THE RELIABILITY OF AN OUTCOME MEASURE FOR ANIMAL ASSISTED THERAPY IN YOUTH WITH AUTISM SPECTRUM DISORDER

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Acknowledgement

Table of Contents

Thesis Abstract

Background: Literature suggests multiple benefits of animal assisted therapy (AAT) for youth diagnosed with Autism Spectrum Disorder (ASD). Outcome measures are crucial for understanding the results of an intervention. Therefore, a video analysis tool was developed to assist in measuring the impact of AAT on positive, play and negative behaviours in ASD.

Outcomes: This study aimed to determine the inter-rater and test-retest reliability of the video analysis tool and to investigate whether AAT session complexity and coder factors influenced the reliability of the tool in this population.

Method: Firstly, a literature review was conducted to increase understanding of AAT and outcome measures for ASD. The manuscript involved the recruitment and training of 23 occupational therapy student raters. These raters then completed two ratings of either a simple or complex video-recorded AAT session. Raters also completed a brief survey detailing their demographic information and experience with youth, ASD and animals. Data was analysed in SPSS using intra-class correlation coefficients (ICCS) and percentage agreement.

Results: The inter-rater and test-retest ICCs for the video analysis tool were good across simple and complex sessions. The percentage agreement was similar regardless of session complexity and rater experience with children and ASD but varied across subscales and rater animal experience.

Conclusion: These findings suggest the video analysis tool has potential as a reliable outcome measure for AAT with youth with ASD. However, further research should increase sample sizes and investigate the construct validity to establish the video analysis tool as a reliable and valid outcome measure.

List of Tables

List of Figures

Literature Review

Aim of Literature Review

The aim of this literature review is to convey existing knowledge on the use and measurement of animal assisted therapy for individuals diagnosed with Autism Spectrum Disorder and evaluate the quality of current evidence.

Literature Search Strategy

A comprehensive search was conducted to obtain all of the relevant literature, statistics and reports in this review. The data bases; Medline, OTseeker, PsychINFO, CINAHL, Scopus and the University of Sydney Library website, as well as government websites were searched between March and October 2018. The search terms utilised included; animal assisted therapy, animal assisted intervention, dogs, assistance dogs, assistance animal, pets, pet therapy, dog therapy, autism, autistic disorder, Autism Spectrum Disorder, therapy, occupational therapy, intervention, therapeutics, outcome measure, reliability. A strict inclusion criterion was not utilised in this review however, recent articles (published in the past 10 years) and studies with greater scientific merit were preferred.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is characterised by continuous deficits in social communication and interaction as well as, restricted, repetitive patterns of behaviour, interests or activities present from early childhood (American Psychiatric Association, 2013). The deficits encompass both verbal and non-verbal communication, including limited ability to initiate and respond to verbal communication, as well as difficulties with appropriate eye contact (American Psychiatric Association, 2013). Behaviours and interests consistent with ASD include repetitive motor movements or object use and an inflexibility in changes to activities and routines (American Psychiatric Association, 2013). For an individual to receive a diagnosis of ASD, these deficits cannot be better explained by another disorder and importantly, must cause significant disruption to the individual's function (American Psychiatric Association, 2013). Therefore, all individuals diagnosed with ASD have restricted functional performance due to aspects of the disorder. These characteristics manifest differently across individuals and the severity of the disorder is classified according to the degree of communication and behavioural impairments, plus level of support required for the individual to function in society (American Psychiatric Association, 2013).

Autism Spectrum Disorder (ASD) has a high prevalence in the Australian population. In 2015, it was estimated that 164,000 Australians had a diagnosis of ASD; a significant increase from the estimate of 64,400 in 2009 (Australian Bureau of Statistics, 2014; Australian Bureau of Statistics, 2017). However, it is possible that this escalation in prevalence is related to alterations to the definition of ASD in 2013 to encompass previous diagnoses including autistic disorder, Asperger's disorder and pervasive development disorder (American Psychiatric Association, 2013).

Additionally, in 2015 the majority of Australians diagnosed with ASD were under the age of 25 (83%), suggesting the disorder is currently primarily affecting young people

(Australian Bureau of Statistics, 2017). Population surveys indicate there is also a disproportionate number of Australian males diagnosed with ASD; approximately four times that of females (Australian Bureau of Statistics, 2017). However, the increased proportion of males diagnosed with ASD may be accounted for due to numerous factors including diagnostic bias and gender stereotypes (Lai, Lombardo & Baron-Cohen, 2014). A specific cause of ASD is yet to be identified and it is likely related to multiple genetic and environmental factors including factors in utero and parental age (Lai et al., 2014). In summary, a considerable number of Australians are diagnosed with ASD, predominantly young males.

Impact of Autism Spectrum Disorder: Individuals

ASD can have a profound effect on the functioning of the individual pertaining to numerous factors. Those diagnosed with ASD have an increased need for assistance compared to age-matched, typically-developing children across the areas of cognitive and emotional tasks, communication and relationships, and education (Australian Bureau of Statistics, 2017), impacting their functional capacity. Kao, Krame, Lijenquist, Tian and Coster (2012), also found that adolescents with ASD had significantly lower functional performance in typical daily activities and social/cognitive tasks compared to those without recognised disability. These limitations may contribute to the reduced quality of life reported by children and adolescents with ASD when contrasted with healthy controls (Ikeda, Hinkson & Krageloh, 2014), suggesting the personal factors associated with ASD interact with the environment to reduce wellbeing. Further, a high percentage of individuals diagnosed with ASD (over 70%) have co-morbidities and experience debilitating psychiatric conditions including anxiety (Lai et al., 2014). These findings strongly indicate that ASD significantly reduces the independence of individuals with the disorder, through reducing functional performance and increasing the assistance required, as well as their wellbeing.

Impact of Autism Spectrum Disorder: Family

Having a child with an ASD diagnosis also has a significant bearing on parents and families, including a negative impact on both the physical and mental health of parents (Karst & Vaughn Van Keck, 2012). Despite these challenges, within a qualitative study, parents reported caring for a child with ASD as rewarding with positive impacts, such as 'being more conscious in life' (Dieleman, Moyson, De Pauw, Prinzie & Soenens, 2018, pg. 33). A family which includes a child with ASD is also associated with reduced parental income and increased perceived economic adversity, particularly as the child ages (Dillenburger, Jordan, McKerr & Keenan, 2014), with these impacts possibly related to the requirements of interventions for ASD. For example, the Australian ASD guidelines (Prior & Roberts, 2012) recommend high intensity interventions of 15-25 hours per week, which can place an significant strain on parents. Further, parents are encouraged to research and evaluate the evidence behind different interventions (Prior & Roberts, 2012), triggering increased time restraints and pressure on parents, whilst the extended family of a child or adolescent with ASD can also be substantially impacted (Petrou, Soul, Koshy, McConachie & Parr, 2018). This finding was reported by parents on the revised Impact on Family Scale, which includes personal strain and familial-social impact, and was heightened by factors including; increased ASD severity, sleep issues and non-verbal communication only (Petrou, Soul, Koshy, McConachie & Parr, 2018). In summary, having a child with ASD has a significant influence on the lives and wellbeing of parents and the entire family.

Interventions for people with Autism Spectrum Disorder

Popular interventions

The desired outcome of interventions for individuals diagnosed with ASD is to increase the individual's quality of life and independence (Lai et al., 2014). According to the survey responses from parents of children and adolescents with ASD, behavioural and educational interventions are the most commonly utilised (Becerra et al., 2017; Carlon, Carter & Stephenson, 2011; Zuckerman, Friedman, Chavez, Shui & Kuhlthau, 2017), consistent with the findings suggesting that it is behavioural and educational interventions which are shown to be the most effective (Lai et al., 2014; Vismara, Rogers, 2010). However, these and other common interventions are primarily supported by low, moderate or insufficient evidence (Lai et al., 2014). Further, a systematic review of randomised controlled trials demonstrated minimal differences between interventions following a behavioural model and social-communication focused and multi-modal developmental models have similar impacts on language, social interaction and adaptive behaviour (Tachibana et al., 2017). It can therefore be summarised, that behavioural and educational interventions are currently the most widely applied interventions for people with ASD however there are limitations to the quality of evidence supporting these, and they may not offer benefits over other interventions.

Pharmaceutical interventions have varying evidence and popularity, with the use of certain pharmaceutical interventions having a higher quality evidence-base (future research is very unlikely to reduce confidence in their effectiveness) than many other popular interventions for reducing ASD symptoms including repetitive and challenging behaviours (Lai et al., 2014). However, these medications can be associated with undesirable side effects and there is limited evidence that they can improve common ASD deficits in communication (Lai et al., 2014). Thus, pharmaceutical interventions may assist individuals with ASD however, they are not appropriate as a complete intervention due to their inability to address

communication characteristic of individuals diagnosed with ASD (American Psychiatric

Association, 2013).

Despite the literature supporting certain interventions, there is currently no single

intervention that is recommended for all individuals diagnosed with ASD (Paynter, Sulek,

Luskin-Saxby, Trembath & Keen 2018). This corresponds with Australian guidelines for

early intervention for those with ASD that propose no intervention is applicable to all

children with ASD due to variation between the individuals and their families (Prior &

Roberts, 2012). Furthermore, research indicates that popular interventions impact different

characteristics of ASD, suggesting that multiple interventions may be required to address all

deficits associated with those diagnosed with ASD (Ospin et al., 2008). For example, applied

behavioural analysis is associated with increased motor and functional skills, but not

improvements in communication and developmental interventions can assist language but not

cognitive development (Ospina et al., 2008). This variation between individuals and the

effectiveness of different interventions may explain why parents in a recent Australian survey

chose to implement multiple interventions for their children with ASD (Carlon, Carter &

Stephenson, 2011), rather than a single intervention.

A range of interventions are employed by multiple professionals, as well as families,

aiming to improve the quality of life and independence of individuals with ASD. However,

these are supported by varying qualities of evidence and are often only able to address certain

aspects of ASD in individuals. Therefore, researchers should continue to investigate the

effectiveness of current and new interventions to improve the outcomes important to

individuals with ASD and their families.

