.4 and 5.5.

5.9.3. Qualitative coach interview results

Reflexive thematic analysis (Braun & Clarke, 2006; 2019) generated verbatim evaluating intervention participation and perceived intervention effectiveness across five themes: motivations to participate; benefits of participation; intervention impact – Bronfenbrenner's

socio-ecological model; intervention impact – empowering coaching framework; and future preferences (see Table 5.2 for definitions). Each theme was comprised of several codes with frequency count (FC – how many coaches mentioned the theme/code) and reference (R – the total number of the identified theme/code).

5.9.3.1. Motivation to participate

All coaches discussed their initial motivations to participate (FC = 5, R = 16), which comprised themes of *networking* (FC = 4, R = 7), *coach education* (FC = 2, R = 4), *coach development* (FC = 3, R = 3) and *sharing new information* (FC = 1, R = 2). *Networking* was the most frequently identified reason for intervention participation, with Coach_4 noting the value of ‘interact[ing] and brainstorm[ing] with other coaches’. Coach_5 stated, ‘in the past it’s valuable [sic] being able to discuss ideas with other coaches.’ In addition, Coach_1 stated, ‘I know some of my biggest takeaways from previous coaching conferences is sitting at the bar afterwards with the more experienced coaches discussing what we went through.’

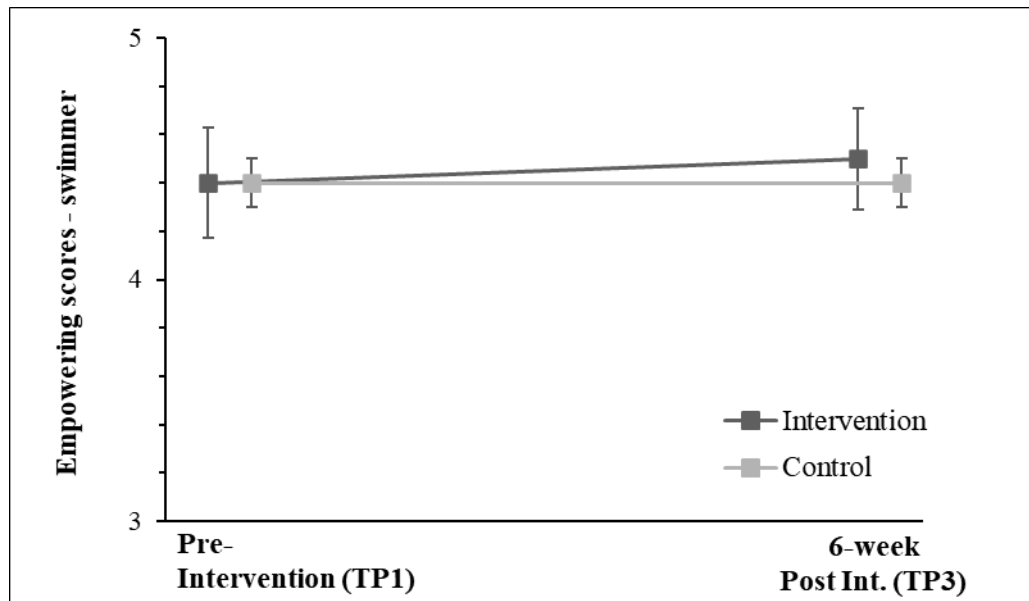


Figure 5.4 Mean (95% CI) swimmer ratings on EDMCQ-C empowering subscales at TP1 & TP3 according to intervention and control group.

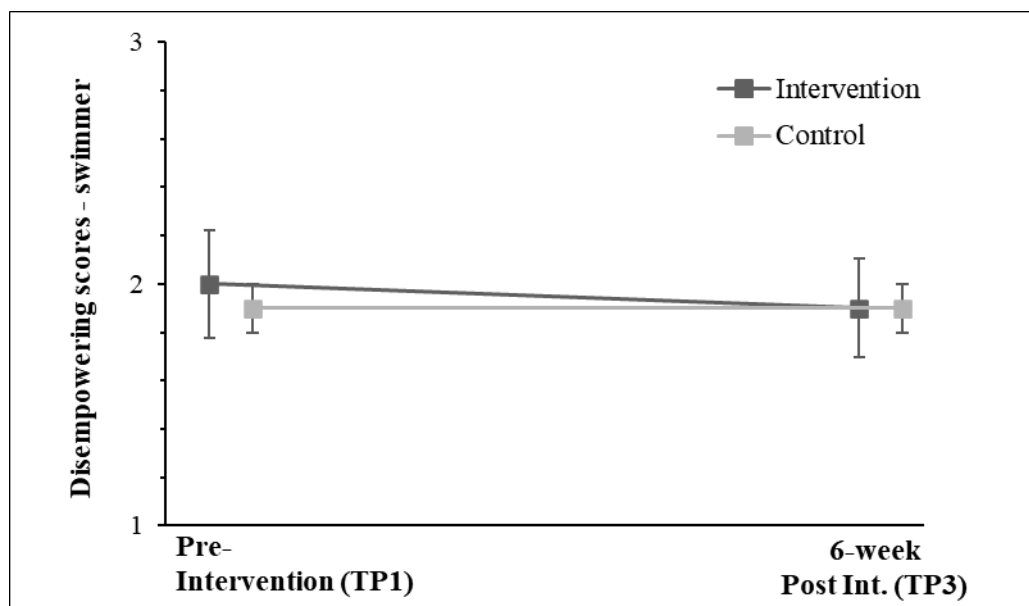


Figure 5.5 Mean (95% CI) swimmer ratings on EDMCQ-C disempowering subscales at TP1 and TP3 according to intervention and control group.

Coach education reflected responses highlighting the desire to participate and learn new information. For example, Coach_5's motivation was 'to learn [sport psychology] and contribute.'

Coach development also included descriptions of the importance of advancing coach relational skills. For example, Coach_5 noted that the ‘main motivation for participating in the program was the situation with a swimmer, because it was really challenging from many perspectives.’ Finally, several coaches noted their motivation to share new information with assistant coaches. For example, Coach_2 explained: ‘When learning new information in the past, I would share this with my coaching staff’, emphasising how it was an important part of their coaching and program evolution.

5.9.3.2. *Benefits of participation*

Five lower-order codes, relating to important ‘takeaways’ from the intervention program were clustered under benefits of participation (FC = 5, R = 52). These were: *communication styles* (FC = 5, R = 15), *coach development* (FC = 2, R = 13), *reassurance* (FC = 4, R = 10), *coach education* (RC = 4, R = 10), and *sharing new information* (FC = 2, R = 4). Although coach–athlete relationships were not explicitly examined in the intervention, it is a topic emphasised in associated research (for example, Jowett & Ntoumanis, 2004; Rhind & Jowett, 2010). All interviews highlighted the importance of *communication styles*. For example, Coach_4 noted: ‘Communication strategies were a big eye-opener for me in terms of, athletes are not all the same. This might work for me or for a certain individual, but it might not work for the other athletes.’ Coach_3 felt that ‘communication styles are completely different now than 10 years ago’ and ‘to communicate with my athletes in a more positive in a way is critical’ (Coach_4). Coach_5 felt it was important ‘to not react immediately to the situation, instead just be there and listen to the athletes, get better at saying something constructive and to ask more about how they are feeling.’

Coaches reflected on *coach development* as the next most important aspect ascertained from the intervention. Coach_3 described how ‘collaborating and exchanging ideas with other coaches’ was invaluable. Coach_2 shared: ‘Talking with other coaches in our break-out groups during the program, has given me a lot more conscious thought on what I’m doing and why I’m doing it.’

Interviewees also highlighted intervention benefits in terms of *reassuring* their current coaching behaviours (coaching practice), with four coaches commenting on how the ‘intervention content provided reminders of previously established coaching ideas’ (Coach_1). Coach_4 stated how ‘the program was beneficial in a way that made me realise and reassess the way I coach.’ Coach_2 commented: ‘The content was really helpful in that it was a reminder of what I do and what had worked well in the past.’ Comparable to ‘motivations to participate’, coaches also discussed intervention benefits in terms of *coach education* (FC = 4, R = 10) and being able to *share new information* with assistant coaches (FC = 2, R = 4). Coach_5 summarised: ‘learning new ideas relating to motivation and relationship skills’ and Coach_1 noted how they were trying to ‘include in their daily training environments and in conversations with their assistant coaches’. Coach_1 also mentioned: ‘The program had helped advanced their understanding of key concepts, which helped be a better coach mentor.’

5.9.3.3. *Intervention impact – Bronfenbrenner’s bio-ecological model*

Intervention impact relative to Bronfenbrenner’s bio-ecological model (FC = 5, R = 16) consisted of two lower-order codes: *Coach–parent interaction patterns* (FC = 3, R = 8) and *interrelations within micro–macro systems* (FC = 3, R = 8). Three coaches understood the strength in working and collaborating with parents alongside youth swimmers. Coach_1 identified: ‘Parents help us to have a better understanding of what’s being reinforced at home.’ Coach_4 noted, ‘I just want to communicate with the parents rather than fight against them, it’s so important to be on the same page.’ In addition, Coach_3 mentioned: ‘How much of an impact parents could have on the athlete development process.’ Coaches’ comments highlight the importance of a functional microsystem between the coach, parent, and athlete. If an athlete experiences conflict within their family and/or coach, their microsystem may break down, which can lead to a range of adverse outcomes (CASD; Bronfenbrenner, 1979).

With reference to *micro–macro system interrelations*, three coaches highlighted that ‘getting to

know the kids, building rapport redirected their negative behaviours without having to show positive behaviours' (Coach_1). Coach_2 described the value in 'getting to know swimmers on more of a personal level; getting to know their lives helped with their swimming.' In alignment, Coach_5 identified how 'every athlete walks into the room with different issues each day (school, home, peer group), so understanding how this might affect them and have an impact on their training is important.' Coaches recognised that all typically occurring activities in which their swimmers engaged in, including the interactions they have with parents and peers outside the pool, can have an impact (positive or negative) on development.

5.9.3.4. Intervention impact – empowering coaching framework

Intervention impact in terms of the empowering coaching framework (FC = 4, R = 18) consisted of three lower-order codes: *Belonging* (FC = 2, R = 8), *Autonomy* (FC = 2, R = 4) and *Competence* (FC = 3, R = 4). Four coaches recognised the impact of implementing more 'empowering' behaviours in their coaching practice. For example, Coach_1 spoke of an empowering situation in their training environment as 'having swimmers take responsibility for initiating certain training activities.' Coach_5 wanted the group to work more as a team, 'so they're all in the one space doing their warm-ups which has absolutely impacted the group... sense of team.' Two coaches identified, how they were able to implement belonging in training by 'developing a team chant' (Coach_2) which from a 'child's perspective goes a long way to establish a sense of belonging within each squad' (Coach_3). Three coaches identified how they addressed the implementation of swimming competency. For example, Coach_2 mentioned: 'when a swimmer got a personal best (PB) in training, they celebrated with that swimmer, so they felt valued.' They also implemented 'self-evaluations for swimmers to track where they're at the end of every season' (Coach_1). Coach_2 also reiterated the importance of creating autonomy in training and gave the example of 'having some swimmers take the lead and take responsibility for initiating certain training activities'. Explicit examples provided by the coaches confirmed the delivery of

Empowering principles during and post-intervention and the translation from theory to practice.

5.9.3.5. Future preferences

All coaches provided recommendations for future intervention delivery (FC = 5, R = 11). The themes raised were associated with preferences of *Timing* (FC = 4, R = 8), *Delivery* (FC = 2, R = 2), and *Theory-practice learning* (FC = 1, R = 1). Four coaches echoed that intervention *timing* should be modified. Because coaches were often up early with training in mornings, intervention sessions should be considerate of their daily training/working schedule (post-training – 8.00 am). Coaches also commented: the ‘two-hour sessions were too long’ (Coach_1) and could be shortened or ‘pre-recorded’ (Coach_5). In contrast, Coach_3 preferred to ‘meet face to face’, while Coach_2 discussed the ‘benefits of going straight from theory-practice (to the pool deck)’.

5.10. Discussion

Applying a mixed-methods quasi-experimental repeated measures design over 12 weeks, the present study sought to develop coaches’ conceptual knowledge and behavioural application of strategies – aligned with empowering coach-created microclimates – via a short-course education intervention. A further key purpose was to evaluate intervention effects on coach-created microclimates from both a coach and athlete perspective. Specific to self-reported coach ratings from TP1–TP3 relative to a control group, analyses identified no interaction effect and no change in ratings for the intervention group on EDMCQ (dis)empowering subscales. In contrast, results from multiple swimmer ratings – not aware of study coach group membership – did identify a significant interaction effect. Significant rating increases and decreases (TP1 versus TP3) on both empowering and disempowering subscales, respectively, were apparent for the intervention group relative to controls with a medium effect size. Follow-up interviews provided verification and triangulation toward intervention benefit and impact on coaching practice. While interventions examining the effect of coach education (in this case, coach motivational microclimates) have been relatively scarce, findings align with prior studies (Duda et al., 2013; McLaren et al., 2015;

Smith et al., 2007) illustrating how coach motivational climate modification in youth sport can positively effect several psychosocial outcomes (for example, enjoyment, perceptions of group cohesion, trait anxiety; Birr et al., 2023).

Several factors and processes may account for the discrepancy in coach and swimmer findings. Most notable, self-reported coach empowering subscale ratings irrespective of the group at TP1 were initially high and remained high at TP2 and TP3. Similarly, for disempowering subscales, coaches' ratings at TP1 were initially low, and remained low, until TP3. Thus, a lack of change may have occurred due to either recruitment bias (Hamill et al., 1980) or genuine competency within the coach sample. Accordingly, this may explain the ceiling effects in self-report ratings (Everitt & Skrandal, 2010), and therefore, less likelihood of room for improvement. Alternatively, high coach ratings may relate to coach interpretation of EDMCQ item content; a potential motivation to be evaluated positively, and therefore, the potential for self-inflationary bias (Hogan et al., 1997). Indeed, recruitment bias and pre-existing competency are possible. Participating coaches did report extensive pre-existing experience (intervention $M = 9.7$ years, $SD = 7.75$, control $M = 13.72$ years, $SD = 7.75$). They had been coaching at respective clubs for extended periods (for example, intervention $M = 5.40$ years, $SD = 3.41$, control $M = 7.72$ years, $SD = 6.74$). Thus, experienced coaches with prior experience of success (for example, in performance or swimmer development terms) may have entered the study with high perceived coaching competency, knowledge and perceived capability to deploy (some) empowering coaching principles; and who were psychologically comfortable in their relationships with swimmers. As such, the potential for EDMCQ rating improvement may have been reduced. These align with Girard et al. (2021), who in applying a quasi-experimental two-day intervention with teachers ($N = 11$) and their students ($N = 207$) to improve the student motivational climate, identified no significant effect on student motivation. Specifically, ratings determined as high at baseline remained high at follow-up time points, potentially accounting for the null results.

In contrast to coach ratings, multiple swimmer ratings of affiliated coaches did find an intervention (interaction) effect, and initially comparing their ratings with coaches is insightful. Swimmer ratings on both empowering and disempowering subscales were generally lower across the intervention relative to coaches, implicitly suggesting they perceived marginally less frequency of both empowering and disempowering features. Still, there is greater efficacy in swimmer ratings as they were: (1) multiple in number (8–10 ratings per coach); (2) independent and with potentially less incentive/coercion for rating bias; and (3) blinded to coach group membership (intervention versus control). As such, the likelihood of rating inaccuracy was potentially minimised. With both empowering and disempowering swimmer ratings changing over time in the theoretically preferred directions, the findings suggest intervention coaches operationalised intervention content and did change their interaction patterns and behaviours, which was subsequently consciously detectable by swimmers. More specifically, autonomy supportive behaviours increased. Autonomy supportive behaviours refer to creating an environment in training that facilitates relative choices and options for child and adolescent athletes. Related to *disempowering*, both controlling, and ego-involving behaviours decreased when comparing swimmer intervention and control groups. These changes were triangulated with qualitative data (see qualitative coach interview results).

The contrary argument to actual intervention effects is the assertion coaches artificially changed their interactional and behavioural patterns as opposed to a genuine, committed change. From knowingly being observed and evaluated by an unknown sample of swimmers, it is possible coaches were motivated to conform or illustrate competency in a socially evaluative situation (USyd researchers and/or SNSW), and where potential benefit may have been gained (a Hawthorne effect; Parsons, 1974; Sommer, 1968). A second artificial possibility relates to contamination of information; whereby coaches and their swimmers may have exchanged information during study involvement (Magill et al., 2019; Stamp et al., 2021). Information

exchange between coaches and swimmers could lead to biased ratings to maintain pre-existing (favourable) relationships. However, these are deemed less likely as study independence was declared and reinforced in recruitment material (for example, advertisements; information statements); pre-intervention time points and throughout questionnaire completion. Further, while NSW supported the intervention, study involvement was conducted independently without knowledge and awareness of club and coach involvement (and vice versa). Instead, evidence for genuine coach interaction and behaviour change is supported by qualitative follow-up interviews.

Qualitative findings contributed to existing literature questioning the efficacy of formalised coach education programs (for example, Abraham et al., 2006; Chesterfield et al., 2010; Irwin et al., 2004). For instance, coaches highlighted an intervention benefit was learning more about the importance of coach–athlete relationships, as opposed to the technical aspect of coaching and becoming more aware of the impact (as a coach) on individuals at any given time. While acknowledged as important to coaching knowledge and practice (Erickson et al., 2007), more traditional approaches to coach education have been criticised on the grounds of being: instructionally didactic; classroom-based; and ‘unidimensional’ (topic piece plus piece teaching), driven by assessments and prescriptions without understanding the complexity of factors which inform coach decision making (Abraham & Collins, 1998). As such, recommendations to address such limitations have included the utilisation of problem-based coaching (Jones & Tumer, 2006), coach mentoring (Cushion et al., 2003), competency-based training (Demers et al., 2006) and communities of practice (Culver & Trudel, 2006).

Development of the present coach education intervention attempted to address previous recommendations and address the research–practice divide (for example, Keegan et al., 2017). This was achieved through the application of theoretically informed, multidimensional psycho-social-behavioural content, with specific relevance to swimming club environments. Intervention delivery encouraged small group discussion, modelling autonomy supportive strategies between

coaches, by providing opportunities for all to participate and share/explore their ideas. Qualitative results, indeed, highlighted the importance of coach networking, as a way of learning from other coaches, and being able to share more nuanced information related to coach communication styles and interpersonal relationships (Côté & Gilbert, 2009). Thus, coach education effectiveness may not be determined by a given type or approach implemented, but what is most pertinent for the purposes, population, sport context, and the intended developmental outcomes.

5.11. Limitations

The present study is not without limitations. First, despite sample size estimation and attempted recruitment across SNSW, a limited number of swimming coaches volunteered to participate. Anecdotally, reasons for lower uptake resonated with a pre-existing competitive (egotistical) coaching culture within swimming; pre-conceptions of intervention benefit and relative importance to performance success; and perceived fear of negative evaluation. Consequently, statistical power on coach rating data was detrimentally affected. Smaller sample sizes likely compromised the capability to detect intervention effects on coach ratings, when a true effect may be present (Type II error; Faber & Fonseca, 2014). To mitigate against this possibility, interviews were incorporated at six-week follow-up (TP3) to help identify intervention effects from coaching standpoints. A second associated limitation was randomisation. Due to limited and progressive recruitment over time at baseline, a true randomisation procedure could not be implemented. Therefore, the possibility of skewness in coach characteristics or tendency for more motivated coaches to participate in the intervention earlier, rather than at follow-up, as offered to control group coaches is possible. Small-scale recruitment coupled with non-randomisation leads to a broader, generalisability, limitation. Study recruitment may not truly reflect a broader population, which may in fact contain a greater prevalence of disempowering (negative) coaching behaviours and connected swimmer microclimates experiences. On these grounds, the recommendation to repeat and extend the pilot to a wider coaching sample, with incentive to attract less experienced

coach may be prudent. More purposefully, as NSW has swimming club-level (re-)registration data (that is, dropout rates), a targeted approach to intervention implementation could be most beneficial.

5.12. Implications

From an applied perspective, the current findings suggest value in the recommendation for sport governing bodies and localised organisations (for example, regional associations, clubs) to conduct both coach education and regular reviews of their localised coach-created microclimates. Coach education content which specifically examines: (1) coach–athlete communication styles and interactional patterns, (2) interrelationships within sporting micro–macro systems; and (3) practical strategies to maximise coach/athlete perceptions of autonomy, competence and belonging (that is, self-determination) could prove most useful. Organisationally led or peer review could also help coaches achieve points 1–3, with benefits to both CASD and continued swimmer development. Alongside changing the incentives, reward and recognition of coaches toward sustained participation-based outcomes, rather than early-age performance, could also prove beneficial toward swimming coach culture and practice change. Individual coaches are recommended to seek self-awareness and interpretation of their instructional, interactional and behavioural approaches utilised. Incorporating independent perspective reviews from youth swimmers, peers, experienced coaches, club managers, and state/national sporting organisations could be highly informative to coaching self-awareness, interaction and behavioural strategy modification and subsequent perceptions of microclimates.

To increase the efficacy of the present findings, future research should include larger sample sizes of coaches and implement an experimental design to evaluate intervention effects. Independent observations and/or video recording (if feasible) of coaches within actual practice settings would be, while resource intensive, potentially highly valuable (for example, application of Multidimensional Motivational Climate Observation System, MMCOS; Smith et al., 2015). In

accompaniment, modification to intervention content, so to be more ecologically valid in delivery, is recommended. Delivery of some intervention content in swimming training and competition setting, with illustrated and modelling examples, could be most effective for coaching perceived value, behaviour change and transfer. Future research and coach education programs could also more greatly consider their impact by incorporating more extended post-intervention follow-up. For instance, if the present coach education intervention is effective, then longitudinal tracking of coach motivational climate ratings should theoretically align with longer-term outcomes of dropout and continuation (for example, survival analysis, see Chapter 3).

5.13. Conclusion

In the context of Australian child and adolescent swimming, findings from a pilot coach educational intervention provide valuable preliminary evidence (from combined swimmer and interview data sources) to suggest coaches can modify the perceived characteristic features of their coaching microclimates within relatively short-term timeframes. As detected by affiliated swimmers, intervention group coaches increased empowering associated coach–swimmer interactions and behaviours; and committedly, reduced disempowering associated coach–swimmer interactions and behaviours. When considered at an individual coach and broader system level, findings suggest equivalent but extended coach education training could be valuable to reducing CASD rates within youth swimming; and help increase the likelihood of attaining functional (Bronfenbrenner & Morris, 1998) longer-term benefits from sustained participation.

5.14. Chapter 5 references

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Chapter 6: Discussion and thesis conclusions

6.1. Overview of main findings

The overall aims of the thesis were to examine, in the context of Australian swimming, whether CASD and retention could be better understood by identifying the salient factors associated with dropout. A subsequent aim was to identify and implement an effective strategy to help improve swimmer retention. Aligned to these overarching aims, the following subsections now review whether thesis sub-aims (see Chapter 1) were addressed by summarising findings from each independent but interconnected study.

Aim 1a – Evaluate existing dropout literature from a bio-ecological systems theory perspective with a qualitative assessment of how the prior literature has been theoretically framed, and identify all factors previously investigated and identified as influential to CASD (Chapter 2).

In Chapter 2, systematic review findings identified how existing CASD literature had predominantly adopted narrow psychological-based theoretical frameworks (for example, Achievement Goal Theory – Nicholls, 1989; Theory of Planned Behaviour – Ajzen, 1991) with a lesser consideration of social-interactional and ecological theoretical explanations. Related to this, prior studies have focused on assessing psychological factors (alone) as key factors and explanations of CASD. The identified studies ($N = 69$) did examine single or multi-sport youth sports contexts worldwide, at different participation levels, with investigation more prevalent at local club-level participation. From a bio-ecological system theory perspective, and with an application of the accompanying PPCT model, competition structure, relative age (*Process* characteristics), participant sex, competence perception (*Personal* characteristics), parental socio-demographics and activity conflicts (*Contextual* characteristics) were identified as more consistent factors influencing CASD. Across the identified studies, 90 factors were extrapolated as being tested for association with CASD (see Table 2.1). Further, Figure 1.2 provides an example of common factors aligned with the PPCT model.

Aim 1b – Evaluate how dropout had previously been defined and measured (Chapter 2).

Chapter 2 identifies that prior studies often failed to provide a definition, or apply a defined consistent definition, and was coupled with restrained analytical approaches. For instance, dropout was often descriptively assessed, measured as annual percentages or frequencies of withdrawal from a group or assigned membership. Some studies utilised basic descriptive analytical approaches (for example, ANOVA, chi-square tests), while more informative approaches tracked across multiple years of (re-)registration data and utilised hazard ratios (for example, Pion et al., 2015), relative risk ratios (Manz et al., 2016), and retention rates relative to baseline norms (for example, Sabo & Veliz et al., 2016) as dropout indices. The benefit of the latter measures is their capability to determine dropout occurrence during a standardised exposure of time (Blagoev et al., 2012) while accounting for sample sizes in respective groups.

To address dropout definitions, research designs, methodological as well as analytical limitations, the novel CASD Study Checklist (CASD-SC) was developed (see Table 2.3). The CASD-SC, a 16-question-response item instrument, encourages researchers to carefully plan their intended CASD study by considering and answering multiple questions related to sequential steps within study implementation. Through such consideration, the CASD-SC attempts to facilitate the attainment of informative, novel and practically informative findings within CASD-related studies. From a thesis standpoint, the CASD-SC was subsequently utilised and completed at the study planning and design stages.

Aim 2 – In the context of Australian swimming, examine long-term CASD rates and determine if multiple or specific factors were influential over time (Chapter 3).

Informed by Chapter 2 findings, Chapter 3 examined the population-representative, long-term participation (re-)registration data of child and adolescent swimmers ($N = 17,161$) aged 10–15 years (inclusive). Of the 17,161 registered swimmers examined, 14,440 (84%) had dropped out after ten years, with approximately 2721 (16%) still participating when data tracking was

terminated (see Table 3.1). Of the 7895 females and 6545 males who had dropped out, 33% and 35%, respectively, had dropped out of swimming after two years.

Kaplan-Meier analyses identified the median sustained re-registration as four years, with 15.9% of swimmers (aged 10–15 years) maintaining participation over ten years. The relatively novel application of survival analysis identified age group, competition level and residential proximity to a city as significantly associated with increased dropout rates across annual re-registration. Cox regressions identified that age group was associated with a 184.9% higher hazard rate (HR) for 10- versus 15-year-olds, meaning dropout rates were much higher at lower age groups. Residential proximity to major cities was influential, with urban swimmers reporting a 24.8% higher HR, per year (irrespective of other factors) than rural swimmers. Meanwhile, level of competition was associated with an 86% higher HR, irrespective of other factors. Swimmers participating at lower competition levels (club/district) were more likely to dropout relative to state/national level swimmers. All other variables assessed were not associated with dropout (for example, swimmer sex and relative age) in the representative sample and context examined.

Aim 3 – To identify and examine whether coach-created motivational climates in the context of child and adolescent swimming were associated with participation status (that is, current or former swimmers) in localised NSW club environments (Chapter 4).

Guided by the background theoretical frameworks in Chapter 1 and informed by the findings in Chapters 2 and 3, Chapter 4 aimed to identify potential reasons NSW swimmers reported high CASD rates. The results from Chapter 3 recommended further examination of coach–athlete interrelations and the influence of more preferred training environments (functional coach-created motivational climates) for sustained sport participation. Therefore, in Chapter 4, the focus shifted toward the coach and the coach-created motivational climate. Considered the nucleus of child and adolescent sport microsystems, and with coaches responsible for implementing the structure and content of training and learning activities over time (Fraser-Thomas et al., 2008; Rottensteiner et

al., 2013), coaches can substantially influence the pattern and nature of social interactions and experiences.

Chapter 4 specifically focused on assessing associations between coach-created motivational climates and CASD, implying that the psychological environments created by coaches and experienced by swimmers could account for observed CASD behaviour. To identify potential associations and provide explanatory reasoning, the study invited continuing ($N = 99$) and former ($N = 104$) swimmers within NSW club settings, aged 8–18 years to complete a standard questionnaire. The questionnaire assessed a combination of personal and family microsystem characteristics and coach-created motivational climate characteristics (coach microsystems). The findings identified that swimmer socio-demographic, participation history and family sport history participation were not associated with CASD. Only older (age group) females (athlete sex) were characteristics associated with dropout status in the sample captured (see Table 4.1). However, while EDMCQ-C analyses identified three cluster types of coach-created climate (empowering, disempowering, and neutral) created and experienced by swimmers, those exposed to empowering and disempowering climates were associated with continuation and dropout behaviour patterns, respectively. More specifically, former swimmers were more than three times as likely ($OR = 3.79$, 95% $CI = 1.79$ – 8.01) to associate their coach with a disempowering versus empowering climate, and were 74% ($OR = 0.26$, 95% $CI = 0.12$ – 0.33) less likely to have experienced an empowering versus disempowering climate. These findings uniquely identify how coach-created motivational microclimate *processes*, including types/forms of social interactions, instruction and behaviour, were likely detrimental to Australian youth swimming participation behaviour.

Aim 4 – To develop and evaluate the impact of a pilot short-course coach education intervention to improve the coach-created motivational climate in a child and adolescent swimming context (Chapter 5).