Occupational Therapy and individuals with ASD

Occupational Therapists have a substantial role in the intervention of individuals

diagnosed with ASD. This is indicated by the high proportion (42.5%-55%) of Australian and

American parents who report utilising occupational therapy for their children with ASD (Carlon, Carter & Stephenson, 2011). Research suggests occupational therapists working with individuals with ASD are primarily providing intervention in the areas of; social skills, play and joint attention, school readiness, motor skills, adaptive behaviours and everyday skills (Paynter, Sulek, Luskin-Saxby, Trembath & Keen, 2018). Research indicates that many of these interventions, such as social skills and joint attention interventions have been indicated to improve social participation including in high quality evidence; systematic reviews, meta-analysis and randomised controlled trials (RCT; Tanner, Hand, O'Toole & Lane, 2015). However, unfortunately occupational therapists were found to employ the greatest number of unsupported interventions when compared to other health professionals, despite an understanding of how to locate evidence (Paynter, Sulek, Luskin-Saxby, Trembath & Keen, 2018). This may be assisted by increased research exploring occupational therapy interventions for ASD.

Multiple interventions are shown to have varying effectiveness on improving different elements of ASD, including interventions delivered by occupational therapists (Lai et al., 2014; Ospina et al., 2008; Tanner, Hand, O'Toole & Lane, 2015; Vismara, Rogers, 2010). However, the variation between individuals with ASD and qualities of evidence mean that no single interventions is recommended universally (Paynter, Sulek, Luskin-Saxby, Trembath & Keen 2018; Prior & Roberts, 2012). Consequently, research should continue to explore the effectiveness of new interventions that may suit the needs of individuals with ASD and their families.

Animals and ASD

Animals are utilised by different health professionals with the aim of improving the well-being of humans. The involvement of animals in interventions is based around the theory that the presence of animals may facilitate cognitive and behavioural change and/or decrease arousal and anxiety in humans (Kruger & Serpell, 2010).

Multiple studies have suggested potential benefits of animals for the well-being of individuals with ASD. Acquiring a pet dog significantly reduced parent-reported anxiety and cortisol awakening response in children with ASD, suggestive of lower anxiety, compared to baseline and matched controls (Viau et al., 2010; Wright et al., 2015). The study also found that pet dogs improved parent reports of family functioning on a standardised measure (Wright et al., 2015), highlighting the benefits of animals for the family unit. Qualitative research also indicated that companion dogs increased human interaction and improved well-being of children with ASD (Bystrom & Persson, 2015). This suggests dogs can assist individuals with ASD to overcome the restrictive personal factors associated with the disorder. Further, in a qualitative study, parents reported service dogs increased the safety and freedom of children with ASD by reducing volatile and dangerous behaviours, thus supporting their ability to safely participate in activities (Burrows & Adams, 2008). These points are indicative of the positive impacts of animals on the function and well-being of children with ASD through impacting their stress responses and behaviour.

Animal Assisted Interventions

The use of animals in human intervention is known as an Animal Assisted Intervention (AAI) and include Animal Assisted Education (AAE), Animal Assisted Therapy (AAT) and Animal Assisted Activities (AAA) (Animal Assisted Intervention International, 2016; Jegatheesaun, 2018). The focus in the current study is AAT which is a structured and goal-oriented therapeutic intervention delivered by formally trained professionals, intended to improve the functioning of individuals (Animal Assisted Intervention International, 2016; Jegathesaun, 2018). AAT differs from AAE which aims to improve cognitive function and is delivered by an educator and AAA which does not require a qualified professional or specific intervention goals. AAIs are contrasted with the use of animals to improve well-being outside specific interventions such as pets or service animals (Animal Assisted Intervention International, 2016; Jegatheesaun, 2018).

Current literature provides a growing evidence base for the benefits of employing AAI as an intervention to increase the health and wellbeing of humans across multiple conditions and disorders. An RCT demonstrated the effectiveness of AAI with dogs in improving depression symptoms, illness perception and pain perception compared to controls (Ambrosi, Peragin, Sarchi & Bona, 2018). AAI has also been investigated in the paediatric population with a recent pilot study finding a significant decrease in fatigue, sadness, fear and pain for cancer patients following AAA (Chubak et al., 2017). However, these findings are contradicted by a RCT indicating that although there was significantly reduced parenting stress following visits from a therapy dog, there was no significant difference between the anxiety of children with cancer who received AAI and those who received standard intervention (McCullough et al., 2018). Petranek, Pencek and Dey (2018) also found a significant increase in ratings of wellbeing and reduced anxiety following AAI in brain tumour patients with low survival rates, however this study had no control group and thus is

only able to provide preliminary evidence supporting this intervention. These findings highlight the potential positive effects of introducing animals into interventions on the wellbeing of clients however, further research of higher quality is necessary to establish these effects.

Animal Assisted Therapy

AAT is an AAI that has demonstrated promising results across a number of physical disabilities and illnesses in adults. For example, in a small multiple single-case study, the introduction of dogs into gait retraining interventions following stroke was associated with the improved walking pace of participants compared to interventions with a walking stick alone (Rondeau et al., 2010). Emerging evidence from a quantitative systematic review also found an association between AAT and increased quality of life, as well as improvements in motor function following stroke across multiple studies, although this improved similarly across other interventions (Charry-Sánchez, Pradilla & Talero-Gutiérrez, 2018a). This review also indicated a positive impact of AAT on balance in multiple sclerosis over other interventions and for improving spasticity and wellbeing following a spinal cord injury although, these improvements were not maintained long-term (Charry-Sánchez et al., 2018a). However, the systematic review by Charry-Sánchez et al. (2018a) included various qualities of literature only excluding case-studies and qualitative research, and thus findings should be interpreted with caution.

The review also suggests AAT may be effective in improving other mental health disorders including depression, anxiety and post-traumatic stress disorder (Charry-Sánchez et al., 2018a). Although some studies had mixed results, the evidence was predominantly positive or neutral compared to common interventions for the disorders (Charry-Sánchez et al., 2018a). Similarly, an RCT found that including a dog in interventions delivered by a psychologist was associated with increased quality of life compared to the intervention alone,

in individuals with schizophrenia, although there was no significant improvement in symptoms (Villalta-Gil et al., 2009). A small study also indicated AAT may be effective in treating anxiety and depression symptoms, as well as cravings in drug-addicted incarcerated adults (Contalbrigo et al., 2017). This literature suggests AAT is at least as effective as usual interventions for improving mental health issues and can also have additional benefits.

There has also been a recent increase in research investigating the effectiveness of AAT for the paediatric population. The preliminary findings from a RCT indicated cognitive behavioural therapy-based AAT was associated with a greater decrease in symptoms of Attention-deficit/hyperactivity disorder, in children than cognitive behavioural therapy alone, although there were improvements across both groups (Schuck, Emmerson, Fine & Lakes, 2015). Another RCT by Stefanini, Martino, Bacci and Tan (2016), also found a significant increase in the social and psychiatric functioning of children and adolescents with acute mental disorders following AAT. Those receiving AAT also had a decrease in internalising behaviours and neither this, nor the functional improvements were seen in the group receiving intervention as usual. A systematic review and meta-analysis of controlled studies, also concluded that evidence supports the application of AAT in paediatric cerebral palsy and pain (Charry-Sánchez, Pradilla & Talero-Gutiérrez, 2018b). However, further evidence was required to confirm the evidence for the use of AAT for ASD (Charry-Sánchez et al., 2018b). Hence, current literature suggests AAT can have benefits for the paediatric population however further research is required to establish the effectiveness of this practice across disorders such as ASD.

Animal Assisted Interventions and individuals with ASD

AAI is being increasingly explored as an intervention for individuals with ASD (O'Haire, 2017). The qualitative reports of parents from children with ASD suggest AAI is a promising intervention for ASD, including improving psychosocial elements such as

emotional wellbeing, self-regulation and social skills using horse-assisted interventions (Tan & Simmonds, 2018b). This is consistent with broader literature investigating AAI with horses, suggesting improvements in communication as well as decreased negative behaviours in children and adolescents with ASD, according to a review of peer-reviewed literature (Tan & Simmonds, 2018a). Two systematic reviews of peer-reviewed studies also reported that AAI for ASD had mixed or positive outcomes on variables including social skills, behaviour and communication, although the included studies had multiple methodological limitations (Davis et al., 2015; O'Haire, 2017). O'Haire (2017) also highlighted that horses are the most commonly used animal in AAI literature for ASD followed by dogs. Thus, AAIs can have a positive impact on individuals with ASD by increasing necessary skills and behaviours for appropriate functioning however, further research is needed to establish AAI as an evidence-based intervention for ASD and particularly with dogs.

The Use of Animals for people with ASD

The high prevalence of horses in AAI literature for treating ASD is mirrored in AAT research (Charry-Sánchez et al., 2018b). Research indicates both dogs and horses exhibit specific behaviours in reaction to human expressions and actions (Merola, Prato-Previde, Lazzaroni & Marshall-Pescini, 2014; Smith, Proops, Grounds, Wathan & McComb, 2016), and that the animals display distinct facial expressions based on their emotions (Caerio, Guo & Mills, 2017; Lansade et al., 2018). This indicates the potential ability of horses and dogs to understand human emotion and for humans to understand theirs through the animals' facial expressions. As such, both animals are beneficial for AAI with ASD due to their ability to communication with humans non-verbally.

Although both animals appear to have similar communication capacities, several factors indicate the benefits of using dogs in AAT over horses. Studies of horse interventions for ASD typically employ an increased staff to participant ratio compared to dogs (O'Haire, 2017), highlighting that horses may have greater labour requirements and thus increased

costs. Horses also have increased space and exercise requirements (Agriculture Victoria, 2015), suggesting dogs may be a more practical and accessible choice. Furthermore, dogs are already established service animals (Fine, 2015) and therefore AAT with dogs will likely be a more accepted intervention. Hence, involving dogs in AAT offers multiple benefits compared to horses and they should be focused on in future literature due to their potential as the most practical, cost-effective and accepted AAT animal.

Animal Assisted Therapy and people with ASD
AAT using dogs shows promising results as an intervention for ASD in a number of small studies. In one case study, participating in structured activities with a psychologist and a dog increased the number and duration of positive behaviours including smiling, eye contact and affection and decreased the frequency of negative behaviours such as verbal aggressive behaviour (Silva, Correia, Lima, Magalhaes & Sousa, 2011). Another case report by Fung (2015), found that measures of social communication in a child with ASD increased following fourteen AAT sessions with a play therapist and an assistance dog. Additionally, a study with a standard single-subject design, found that AAT, combined with the social story method resulted in a statistically significant increase in the frequency of social interactions in three children with ASD, compared to baseline and the social story intervention alone (Grigore & Rusu, 2014). These studies indicate the potential benefits of AAT for improving the social interaction in children with ASD.