To address Aim 4, a quasi-experimental, mixed-methods, pilot coach-created microclimate intervention was designed and implemented. The intervention aimed to determine whether coaching motivational microclimates could be modified to improve child and adolescent swimming experiences. The intervention consisted of three $\times$ 2-hour, group-based, online educational sessions with a single ‘top-up’ session thereafter. Compared to traditional coach education approaches, the pilot intervention attempted to better address the research–practice divide (for example, Keegan et al., 2017) by applying theoretically informed, multidimensional psycho-social-behavioural content, small group activities, and with encouragement for coaches to discuss, share and explore ideas of implementation within coaching behaviours (see Table 5.1).

In determining intervention effects, coach self-ratings provided at pre- and post-intervention revealed no significant interaction effect, referring to no changes in intervention group ratings over time relative to controls. Findings suggested that: coaches did not modify their coach motivational microclimates; coaches did not personally detect any perceived significant changes in practice; or alternative processes were impacting the capability to self-report changes (for example, initial high competency; self-rating ceilings). In comparison, greater efficacy for intervention impact was suggested by the multiple, independent and coach-membership blinded, swimmer ratings pre–post intervention. Swimmer ratings identified significant interaction effects with a medium effect size. Specifically, intervention coaches relative to controls were perceived to increase and decrease their empowering and disempowering motivational climate features over time. To be more exact, autonomy-supportive behaviours (for example, creating an environment that facilitates athlete choices and options) increased. Related to disempowering behaviours, both controlling (for example, intimidation or devaluing the athletes’ opinion) and ego-involving (for example, excluding athletes when they make mistakes) behaviours decreased. These changes were triangulated with qualitative data (see qualitative coach interview results in Chapter 5).

The intervention's perceived benefit and practice impact was also verified in qualitative coach interview data. Qualitative findings provided evidence to suggest case coaches did modify social interaction, communication strategies, and behaviours in accordance with motivationally empowering characteristics (see qualitative results in Section 5.9.3). On this basis, the potential impact and benefit of the pilot coach education intervention were predominantly confirmed. If the intervention was repeated and extended for broader delivery with SNSW coaches, then it is possible benefits to youth swimmer experiences could occur; thereby helping to address CASD within the youth swimming context.

On the presumption of dropout being a less desirable behavioural outcome, in contrast to sustained participation, the thesis further explored the problem of childhood and adolescent sport dropout in general, and uniquely in Australian swimming. Acknowledging the multitude and complexity of child and adolescent sport behaviours, the thesis informs organisational and practitioner-level strategies, through the recommendation of coach education/professional development programs, targeted at specifically improving coach-created microclimates. Although it was outside the scope of the thesis to identify all the potential factors which independently (or interactively) influence sport behaviour, the outcomes identified by the thesis could cost-effectively help to immediately change/address current practice and provide an evidence base to help change an organisation cultural mindset.

6.2. Thesis strengths

The studies presented within the thesis are novel in terms of conceptualisation, research question focus, methodological design, and analysis approaches, leading to unique and informative findings in the research field. The theoretical framework and studies provide a basis for a more in-depth understanding of CASD, and how coaches and their subsequent coach-created microsystems can influence sport participation behaviours. To highlight and summarise, several key strengths are now emphasised.

6.2.1. Strength 1: Application of integrated frameworks

The thesis applied a meta-theoretical framework integrating the role of social-environmental factors alongside intra-personal, inter-personal and structural-level explanations of CASD. This theoretical lens helped identify how interrelated characteristics (stable attributes) and processes (relationships and interactions) in multiple ways (bio-psycho-social-ecological) spanning levels from individual–national policy level could be associated and explanatory of CASD. By framing studies within the framework, the present thesis could adopt both macro- and micro-level positions of understanding, analysis, and interpretation. Bio-ecological human development theory applied to CASD helped identify and guide toward both novel research future directions (for example, CASD-SC development; see Table 2.3) and orientate toward the focus of potential solution and applied strategies to address the CASD problem. Likewise, integrated frameworks informed thesis evolution from achieving a better understanding of CASD influential factors across sporting contexts to identifying practical initiatives, such as the pilot coach-created microsystem intervention (Chapter 5).

6.2.2. Strength 2: Development of a study planning tool to address CASD

To improve methodological quality, analytical rigour and help achieve more informative findings, the CASD-SC was developed (see Chapter 2). The CASD-SC contains 16 items, inviting researcher(s) to carefully consider and declare their dropout definition, methods of measurement, theoretical framework applied, research questions, methodological design/approach, sampling and context criteria, (non-)examined potentially influential variables, and the adopted data-analytical approach. If implemented by future researchers, it is predicted more impacting, novel and informative studies, with results informing more targeted strategies addressing CASD could occur.

6.2.3. Strength 3: Diverse research designs and analytical methods

The thesis applied various methodological approaches, research designs and data analysis techniques. These include a mixed-method systematic literature review, two empirical retrospective cohort studies and a quasi-experimental intervention study. The thesis combined high-quality research methods (validated and reliable tools) with real-world application (practical intervention). For instance, Chapter 3 deployed a retrospective tracking design (annual swimmers' registrations over time) and used a novel survival analysis approach not commonly adopted in sport and physical activity literature. Sporting organisations can potentially utilise more advanced study designs and analytical approaches to estimate dropout odds or rates and assess the influence of multiple independent (or interactional) factors within specified timeframes.

Chapter 4 uniquely identified factors associated with *actual* sport behavioural outcomes (swimming dropout versus continuation) rather than *intentions* to dropout, as has often previously been examined in the extant literature. EDMCQ-C cluster analyses identified three types of coach-created climates (empowering, disempowering, and neutral), with disempowering and empowering types associated with dropout and continuation. Chapter 5 applied a quasi-experimental repeated-measures mixed-methods intervention to evaluate the effect of a 12-week coach intervention program on coach and athlete motivational microclimate ratings. Findings from this novel pilot study intervention provided preliminary (partial) evidence to suggest coach motivational microclimates, encompassing components of social interaction, communication, and behaviour, were positively modified via a short educational intervention.

6.2.4. Strength 4: Theoretically integrated coach-education program

A theoretically integrated and trialed coach education intervention program was conducted to explicitly consider the granular associations of coach-created motivational microclimate changes to functionally influence CASD (Chapter 5). By integrating multiple, complementing theoretical frameworks, the intervention provided valuable preliminary evidence to suggest that coaches can

modify coaching microclimate characteristics within relatively short-term timeframes. When considered at an individual coach and broader system level, the findings suggest equivalent but extended coach education training could be valuable for reducing CASD rates within early participation stages of swimming and increasing the likelihood of attaining functional longer-term developmental benefits from sustained participation.

6.3. Thesis limitations

Despite the strengths of the thesis and novel contributions to CASD literature, limitations should also be considered. Present factors and processes influencing dropout in the present study may (or may not) be valid at different time points, other geographical locations, or other sports contexts. Likewise, careful consideration must be taken in view of broader social and cultural contexts. CASD and the coach-created microclimate may not be experienced the same way across cultures and contexts (Toms & Jeanes, 2022). The studies contained within the thesis do not account for the influence of the full array of CASD factors and motivational influences in a social context, which is very unlikely to be determined by only one person (the coach). Many interrelated, competing concepts influence one another's motivation. Nonetheless, present findings could easily be extracted and developed to assist functional outcomes (positive psychological, social, and physical health benefits) across a range of sports.

The potential for recruitment and reporting bias should also not be ignored (Hamill et al., 1980; Podsakoff et al., 2003). In Chapter 4, the recruited former swimmers (and their parents) may have had genuinely more negative (disempowering) experiences and were potentially more motivationally inclined to report more negative experiences. Inversely, recruited continuing swimmers may have had disproportionately positive experiences in their respective coaching climates. Further, the accuracy of self-reporting measures and the possibility of recall bias may have impacted the reliability of the questionnaire findings within Chapter 4 and Chapter 5. Self-inflationary protection reasons (Hogan et al., 1997) were possible at initial evaluation time points

during questionnaire completion in Study 5. Participating coaches reported extensive coaching experience. Therefore, coaches with prior knowledge of success (for example, in performance or swimmer development terms) may have entered the study with high self-perceived coaching competency.

It is also important to acknowledge the small sample size of coaches volunteering to participate in the intervention study (Chapter 5). Smaller sample sizes potentially compromised the capability to detect intervention effects on coach ratings when an actual effect may be present (Type II error; Faber & Fonseca, 2014). To mitigate against this possibility, interviews were incorporated at a six-week follow-up (TP3) to help identify intervention effects from coaching standpoints. A second-associated limitation was randomisation. Due to limited and progressive recruitment over time at baseline, a true randomisation procedure could not be implemented. Therefore, skewness in coach characteristics or the tendency for more motivated coaches to participate in the intervention is possible.

6.4. Applied implications

Current implications from the thesis identified several applied and research recommendations for practitioners (for example, coaches, club managers), sporting systems (for example, National Sporting Organisations [NSOs]), parents and government organisations. From a research and sport organisational standpoint, future studies should address the definitional, theoretical causes (factors/processes involved), measurement and analytical limitations of sport dropout.

6.4.1. Coaches (microsystem)

Results from the thesis highlight the significance of coaches as central agents who lead and structure their environments to create optimal (functional) conditions maximising child and adolescent sports development. Given their frequent interactions with athletes, coaches should consider how coach-created microclimates can impact vital factors for positive sporting

experiences and psychosocial development. What coaches do and how they do it from experience and knowledge shapes an individual's interpretation (for example, perceptions and meaning) and subsequent behaviour (for example, engagement/disengagement). Key findings from the thesis include designing and implementing behaviours, communication strategies, values and conduct aligned to an empowering climate. A coach-created microclimate combining task-involving, autonomy-supportive, and socially supportive relational exchanges between individuals (for example, sports participants and coaches) may increase the likelihood of child and adolescent athletes attaining the physical, psychological, and social developmental outcomes from longer-term sports involvement. Avoiding controlling coach behaviours, such as pressurising, coercing and intimidation, and avoiding the use of extrinsic rewards/reinforcements to reward participant behaviour, should be paramount.

Individual coaches should aim to increase self-awareness through constant self-reflection and evaluation of coaching behaviours. Including multiple assessments (for example, with athletes, peers, club managers, state/national sporting organisations) and conducting periodic reviews could improve the coach-created microclimate. Findings also identified the importance of interactions with other coaches, group education and coach mentoring.

6.4.2. Parents (microsystem)

Thesis findings also suggest several implications for parents of child and adolescent athletes. Increasing parental knowledge of the coach-created microclimate could assist young athletes to (sub-)consciously interpret and evaluate such information. As a lack of positive emotional support from key social agents (for example, parents) is associated with a higher likelihood of dropout, developing and implementing parent education and information sessions could generate a better understanding of influential CASD factors. Emphasising interpersonal relationships with significant others (for example, coaches and peers), parents may find monitoring their child's experience towards training and competition more conducive to their psychosocial needs and

long-term development. Hopefully, such information would help improve the longevity of participation and involvement within sports associated with high dropout rates.

Improved parent knowledge could help generate better understanding and explanations to help inform parent decision making and support associated with participation and competition involvement. To aid such understanding, online and in-person educational resources (for example, videos, self-paced modules) may include thesis findings that help parents identify empowering coach-created microclimates, in contrast to disempowering behaviours. Implementing personal/peer review and self-reflection for evaluation relating to coach-created microclimates could be valuable toward facilitating coach behaviour change and optimising climates.

6.4.3. Club managers (mesosystem)

The thesis findings consider community organisations (for example, sports clubs) and their leaders as essential facilitators for sporting and physical activity provision. There is an opportunity for crucial club personnel to assist NSOs, coaches, parents and athletes with systematic tracking and reporting of CASD data. Such tracking would generate more informed decision making related to selection and training intervention. Realigning financial and educational resources from NSOs to assist with data reporting and adopting club-led coach education programs to promote the sharing of CASD responsibility while focusing on integrating ‘multidimensional’ psychosocial approaches could be beneficial.

More broadly, there is an opportunity for clubs, in conjunction with their coaches, to educate parents. Increasing club knowledge regarding the coach-created microclimate could also assist key personnel in understanding and identifying the factors currently leading to child and adolescent athletes being exposed to suboptimal motivational climates. Clubs could assist athletes, coaches, parents, and practitioners in educating and raising CASD awareness, potentially identifying ‘when’ and ‘where’ to change/address current practice at grassroots level and provide

an evidence base to help shift an organisation's cultural mindset which has historically prioritised early-age intensive training and investment (that is, selection of the few to the dropout of many).

6.4.4. National sporting organisations (macrosystem)

NSOs are responsible for creating and implementing systems encouraging practitioners to consider the potential array of factors (*micro* individual – *macro* organisational structures and policy) to optimise athletes' long-term participation and development. With CASD in mind, one key implication for NSOs is the systematic tracking and reporting of dropout data. Measuring and tracking sport participation and dropout trends is essential to identify and evaluate critical environments. As the findings identified, annual new registrations effectively mask the presence of high dropout rates, potentially nullifying the suggestion of low retention rates. NSOs could consider using similar analytical techniques to those used in the thesis (for example, survival analysis) to assess and track dropout trends accurately.

From a swimming perspective, as swimmers as young as ten years or less are introduced to the sport, NSOs may need to recognise better and integrate participant development needs by de-emphasising performance-driven outcomes. A greater emphasis on fun, social, cooperative and team-orientated activities (creating a sense of belonging) with less focus on inter-individual competition may be more preferential. Encouraging initiatives such as NSW's 'Swim League' – a relatively new team-based aquatic event for younger age groups (for example, 10- and 11-year-olds) swimmers – could be helpful. Avoiding contexts designed around early-age athlete performance, where coaches are evaluated on performance-associated metrics, could assist. NSOs may also need to consider the key elements of a 'healthy competitive pathway' progression based on age and stage of development.

Current findings also implicate the need for NSOs to investigate further the factors leading to child and adolescent swimmers being exposed to suboptimal coach-created microclimates.

Integrating multidimensional psychosocial approaches to coach education to protect against CASD could be beneficial. Connecting coach education and communication between NSOs, researchers and coaching practice by changing incentives, rewards and recognition of coaches through sustained participation-based outcomes rather than early-age performance could also assist.

6.5. Research implications

From a research perspective and to help achieve a more comprehensive explanatory understanding of CASD, thesis implications point toward the need for longitudinal assessments of dropout patterns within sport contexts with the application of multilevel and multifactorial frameworks (for example, the PPCT model). Correspondingly, more advanced analytical approaches, incorporating multifactorial assessment over time, would help more accurately estimate dropout odds or rates, as well as better identify the underlying processes involved. Such investigation would consequently help inform the design, content, and implementation of context sensitive CASD intervention or prevention strategies. For sport contexts with heightened CASD rates, perhaps the most immediate recommendation is establishing system-wide stakeholder knowledge of CASD and how such rates are effectively undermining organisational outcomes. These outcomes may include financial income, youth–adult participation transition, post-participation interest/value of the sport, and/or sport popularity/commercial value. Examining these relationships may be more impacting to promote change at an organisational-wide level.

With interactions between coaches and child/adolescent participants and the psychosocial features of their created microclimates positioned at the core of CASD, future research must consider the potential value of larger-scale intervention across or within sporting organisations. Extending research to a wider coaching sample (that is, athletes of different ages and stages of development), would also be advantageous. Evaluating whether different forms of coach education are effective to invoke functional coaching behaviour and conduct change would seem valuable. For example,

independent observations, peer review, and/or reassessments of coach-created motivational microclimates within actual practice settings could be a valuable methodological step increasing the likelihood of behaviour change. Recommended observational or peer review could involve highly skilled coaches, leading SNSW staff or club personnel. Implementing longitudinal reviews or ‘check-ins’ of coach-created motivational microclimates could help substantiate impact on short-term (for example, athlete psychology) and longer-term outcomes (for example, athlete dropout versus retention rates).

6.6. Concluding statements

Given the background context and problem of CASD, the thesis overall contributes research and applied knowledge. Each study contained within, and their associated findings, accumulates to provide increased knowledge as to the overall factors potentially influencing CASD, in a given population and context at given time points. Within the context of SNSW, the study results confirmed relationships between age group, competition level, city proximity and coach-created motivational climates with CASD. Central to CASD, the thesis illuminates the importance of psychological and social characteristic features within coaching environments.

The findings emphasise the importance of coaches’ interaction capabilities and behaviours on psychosocial and behavioural outcomes in child and adolescent swimmers. Coach relational and social-relational skills, the implicit message meaning (positive and negative) from instructional behaviours, shape athlete affect, cognition, and behavioural responses (CASD and retention). From an applied perspective, being able to implement and modify coach-created motivational microclimates by incorporating empowering strategies, appears central to optimising functional, more sustained child and adolescent participation behaviours. The relative success of the pilot coach education intervention in swimming provides a preliminary, first step, and potential course of action in Australian regional–national swimming.

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Appendices

Appendix A: Chapter 3 – Human Research Ethics Committee Approval



Research Integrity & Ethics Administration

Human research ethics committee
Thursday, 12 September 2019

Dr Stephen Coble

Exercise Health and Performance; Faculty of Health Sciences
Email: stephen.coble@sdney.edu.au

Dear Stephen,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application. I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	2019/695
Project Title:	An examination of participation and dropout trends in New South Wales youth Swimmers.
Authorised Personnel:	Coble Stephen; Abbott Shaun; Heathcote Mark;
Approval Period:	12 September 2019 to 12 September 2023
First Annual Report Due:	12 September 2020

Documents Approved:

Date Uploaded	Version Number	Document Name
09/09/2019	Version 2	RDMP Research Management Plan revised
09/09/2019	Version 2	Swimming NSW Support Letter
29/07/2019	Version 1	External Research Declaration

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
 - Serious or unexpected adverse events (which should be reported within 72 hours).
 - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirement
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification. Sincerely,



Dr Helen Mitchell Chair

Human Research Ethics Committee (HREC 1)

Appendix B: Chapter 3 – Support Letter Swimming NSW

9 September 2019

Dr Stephen Cobley
Associate Professor

The University of Sydney
K208 Cumberland Campus
75 East Street

Lidcombe NSW 2141



Re: Swimming NSW Human Research Ethics Support Letter

Dear Stephen,

On behalf of Swimming NSW Limited, I hereby give permission and authorise for you and your research student to examine our swimming participation data. To confirm, the analysis of participation data from our database for the year's 2010-present will be made available.

I, and Swimming NSW, fully support data analysis and support the potential for publication. I understand that a specific research paper examining participation and dropout trends as well as relative age effects in swimming will be the targeted outcome.

We are aware that such information in the past has proved extremely beneficial in supporting changes being made at a national and regional level to our competitive structures. Further, we consider that such an analysis of our data, will inform NSW strategies and coach education to help improve our sport. Therefore, we look forward and welcome study findings.

In terms of the data shared, and overseen by myself on behalf of Swimming NSW, I request that such data be kept confidential and anonymous during analysis. Data that is stored will be retained for 20 years (that is, until participants turn 25 years). At the end of the retention period, we permit the data to be archived and stored in a repository with anonymity and personal identifying information not available. As the data belongs to Swimming NSW, we ask that the data not be made available for open access, instead restricted to approved individuals associated with the research study.

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ABN 69 111 987 430

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admin@nsw.swimming.org.au



Yours sincerely,

Mark Heathcote | Chief Executive Officer | Swimming NSW Ltd.

Appendix C: Chapter 4 – Human Research Ethics Committee Approval



Research Integrity & Ethics Administration

Human research ethics committee

Friday, 26 February 2021

Dr Stephen Cobley

Exercise Health and Performance; Faculty of Medicine and Health

Email: stephen.cobley@sydney.edu.au

Dear Stephen,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	2020/683
Project Title:	Ascertaining a better understanding of micro-climatic factors associated with dropout and retention in Australian youth swimmers
Authorised Personnel:	Cobley Stephen; Moulds Kylie; Heathcote Mark;
Approval Period:	26/02/2021 to 26/02/2025
First Annual Report Due:	26/02/2022

Documents Approved:

Date Uploaded	Version Number	Document Name
02/12/2020	Version 2	Appendix 7_Dropout Survey Updated 2_12
02/12/2020	Version 2	Appendix 8_Returning Swimmers Survey Updated 2_12
02/12/2020	Version 2	Appendix 10_Swimming Aus Safeguarding children policy
02/12/2020	Version 2	Appendix 9 Recruitment invitation email_Updated 1_12
24/08/2020	Version 1	Parent Guardian PIS
24/08/2020	Version 1	Child 13-15 PIS
24/08/2020	Version 1	Child 12 & U PIS
21/08/2020	Version 1	Parent Guardian PCF
21/08/2020	Version 1	Child 15 & U PCF

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
 - Serious or unexpected adverse events (which should be reported within 72 hours).
 - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.

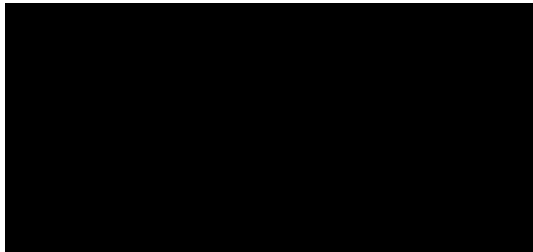
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.



THE UNIVERSITY OF
SYDNEY

Please contact the Ethics Office should you require further information
or clarification. Sincerely,



Associate Professor Mark Arnold

Chair, Human Research Ethics Committee (HREC 2)

Appendix D: Chapter 4 – Information Statements



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Copley

Level 6 – Susan Wakil Health Building D18

Mark Heathcote

The University of Sydney

Kylie Moulds

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INFORMATION STATEMENT: PARENT/GUARDIAN

(1) What is this study about?

Your child has been invited to take part in a research study examining reasons for dropout or continued participation in New South Wales (NSW) youth swimmers. Swimming NSW is conducting the study in partnership with The University of Sydney.

Your child is invited to participate as they were registered with a swimming club affiliated with Swimming NSW between 2017-2019. This study will examine the demographic and psychosocial factors associated with dropout or sustained participation in youth swimming. Findings will help identify regional, club, swimming context, and individual characteristics associated with dropout and retention. Information collected will help Swimming NSW identify strategic initiatives to help increase the likelihood of longer-term swimming participation.

This Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to let your child take part. Please read this statement carefully and ask questions about anything you don't understand or want to know more about. Participation in the study is voluntary.

By giving your consent, you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree for your child under your guardianship/care to take part in the study as outlined below.

- ✓ Agree to the use of the information you and your child provide for analysis as outlined below.

(2) Who is running the study?

The study is being led and carried out by:

- Assoc. Prof. Stephen Cobley – The University of Sydney
- Mark Heathcote – Swimming New South Wales Limited
- Kylie Moulds – The University of Sydney

Funding declaration:

There is no financial assistance associated with this study.

(3) What will the study involve?

Following your consent as a parent/guardian, we will also invite your child to participate. You and your child will then be invited to participate by completing an online survey via email. Eligible individuals will be those who registered as a swimming¹² member with Swimming NSW during 2017-2019, and who were between the ages of 10-16 years. If you receive an email inviting participation and your child is currently under the age of 16, then we will recommend that the parent/guardian and child complete the online survey together. The survey is written in English; thus, if English is not your primary language, consider contacting the researcher for assistance, or by asking someone for support.

The online survey will ask for some information related to (1) your socio-demographic background (for example, age); (2) your participation background in swimming; and (3) the reasons for your child's continued or discontinued swimming participation. The survey will take around 10–15 minutes to complete and can be accessed on a computer or mobile device. As part of consent, we will then connect the information you've provided already to Swimming NSW (for example, club name club etc.) as part of registration. This step will help enable more efficient data collection.

(4) How much time will the study take?

Participation in this study should take no longer than 10 – 15 minutes.

(5) Who can take part in the study?

We would like to invite all individuals (aged between 10-16 years) who first registered with a Swimming NSW affiliated club during 2017-2019, and who have re-registered (or not) with a Swimming NSW affiliated club during the 2019- 2021 membership seasons.

¹² Swimmers are registered financial members of a club who may swim at club, region, state or national level. Swimmers must be registered to compete in any level of competition in NSW.

(6) Does my child have to be in the study? Can they withdraw from the study once they've started?

Being in this study is completely voluntary, your child does not have to take part. Your decision to permit participation will not affect your or your child's relationship (now or in the future) with anyone at Swimming NSW/Swimming Australia or The University of Sydney. If you decide to let your child participate, then change your mind later (or your child no longer wishes to take part), they are free to withdraw from the study at any time. You can do this by notifying the lead researcher or individuals listed on this information statement.

Submitting your online completed survey is an indication of your consent to participate in the study. You can withdraw your responses if you change your mind about having them included in the study, up to the point where we have analysed and published the results.

(7) Are there any risks or costs associated with being in the study?

We do not expect that there will be any risks or costs associated with study participation for you or your child.

(8) Are there any benefits associated with being in the study?

If you fully complete the online survey, you will be automatically entered into a prize draw. Swimming NSW has agreed to offer the following prizes: 6 x Swimming NSW swim shop vouchers (valued at \$50 each) for returning swimmers. While for non-returning swimmers, 6 x Coles Myer Gift vouchers (valued at \$50 each) will be available to win. Otherwise, there are no immediate benefits from study involvement.

In the longer-term, the information collected from this study does relate to improving Swimming NSW coach education, training, and practices associated with the process of athlete development. As such, the study is hoping to improve professional practice across Swimming NSW, with hopefully indirect benefit to future swimmers.

(9) What will happen to the information collected during the study?

Information collected from your child will be used for research purposes only. Your child's information will be stored securely, and their identity/information will be kept strictly confidential, except as required by law. Overall, study findings may be published in student theses, scientific literature, or presented as part of a conference, but your child will never be individually identifiable in these publications. On no occasion will any information related to your child be shared or disclosed. In other words, confidentiality and anonymity will be ensured.

By providing your consent, you are allowing us to collect information for the purposes of this study and possible future studies. We don't know at this stage what these other projects will involve. We will seek ethical approval before using the data. All data collected will be kept secure in online University, password-protected, data-storage centres operated by The University of Sydney. Only the researchers named in this information statement will have access to data collected.

(10) Can we tell other people about the study?

Yes, you are welcome to tell other people about the study.

(11) What if we would like further information about the study?

When you have read this information, Assoc. Prof. Stephen Copley (The University of Sydney) and Mark Heathcote (Swimming New South Wales) will be available for further discussion and will answer any questions you may have. If you, or your child, would like to know more at any stage, please feel free to contact Assoc. Prof. Stephen Copley at 935-19033; email: stephen.copley@sydney.edu.au or Mark Heathcote email: mark.heathcote@nsw.swimming.org.au.

(12) Will we be told the results of the study?

You and your child have a right to receive feedback about your child's results and the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box on the consent form. This feedback will be in the form of a one-page lay summary. You will receive this feedback after the study is finished.

(13) What if we have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called the Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney (No. 2020/683). As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect people who agree to take part in research studies.

If you (or the person under your guardianship/care) are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information statement is for you to keep

Youth Information Statement (13-16 Years)



Sydney School of Health Sciences

Faculty of Medicine and Health

ABN 15 211 513 464

Assoc. Prof. Stephen Coble

Room K208

Mark Heathcote

Building and code C42

Kylie Moulds

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Facsimile: +61 2 9351 9033

Email:

stephen.coble@sydney.edu.au

Web: <http://www.sydney.edu.au/>

INFORMATION STATEMENT: YOUTH 13 – 16 YEARS

(1) What is this study about?

You have been invited to take part in a research study examining reasons for dropout or continued participation in New South Wales (NSW) youth swimmers. Swimming NSW is conducting the study in partnership with The University of Sydney.

You have been invited to participate as you were registered with a swimming club affiliated with Swimming NSW between 2017-2019. This study will look at some factors associated with dropout or sustained participation in youth swimming. To do this we would like to ask some questions relating to your participation experience, your background in swimming, and the reasons for your continued or discontinued swimming participation.

This Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part. Please read this statement carefully and ask questions about anything you don't understand or want to know more about. Participation in the study is voluntary.

By giving your consent, you are telling us that you:

- ✓ Understand what you have read.

- ✓ Agree to take part in the study as outlined below.
- ✓ Agree to the use of the information that you provide for data-analysis as outlined below.

You will be given a copy of this Information Statement to keep.

(2) Who is running the study?

The study is being led and carried out by:

- Assoc. Prof. Stephen Cobley – The University of Sydney
- Mark Heathcote – Swimming New South Wales Limited
- Kylie Moulds – The University of Sydney

Funding declaration:

There is no financial assistance associated with this study.

(3) What will the study involve?

If you and your parent/guardian consent to taking part in the study, you will be invited to participate by completing an online survey via email. Eligible individuals will be those who registered as a swimming¹³ member with Swimming NSW during 2017-2019, and who were between the ages of 10-16 years.

(4) How much time will the study take?

Participation in this study should take no longer than 15 – 20 minutes.

(5) Who can take part in the study?

We would like to invite all individuals (aged between 10-16 years) who first registered with a Swimming NSW affiliated club during 2017-2019, and who have re-registered (or not) with a Swimming NSW affiliated club during the 2019- 2021 membership seasons.

(6) Do I have to be in the study? Can I withdraw from the study once I've started?

If you decide you want to take part and then change your mind later, that is ok. All you need to do is tell us that you don't want to be in the study anymore. If you have any questions, you can ask us or your family or someone who looks after you. If you want to talk to us about it, you can call Assoc. Prof. Stephen Cobley (The University of Sydney) at 9351 9033 or Mark Heathcote (Swimming NSW) at 9763 5833.

¹³ Swimmers are registered financial members of a club who may swim at club, region, state or national level. Swimmers must be registered to compete in any level of competition in NSW.

(7) Are there any bad things about being in the study?

We don't think it will be bad for you or cost anything.

(8) Are there any good things about being in the study?