A number of studies with increased sample sizes have added further support to the use of dogs in AAT for children with ASD. One study using a between measures design compared social skills training for 31 children and adolescents with ASD, with and without the presence of a therapy dog (Becker, Rogers & Burrows, 2017). The results indicated that children in the experimental group had significantly reduced symptoms, as well as a reduction in interpersonal and personal problems, as measured by the Children's Depression

Inventory (CDI-2) (Becker et al., 2017). However, there was no significant group differences on other subscales of the CDI-2 and these improvements over time were not significant (Becker et al., 2017). Fung and Leung (2014) employed play therapy utilising a dog (experimental group) or a doll (control group) with a group of 10 children diagnosed with ASD. The results indicated that verbal social behaviour increased significantly throughout the sessions, but the difference between the control and experimental groups was not significant (Fung & Leung, 2014). These results indicate that AAT can increase wellbeing, as well as behaviours and skills necessary for participation in social activities in individuals with ASD. However, the mixed findings and methodological limitations of current literature indicate further research is required before AAT can be established as an evidence-based practice for ASD. To achieve high quality research, appropriate outcome measures must be selected.

Outcome Measures

Outcome measures enable the measurement of changes over time (Cook, 2007). They are used to record data on outcomes pre- and post-intervention, facilitating understanding of the impact of an intervention by allowing comparison (Cook, 2007). The most appropriate outcome measures are valid and reliable as this can facilitate an accurate representation of true changes in the outcome (Cook, 2007). Occupational therapists make decisions on the implementation of different interventions based on information from outcome measures (Law, Baum & Dunn, 2017). Therefore, it is crucial that research employs appropriate outcome measures to enable professionals to measure the effectiveness of interventions, thereby selecting the most effective intervention for their clients.

Outcome measures in ASD research

In order to accurately compare the effectiveness of multiple interventions, consistent outcome measures must be used across studies (Cook, 2007). Unfortunately, a review of literature on ASD interventions reported that 289 different measurement tools were used in only 195 studies (Bolte & Diehl, 2013), indicating there is no widely accepted outcome measure for ASD interventions. This finding was mirrored in a smaller review specific to literature on adults with ASD where a variety of outcome measures were employed across 29 studies with only 8 studies utilising the same measure (Brugha, Doos, Tempier, Einfeld & Howlin, 2015). Therefore, professionals are unable to accurately compare interventions for ASD based on current literature, as outcome measures vary widely across studies and interventions. This limits the ability of therapists to provide the best possible intervention for their clients, as they are unable to accurately identify the most effective intervention.

The majority of outcome measures used in current ASD literature also primarily focus on one behaviour/element of the individual. This is demonstrated in the review of outcome

measures by Bolte and Diehl (2013), finding that few of the 289 tools included a variety of

behaviours. Further, the tools utilised in studies measuring the effectiveness of ASD

interventions frequently neglect to include primary ASD symptoms (Brugha et al., 2015).

Outcome measures that focus on one behaviour/element can be useful to understand the

impact of the intervention on a single aspect however, they are unable to capture the impact

of the intervention on the entire person, consistent with the aims of occupational therapy

(WFOT, 2013).

Importantly, several widely used outcome measures in ASD literature are not valid for

the populations they are applied in. For example, a large proportion of the tools used as

outcome measures for adults with ASD were not designed or validated as outcome measures

and/or were not appropriate for the population studied; age, IQ and/or diagnosis (Brugha et

al., 2015). McConachie et al., (2015) also completed a systematic review of outcome

measures in ASD literature, highlighting that 75 frequently used outcome measures in ASD

literature have limited validity. Furthermore, the reliability and validity in many of the

outcome measures used has not been investigated. This was indicated by a systematic review

of tools used to measure behaviour problems in ASD finding that across 15 studies, half of

the outcome measures were not supported by literature (Hanratty et al., 2015). Therefore, a

large proportion of current ASD literature uses unsupported outcome measures.

Outcome Measures in AAT for ASD

Similarly, the outcome measures used in current literature investigating AAT for

individuals with ASD have a number of limitations. For example, many of these outcome

measures focus on positive social behaviours and do not include the measurement of negative

and/or play behaviours, rendering it difficult to determine the impact of AAT on all personal

factors (Becker et al., 2017; Grigore & Rusu, 2014). As occupational therapy frequently

claims and strives to adopt a holistic understanding of individuals and approach to practice

(McColl, 1994), it is crucial that researchers measure multiple outcomes to understand how an intervention impacts their daily lives.

Furthermore, the majority of tools used in AAT for ASD do not measure whether the behaviour is directed towards the therapist, dog or parent (Becker et al., 2017; Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014). Therefore, it is unclear whether AAT only impacts behaviour towards animals or is also able to increase participation in other activities. This is important when interpreting the impacts of AAT in individuals with ASD as the aim of AAT should be to increase human interactions (Fung & Leung, 2014) and generalise learnt skills for those with ASD. Therefore, tools should record who the behaviour is directed towards, in order to measure whether AAT can improve performance and participation in human-human interactions, essential for daily functioning.

Finally, although the majority of studies using self-developed outcome measures establish inter-rater reliability, they do not investigate the test-retest reliability of their tool (Becker et al., 2017; Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014; Silva et al., 2011). Test-retest reliability provides understanding of how ratings of a tool are impacted by error hence, it is unclear whether the reported changes in AAT research reflect changes in participants or measurement errors (Burns, 2000). To accurately understand the impact of AAT, we must establish the test-retest reliability of the outcome measures employed in research.

Overall, limitations of the outcome measures employed in current literature may result in a misinterpretation of the role of AAT on the function and wellbeing of individuals with ASD. Consequently, it is crucial to develop a reliable and valid outcome measure that can be utilised across studies to allow comparison of the results of future research.

Conclusion

ASD is a complicated disorder that affects a large proportion of the population and has a significant impact on many aspects of functioning for individuals. Currently, a vast range of interventions are employed in the intervention of ASD in youth with varying effectiveness and popularity. However, no single intervention is unanimously endorsed for improving the functional capacity of individuals with ASD. AAT is an emerging therapy for the intervention of ASD with a number of studies indicating potential benefits, although many of these have several limitations including inconsistent, nonvalid and/or unreliable outcome measures. Unfortunately, outcome measures applied in ASD literature are predominantly inappropriate or inaccurate. Therefore, a new outcome measure must be created and validated to accurately understand the impact of AAT for individuals with ASD.

Current Study

Assistance Dogs Australia and the University of Sydney are investigating the impact of AAT on children and adolescents with ASD. This research includes 78 youth diagnosed with ASD, who have each attended 5 video-recorded AAT sessions with an occupational therapist and a trained dog. Due to the need for an appropriate tool to measure the outcomes of this study, occupational therapy students developed a video analysis tool. On this tool, users rate the occurrence and duration of common ASD related behaviours, influenced by AAT, during video recordings of AAT sessions. These encompass multiple behavioural areas including positive behaviours (verbal and non-verbal), play and negative behaviours and whether the behaviour was directed towards the therapist/trainer, dog or parent/sibling is also recorded.

The current study aims to evaluate whether the video analysis tool is a reliable outcome measure for AAT with children and adolescents with ASD and to investigate rater

factors that may impact the reliability of the tool. Therefore, the study will explore the following questions;

1.   Does this video analysis tool have acceptable inter-rater and test-retest reliability as an outcome measure for AAT with children and adolescents with ASD?

2.   Do rater factors including age, experience and education impact the inter-rater and test-retest reliability of the video analysis tool?

3.   Does the AAT session complexity influence the test-retest and inter-rater reliability of the video analysis tool?

This study will increase the accuracy of the interpretation of findings in the broader project with Assistance Dogs Australia, as well as in future research for AAT with individuals with ASD, improving evidence-based practice.

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Journal Manuscript

The Reliability of an Outcome Measure for Animal Assisted Therapy in Youth with Autism Spectrum Disorder

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Abstract

Background: A reliable outcome measure is crucial to understand the impact of emerging interventions, such as animal assisted therapy (AAT) for individuals diagnosed with Autism Spectrum Disorder (ASD). A video analysis tool was created to measure the impact of AAT on people with ASD by recording the frequency and duration of positive, play and negative behaviours.

Outcomes: This study aimed to determine the inter-rater and test-retest reliability of the video analysis tool and to investigate whether AAT session complexity and rater factors influenced the reliability of the tool in this population.

Methods: Following training in use of the tool, 23 occupational therapy students from an Australian metropolitan university, rated a simple or complex video-recorded AAT session on two occasions. The raters also completed a survey to obtain demographic information. Expert raters determined acceptable score ranges which were compared with collected data in SPSS to determine Intraclass Correlation Coefficients (ICC).

Results: The ICCs of the video analysis tool were 0.84 (simple session) and 0.894 (complex session) for inter-rater and 0.84 (simple session) and 0.89 (complex session) for test-retest reliability. The percentage agreement was similar regardless of session complexity and rater experience with children and ASD but varied across subscales and rater animal experience.

Discussion/conclusion: This study indicates the video analysis tool has potential as a reliable outcome measure for AAT with individuals with ASD however, further research utilising increased sample sizes is required to establish the effectiveness of this tool.

Key Words: outcome measure, video analysis, Autism Spectrum Disorder, animal assisted therapy, animal assisted interventions

Autism Spectrum Disorder (ASD) is characterised by limitations in communication, as well as repetitive interests and behaviour disrupting the individual's function (American Psychiatric Association, 2013). The estimated number of Australians diagnosed with ASD in Australia is 164,000 in 2015 (Australian Bureau of Statistics, 2017).

ASD can have a profound impact on the diagnosed individual and their family. Those diagnosed with ASD require greater assistance in daily tasks and report a decreased quality of life compared to typically developing children (Australian Bureau of Statistics, 2017; Ikeda, Hinkson & Krageloh, 2014). Further, having a child with an ASD diagnosis is associated with reduced mental and physical health of parents and can have a negative impact on the family unit (Karst & Vaughn Van Keck, 2012; Petrau, Soul, Koshy, McConachie & Parr, 2018).

Recently, there has been an increase in the incorporation of animals into interventions for individuals with ASD. These are known as Animal Assisted Interventions and include Animal Assisted Therapy (AAT); a structured and goal oriented therapeutic intervention, delivered by formally trained professionals (Jegathesaun, 2018).

A number of small studies investigating AAT using dogs as a intervention for people with ASD demonstrate promising results. Two studies (n= 1 and n=3) found that AAT with dogs increased the social communication of children with ASD compared to baseline (Fung, 2015; Grigore & Rusu, 2014). Another case study also found increased number and duration of positive behaviours, including smiling and affection and a decreased frequency of negative behaviours, such as verbal aggressive behaviour, following AAT (Silva, Correia, Lima, Magalhaes & Sousa, 2011).

The results of two studies with slightly greater sample sizes also support the use of AAT with dogs for individuals with ASD in the paediatric population. Fung and Leung (2014) found that verbal social behaviours increased significantly throughout play therapy

sessions with a dog in 10 children diagnosed with ASD. However, these increases were mirrored when the dog was replaced with a doll in the control group, making it unclear whether AAT is more effective than other interventions (Fung & Leung, 2014). Another study with a sample size of 31 children and adolescents with ASD reported that those receiving social skills training with a dog had significantly reduced symptoms, as well as a reduction in the interpersonal and personal problems elements of the Children's Depression Inventory (CDI-2) (Becker, Rogers & Burrows, 2017). However, this change was not significant over time and there was no significant difference between the groups in other CDI-2 subscales (Becker et al., 2017). Therefore, current literature presents emerging evidence for the use of AAT to treat children and adolescents with ASD, however further research is required with greater sample sizes to establish AAT as an evidence-based practice.

Unfortunately, the majority of tools employed as outcome measures in current literature are not supported and/or valid outcome measures for individuals with ASD and/or for the population they are applied in (Brugha et al., 2015; Hanratty et al., 2015; McConachie et al., 2015). Similarly, although the majority of studies creating their own measurement tool for AAT establish inter-rater reliability, they do not investigate the test-retest reliability (Becker et al., 2017; Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014; Silva et al., 2011). This means it cannot be accurately determined whether changes on these tools are due to changes in the participants, or measurement error (Burns, 2000; Cook, 2007). Furthermore, the tools used in AAT research with those with ASD often measure single outcomes and do not record whether behaviours are directed towards humans or dogs, thus it is unclear how AAT impacts different functional outcomes for participants or human-human interactions (Becker et al., 2017; Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014).

To overcome these limitations, Master of Occupational Therapy Students developed a tool to measure the behaviours of the participants in the Assistance Dogs Australia (ADA) study. The tool covers positive social behaviours, play and negative behaviours in addition to rating who the behaviour was directed towards. However, the reliability of this tool must be established to determine whether it can accurately measure changes in behaviour.

Therefore, this study aims to determine whether the video analysis tool is a reliable outcome measure for AAT with children and adolescents with ASD and to investigate the rater and session factors that may impact the reliability of the tool. Hence, this study will explore the following questions;

1. Does this video analysis tool have acceptable inter-rater and test-retest reliability as an outcome measure for AAT with children and adolescents with ASD?

2. Do rater factors including age, experience and education impact the inter-rater and test-retest reliability of the video analysis tool?

3. Does the complexity of the AAT session impact reliability?

A similar study investigated the inter-rater and test-retest reliability for the Brief Observation of Social Communication Change (BOSCC) utilising video recordings of individuals with ASD (Grzadzinski et al., 2016). This study found that the BOSCC had excellent inter-rater reliability and good to excellent test-retest reliability according to Portney and Watkins (2008), whilst other outcome measures used in AAT research with individuals with ASD also have strong inter-rater reliability (Becker et al., 2017; Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014; Silva et al., 2011). As the video analysis tool includes many similar constructs to these tools, it is hypothesised that the it will also have inter-rater and test-retest reliability within the good to excellent ranges outlined by Portney and Watkins (2008). It is also hypothesised that simple and complex AAT sessions

will have comparable reliability, as raters will have viewed identical, stagnant content regardless of complexity.

Methodology

The current study used video-recorded AAT sessions from a larger study with Assistance Dogs Australia (ADA) investigating the impact of AAT on individuals with ASD. The ADA study includes 78 participants who each attended 5 video-recorded AAT sessions. Informed consent was obtained from these participants to use the video-recordings in this study. This study was granted ethical approval from the University of Sydney Human Research Ethics Committee (2016/984) as an amendment to the ADA study.

Participants

The participants in this study were the raters who used the video analysis tool to rate the video-recorded AAT sessions. Raters were recruited via an email sent by a student researcher to all undergraduate and postgraduate Occupational Therapy students studying at an Australian metropolitan university. Occupational Therapy students were selected as they are similar to occupational therapists who are expected to rate the tool in a clinical setting (Kottner et al., 2011).

This was a convenience sample, and all students who expressed interest in participating and were able to attend the training and rater sessions were included in the study. There were no exclusion criteria as it was expected that any professional should be able to use an appropriate outcome measure given adequate training. A total of 23 raters attended the first rater session and 19 of these raters also attended the second session. This number of raters is greater than that applied to investigate the reliability of similar tools in ASD (Grzadzinski et al., 2016) and AAT (Fung & Leung, 2014; Fung, 2015; Grigore & Rusu, 2014; Silva et al., 2011). Written, informed consent was obtained from all participants prior to commencing data collection.

Data Collection and Instruments

The Video Analysis Tool

The video analysis tool created for this study is shown in Figure 1 and measures behaviours across three subscales; positive social behaviours, play behaviours and negative behaviours. These behaviours were included as the subscales based on commonly reported outcomes from AAI on individuals with ASD (Esteves & Stokes, 2008; O'Haire, McKenzie, Beck & Slaughter, 2013; Prothmann, Ettrich & Prothmann, 2009). Positive behaviours include verbal social behaviours; questioning/commenting, responding/explaining, initiating a conversation and expression of needs/giving cues to the dog and non-verbal social behaviours; eye contact, following instruction, non-verbal imitation and affection. The play behaviours on the tool include turn-taking, initiation of a new activity and participation in an activity. Finally, negative behaviours include non-verbal negative behaviour, verbal negative behaviour, avoidance behaviours and self-stimulatory behaviours. When a behaviour is observed, it is rated on the tool using a tally, and the duration of play and negative behaviours are also recorded in minutes and seconds. Whether the positive and play behaviours are directed towards the therapist/trainer, dog or parent/sibling is also rated on the tool. The detailed script of instructions for the tool is found in the appendix (Appendix A).

[Insert Figure 1 here]

Rater Information Survey

A short survey was created to determine the experience and education of the raters. This was designed to gather information to assist in determining which rater characteristics, if any, influence the test-retest and inter-rater reliability of the tool. A complete copy of the survey is found in the appendix (Appendix B).

The survey included ten questions covering factors suggested to influence the ratings of raters and the perceptions of college students; gender, age, education and experience with

children, ASD and animals (Payne & Wood, 2015; Wang, 2010). Responses to the survey were rated into SPSS.

Selection of AAT Sessions

Video recordings of the third AAT session with each participant from the larger study were used in this research. The sessions were categorised as simple or complex based on the number and involvement of caregivers/siblings, the speech clarity of the participant and the pace of the session (time between different activities). Five minutes of each session was observed and a session was considered simple/complex if it met at least two of the criteria. If the session moved out of the therapy room during the first twenty-five minutes, and therefore was not video recorded, it was excluded from the study. One simple and one complex session were then randomly selected to be rated in the current study.

Data Collection

All raters attended a one-hour mandatory training session, a commonly utilised strategy for raters in reliability studies and designed to reduce the impact of bias on ratings (Lumley & McNamara, 1995; Semmelroth & Johnson, 2013). During this session the raters were provided with a copy of the tool and an instructor read directions on how to use the tool, including thorough definitions and examples of all behaviours. The instructor read from a script and the answers to any questions were shared between all raters via email to ensure consistency of information. The raters then practiced using the tool by rating two five-minute sample clips from the AAT sessions.

Exactly two weeks after their training session, raters attended a two-hour rating session. The session included a recap of the training, as well as the emailed question responses to ensure all raters acquired the same information. Raters then practiced rater a five-minute session clip on the tool and were subsequently randomly allocated to rate either

the simple or complex 25-minute clip of the AAT session. One group of raters viewed only the simple session and another group viewed only the complex session. Raters were blinded to the complexity of the session but were aware that their rating would be compared to establish reliability (Kottner et al., 2011). The raters were seated independently, as raters are expected to be able to rate the tool independently in clinical situations (Kottner et al., 2011). Raters viewed these sessions on individual desktop computers with headphones to reduce information sharing of visual and auditory stimuli, (Semmelroth & Johnson, 2013) and were able to pause the clip at any time throughout the session.

Between thirteen and sixteen weeks after the first session, the raters attended a second rating session. This interval was selected to accommodate a greater proportion of raters by avoiding study break and fieldwork dates in an attempt to minimise drop out. This interval is also consistent with recommendations from Frost, Reeve, Liepa, Stafford & Hays (2007) outlining that the time interval between rating sessions must be large enough to reduce recall of previous rating scores by raters. Frost et al. (2007) also warn against using time intervals which are too large as there may be changes in the participants being rated however this is not a current concern as the tool was used for videos with stagnant content.

The format of the second rating sessions was identical to the first; training instructions were recapped, raters practiced rating the 5-minute AAT clip, and then rated the same 25-minute clip they were randomly allocated to in the first session (simple/complex). Raters also completed the *Rater Information Survey* in this session.

All training and rater sessions were held on the campus of an Australian metropolitan university. The clips were viewed on university owned computers.

Data Analysis

Gold Standard Comparator

A gold standard comparator technique, comparing the scores of experts to the student raters, was utilised in order to determine the reliability of this video analysis tool, as applied in other reliability studies (To, Estrabillo, Wang & Cicutto, 2008).

The Occupational Therapist and Occupational Therapy Student involved in creating and revising the tool and training were the expert raters for this study. They independently rated the two sessions and the expert score for each behaviour was the mean of these scores. The difference between the scores of the two raters for each behaviour was considered the acceptable variance from the expert score. This variance was added and subtracted to the expert score to create acceptable scores. In order to grade the distance of scores outside the acceptable range, the level of variance was added and subtracted to the upper and lower limits, to develop lower and upper ranges.

For example, if expert one rated a behaviour 18 and expert two rated the same behaviour 22, the expert score would be 20 with a variance of 4. The acceptable range of scores for that behaviour would be 16 to 24 (mean =/- 4) the lower range would be 12-15 and the upper range 25-28.

Student rater scores within the acceptable range were classified as in 100% agreement with the gold standard comparator and these were coded into SPSS. The full list of expert scores, ranges and variance are found in the appendix (Appendix C and D).