If you fully complete the online survey, you will be automatically entered into a prize draw. Swimming NSW has agreed to offer the following prizes: 6 x Swimming NSW swim shop vouchers for returning swimmers. While for non-returning swimmers, 6 x Coles Myer Gift vouchers will be available to win.

We hope that what we learn will help you and other swimmers in the future. However, we cannot guarantee that you will receive any direct and immediate benefits from being in the study.

(9) What will happen to the information collected during the study?

Information collected from you will be used for research purposes only. Your information will be stored securely, and your identity/information will be kept strictly confidential, except as required by law. Overall, study findings may be published in student theses, scientific literature, or presented as part of a conference, but you will never be individually identifiable in these publications. On no occasion will any information related to you be shared or disclosed. In other words, confidentiality and anonymity will be ensured.

(10) Can I tell other people about the study?

Yes, you are welcome to tell other people about the study.

(11) What if I would like further information about the study?

When you have read this information, Assoc. Prof. Stephen Copley (The University of Sydney) and Mark Heathcote (Swimming New South Wales) will be available for further discussion and will answer any questions you may have. If you, would like to know more at any stage, please feel free to contact Assoc. Prof. Stephen Copley at 935-19033; email: stephen.copley@sydney.edu.au or Mark Heathcote email: mark.heathcote@nsw.swimming.org.au.

(12) Will I be told the results of the study?

You can receive feedback about your results and the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box on the consent form. This feedback will be in the form of a one page lay summary. You will receive this feedback after the study is finished.

(13) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called The Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney (No. 2020/683). As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in*

Human Research (2007). This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information statement is for you to keep

Child Information Statement (12 Years & Under)



ABN 15 211 513 464

**Sydney School of Health Sciences
Faculty of Medicine and Health**

Assoc. Prof. Stephen Cobley

Room K208

Mark Heathcote

Building and code C42

Kylie Moulds

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Facsimile: +61 2 9351 9033

Email: stephen.cobley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

Hello. My name is Assoc. Prof. Stephen Cobley from The University of Sydney.

Swimming NSW/Swimming Australia Limited and The University of Sydney are doing a study to learn more about what you think about your experiences in swimming. After reading this Information Sheet, you can decide if you want to take part in the study or not. You do not have to – it is up to you. This sheet tells you what questions we will ask if you decide to take part, so please read it carefully. If you decide you want to take part and then change your mind later, that is ok. All you need to do is tell us that you don't want to be in the study anymore. If you have any questions, you can ask us or your family or someone who looks after you. If you want to talk to us about it, you can call Assoc. Prof. Stephen Cobley at 9351 9033 or Mark Heathcote (Swimming NSW) at 9763 5833.

What will happen if I say that I want to be in the study?

If you decide that you want to take part, you are invited to answer some questions looking at your experiences in swimming. The questions include some general information, your history in swimming, your parents swimming/sporting history, the reasons why you enjoy swimming or have decided not to continue with swimming and your training/coaching environment.

Will anyone else know what I say or do in the study?



All the information that we collect will be stored in a safe place, and we will look after it very carefully. We will write a report about what we do and show it to other people, but we won't say your name on the report and no one will know that you were in the study.



How long will the study take?

The questions should take no longer than 15 – 20 minutes of your time to complete.

Are there any good things about being in the study?



We hope that what we learn will help you and other swimmers in the future. We can provide some specific feedback related to your experience in swimming. If you fully complete the online survey, you will be automatically entered into a prize draw. Swimming NSW has agreed to offer the following prizes: 6 x Swimming NSW swim shop vouchers for returning swimmers. While for non-returning swimmers, 6 x Coles Myer Gift vouchers will be available to win.

Are there any bad things about being in the study?



We don't think it will be bad for you or cost anything.

Will we tell you what we learnt in the study at the end?



Yes, if you would like us to. There is a question on your consent form that asks if you want to see your results and what we learnt. If you circle yes, then we will tell you once the study is finished. You can also ask the researchers about your results at any time during the study.

What if you are not happy with the study or the people doing the study?

If you are not happy with how we are doing the study or how we treat you, then you or the person who looks after you can:

- **Call** the university on 02 8627 8176 or
- Write an **email** to human.ethics@sydney.edu.au or
- **Fax** +61 2 8627 8177 (Facsimile)

This sheet is for you to keep

Appendix E: Chapter 4 – Consent Forms



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Cobley

Room K208

Mark Heathcote

Building and code C42

Kylie Moulds

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Facsimile: +61 2 9351 9033

Email:

Stephen.cobley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

PARENT/GUARDIAN CONSENT FORM

I, [PRINT PARENT'S/GUARDIAN'S NAME],
consent to my child [PRINT CHILD'S NAME]
participating in this research study.

In giving my consent I state that:

- ✓ I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- ✓ I have read the *Information Statement* and have been able to discuss my child's involvement in the study with the researcher, if I wished to do so.
- ✓ The researchers have answered any questions that I had about the study and I am happy with the answers.
- ✓ I understand that being in this study is completely voluntary and my child does not have to take part. My decision whether to let them take part in the study will not affect our relationship with anyone - now or in the future - at Swimming NSW/Swimming Australia Limited or The University of Sydney.
- ✓ I understand that my child can withdraw from the study at any time and that I can request all data regarding my child be redacted upon withdrawal.

- ✓ I understand that personal information about my child that is collected over the course of this study will be stored securely and will only be used for purposes that I have agreed to. I understand that information about my child will only be told to others with my permission, except as required by law.
- ✓ I understand that the results of this study may be published and that publications will not contain my child's name or any identifiable information about my child.

I consent to:

- **Participating in the online survey outlined in the Information Statement**
- **My child participating in the online survey outlined in the Information Statement**
- **The researchers named on this consent form using data collected from my child in future research unless I ask the researchers to redact information about my child upon withdrawal. The identity of my child will remain hidden where their data is used in future research.**
- **Being contacted about future studies**
- **Would you like to receive feedback about the overall results of this study?**

Parent's/guardian's signature:

.....

Signature

.....

PRINT name

Date

Youth Consent Form (13-16 Years)



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Copley

Room K208

Mark Heathcote

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Kylie Moulds

The University of Sydney

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Facsimile: +61 2 9351 9033

Email:

Stephen.copley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

CONSENT FORM: YOUTH

If you are happy to be in the study, please

- **write** your **name** in the space below
- **sign** your **name** at the bottom of the next page
- put the **date** at the bottom of the next page.

You should only say 'yes' to being in the study if you know what it is about and you want to be in it. If you don't want to be in the study, don't sign the form.

I,[PRINT NAME], am happy to be in this research study.

In saying yes to being in the study, I am saying that:

- ✓ I know what the study is about.

- ✓ I know what I will be asked to do.
- ✓ Someone has talked to me about the study.
- ✓ My questions have been answered.
- ✓ I know that I don't have to be in the study if I don't want to.
- ✓ I know that I can pull out of the study at any time if I don't want to do it anymore.
- ✓ I know that I can ask the researchers to not include information about me in future research.
- ✓ I know that I don't have to answer any questions that I don't want to answer.
- ✓ I know that the researchers won't tell anyone what I say when we talk to each other, unless I talk about being hurt by someone or hurting myself or someone else.
- ✓ I know that I can ask for my results at any time.

Now we are going to ask you if you are happy to do a few other things in the study. Please tick 'Yes' or 'No' to tell us what you would like.

Are you happy to participate in the online survey that was described in the Information Sheet?

Yes No

You know that you can ask the researcher about your results during the study.

Yes No

You know that the researcher will not share your results with anyone.

Yes No

Do you want us to tell you what we **learnt** in the study?

Yes No

.....

Signature

Appendix F: Chapter 5 – Human Research Ethics Committee Approval



THE UNIVERSITY OF
SYDNEY

Research Integrity & Ethics Administration

HUMAN RESEARCH ETHICS COMMITTEE

Friday, 12 August 2022

Dr Stephen Coble
Exercise Health and Performance; Faculty of
Medicine and Health

Email: stephen.coble@syrdney.edu.au

Dear Stephen,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved. Details of the approval are as follows:

Project No.:	2022/442
Project Title:	Motivational climate change: A guiding light for youth sport dropout?
Authorised Personnel:	Coble Stephen; Heathcote Mark;
Approval Period:	12/08/2022 to 12/08/2026
First Annual Report Due:	12/08/2023

Documents approved:

Date Uploaded	Version Number	Document Name
08/08/2022	Version 3	Appendix 5 Coach PIS - Control
08/08/2022	Version 3	Appendix 5 Coach PIS - Intervention
29/07/2022		Appendix 11 - EDMCQ - Coach
22/04/2022		Appendix 16 Coaching Climate Intervention Workshop Sessions
22/04/2022	Version 1	Appendix 2 Child 12 years & Under PIS (Int & control)
22/04/2022	Version 1	Appendix 4 Parent PCF (Intervention & control group) Draft
22/04/2022	Version 1	Appendix 6 Coach PCF (Intervention & control group) Draft
22/04/2022		Appendix 7 Coaching climate intervention survey (coach)
22/04/2022		Appendix 8 Coaching climate intervention survey (athlete)
22/04/2022		Appendix 12 Focus groups Post EC (Intervention & Control)
22/04/2022		Appendix 13 Schematic of coaching climate intervention
22/04/2022		Appendix 14 Overview of session topics, structure & content
22/04/2022		Appendix 15 Climate Intervention Workshop Sessions 1 - 4
22/04/2022		Appendix 1 Parent-Guardian PIS (Intervention & control group)
22/04/2022		Appendix 3 Child 13-16 years PIS (Int & control group)
22/04/2022		Appendix 9 Coach intervention survey - Session 1
22/04/2022		Appendix 17 SAL Safeguarding Children & Young People Policy
22/04/2022		Appendix 18 Recruitment invitation email (Coach)
22/04/2022		Appendix 19 RDMP updated
22/04/2022		Appendix 21 Recruitment invitation for social media (Coach)
22/04/2022		Appendix 20 Swimming NSW Human Research Ethics Support
22/04/2022		Appendix 10 EDMCQ - athlete (Intervention & control)

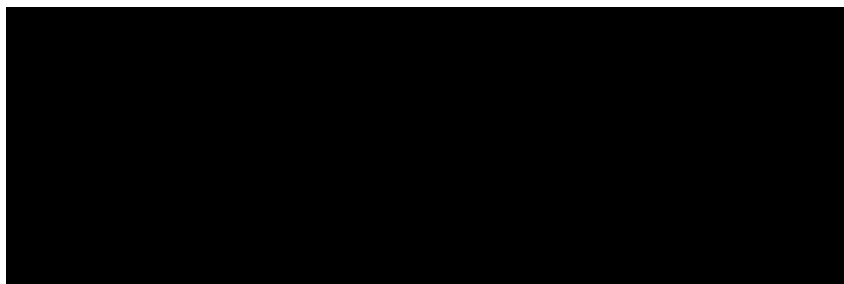
Condition/s of Approval

- Research must be conducted according to the approved proposal
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
 - Serious or unexpected adverse events (which should be reported within 72 hours).
 - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,



Associate Professor

Haryana Dillon Chair

Human Research Ethics Committee (HREC 3)

Appendix G: Chapter 5 – Information Statements



THE UNIVERSITY OF
SYDNEY

**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Cobley

Level 6 Susan Wakil Health Building
D18

Dr Kotryna Fraser

The University of Sydney

Mark Heathcote

NSW 2006 AUSTRALIA

Kylie Moulds

Telephone: +61 2 9351 9033

Email:

stephen.cobley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

INFORMATION STATEMENT: PARENT/GUARDIAN

(1) What is this study about?

Your child has been invited to take part in a research study as your child's coach is participating in a pilot coach education program. As part of the study, the coaching climate - as created by your coach - will be examined. The study and coach education program are being completed by Swimming NSW in partnership with The University of Sydney.

This study will examine the effect of a coach education program on the motivational climates created by swimming coaches. Motivational climate can be defined as the environment created by a coach and perceived by an athlete (that is, what the coach does, says and how they structure the environment). Findings will help identify the specific characteristics of coaching/club environments that are more motivating and engaging for developing swimmers. Study information obtained will help Swimming NSW identify strategic initiatives to help improve participatory experiences in swimming and increase the likelihood of longer-term participation.

This Information Statement tells you about the research study and the nature of involvement. Knowing what is involved will help you decide if you want to take part. Please read this statement carefully and ask questions about anything you don't understand or want to know more about. Participation in the study is voluntary.

By giving your consent, you are telling us that you:

- ✓ Understand what you have read.

- ✓ Agree to take part in the study as outlined below.
- ✓ Agree to the use of information provided for analysis as outlined below.

You will be given a copy of this Information Statement to keep.

(2) Who is running the study?

The study is being led and carried out by:

- Assoc. Prof. Stephen Cobley – The University of Sydney
- Dr Kotryna Fraser – The University of Sydney
- Mark Heathcote – Swimming New South Wales Limited
- Kylie Moulds – The University of Sydney

Funding declaration:

There is no financial assistance associated with this study.

(3) What will the study involve?

Following your consent as a parent/guardian, we will also invite your child to participate. If you and your child agree to take part in this study, we will ask you to complete the following steps:

- To complete an online survey. You and your child will be asked to report demographic information, swimming history, parental sports history, and your perception of the coaching climate. The survey will take around 15-20 minutes to complete. The survey will be accessible via either a computer or mobile device and can be completed at a time convenient to you. Survey completion will be anonymous to the coach and the club.
- After initial survey completion, you will then be asked to complete the coaching climate component of the survey again three and nine weeks later. Again, survey completion will remain anonymous.

(4) How much time will the study take?

You will be asked to complete an online survey initially which will take 15-20 mins. You will then be asked to complete the online survey again three and nine weeks later which will take 5-10 mins to complete. All data collection procedures will be completed over a 12-week period.

(5) Who can take part in the study?

We would like to invite all individuals (aged between 10-16 years as of 31/12/2022) who are currently registered with a Swimming NSW affiliated club and whose coach/es have been invited to the intervention study.

Invited coaches must be 'Development' and 'Advanced' coaches who are currently registered members with the Australian Swimming Coaches and Teachers Association (ASCTA) and over 18 years of age, who have been coaching at their current club for no less than 12 months.

(6) Does my child have to be in the study? Can they withdraw from the study once they've started?

Participation in this study is voluntary, your child does not have to take part. Your decision to participate will not affect you or your child's relationship (now or in the future) with anyone at Swimming NSW, Swimming Australia or The University of Sydney. If you decide to participate, then change your mind later, you are free to withdraw from the study at any time. You can do this by notifying the lead researcher or individuals listed on this information statement. All collected data associated with you will be removed and destroyed securely. You can withdraw from this study before data is submitted for a PhD thesis or publication.

By submitting your online completed surveys is an indication of your consent to participate. You can withdraw your responses if you change your mind about having them included in the study, up to the point where we have analysed and published the results.

(7) Are there any risks or costs associated with being in the study?