Statistical Analysis

All data analysis was completed in the statistical program, SPSS. Descriptive statistics were calculated including means with 95% confidence intervals (95% CI) for demographic information.

The inter-rater and test re-test reliability of the tool was calculated using intra-class correlation coefficients, (ICCs) (Hallgren, 2012; Terwee et al., 2007). A two-way mixed effects model was utilised in this study and the average measures ICCs were selected. The results were interpreted using the ranges of ICCs recommended by Portney and Watkins (2008), suggesting that agreement between raters is poor for values <0.50, moderate for values between 0.50-0.75, good for values between 0.75-0.90 and excellent for values >0.90.

Percentage agreement was also calculated for the subscales and behaviours on the tool across the complexity of the AAT session, as well as experience with children, ASD and animals.

Results

Rater Demographics

All raters provided their year level and gender when expressing interest for the study, whilst the remaining demographic data was obtained for 19 of the 23 raters. The missing 4 raters were unable to attend the second rating session during which the survey was distributed and did not respond to email requests to return the survey. Table 1 depicts the demographic data across the two groups.

[Insert Table 1]

The majority of the raters were in the Postgraduate Occupational Therapy program (n=17) and the rater year of study was split similarly between the two groups. Raters ranged from 19 to 30 years of age (mean=24.37), and the difference between the mean rater age in the two groups was minimal. The level of rater experience with children and ASD were similar across the two groups. A larger proportion of raters had experience with animals in the simple compared to the complex AAT session group (100%).

Percentage Agreement: Subscales, Session Complexity, Rater Experience

The percentage agreement varied across the subscales of the tool depending on the complexity of the AAT session and the prior experience of raters. These are presented in Table 2.

The total percentage agreement for both sessions ranged from 62% (*Positive Verbal Behaviours*) to 79.3% (*Negative Behaviours*) across the four subscales. The percentage agreement of the 45 individual behaviours ranged from 4.3% to 100%. Agreement was highest (100%) for *Imitation- Caregiver/Sibling* and *Turn Taking- Caregiver/Sibling*.

There were differences in percentage agreement between simple and complex sessions of greater than 10% for 32 of the 45 behaviours on the tool, however agreement differences were minimal for the subscales of the tool (maximum 1.7%). Overall, agreement

was greater for subscales with an expert score of 0, and all behaviours with perfect agreement (100%) had an expert score of 0.

The percentage agreement of the subscales differed minimally (<10%) between raters with a presence or absence of experience with children and ASD. There was a large difference between the agreement of raters with a presence or absence of animal experience on the *Positive Verbal Behaviours* subscale (17.5%), with higher percentage agreement for raters with experience with animals (63.3%) compared to raters without (45.8%). Difference on the remaining subscales across animal experience was minimal (<10%). There were large differences (>10%) between the agreement of raters with experience compared to no experience in 18 behaviours for experience with children, 16 behaviours for experience with ASD and 31 behaviours for experience with animals.

[Table 2]

Inter-Rater Reliability

The ICC for the inter-rater reliability of the tool was 0.84 (95% CI, 0.769-0.894) for the simple AAT session and 0.89 (95% CI, 0.848-0.930) for the complex AAT session.

Test-Retest Reliability

In the simple AAT session, the ICC for the test-retest reliability of the video analysis tool was 0.84 (95% CI, 0.769-0.894). The ICC for the test-retest reliability of the tool in the complex AAT session was 0.89 (95% CI, 0.848-0.930).

Discussion

This study aimed to determine the inter-rater and test-retest reliability of the video analysis tool for AAT with youth with ASD. The primary results suggest that the video analysis tool has good inter-rater and test-retest reliability for this population, however, the inter-rater reliability varied across different subscales. The secondary aim was to investigate the impact of session complexity, rater factors, and rater experience on inter-rater reliability of the tool. Findings suggest that session complexity and rater experience with children and ASD had a minimal impact on inter-rater reliability. However, prior animal experience may increase the reliability of the *Positive Verbal Behaviours* subscale, compared to those with no experience. This study was unable to explore the influence of rater factors; age and gender on the reliability of the tool due to the limited diversity of the raters.

Inter-Rater Reliability

Inter-rater reliability allows understanding of the degree of consensus across different raters using the same tool (de Souza, Alexandre & Guirardillo, 2017). This study found the video analysis tool has good inter-rater reliability, therefore it can be assumed that scores on the tool will be consistent across raters observing the same participant, provided the raters are similar to those in the current research.

Consensus of ratings may suggest that raters had a similar understanding of the tool's outcomes. This may result from successful training, which has been indicated to improve the inter-rater reliability of student raters in dentistry (Lin et al., 2013). However, the cause of good inter-rater reliability cannot be confirmed in this study as levels of agreement and understanding of the tool were not confirmed following training (Castorr et al., 1990).

Inter-rater reliability varied across the different subscales of the video analysis tool. *Negative Behaviours* had the greatest percentage agreement, which may indicate negative behaviours are easier to correctly identify in individuals with ASD. Alternatively, a greater

proportion of negative behaviours had an expert rating score of 0 and thus it may be easier for independent raters to correctly identify the absence of a behaviour rather than a correct frequency.

The outcome measures of two studies investigating the impact of AAT for individuals with ASD also reported strong levels of inter-rater reliability for their outcome measures (Fung & Leung, 2014, Silva et al., 2011). Although it is difficult to accurately compare the inter-rater reliability of these tools to the current findings due to different data analysis procedures, these tools appear to have increased inter-rater reliability compared to the current findings (Fung & Leung, 2014, Silva et al., 2011). This may be related to differences in the outcomes measured by the tools or the raters used in these studies. For example, Silva et al. (2011) measured a greater proportion of negative behaviours and Fung and Leung (2014), excluded raters based on their experiences with animals.

Gzradzinski et al. (2016) also reported robust inter-rater reliability for the BOSCC for children with ASD using video recordings. Corresponding with the current study, they also found that inter-rater reliability varied across different subscales of behaviour (Gzradzinski et al., 2016). The inter-rater reliability estimates were slightly greater than those in the current study, ranging from good to excellent according to Portney and Watkins (2008; Gzradzinski et al., 2016), which may be the result of increased outcomes measured on the video analysis tool.

The good inter-rater reliability of the video analysis tool suggests it is appropriate for use in studies with multiple raters, however there are some limitations that require discussion. This is crucial in health professions such as occupational therapy in which data in research and clinical practice are often collected by multiple clinicians (McHugh, 2012).

Test-Retest Reliability

This study also found that the video analysis tool had good test-retest reliability for the AAT sessions. These results suggest that raters consistently scored the same information over time.

There are multiple potential explanations for these results. It is unlikely that the consistency across ratings resulted from raters recalling their first rating of the tool due to the large time interval between the two ratings. Polit (2014), suggests that short time intervals such as one week may increase the risk of raters recalling their previous scorings on outcome measures. Usual time intervals for test-retest reliability are 10 to 14 days (Keszei, Novak & Streiner, 2010), this study employed a larger time interval of 13 to 16 weeks. Therefore, the good levels of inter-rater reliability were more likely related to the raters' consistent understanding of the behaviours within the tool. Interestingly, the ICCs were identical for both inter-rater and test-retest reliability. This may indicate that all raters had a similar approach to rating the tool in the first and second rating, despite the participant drop out. This could be due to the success of the standardised training, but cannot be confirmed as understanding was not measured following training (Castorr et al., 1990).

To the author's knowledge, no literature has measured the test-retest reliability of an outcome measure designed for AAT with individuals with ASD. Therefore, it is difficult to accurately compare the current findings to the body of literature. However, recent studies have also established the test-retest reliability of tools to measure behaviours in individuals diagnosed with ASD. Gzradzinski et al. (2016) established similar levels of good test-retest ICCs according to Portney and Watkins (2008), for the BOSCC using 40 videos. This was despite methodological differences compared to the current study including increased rater training and experience using the tool and non-stagnant content (two videos of the same child) (Gzradzinski et al., 2016). The Autism Impact Scale measures many similar behaviours to the video analysis tool and also has good levels of test-retest reliability determined by

Pearson's correlation (Kanne et al., 2014). Kanne et al. (2014) used a large sample of participants (n=440) observed in live sessions by 50 raters, contrasting with the stagnant content and small size of the current study. Therefore, the video analysis tool appears to have similar test-retest reliability to two other measures with similar constructs, despite methodological differences.

Importantly, the good test-retest reliability supports the use of the tool as an outcome measure. This is because researchers can have greater confidence that changes on the tool reflect changes in individuals rather than rating errors (Burns, 2000; Cook, 2007). This supports the ability of professionals, such as occupational therapists to make more accurate decisions on the effectiveness of interventions and therefore provide best practice for their clients (Law, Baum & Dunn, 2017).

Reliability and the Complexity of the Session

In addition, this study found that both simple and complex sessions had good inter-rater and test-retest reliability. Although reliability was marginally higher for complex sessions compared to simple sessions, the inter-rater and test-retest reliability results were good for both sessions, suggesting that session complexity has a minimal impact on reliability.

The percentage agreement across subscales does not highlight a reason for the slight increase in ICCs for the complex AAT session compared to the simple session. Further analysis outside the scope of this study is required to understand this small difference.

These findings provide preliminary evidence that the tool is reliable for the population of AAT session video recordings in the larger study as the complexity of the session rated did not dramatically impact the reliability of the tool. However, further research is required to confirm this conclusion.

Rater Experience and Reliability

This study found that agreement was similar for raters with varying experience with children and ASD. Agreement was also similar for raters with and without experience with animals across all subscales, except *Positive Verbal Behaviour* in which there was a moderate difference, with higher agreement for raters with animal experience.

These findings suggest that rater experience with children and ASD does not impact the inter-rater reliability of the tool. This was found despite research suggesting experience and exposure to ASD is associated with increased sympathy and lower anger in reaction to challenging ASD behaviours (Payne & Wood, 2015). Therefore, these effects may not influence ratings on the video analysis tool. It is also possible that this association is found in all occupational therapy students due to occupational therapy's focus on client-centeredness and function (World Federation of Occupational Therapists, 2013), thus experience with ASD had a minimal impact.