We do not foresee any substantial risks or costs associated with study participation. However, there is the potential for minor distress when reflecting on and rating the coaching climate. Should your child feel like seeking support for any stressful experience please contact Swimming Australia's Integrity & Risk Unit: integrity@swimming.org.au or 039910 0723. Independent support, without notification to the University of Sydney research team, Swimming NSW or the club officer involved in this study is also available at kidshelpline: 1800 551800.

(8) Are there any benefits associated with being in the study?

Information collected from this study will inform how Swimming NSW could improve coach education and training associated with swimmer development. Your participation in this study will help improve professional practice across Swimming NSW, with potential benefits to future coaches and swimmers.

(9) What will happen to the information collected during the study?

By providing your consent, you are allowing us to collect information for the purposes of this study and possible future studies. The online surveys are hosted on the REDCap survey platform. This platform is hosted on secure and encrypted University-licensed servers within Australia, and they meet University standards for security, data ownership and privacy. Only the researchers named in this information statement will have access to the data collected. If you provide us with any identifiable information, it will be kept strictly confidential, except as required by law. In accordance with the Research Data Management Plan (RDMP) any data you provide will be de-identified and stored securely on the password-protected University of Sydney's edition of OneDrive during the project. OneDrive is a cloud file storage service that stores data on secure

servers within Australia. While performing analysis, study materials will be stored on password-protected computers belonging to the named investigators.

Upon completion, data will be retained securely for a minimum period of 20 years or until participants are 25 years of age (whichever is longer) from the date of publication and archived with Records Online, the University of Sydney's corporate record-keeping system managed by Archives and Records Management Services (ARMS). Consistent with the University of Sydney's Research Data Management procedures 2015. The de-identified research data and primary materials may be made available in online public data repositories (for example, Open Access Framework) and Sydney eScholarship Repository that can be accessed by other researchers for further research.

Overall, study findings will be used for a PhD thesis, scientific literature, conference presentations and/or media outlets. A summary report may be submitted to Swimming NSW. You will not be individually identifiable in these publications or reports.

(10) Can we tell other people about the study?

You can disclose the nature and purpose of the study. However, to help prevent influence upon other potential participants we ask that you don't share the specific details or nature of your involvement with your coach or otherwise, until study completion. Upon study completion we will identify and contact you when your study involvement can be freely communicated.

(11) What if we would like further information about the study?

When you have read this information, Assoc. Prof. Stephen Copley (The University of Sydney) and Mark Heathcote (Swimming New South Wales) will be available for further discussion and will answer any questions you may have. If you, or your child, would like to know more at any stage, please feel free to contact Assoc. Prof. Stephen Copley at 935-19033; email: stephen.copley@sydney.edu.au or Mark Heathcote email: mark.heathcote@nsw.swimming.org.au.

(12) Will we be told the results of the study?

You and your child have a right to receive feedback as to the overall study results. You can tell us that you wish to receive feedback by ticking the relevant box on the consent form. Feedback will be provided in a one-page lay summary. You will receive this feedback after the study is finished.

(13) What if we have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called the Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney (No. 2022/442). As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect people who agree to take part in research studies.

If you (or the person under your guardianship/care) are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study,

please contact the University using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information statement is for you to keep

Youth Information Statement (13-16 Years)



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Coble

Level 6 Susan Wakil Health Building
D18

Dr Kotryna Fraser

The University of Sydney

Mark Heathcote

NSW 2006 AUSTRALIA

Kylie Moulds

Telephone: +61 2 9351 9033

Email: stephen.coble@syrdney.edu.au

Web: <http://www.syrdney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

INFORMATION STATEMENT: YOUTH 13 – 16 YEARS

(1) What is this study about?

Your child has been invited to take part in a research study as your child's coach is participating in a pilot coach education program. As part of the study, the coaching climate - as created by your coach - will be examined. The study and coach education program are being completed by Swimming NSW in partnership with The University of Sydney.

This study will examine the effect of a coach education program on the motivational climates created by swimming coaches. Motivational climate can be defined as the environment created by a coach and perceived by an athlete (that is, what the coach does, says and how they structure the environment). Findings will help identify the specific characteristics of coaching/club environments that are more motivating and engaging for developing swimmers. Study information obtained will help Swimming NSW identify strategic initiatives to help improve participatory experiences in swimming and increase the likelihood of longer-term participation.

This Information Statement tells you about the research study and the nature of involvement. Knowing what is involved will help you decide if you want to take part. Please read this statement carefully and ask questions about anything you don't understand or want to know more about. Participation in the study is voluntary.

By giving your consent, you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the study as outlined below.

- ✓ Agree to the use of information provided for analysis as outlined below.

You will be given a copy of this Information Statement to keep.

(2) Who is running the study?

The study is being led and carried out by:

- Assoc. Prof. Stephen Cobley – The University of Sydney
- Dr Kotryna Fraser – The University of Sydney
- Mark Heathcote – Swimming New South Wales Limited
- Kylie Moulds – The University of Sydney

Funding declaration:

There is no financial assistance associated with this study.

(3) What will the study involve?

Following your consent as a parent/guardian, we will also invite your child to participate. If you and your child agree to take part in this study, we will ask you to complete the following steps:

- To complete an online survey. You and your child will be asked to report demographic information, swimming history, parental sports history, and your perception of the coaching climate. The survey will take around 15-20 minutes to complete. The survey will be accessible via either a computer or mobile device and can be completed at a time convenient to you. Survey completion will be anonymous to the coach and the club.
- After initial survey completion, you will then be asked to complete the coaching climate component of the survey again three and nine weeks later. Again, survey completion will remain anonymous.

(4) How much time will the study take?

You will be asked to complete an online survey initially which will take 15-20 mins. You will then be asked to complete the online survey again three and nine weeks later which will take 5-10 mins to complete. All data collection procedures will be completed over a 12-week period.

(5) Who can take part in the study?

We would like to invite all individuals (aged between 10-16 years as of 31/12/2022) who are currently registered with a Swimming NSW affiliated club and whose coach/es have been invited to the intervention study.

Invited coaches must be 'Development' and 'Advanced' coaches who are currently registered members with the Australian Swimming Coaches and Teachers Association (ASCTA) and over 18 years of age, who have been coaching at their current club for no less than 12 months.

(6) Do I have to be in the study? Can I withdraw from the study once I've started?

Participation in this study is voluntary, your child does not have to take part. Your decision to participate will not affect you or your child's relationship (now or in the future) with anyone at Swimming NSW, Swimming Australia or The University of Sydney. If you decide to participate, then change your mind later, you are free to withdraw from the study at any time. You can do this by notifying the lead researcher or individuals listed on this information statement. All collected data associated with you will be removed and destroyed securely. You can withdraw from this study before data is submitted for a PhD thesis or publication.

By submitting your online completed surveys is an indication of your consent to participate. You can withdraw your responses if you change your mind about having them included in the study, up to the point where we have analysed and published the results.

(7) Are there any bad things about being in the study?

Normally, we do not think there will be anything bad or any costs associated with study participation. However, there is the potential for distress when reflecting on the coaching climate. Should you feel like seeking support for any distressful experience independently, and without notification to the University of Sydney research team, Swimming NSW, Swimming Australia or the club officer involved in this study, feel free to contact kids helpline: 1800 551800.

(8) Are there any good things about being in the study?

Information collected from this study will inform how Swimming NSW could potentially improve coach education and training associated with swimmer development. Your participation in this study will help improve professional practice across Swimming NSW, with potential benefits to future coaches and swimmers.

(9) What will happen to the information collected during the study?

By providing your consent, you are allowing us to collect information for the purposes of this study and possible future studies. The online surveys are hosted on the REDCap survey platform. This platform is hosted on secure and encrypted University-licensed servers within Australia, and they meet University standards for security, data ownership and privacy. Only the researchers named in this information statement will have access to the data collected. If you provide us with any identifiable information, it will be kept strictly confidential, except as required by law. In accordance with the Research Data Management Plan (RDMP) any data you provide will be de-identified and stored securely on the password-protected University of Sydney's edition of OneDrive during the project. OneDrive is a cloud file storage service that stores data on secure servers within Australia. While performing analysis, study materials will be stored on password-protected computers belonging to the named investigators.

Upon completion, data will be retained securely for a minimum period of 20 years or until participants are 25 years of age (whichever is longer) from the date of publication and archived with Records Online, the University of Sydney's corporate record-keeping system managed by Archives and Records Management Services (ARMS). Consistent with the University of Sydney's Research Data Management procedures 2015. The de-identified research data and primary materials may be made available in online public data repositories (for example, Open Access

Framework) and Sydney eScholarship Repository that can be accessed by other researchers for further research.

Overall, study findings will be used for a PhD in thesis, scientific literature, conference presentations and/or media outlets. A summary report may be submitted to Swimming NSW. You will not be individually identifiable in these publications or reports.

(10) Can I tell other people about the study?

You can disclose the nature and purpose of the study. However, to help prevent influence upon other potential participants we ask that you don't share the specific details or nature of your involvement. We ask that once the study has commenced you keep study details confidential. Upon study completion we will identify and contact you when your study involvement can be freely communicated.

(11) What if I would like further information about the study?

When you have read this information, Assoc. Prof. Stephen Copley (The University of Sydney) and Mark Heathcote (Swimming New South Wales) will be available for further discussion and will answer any questions you may have. If you, would like to know more at any stage, please feel free to contact Assoc. Prof. Stephen Copley at 935-19033; email: stephen.copley@sydney.edu.au or Mark Heathcote email: mark.heathcote@nsw.swimming.org.au.

(12) Will I be told the results of the study?

You can receive feedback about your results and the overall results of this study. You can tell us that you wish to receive feedback by ticking the relevant box on the consent form. This feedback will be in the form of a one page lay summary. You will receive this feedback after the study is finished.

(13) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called The Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney (No. 2022/442). As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information statement is for you to keep

Child Information Statement (12 Years & Under)



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Cobley

Level 6 Susan Wakil Health Building
D18

Dr Kotryna Fraser

The University of Sydney

Mark Heathcote

NSW 2006 AUSTRALIA

Kylie Moulds

Telephone: +61 2 9351 9033

Email:

stephen.cobley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

INFORMATION STATEMENT: CHILD 12 YEARS & UNDER

Hello. My name is Assoc. Prof. Stephen Cobley from The University of Sydney.

Swimming NSW/Swimming Australia Limited and The University of Sydney are doing a study to learn more about what you think about your experiences in swimming. After reading this Information Sheet, you can decide if you want to take part in the study or not. You do not have to – it is up to you. This sheet tells you what questions we will ask if you decide to take part, so please read it carefully. If you decide you want to take part and then change your mind later, that is ok. All you need to do is tell us that you don't want to be in the study anymore. If you have any questions, you can ask us or your family or someone who looks after you. If you want to talk to us about it, you can call Assoc. Prof. Stephen Cobley at 9351 9033 or Mark Heathcote (Swimming NSW) at 9763 5833.

What will happen if I say that I want to be in the study?

If you decide that you want to take part, you are invited to answer some questions looking at your experiences in swimming. The questions include some general information, your history in swimming, your parents swimming/sporting history and your training/coaching environment.

Will anyone else know what I say or do in the study?



All the information that we collect will be stored in a safe place, and we will look after it very carefully. We will write a report about what we do and show it to other people, but we won't say your name on the report and no one will know that you were in the study.

How long will the study take?



You will be asked to complete a survey at the start of the study which will take 15-20 mins to complete. You will then be asked to complete the online survey again at three and nine weeks after, both of which will take 5-10 mins to complete.

Are there any good things about being in the study?



We hope that what we learn will help you and other swimmers in the future. We can provide some specific feedback related to your experience in swimming.

Are there any bad things about being in the study?



We don't think it will be bad for you or cost anything. However, if you do feel bad after answering the surveys and feel like you need someone to talk to please contact Swimming Australia's Integrity & Risk Unit on 039910 0723 or to speak to someone independently of the research team, please contact kidshelpline: 1800 551800.

Will we tell you what we learnt in the study at the end?



Yes, if you would like us to. There is a question on your consent form that asks if you want to see your results and what we learnt. If you circle yes, then we will tell you once the study is finished. You can also ask the researchers about your results at any time during the study.

What if you are not happy with the study or the people doing the study?

If you are not happy with how we are doing the study or how we treat you, then you or the person who looks after you can:

- **Call** the university on 02 8627 8176 or
- Write an **email** to human.ethics@sydney.edu.au or
- **Fax** +61 2 8627 8177 (Facsimile)

Coach Information Statement



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Coble

Level 6 Susan Wakil Health Building
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Dr Kotryna Fraser

The University of Sydney

Mark Heathcote

NSW 2006 AUSTRALIA

Kylie Moulds

Telephone: +61 2 9351 9033

Email:

stephen.coble@sydney.edu.au

Web: <http://www.sydney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

INFORMATION STATEMENT: COACH

(1) What is this study about?

You have been invited to take part in a research study examining the coaching climates created in New South Wales (NSW) youth swimming. Swimming NSW is conducting the study in partnership with The University of Sydney.

This study will examine how the motivational climate can shape an individual's interpretation of, and responses to, typical training activities. The study will examine the effect of a coach education program on created motivational climates. Findings will help identify the specific characteristics of coaching/club environments that are more motivating and engaging for developing swimmers. Study information obtained will help Swimming NSW identify strategic initiatives to help improve participatory experiences and increase the likelihood of longer-term swimming participation.

This Information Statement tells you about the research study and the nature of involvement. Knowing what is involved will help you decide if you want to take part. Please read this statement carefully and ask questions about anything you don't understand or want to know more about. Participation in the study is voluntary.

By giving your consent, you are telling us that you:

- ✓ Understand what you have read.
- ✓ Agree to take part in the study as outlined below.
- ✓ Agree to the use of information provided for analysis as outlined below.

You will be given a copy of this Information Statement to keep.

(2) Who is running the study?

The study is being led and carried out by:

- Assoc. Prof. Stephen Cobley – The University of Sydney
- Dr Kotryna Fraser – The University of Sydney
- Mark Heathcote – Swimming New South Wales Limited
- Kylie Moulds – The University of Sydney

Funding declaration:

There is no financial assistance associated with this study.

(3) What will the study involve?

If you agree to take part in this study, we will ask you to complete the following steps:

- Following your consent, you will be asked to complete an online survey where demographic information, your coaching history, and perception of your own coaching climate will be reported. The survey will take around 15-20 minutes to complete. The survey will be accessible via either a computer or mobile device.
- To help you benefit from the coach education program the most, we will invite at least ten swimmers to also complete the online survey about your coaching climate. In conjunction with the University of Sydney's research team and your club, we will ask you to help facilitate swimmer involvement. The swimmers should be between the ages of 10 and 16 as at 31/12/2022 and who you coach on a regular basis. At this point, invited and participating swimmers will also be asked to complete an online survey reporting demographic information, swimming history, parental sports history, and perception of the coaching climate.
- Coaches will then be invited to participate in a new pilot coach education program. Informed by literature/scientific evidence, the program explains and examines coaching climates and the factors which impact athlete motivation. The program will be delivered online in 3 x 2-hour weekly sessions conducted by the research team. The program will consist of educational information and interactive group activities.
- Following the educational program, you will be asked to complete the motivational climate component of the survey again upon completion of the program and 6 weeks later. A 2-hour top-up session will be conducted 3 weeks after the intervention program.