It must be noted that the moderate agreement decrease for raters without animal experience is confounded with session complexity, as all raters without experience with animals observed the complex AAT session. However, there was only a minimal impact of session complexity so this should not impact the animal experience. Research suggests that social work and sociology students with positive animal experiences were more likely to endorse animal assisted interventions (Lopez-Cepero & Perea-Mediavilla, 2016). This may assist to explain some of the variance between levels of animal experience on *Positive Verbal Behaviours*, as those with animal experience may have improved motivation to learn how to effectively apply the tool.

Overall, these results suggest the video analysis tool can be utilised across occupational therapy student raters with varying experience with children and ASD with minimal variance in inter-rater reliability. However, limited rater exposure to animals may reduce the inter-rater reliability of the tool.

Limitations of the Study

The limitations of this study should be considered when interpreting its results. These include methodological limitations surrounding training, such as the short training duration and opportunity to practice compared to other studies (Gzradzinski et al., 2016; Kanne, et al., 2014). These may have been too brief for raters to develop an effective understanding of the tool, and the lack of agreement testing following training means it cannot be concluded whether the training was effective (Castor et al., 1990).

The small sample of AAT videos rated (n=2) also reduces the generalisability of these findings to the wider AAT sessions, as a minimum of 50 participants are recommended to establish reliability (Terwee et al., 2007). This is particularly the case for the comparison between simple and complex sessions as only one example of each was rated, and therefore this cannot be generalised.

The rater population also consisted exclusively of young women, thus these findings cannot be generalised to raters of other genders and ages.

Future Research Suggestions

Future research should aim to improve the limitations of this study. This includes increasing the number of AAT videos rated, as well as the number and diversity of raters included in the reliability analysis. Establishing good reliability across these factors will allow findings to be generalised to the broader population of raters, and youth with ASD.

Further, future research could improve on the methodology of the current study by increasing the training durations, as well as including an assessment of agreement following training and at different stages of the investigation. This will facilitate an understanding of whether training is successful for raters and if the variation between subscales and behaviours is caused by misunderstanding, or another factor.

Another recommendation is that future research investigate the construct validity of the video analysis tool. While this study suggests good reliability, which is necessary to establish validity, this does not equate to construct validity as the raters may consistently rate behaviours incorrectly (Gage, Prykanowski & Hirn, 2014). Therefore, future studies must also investigate the validity to ensure the tool measures what it aims to measure prior to applying the measure to determine change in youth with ASD.

Conclusion

This study found that the video analysis tool has good inter-rater and test-retest reliability across a simple and complex AAT session for youth diagnosed with ASD, using female occupational therapy student raters. This research also suggests that the inter-rater reliability of the tool varies depending on the subscale and animal experience of the raters.

These findings provide preliminary evidence that the tool is an appropriate outcome measure for AAT with youth diagnosed with ASD and can be utilised with multiple raters. Further, good test-retest reliability suggests changes in the tool represent changes in the individual measured rather than error (Burns, 2000; Cook, 2007), and thus researchers and clinicians can have greater confidence in their findings on the tool.

Despite these positive findings, further research is required to build on the limitations and scope of this study and to establish the video analysis tool as a reliable and valid outcome measure. This includes evaluating and improving the training protocol, broadening the number of recorded AAT sessions rated, and investigating the construct validity of the tool.

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Appendix A: Script for Training Procedure

Participants previously informed to bring a pen (blue or black) and timing device such as their phone.

three pages of the tool displayed on the desk of each participant

This tool uses a combination of frequency (via a tally) and duration (measured with a stop watch) to measure behaviours during the session. These behaviours are based on common symptoms of Autism and are broken up into four sections; positive verbal behaviour, positive non-verbal behaviour, play and negative behaviours. We will go through these areas and how to rate them in detail now, there will be time for questions at the end but if you have any questions at any point just ask.

A number of individuals are present in each session including;
- Occupational Therapist (OT)
- Assistance Dog
- Trainer
- Child
- Parent(s) (and sometimes siblings)

Therefore, in each of the sections of the tool there are three columns so that you can note whether the behaviour or interaction was directed at;
- The OT or trainer
- The Assistance Dog
- Parent(s)/sibling

Page one:

Positive behaviour is divided into verbal and non-verbal social behaviour. There are four positive verbal social behaviours on the left-hand side of the table; questioning/commenting, responding/explaining, initiation and expression of needs/cues. The definitions are written next to these on the tool and are;
- Questioning/commenting: the child asks a question or makes a comment. For example;
  o Question: child asks the therapist 'what's that?'
  o Comment: child says to the trainer 'He looks tired'
- Responding/explaining: the child responds to a question that has been asked or provides more detail on a topic. For example;
  o Responding: the therapist asks the child what they will do after the session and the child responds 'I am going to school'. This response would go in the responding/explaining and interaction with therapist section even if the child was not looking at the therapist when they answered.
  o Explaining: the child provides detail about a previous experience with a dog or provides explanations of a preferred topic
- Initiation: the child begins a conversation with someone else in the room or instructs the dog without being prompted or asked to do so. For example;
  o The child asks the therapist what their favourite colour is or asks the dog to sit without being instructed to
- Expression of needs/cues: the child expresses what they want or need or gives the dog a cue (instruction). For example;
  o Expression of needs: the child states they need to use the bathroom or would like to brush the Assistance Dog
  o Giving the dog a cue: the child gives a direction to the dog e.g. sit, down, wait, come, fetch, shake.

If you see one of these four behaviours you would find this behaviour in the row and then determine if it was an interaction with the therapist/ dog trainer, dog or parent/sibling and mark in this column. If you aren't clear on who the interaction was with, make a mark in the appropriate column. Do not make two markings i.e. if the child makes a comment without looking at anyone in particular, chose one of the columns e.g. interaction with the trainer, DO NOT MAKE TWO TALLIES even if the question was directed at the trainer and parent, chose one.

Non-verbal positive social behaviour is also divided into four categories of behaviour down the left-hand side of the table. These are; eye contact/looking, following instructions, imitation and affection. The definitions are also written in the table and are as follows;
- Eye contact/looking: looking directly into the therapist, trainer or parent's eyes or watching/looking at a person or the dog. For example:
    o Looking: the child watches the dog eating
- Following instruction: the child completes the action or task requested by the therapist, parent or trainer. For example;
    o The therapist asks the child to brush the dog and they complete this task
- Imitation: the child copies the action of the therapist without verbal instruction. If the child is verbally instructed to complete an activity the tally would be made in the following instruction row e.g. do this *waves* and the child copies. An example of imitation would be;
    o The therapist begins brushing the dog and the child copies without instruction
- Affection: the child is affectionate towards the dog or therapist during the session. For example;
    o Kissing the dog or hugging the therapist
    o N.B. if the child is instructed to display affection e.g. the parent says 'give Claire a hug' this is classified as following instruction.

As said before, when one of these behaviours is observed, a tally should be marked in the row of the behaviour and the column of who the interaction was with. DO NOT make two tallies for the same behaviour.

Page two:
Play is split into three behaviours; turn taking, initiating and participation. Again, brief definitions are found in the left-hand column and are as follows.
- Turn taking: the child alternates doing something in a task with someone else. For example;
    o The child and therapist alternate throwing an item for the dog to fetch i.e. child throws, dog returns then therapist throws, dog returns and child throws etc.
- Initiating: the child begins an activity without being prompted. For example;
    o The child picks up a book and starts reading to the dog without being asked to do so.
- Participation: the child participates in the activity or attends to the activity with the therapist, dog or parents. This is measured by frequency and duration so when this is observed record a tally and the amount of time the child was participating. For example;
    o Doing: The child prepares food for the dog for 10 minutes without walking away. If the child walked away at 5 minutes a tally would be made for participation and the time recorded at 5 minutes.

- o   Attending: child observes the therapist brush the dog. Time the child spends observing is recorded.

Similarly to the other sections, if the child is participating in an activity that involves multiple individuals e.g. therapist and parent or dog and trainer, record the tally and duration in the section that seems most appropriate to you, do not make the tally twice.

Page three:

Negative behaviours are split into four more broad areas seen in the left-hand column of the table. The areas are; negative non-verbal behaviour, negative verbal behaviour, avoidance behaviours and self-stimulatory behaviours. A description of these is written in the column.

- Negative non-verbal behaviour: the child displays physically aggressive or violent behaviour and dropping/throwing items (which may or may not be aggressive). For example;
    - o   The child pushes their parent
    - o   The child hits the table in frustration
    - o   The therapist hands the child an object and the child intentionally drops it on the floor
- Negative verbal behaviour: the child verbally protests or refuses to engage in an activity or makes a negative expression which could include swearing or a rude comment. For example;
    - o   The child refuses to brush the dog (this does not include choosing one activity over another if offered e.g. the therapist asks the child whether they would like to brush the dog or make him lunch and the child choses to make him lunch)
    - o   The child insults the therapist/parent/trainer
    - o   The child becomes frustrated with an activity and swears
- Avoidance behaviours: the child demonstrates a behaviour designed at avoiding a conversation or activity such as turning away, ignoring the therapist/dog/parent or escaping. For example;
    - o   The therapist asks the child a question and they refuse to answer
    - o   The child gets up and leaves an activity and/or attempts to leave the room
- Self-stimulatory behaviours: the child demonstrates behaviours in order to stimulate themselves. This can include verbal self-stimulatory behaviour e.g. repeating words, scripted phrases or making sounds) and non-verbal self-stimulatory behaviour (e.g. repetitive motor movements or object use). This does not include attempts at communication e.g. a grunt or mumbled response to a question. For example;
    - o   The child repeats a story to themselves
    - o   The child continuously flaps their hands

As I've said, don't rate the same activity more than once in the different interaction sections. However, one activity can kind of be two things at once for example, a child ran away from the therapist and went and kissed his mother. This would be both avoiding the therapist and affection for his mother.

- If you can't see something, e.g. child is turned away from the camera, don't assume, only rate what you can see. E.g. if the child is facing the therapist don't assume eye contact if all you can see is the back of his head

Questions?

Appendix B: Rater Information Survey
Rater Information Survey:

1. What is your age (years)?

    AGE:_____

2. Have you completed any tertiary study prior to your current degree?

    YES   NO

3. If yes, what was your prior degree(s) (including major if relevant) and what is the

    duration of your previous tertiary study (years and months)?

    DURATION:_____

4. Do you have any experience working with children (under 18 years)?

    YES   NO

5. If you answered yes to question 4, what is the approximate duration of your

    experience with children (months and years)? And please describe your experience.

    DURATION:_____

    DESCRIBE:_____

    _____

6. Are you a parent/caregiver?

    YES   NO

7. Have you had any experience with individuals diagnosed with autism spectrum

    disorder (ASD)?