Participating swimmers will also be asked to complete the motivational climate component of the survey at the same time. Finally, you will be invited to participate in a focus group interview consisting of 3-5 coaches who took part in the educational program with you. The focus group will take place approximately 6 weeks after the completion of the educational program.

(4) How much time will the study take?

Participation in the coach education program consists of 3 x 2-hour educational and interactive sessions delivered online for 3 weeks (via Zoom), as well as an additional 2-hour top-up session conducted 3 weeks after the completion of the intervention program.

You will be asked to complete an online survey before the start of the educational program which will take 15-20 mins. You will then be asked to complete the online survey again upon completion of the educational program and 6 weeks later both of which will take 5-10 mins to complete. You will also be invited to participate in a focus group interview, which will be recorded for later transcription and last for approximately 20-30 minutes. All data collection procedures will be completed over a 12-week period.

(5) Who can take part in the study?

We invite 'Development' and 'Advanced' coaches who are currently registered members with the Australian Swimming Coaches and Teachers Association (ASCTA) and over 18 years of age, who have been coaching at their current club for no less than 12 months. We are also looking to recruit ten swimmers per coach aged between 10-16 as of 31/12/2022.

(6) Do I have to be involved in the study? Can I withdraw from the study once I've started?

Participation in this study is voluntary, you do not have to take part. Your decision to participate will not affect your relationship (now or in the future) with anyone at Swimming NSW, Swimming Australia or The University of Sydney. If you decide to participate, then change your mind later, you are free to withdraw from the study at any time. You can do this by notifying the lead researcher or individuals listed on this information statement. All collected data associated with you will be removed and destroyed securely. You can withdraw from this study before data is submitted for a PhD thesis or publication.

By submitting your online completed surveys and participation in the focus group is an indication of your consent to participate. You can withdraw your responses if you change your mind about having them included in the study, up to the point where we have analysed and published the results.

(7) Are there any risks or costs associated with being in the study?

Normally, we do not foresee there will be any risks or costs associated with study participation.

(8) Are there any benefits associated with being in the study?

Being involved in the study and educational program you will receive knowledge that will potentially benefit your coaching practise. Information collected from this study will inform how Swimming NSW could potentially improve coach education and training associated with

swimmer development. Your participation in this study will help improve professional practice across Swimming NSW, with potential benefits to future coaches and swimmers.

(9) What will happen to the information collected during the study?

By providing your consent, you are allowing us to collect information for the purposes of this study and possible future studies. The online surveys are hosted on the REDCap survey platform. This platform is hosted on secure and encrypted University-licensed servers within Australia, and they meet University standards for security, data ownership and privacy. Only the researchers named in this information statement will have access to the data collected. If you provide us with any identifiable information, it will be kept strictly confidential, except as required by law. In accordance with the Research Data Management Plan (RDMP) any data you provide will be de-identified and stored securely on the password-protected University of Sydney's edition of OneDrive during the project. OneDrive is a cloud file storage service that stores data on secure servers within Australia. While performing analysis, study materials will be stored on password-protected computers belonging to the named investigators.

Upon completion, data will be retained securely for a minimum period of 5 years from the date of publication and archived with Records Online, the University of Sydney's corporate record-keeping system managed by Archives and Records Management Services (ARMS). Consistent with the University of Sydney's Research Data Management procedures 2015. The de-identified research data and primary materials may be made available in online public data repositories (for example, Open Access Framework) and Sydney eScholarship Repository that can be accessed by other researchers for further research.

Overall, study findings will be used for a PhD in thesis, scientific literature, conference presentations and/or media outlets. A summary report may be submitted to Swimming NSW. You will not be individually identifiable in these publications or reports in terms of using de-identified quotes from the focus groups.

(10) Can we tell other people about the study?

You can disclose the nature and purpose of the study. However, to help prevent influence upon other potential participants we ask that you don't share the specific details or nature of your involvement. We ask that once the study has commenced you keep study details confidential. Upon study completion we will identify and contact you when your study involvement can be freely communicated.

(11) What if we would like further information about the study?

When you have read this information statement, Assoc. Prof. Stephen Copley (The University of Sydney) and Mark Heathcote (Swimming New South Wales) will be available for further discussion and will answer any questions you may have. If you would like to know more at any stage, please feel free to contact Assoc. Prof. Stephen Copley at 935-19033; email: stephen.copley@sydney.edu.au or Mark Heathcote email: mark.heathcote@nsw.swimming.org.au.

(12) Will we be told the results of the study?

You have a right to receive feedback about the overall results of this study. You can indicate you wish to receive feedback by ticking the relevant box on the consent form. This feedback will be in the form of a one-page lay summary. You will receive this feedback after the study is finished.

(13) What if we have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called the Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney (No. 2022/442). As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007)*. This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information statement is for you to keep

Appendix H: Chapter 5 – Consent Forms



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Cobley

Level 6 Susan Wakil Health
Building D18

Mark Heathcote

The University of Sydney

Kylie Moulds

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Email:

Stephen.cobley@sydney.edu.au

Web: <http://www.sydney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

PARENT/GUARDIAN CONSENT FORM

I, [PRINT PARENT'S/GUARDIAN'S NAME],
consent to my child [PRINT CHILD'S
NAME] participating in this research study.

In giving my consent I state that:

- ✓ I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- ✓ I have read the *Information Statement* and have been able to discuss my child's involvement in the study with the researcher, if I wished to do so.
- ✓ The researchers have answered any questions that I had about the study and I am happy with the answers.
- ✓ I understand that being in this study is completely voluntary and my child does not have to take part. My decision whether to let them take part in the study will not affect our relationship with anyone - now or in the future - at Swimming NSW/Swimming Australia Limited or The University of Sydney.
- ✓ I understand that my child can withdraw from the study at any time and that I can request all data regarding my child be redacted upon withdrawal.

- ✓ I understand that personal information about my child that is collected over the course of this study will be stored securely and will only be used for purposes that I have agreed to. I understand that information about my child will only be told to others with my permission, except as required by law.
- ✓ I understand that the results of this study may be published and that publications will not contain my child's name or any identifiable information about my child.

I consent to:

- **Participating in the online survey outlined in the Information Statement**
☐ YES ☐ NO
- **My child participating in the online survey outlined in the Information Statement**
☐ YES ☐ NO
- **The researchers named on this consent form using data collected from my child in future research, unless I ask the researchers to redact information about my child upon withdrawal. The identity of my child will remain hidden where their data is used in future research.**
☐ YES ☐ NO
- **Being contacted about future studies**
☐ YES ☐ NO
- **Would you like to receive feedback about the overall results of this study?**
☐ YES ☐ NO

Parent's/guardian's signature:

.....

Signature

.....

PRINT name

Date

Coach Consent Form



**Sydney School of Health Sciences
Faculty of Medicine and Health**

ABN 15 211 513 464

Assoc. Prof. Stephen Coble

Level 6 Susan Wakil Health Building
D18

Dr Kotryna Fraser

The University of Sydney

Mark Heathcote

NSW 2006 AUSTRALIA

Kylie Moulds

Telephone: +61 2 9351 9033

Email:

Stephen.coble@sydney.edu.au

Web: <http://www.sydney.edu.au/>

RESEARCH PROJECT TITLE:

Motivational climate change: A guiding light for youth sport dropout?

COACH CONSENT FORM

I, [PRINT NAME], consent to participating in this research study.

In giving my consent I state that:

- ✓ I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- ✓ I have read the *Information Statement* and have been able to discuss my involvement in the study with the researcher, if I wished to do so.
- ✓ The researchers have answered any questions that I had about the study and I am happy with the answers.
- ✓ I understand that being in this study is completely voluntary and I do not have to take part. My decision to take part in the study will not affect my relationship with anyone - now or in the future - at Swimming NSW/Swimming Australia Limited or The University of Sydney.
- ✓ I understand that I can withdraw from the study at any time and that I can request all data regarding my participation to be redacted upon withdrawal.

- ✓ I understand that personal information collected over the course of this study will be stored securely and will only be used for purposes that I have agreed to. I understand that information will only be told to others with my permission, except as required by law.
- ✓ I understand that the results of this study may be published and that publications will not contain my name or any identifiable information about me.

I consent to:

- **Participating in the online survey outlined in the Information Statement**

☐ YES ☐ NO

Participating in the focus group outlined in the Information Statement

☐ YES ☐ NO

- **The researchers named on this consent form using data collected from me in future research, unless I ask the researchers to redact information about me upon withdrawal. My identity will remain hidden where my data is used in future research.**

☐ YES ☐ NO

- **Being contacted about future studies**

☐ YES ☐ NO

- **Would you like to receive feedback about the overall results of this study?**

☐ YES ☐ NO

.....

Signature

.....

PRINT name

Date

Appendix I: Chapter 5 – Recruitment invitation email – coach



THE UNIVERSITY OF
SYDNEY

Sydney School of Health Sciences
Faculty of Medicine and Health

ABN 15 211 513 464

Assoc. Prof. Stephen Coble

Room K208

Dr Kotryna Fraser

Building and code C42

Mark Heathcote

The University of Sydney

Kylie Moulds

NSW 2006 AUSTRALIA

Telephone: +61 2 9351 9033

Facsimile: +61 2 9351 9033

Email: stephen.coble@sydney.edu.au

Web: <http://www.sydney.edu.au/>

Dear <<PERSONAL NAME>>,

Our names are Assoc. Professor Stephen Coble and Kylie Moulds and in partnership with Swimming NSW we are conducting a study to explore the factors which can impact motivation in New South Wales (NSW) youth swimming. You have been invited to take part in this study which will examine how the motivational climate can shape an individual's interpretation of, and responses to, training activities. Findings will help identify specific characteristics of coaching/club environments and could provide greater insight into the factors and processes that help sustain longer-term swimming participation.

You will be provided with a new pilot education program (at no cost) considering the coaching climate and factors which can impact athlete motivation. Effectiveness of the program which has been informed by literature/scientific evidence, will be evaluated by the current study. The education program will consist of 3 x 2-hour sessions conducted by the research team in an online format, consisting of educational information and interactive group activities

For more information and to participate in the study, please see Attached PDF (PIS; Appendix L).

Numbers will be limited, so please respond to Kylie Moulds kmou5976@uni.sydney.edu.au by 30 September, 2022 if you would like to participate in the study. A waitlist will also be available for interested coaches.

Swimming NSW would like to thank you for being one of their members and appreciate you taking the time to further develop your coaching expertise. Your responses will help Swimming NSW and the researchers at The University of Sydney continue to grow and improve the swimming experience of youth in NSW.

Kind regards



Assoc. Professor Stephen Cobley – The University of Sydney

Appendix J: EDMCQ-C adapted for swimming

Section A: This list describes what coaches said or did in your swimming group/club. When giving your answers, think about what your main coach normally said or did. What do you think it was like training with your coach most of the time *during the last 3-4 weeks* of your involvement with swimming? What kind of atmosphere did your coach generally create in *the last 3 – 4 weeks*?

When completing this section, think about <i>the last 3–4 weeks at your swimming group/club.</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. My coach encouraged us to try new swimming skills & techniques.	1	2	3	4	5
2. My coach was less friendly with us if we didn't make the effort to see things his or her way.	1	2	3	4	5
3. My coach gave us choices and options.	1	2	3	4	5
4. My coach tried to make sure we felt good when we tried our best.	1	2	3	4	5
When completing this section, think about <i>the last 3-4 weeks at your swimming group/club.</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. My coach substituted/replaced us when we made a mistake.	1	2	3	4	5
6. My coach emphasised that it was important we participated in swimming because we really want to.	1	2	3	4	5

7. My coach was less supportive when we were not swimming well.	1	2	3	4	5
8. My coach could really be counted on to care, no matter what happened.	1	2	3	4	5
9. My coach gave most attention to the best swimmers in the club/group.	1	2	3	4	5
10. My coach yelled at us if we made mistakes.	1	2	3	4	5
11. My coach made sure we felt successful when we improved.	1	2	3	4	5
12. My coach paid less attention to us if we displeased him or her.	1	2	3	4	5
13. My coach acknowledged us when we tried hard.	1	2	3	4	5
14. My coach really appreciated us as people, not just as swimmers.	1	2	3	4	5
15. My coach only allowed something we like to do at the end of training if we had done well during the session.	1	2	3	4	5
16. My coach answered our questions fully and carefully.	1	2	3	4	5
17. My coach was less accepting of us if we disappointed him or her.	1	2	3	4	5
18. My coach made sure that we all contributed in some important way.	1	2	3	4	5
19. My coach had his or her favourite swimmers in our group/club.	1	2	3	4	5
20. My coach only rewarded us with prizes if we swam well.	1	2	3	4	5
21. My coach only praised those who swam the best.	1	2	3	4	5

22. When my coach asked us to do something, he or she tried to explain why this would be good to do so.	1	2	3	4	5
23. My coach made sure everyone had an important role in the group/at the club.	1	2	3	4	5
24. My coach shouted at us in front of others to make us do certain things.	1	2	3	4	5
25. My coach thought that only the best swimmers should represent the group/club in competitions.	1	2	3	4	5
26. My coach threatened to punish us to keep us in line during training.	1	2	3	4	5

When completing this section, think about *the last 3-4 weeks at your swimming group/club*.