    YES   NO

8. If you answered yes to question 7, what is the approximate duration of your

    experience (years and months)? And please describe your experience.

DURATION:_____

DESCRIBE:_____

_____

9. Have you had any experience with animals/dogs (including pets)?

YES   NO

10. If you answered yes to question 9, what is the approximate duration of your

experience (years and months)? And please describe your experience.

DURATION:_____

DESCRIBE:_____

_____

Appendix C: Gold Standard Comparator Simple Session

Gold Standard Comparator Scores and Ranges- Simple AAT Session

Behaviour	Interaction w/	Expert Score	**Acceptable range (2)**	Lower range (1)	Higher range (3)	Variance
Questioning	Therapist/Trainer	34	**29-39**	24-28	40-44	5
	Dog	1	**0-2**	N/A	3	1
	Caregiver/Sibling	2	**0-4**	N/A	5-6	2
Responding	Therapist/Trainer	36	**31-41**	26-30	42-46	5
	Dog	2	**1-3**	0	4	1
	Caregiver/Sibling	4	**2-6**	0-1	7-8	2
Initiation	Therapist/Trainer	3	**1-5**	0	6-7	2
	Dog	0	**0-2**	N/A	3-4	2
	Caregiver/Sibling	0	**0-2**	N/A	3-4	2
Cues	Therapist/Trainer	2	**1-3**	0	4	1
	Dog	2	**1-3**	0	4	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Eye contact	Therapist/Trainer	8	**6-10**	4-5	11-12	2
	Dog	0	**0-2**	0	3-4	2
	Caregiver/Sibling	0	**0-2**	0	3-4	2
Instruction	Therapist/Trainer	6	**4-8**	2-3	9-10	2
	Caregiver/Sibling	0	**0-2**	N/A	3-4	2
Imitation	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Affection	Therapist/Trainer	0	**0-2**	N/A	3-4	2

	Dog	9	**5-13**	1-4	14-17	4
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Turn Taking	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Initiating	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Participation Frequency	Therapist/Trainer	4	**2-6**	0-1	7-9	2
	Dog	2	**1-3**	0	4	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
	Individual	0	**0-1**	N/A	2	1
Participation- Duration (Seconds)	Therapist/Trainer	806	**791-821**	776-790	822-836	15
	Dog	157	**123-191**	89-122	192-225	34
	Caregiver/Sibling	0	**0-10**	N/A	11-20	10
	Individual	0	**0-10**	N/A	11-20	10
Negative Non-Verbal Behaviour- Frequency		2	**1-3**	0	4	1
Negative Non-Verbal Behaviour- Duration (Seconds)		6	**1-11**	0	12-16	5
Negative Verbal Behaviour- Frequency		0	**0-1**	N/A	2	1
Negative Verbal Behaviour- Duration (Seconds)		0	**0-5**	N/A	6-10	5

Avoidance Behaviours- Frequency	0	**0-1**	N/A	2	1
Avoidance Behaviours- Duration (Seconds)	0	**0-5**	N/A	6-10	5
Self-stimulatory behaviours- Frequency	0	**0-1**	N/A	2	1
Self-stimulatory behaviours- Duration	0	**0-5**	N/A	6-10	5

Appendix D: Gold Standard Comparator Complex Session

Gold Standard Comparator Scores- Complex Session

Behaviour	Interaction w/	Expert Score	**Acceptable range (2)**	Lower range (1)	Higher range (3)	Variance
Questioning	Therapist/Trainer	35	**30-40**	25-29	41-45	5
	Dog	2	**1-3**	0	4	1
	Caregiver/Sibling	2	**0-4**	N/A	5-6	2
Responding	Therapist/Trainer	44	**37-51**	30-36	52-58	7
	Dog	0	**0-2**	N/A	3-4	2
	Caregiver/Sibling	8	**6-10**	4-5	11-12	2
Initiation	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Cues	Therapist/Trainer	1	**0-2**	N/A	3	1
	Dog	6	**4-8**	2-3	9-10	2
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Eye contact	Therapist/Trainer	5	**2-8**	0-1	9-11	3
	Dog	1	**0-2**	N/A	3	1
	Caregiver/Sibling	1	**0-2**	N/A	3	1
Instruction	Therapist/Trainer	8	**3-13**	0-2	14-18	5
	Caregiver/Sibling	0	**0-2**	N/A	3-4	2
Imitation	Therapist/Trainer	0	**0-2**	N/A	3-4	2
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Affection	Therapist/Trainer	0	**0-2**	N/A	3-4	2

	Dog	11	**8-14**	5-7	15-17	3
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Turn Taking	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Initiating	Therapist/Trainer	0	**0-1**	N/A	2	1
	Dog	0	**0-1**	N/A	2	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
Participation Frequency	Therapist/Trainer	4	**2-6**	0-1	7-9	2
	Dog	1	**0-2**	N/A	3	1
	Caregiver/Sibling	0	**0-1**	N/A	2	1
	Individual	0	**0-1**	N/A	2	1
Participation-Duration (Seconds)	Therapist/Trainer	107	**64-150**	21-63	151-193	43
	Dog	474	**420-528**	366-419	529-582	54
	Caregiver/Sibling	0	**0-10**	N/A	11-20	10
	Individual	0	**0-10**	N/A	11-20	10
Negative Non-Verbal Behaviour-Frequency		0	**0-1**	N/A	2	1
Negative Non-Verbal Behaviour-Duration (Seconds)		0	**0-5**	N/A	6-10	5
Negative Verbal Behaviour-Frequency		0	**0-1**	N/A	2	1
Negative Verbal Behaviour-Duration (Seconds)		0	**0-5**	N/A	6-10	5

Avoidance Behaviours- Frequency	3	**2-4**	1	5	1
Avoidance Behaviours- Duration (Seconds)	20	**10-30**	0-9	31-40	10
Self-stimulatory behaviours- Frequency	0	**0-1**	N/A	2	1
Self-stimulatory behaviours- Duration	0	**0-5**	N/A	6-10	5

Appendix E: Consent Form and Information Statement

Assistance Dogs Australia
Giving Freedom & Independence

THE UNIVERSITY OF SYDNEY

Discipline of Occupational Therapy

Faculty of Health Sciences

ABN 15 211 513 464

Chief Investigator

Lynette Mackenzie, Associate Professor

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The University of Sydney
NSW 2006 AUSTRALIA
Telephone: +61 2 93519832
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Email:
Lynette.Mackenzie@sydney.edu.au
Web: http://www.sydney.edu.au/

Validation of video analysis tool to support investigation: Outcomes of a therapeutic program with children and adolescents with autism using trained Assistance Dogs

PARTICIPANT CONSENT FORM

I, ... [PRINT NAME], agree to take part 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 Participant Information Statement and have been able to discuss my involvement in the study with the researchers 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 whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney now or in the future.

✔ I understand that I can withdraw from the study at any time.

✔ I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me 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.

Outcomes of a therapeutic program with children and adolescents with autism using trained Assistance Dogs - video analysis
Version 1   12.9.2017

Page 2 of 2

I consent to:

- **Being asked to rate videotapes using an analysis tool**   YES   ☐   NO   ☐

I would like to receive feedback about the overall results of this study YES   ☐   NO   ☐

If you answered **YES**, please indicate your preferred form of feedback and address:

☐ Postal: _____

_____

☐ Email: _____

....
Signature

....
PRINT name

....
Date

Outcomes of a therapeutic program with children and adolescents with autism using trained Assistance Dogs - video analysis
Version 1   12.9.2017

Page 2 of 2

Assistance Dogs Australia
Giving Freedom & Independence

THE UNIVERSITY OF **SYDNEY**

Discipline of Occupational Therapy
Faculty of Health Sciences

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Validation of video analysis tool to support investigation: Outcomes of a therapeutic program with children and adolescents with Autism using trained assistance dogs

PARTICIPANT INFORMATION STATEMENT

1.   What is the study about?

The broader study is investigating the role of assistance dogs in facilitating communication, social engagement and play in children and adolescents with autism spectrum disorder (ASD). Therapy sessions involve an occupational therapist, an assistance dog and an assistance dog trainer; sessions are recorded, with participant consent, using 2 video recording devices.

This extension of the study will investigate the validity of a video analysis tool to investigate any behaviour change in individuals with a diagnosis of ASD across the five sessions. Inter-rater reliability of the tool will be assessed across content graded as easy, moderate and complex by multiple raters.

This study is possible as a result of a research grant from S-Centre Group (Westfield) to Assistance Dogs Australia.

By giving your consent to take part in this study you are telling us that you:
- ✓   Understand what you have read.
- ✓   Agree to take part in the research study as outlined below.
- ✓   Agree to the use of your personal information as described.

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

2.   Who is carrying out the study?

The Faculty of Health Sciences at the University of Sydney and Assistance Dogs Australia are conducting the study. The lead investigator is Associate Professor Lynette Mackenzie. Other investigators are Dr Meryl Lovarini, Dr Kim Bulkeley and Miss Claire Dickson. Claire is the occupational therapist conducting the therapy sessions.

Outcomes of a therapeutic program with children and adolescents with Autism using trained assistance dogs - video analysis
Version 2   12.10.2017

Page 1 of 3

3.   What does the study involve?

The broader research project involves therapy sessions with a focus on play and engagement that will be one hour to ninety minutes in length. Seventy-five individuals in total will be involved in five therapy sessions at no cost, conducted over five consecutive weeks.

This extension of the study will involve viewing a number of recorded therapy sessions and using the video analysis tool to record the nature, duration and frequency of positive and negative behaviours. Ratings given by each rater will be compared and inter-rater reliability will be calculated.

Students will receive written instructions prior to the rating session. Students will attend a half hour training session prior to data collection for the project. Ms. Dickson, the ADA researcher, will meet with all the students together to allocate groups.tool.

4.   How much time will the study take?

Recorded therapy sessions that will be viewed by raters range from one hour to ninety minutes in length, analysis of one session is predicted to take 1-2 hours depending on session length and familiarity with the tool.

5.   Can I withdraw from the study?

Participation in this study is voluntary; you are under no obligation to consent. If you do consent, you can withdraw at any time without affecting your relationship with the University of Sydney or Assistance Dogs Australia. You may contact the research investigators at any time to withdraw from the study.

6.   Will anyone else know the results?

Only the research team will have access to the results of the video observation ratings.