Strongly Disagree Disagree Neutral Agree Strongly Agree

27. My coach listened openly and did not judge our personal feelings.	1	2	3	4	5
28. My coach let us know that all the swimmers were a part of the club/group's success.	1	2	3	4	5
29. My coach mainly used rewards/praise to make us complete all the tasks he or she set during training.	1	2	3	4	5

30. My coach encouraged swimmers in our club/group to help each other learn.	1	2	3	4	5
31. My coach tried to interfere in aspects of our lives outside of swimming (that is, school, other sports/activities).	1	2	3	4	5
32. My coach thought that it is important for us to participate in swimming because we enjoy it.	1	2	3	4	5
33. My coach favoured some of us more than others.	1	2	3	4	5
34. My coach encouraged us to really work together.	1	2	3	4	5

Appendix K: EDMCQ – Coach version

All coaches have different teaching styles and behaviours. We would like to know more about your own coaching style with the athletes in your swimming squad. Read each of the following statements carefully and respond to each in terms of how you normally interacted **with the swimmers during today's coaching session.**

'During today's session...'	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I encouraged athletes to try new skills.	1	2	3	4	5
2. I was less friendly with athletes if they didn't make the effort to see things my way.	1	2	3	4	5
3. I gave my athletes choices and options.	1	2	3	4	5
4. I tried to make sure athletes felt good when they tried their best.	1	2	3	4	5
5. I didn't select athletes for the best roles if they made mistakes.	1	2	3	4	5
6. I thought it was important that athletes participated in swimming because they really want to.	1	2	3	4	5
7. I was less supportive of athletes when they were not practicing and/or performing well.	1	2	3	4	5
8. I could really be counted on to care, no matter what happened.	1	2	3	4	5
9. I gave most of my attention to the best athletes.	1	2	3	4	5
10. I yelled at players for messing up.	1	2	3	4	5
11. I ensured that athletes felt successful when they improved.	1	2	3	4	5

'During today's session...'	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
12. I paid less attention to athletes if they had displeased me.	1	2	3	4	5
13. I acknowledged athletes who tried hard.	1	2	3	4	5
14. I really appreciated athletes as people, not just as athletes.	1	2	3	4	5
15. I only allowed my athletes to do something they liked to do at the end of the session if they had done well during the session.	1	2	3	4	5
16. I answered athletes' questions fully and carefully.	1	2	3	4	5
17. I was less accepting of athletes if they had disappointed me.	1	2	3	4	5
18. I ensured that each athlete contributed in some important way.	1	2	3	4	5
19. I had my favourite athletes.	1	2	3	4	5
20. I only rewarded my athletes with prizes or treats if they had performed well.	1	2	3	4	5
21. I only praised athletes who performed the best.	1	2	3	4	5
22. When I asked athletes to do something, I tried to explain why this would be good to do so.	1	2	3	4	5
23. I ensured everyone had an important role on the team.	1	2	3	4	5
24. I shouted at athletes in front of others to make them do certain things.	1	2	3	4	5

'During today's session...'	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
25. I thought that only the best athletes should be on the team.	1	2	3	4	5
26. I threatened to punish athletes to keep them in line during the session.	1	2	3	4	5
27. I listened openly and did not judge athletes' personal feelings.	1	2	3	4	5
28. I let all my athletes know that they are part of the success of the team.	1	2	3	4	5
29. I mainly used rewards/praise to make athletes complete all the tasks I set during the session.	1	2	3	4	5
30. I encouraged athletes to help each other learn.	1	2	3	4	5
31. I tried to interfere in aspects of athletes' lives outside of swimming.	1	2	3	4	5
32. I thought that it was important for my athletes to swim because they enjoyed it.	1	2	3	4	5
33. I favoured some athletes more than others.	1	2	3	4	5
34. I encouraged my athletes to really work together as a team.	1	2	3	4	5

Appendix L: Chapter 5 – Post-Intervention Coach Interview Schedule



Questions				
<i>Area of Investigation</i>	<i>Main question/s</i>	<i>Probes</i>	<i>Prompts</i>	<i>References</i>
Opening and recap of the coach education program <i>Thank them for agreeing to be interviewed post program</i> <i>Provide an overview of the interview purpose.</i> <i>Emphasise confidentiality.</i> <i>Emphasise the importance of their thoughts, perspectives and insight. There are no right or wrong answers; their personal insight, understanding, perspective and explanations are important. This will help to more effectively work with them in the future.</i> <i>Remind they have the right not to answer question(s); or can return to questions to add, remove, or re-consider discussion/responses.</i>	Did the program meet your initial expectations?	What were your motivations to join the program? Were your expectations met?	Can you tell me more about that?	

<i>Overall accuracy and detail will help in working with you as part of the assignment.</i>				
Online sessions	What can you remember most about the online sessions?	Content? Key concepts/ideas covered? What did you learn about the key features of an empowering climate? What did you learn about how an empowering climate can be beneficial? What did you learn about the features of a disempowering climate? What did you learn about the likely consequences of a disempowering climate?	Can you tell me more about any of these key areas? Can you provide specific examples?	Empowering™ Coaching (2018) http://empoweringcoaching.co.uk/
	To what extent has your involvement in this program changed your practice and views on coaching?	In terms of how you organise and deliver your training sessions? In terms of how you speak to and interact with your swimmers during training? In terms of how you speak to and interact you're your swimmers at competition?	What impact did it have on the swimmers? How did you feel when you tried this new empowering strategy?	Duda (2013); Reynders et al. (2013)

Post program experiences	Thinking about what you learnt during the program and your experiences in coaching since the program, can you give some examples of strategies that you think are effective in motivating your swimmers?	What is the specific goal of the strategy? What behaviour/response do you expect to see in your swimmers? What indicates to you that the motivational strategy is effective (that is, what is the effect on the swimmers?)	Can you tell me more about any of these key areas?	Larsen et al. (2014)
Program summary	What did you like/dislike most about the program?	Content? Delivery? Timing?		
Summary and ending questions	Of all the areas we have discussed, which one is the most important to you? Would you like to add one last thing?			
Closing <i>I would like to again thank you for participating in today's discussion and remind you that any comments that you made here today will remain confidential and for research purposes only.</i>				

Appendix M: Chapter 5 – Demographic and coaching history questionnaires

General demographic information

Are you:

- ☐ Female
☐ Male
☐ Prefer not to say

What is your date of birth?

What is the postcode of the suburb/area where you currently live?

With which ethnic group do you identify?

- ☐ Australian
☐ Indigenous Australian/Torres Strait Islander
☐ New Zealander
☐ Asian
☐ Indian
☐ Middle Eastern
☐ European
☐ North American
☐ South American
☐ African
☐ Prefer not to answer
☐ Other

Please specify 'other'

15-03-2022 9:36am

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Coaching History

What is your current Swimming Australia coach accreditation?

- ☐ Swimming Aus Development Coach
☐ Swimming Aus Advanced Coach
☐ Swimming Aus Performance Coach

Approximately, how many years overall coaching experience do you have?

(Please answer in years, e.g., 6.5 years)

Approximately, how many years have you been coaching at your current accreditation level?

Approximately, how many years have you been coaching at your current club?

(Please answer in years, e.g., 8.0 years)

What is the highest level of swimming competition you competed at?

- ☐ recreational level
☐ club level
☐ state level
☐ national level
☐ international level

In a typical week, how many hours would you spend coaching swimming ? Include all swimming related coaching activities you are involved in, i.e. (pool sessions, dry land, planning etc)

- ☐ Less than 2 hours
☐ Less than 4 hours
☐ Less than 6 hours
☐ 6 - 10 hours
☐ 11 - 14 hours
☐ 15 or more hours

In a typical week, how many swimmers would you have in each session?

- ☐ 1 - 2 swimmers
☐ 3 - 5 swimmers
☐ 5 - 10 swimmers
☐ 10 - 15 swimmers
☐ >15 swimmers

Would you consider the amount of hours you coach to be:

- ☐ Full time (Permanent contract >38 hours per week)
☐ Part time (Fixed term contract < 38 hours per week)
☐ Casual (no firm advanced commitment to continuing and indefinite work according to an agreed pattern of work with employer)
☐ Other
(Type of employment)

Other

Is coaching swimming your primary occupation?

- ☐ Yes
☐ No

What industry is your secondary occupation in?

- ☐ Accommodation and Food Services
- ☐ Administrative and Support Services
- ☐ Agriculture, Forestry and Fishing
- ☐ Arts and Recreation (Sport) Services
- ☐ Construction
- ☐ Education and Training
- ☐ Electricity, Gas, Water and Waste Services
- ☐ Financial and Insurance Services
- ☐ Health Care and Social Assistance
- ☐ Information Media and Telecommunications
- ☐ Manufacturing
- ☐ Mining
- ☐ Personal Services
- ☐ Professional, Scientific and Technical Services
- ☐ Public Administration and Safety
- ☐ Rental, Hiring and Real Estate Services
- ☐ Retail Trade
- ☐ Thematic Reports
- ☐ Transport, Postal and Warehousing
- ☐ Wholesale Trade

Appendix N: Chapter 5 – Demographic and swimmer history questionnaires

Please be reminded for child and parent to complete the below general/demographic questions together

Are you:

- ☐ Female
☐ Male
☐ Prefer not to say

What is the postcode of the suburb/area where you currently live:

With which ethnic group do you identify?

- ☐ Australian
☐ Indigenous Australian/Torres Strait Islander
☐ New Zealander
☐ Asian
☐ Indian
☐ Middle
☐ Eastern
☐ European
☐ North
☐ American
☐ South American
☐ African
☐ Prefer not to answer
☐ Other

Please specify 'other'

Swimmer history

Please be reminded for child and parent to complete the below questions related to swimming history together.

Approximately, how old were you when you first began regular structured swimming lessons?

_____ (Please answer in years, e.g., 6.5 years)

Approximately, how old were you when you first began swimming in a squad with a coach? Please write N/A if you have never been involved in a squad.

_____ (Please answer in years, e.g., 8.0 years)

For how many years have you been a member of your current club?

For how many years have you been coached by your current coach/es?

In the last month how many hours per week would you have spent at swimming training on average? Include all swimming related training activities, i.e. (pool sessions, dry land etc)

- ☐ Less than 2 hours
- ☐ Less than 4 hours
- ☐ Less than 6 hours
- ☐ 6 - 10 hours
- ☐ 11 - 14 hours
- ☐ 15 or more hours

In the last year, how many swimming meets across the year did you compete in?

_____ (For example: 2 x meets per month x 10 months = 20)

How many specific swimming events did you compete in (on average) at each meet?

Family sport history

Please complete the below questions related to your family history in sport.

We would now like to ask some questions about your family, and their participation in sport.

Which of the following family members have had an influence on your sporting involvement?

Please tick all who are most relevant to you:

- ☐ Biological mother
- ☐ Biological father
- ☐ Sister(s)
- ☐ Brother(s)
- ☐ Female legal guardian
- ☐ Male legal guardian
- ☐ Other (e.g., grandparents, aunt, uncle)

Please specify 'other'

Has your biological mother ever participated in swimming for an extended period of time (i.e., 2 years or more)?

- ☐ Yes
- ☐ No

What is the highest level of swimming competition your biological mother has participated at?

- ☐ recreational level
- ☐ club level
- ☐ regional level
- ☐ state level
- ☐ international level

Has your biological mother participated in any other sports for an extended period of time (i.e., 2 years or more)?

- ☐ Yes
- ☐ No

In which sport(s) has your biological mother participated in for an extended period of time (i.e., 2 years or more)?

- ☐ Running/Athletics
- ☐ Cycling
- ☐ Football (Soccer)
- ☐ Tennis
- ☐ Basketball
- ☐ Netball
- ☐ Golf
- ☐ Australian Rules Football
- ☐ Cricket
- ☐ Gymnastics
- ☐ Hockey
- ☐ Softball/Baseball
- ☐ Surfing
- ☐ Martial Arts
- ☐ Rugby/Touch Football
- ☐ Other

Please specify 'other'

Regardless of the sport(s) identified, what is the highest level of competition your biological mother has competed at?

- ☐ recreational level
- ☐ club level
- ☐ regional level
- ☐ state level
- ☐ international level

Appendix O – About the author

KYLIE MOULDS

ORCID ID 0000-0002-8445-6122



Education

The University of Sydney, Australia (2019– current)

PhD Candidate

Faculty of Medicine & Health

Curtin University of Technology, Perth, Australia (2010–2012)

Graduate Certificate in Tertiary Teaching.

Monash University, Melbourne, Australia (2013–2017)

Bachelor of Behavioural Science

Specialisation – Psychological Studies & Sociology

University of Queensland, Australia (2004 –2010)

Graduate Diploma in Applied Science

Masters in Sports Coaching

Publications

Book chapters

Cobley, S. & Moulds, K. (2023). The Child and Adolescent Sport Dropout Problem: Could Modifying the Coaching Microsystem Climate Help? In *Routledge Handbook of Coaching Children in Sport*. Routledge, (pp. 260–273).

Cobley, S., Abbott, S., Moulds, K., Hogan, C. & Romann, M. (2020). Re-balancing the relative age effect scales: Meta-analytical trends, mechanisms and corrective adjustment procedures as a solution. In J. Dixon, S. Horton, L. Chittle & J. Baker (Eds). *Relative age effects in sport: International perspectives*. United States, Routledge, (pp. 136–153).

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- Moulds, K., Fraser, K. K., Karp, J., Kapocius, O., Heathcote, M., Appleton, P. R. & Cobley, S. (2023). Coach-created motivational climate ratings differentiate between dropout and continuation in Australian youth swimming. *International Journal of Sports Science & Coaching*. <https://doi.org/10.1177/17479541231174806>
- Moulds, K., Galloway, S., Abbott, S. & Cobley, S. (2022). Youth sport dropout according to the Process-Person-Context-Time model: a systematic review, *International Review of Sport and Exercise Psychology*, DOI: 10.1080/1750984X.2021.2012817
- Moulds K., Abbott S., Pion J., Brophy-Williams C., Heathcote M., Cobley S. (2020). Sink or Swim? A survival analysis of sport dropout in Australian youth swimmers. *Scandinavian Journal of Medicine and Science in Sports*, 30 (11), 2222–2233.
- Abbott, S., Moulds, K., Salter, J., Romann, M. & Cobley, S. (2020). Testing and application of corrective adjustment procedures for improving the accuracy of athlete selection in female youth swimming, *Journal of Sports Sciences*, 38 (10), 1077–1084.

Conferences/other

- Moulds, K., Galloway, S., Abbott, S. & Cobley, S. (2021). Youth sport dropout according to Bronfenbrenner's Process-Person-Context-Time (PPCT) model. *International Society of Sport Psychology (ISSP) 15th World Congress*, Taipei. 4th October.
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Professional experience

The University of Canberra, Australia (2022 – current)

Lecturing and tutoring in Sport and Exercise – Faculty of Health

- Sport and Performance Psychology
- Professional Practice (Health)

Tennis Australia (2022 – current)

- Coach development services for Tennis Australia's Coach Connect (Women in Coaching) program, including:
 - Workshop preparation and presentations
 - Additional education and development with coaches

The University of Sydney, Australia (2020–2022)

Lecturing and tutoring in Exercise & Sport Psychology – Faculty of Medicine & Health

- Exercise and Sport Psychology

The University of Melbourne, Australia (2018–2019)

Lecturing and tutoring – Melbourne Graduate School of Education

- Sports Coaching: Theory and Practice
- Sports Science and Coaching Applications

Memberships

- International Society of Sport Psychology (ISSP)
- North American Society for the Psychology of Sport and Physical Activity (NASPSPA)
- Australian Psychological Society (APS)
- APS College of Sports & Exercise Psychologists
- American Psychological Association (APA)
- Tennis Coaches Australia – High Performance Coaching Qualification (2010 – current)
- International Tennis Club of Australia
- UK Coaching

Additional courses

- Coursera – Survival Analysis in R for Public Health, Semester 2, 2019
- The University of Sydney – Introductory Biostatistics, Semester 1, 2020
- The University of Sydney – SPSS workshop for HDR students, Semester 1, 2020
- The University of Sydney – REDCap Training, Semester 1, 2021
- The University of Sydney – Meet your HDR Writing Goals, Semester 1, 2022