7.   Will the study benefit me?

The study aims to increase understanding of the value of assistance dogs in supporting children and young persons with ASD to engage in social interaction, communication and play. Enhanced understanding of the role of assistance dogs in occupational therapy sessions will enable clinicians to utilise assistance dogs to meet the specific needs of children and young persons with ASD.

Involvement in validation of the video analysis tool will provide experience and insight into the research process and into the stages of tool development and implementation across a major pilot research project.

8.   Can I tell other people about the study?

Yes.

9.   What if I require further information about the study or my involvement in it?

When you have read this information Lynette Mackenzie, Meryl Lovarini or Claire Dickson are available to discuss it with you further and answer any questions you may have. If you would like to know more about this study at any stage, please feel free to contact Lynette Mackenzie at lynette.mackenzie@sydney.edu.au or Meryl Lovarini at meryl.lovarini@sydney.edu.au or Claire Dickson at cdickson@assistancedogs.org.au.

Outcomes of a therapeutic program with children and adolescents with Autism using trained assistance dogs – video analysis
Version 2 12.10.2017

Page 2 of 3

10. What if I have a complaint or any concerns?

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney [project number: 2016/984]. 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 project number.

The Manager, Ethics Administration, University of Sydney:
- Telephone: +61 2 8627 8176
- Email: ro.humanethics@sydney.edu.au
- Fax: +61 2 8627 8177 (Facsimile)

This information sheet is for you to keep

Appendix F: Ethical Approval

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
Human Research Ethics Committee

Tuesday, 10 January 2017

Assoc Prof Lynette Mackenzie
Ageing Work and Health Unit; Faculty of Health Sciences
Email: lynette.mackenzie@sydney.edu.au

Dear Lynette

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

After consideration of your response to the comments raised your project has been approved.

Approval is granted for a period of four years from **10 January 2017** to **10 January 2021**

Project title:	**Outcomes of a therapeutic program with children and adolescents with Autism using trained assistance dogs**
Project no.:	**2016/984**
First Annual Report due:	**10 January 2018**
Authorised Personnel:	**Mackenzie Lynette; Dickson Claire; Lovarini Meryl Patricia;**

Documents Approved:

Date	Type	Document
18/11/2016	Version 1	Interview schedule for parents and caregivers
18/11/2016	Version 1	FHS video recording release form
18/11/2016	Version 1	Baseline participant assessment
18/11/2016	Version 1	Observation sheet
20/11/2016	Version 1	Outcome measure: Autism Treatment Evaluation Checklist
21/11/2016	Version 1	Flyer for interested participants at the information session
21/11/2016	Version 1	Consent form
05/01/2017	Version 2	Revised participant information statement

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).

THE UNIVERSITY OF
SYDNEY

- 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 Stephen Assinder
Chair
Human Research Ethics Committee (HREC 1)

The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007).

THE UNIVERSITY OF
SYDNEY

Research Integrity & Ethics Administration
Human Research Ethics Committee

Friday, 27 October 2017

Assoc Prof Lynette Mackenzie
Ageing Work and Health Unit; Faculty of Health Sciences
Email: lynette.mackenzie@sydney.edu.au

Dear Lynette

Your request to modify this project, which was submitted on 14/09/2017, has been considered.

After consideration of your response to the comments raised the project has been approved to proceed with the proposed amendments.

Details of the approval are as follows:

Project Title: Outcomes of a therapeutic program with children and adolescents with Autism using trained assistance dogs

Project No.: 2016/984

New Approved Documents:

Date	Type	Document
13/09/2017	Participant Consent Form	Consent Form For Raters
12/10/2017	Participant Info Statement	Revised PIS

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

Sincerely

Associate Professor Stephen Fuller
Deputy Chair
Human Research Ethics Committee (HREC 3)

> **The University of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007) and the NHMRC's Australian Code for the Responsible Conduct of Research (2007).**

Research Integrity & Ethics Administration
Research Portfolio
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The University of Sydney
NSW 2006 Australia

T +61 2 9036 9161
E human.ethics@sydney.edu.au
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ABN 15 211 513 464
CRICOS 00026A

Appendix G: Journal of Autism and Developmental Disorders

MANUSCRIPT FORMAT

All JADD manuscripts should be submitted to Editorial Manager in 12-point Times New Roman with standard 1-inch borders around the margins.

APA Style

Text must be double-spaced; APA Publication Manual standards must be followed.

As of January 20, 2011, the Journal has moved to a double-blind review process. Therefore, when submitting a new manuscript, DO NOT include any of your personal information (e.g., name, affiliation) anywhere within the manuscript. When you are ready to submit a manuscript to JADD, please be sure to upload these 3 separate files to the Editorial Manager site to ensure timely processing and review of your paper:

- A title page with the running head, manuscript title, and complete author information. Followed by (page break) the Abstract page with keywords and the corresponding author e-mail information.
- The blinded manuscript containing no author information (no name, no affiliation, and so forth).
- The Author Note

TYPES OF PAPERS

Articles, Commentaries Brief Reports, Letters to the Editor

- The preferred article length is 20-23 double-spaced manuscript pages long (not including title page, abstract, tables, figures, addendums, etc.) Manuscripts of 40 double-spaced pages (references, tables and figures counted as pages) have been published. The reviewers or the editor for your review will advise you if a longer submission must be shortened.
- Special Issue Article: The Guest Editor may dictate the article length; maximum pages allowed will be based on the issue's page allotment.
- Commentary: Approximately 20-25 double-spaced pages maximum, with fewer references and tables/figures than a full-length article.
- A Brief Report: About 8 double-spaced pages with shorter references and fewer tables/figures. May not meet the demands of scientific rigor required of a JADD article – can be preliminary findings.
- A Letter to the Editor is 6 or less double spaced pages with shorter references, tables and figures.
  Style sheet for Letter to the Editor:
- A title page with the running head, manuscript title, and complete author information including corresponding author e-mail information
- The blinded manuscript containing no author information (no name, no affiliation, and so forth):-
  - 6 or less double spaced pages with shorter references, tables and figures
  - Line 1: "Letter to the Editor"
  - Line 3: begin title (note: for "Case Reports start with "Case Report: Title")
  - Line 6: Text begins; references and tables, figure caption sheet, and figures may follow (page break between each and see format rules)

REVIEW YOUR MANUSCRIPT FOR THESE ELEMENTS

Order of manuscript pages

Title Page with all Author Contact Information & Abstract with keywords and the corresponding author e-mail information.

Blinded Manuscript without contact information and blinded Abstract, and References
Appendix
Figure Caption Sheet
Figures
Tables
Author Note

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  Bold for vectors, tensors, and matrices.

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  Slifka, M. K., & Whitton, J. L. (2000) Clinical implications of dysregulated cytokine production. Journal of Molecular Medicine, https://doi.org/10.1007/s001090000086

- Book

Calfee, R. C., & Valencia, R. R. (1991). APA guide to preparing manuscripts for journal publication. Washington, DC: American Psychological Association.

- Book chapter

  O'Neil, J. M., & Egan, J. (1992). Men's and women's gender role journeys: Metaphor for healing, transition, and transformation. In B. R. Wainrib (Ed.), Gender issues across the life cycle (pp. 107–123). New York: Springer.

- Online document

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Figures

Figure 1: The Video Analysis Tool

Behaviour	Interaction w/ THERAPIST or DOG TRAINER	Interaction w/ DOG	Interaction w/ CAREGIVER or SIBLING
Positive Verbal social behavior			
Questioning/commenting: asks a question or makes a comment			
Responding/ explaining: answers a question or provides more detail			
Initiation: begins a conversation or instructs the dog without prompts			
Expression of needs/cues: expresses a want/gives dog a cue			
Positive non-verbal social behavior			
Behaviour	**Interaction w/ THERAPIST or DOG TRAINER**	**Interaction w/ DOG**	**Interaction w/ CAREGIVER or SIBLING**
Eye Contact: looks directly into another's eyes			
Following Instruction: doing the requested action or task		■	
Imitation: copying the therapist instruction			
Affection: affectionate towards dog/therapist			

Behaviour	Interaction w/ THERAPIST or DOG TRAINER		Interaction w/ DOG		Interaction w/ CAREGIVER or SIBLING		Individual play	
Play								
Turn taking: to alternate in doing something with someone else							■	
Initiating: to begin an activity without being prompted							■	
Participation - Doing - Attending - Sharing Doing the activity or attending to the activity with the therapist/dog/parent.	F	D	F	D	F	D	F	D

Negative Behaviours		
	Frequency	**Duration**
Negative Non-verbal Behaviour - Aggression - Throwing - Dropping		
Negative Verbal Behaviour: protest/refusal to engage in an activity or negative expression e.g. swearing or rude comment.		
Avoidance Behaviours: Turning away, ignoring the therapist/dog/parent or escaping		
Self-Stimulatory Behaviours: Including verbal self-stimulatory behavior and non-verbal self-stimulatory behavior		

Tables

Table 1: Rater demographics and experience

	Simple Case Group		Complex Case Group	
	Mean	**95% CI**	**Mean**	**95% CI**
Rater Age (n=19*)	24.89[1]	22.16-27.62	23.90	21.15-26.65
	Frequency	**Percentage**	**Frequency**	**Percentage**
Number of Raters (n=23)	11	47.8	12	52.2
Gender (n=23)				
Female	11	100	12	100
Year of Study (n=23)				
Undergraduate Year One	0	0	1	8.3
Undergraduate Year Two	1	9.1	2	16.7
Undergraduate Year Three	0	0	0	0
Undergraduate Year Four	1	9.1	1	8.3
Postgraduate Year One	6	54.5	5	41.7
Postgraduate Year Two	3	27.3	3	25
Prior Rater Experience (n=19*)				
Experience as a caregiver	0	0	0	0
Experience with children	7	77.8	8	80
Experience with ASD	6	66.7	8	80
Experience with animals	9	100	6	60

*Missing data from the four raters who did not complete the survey.

1. All statistics are reported to 0.01

Table 2: Percentage agreement and expert scores- session complexity and rater experience

	Total[1]	Case 1 expert score	Case 1 % agree	Case 2 expert score	Case 2 % agree	E[2]-children*	NE[3]-children*	E-ASD*	NE-ASD*	E-animal*	NE-animal*
Positive Verbal Behaviours:											
Questioning/commenting-Therapist/trainer	4.3[4]%	34	9.1%	35	0%	6.7%	0%	7.1%	0%	6.7%	0.0%
Questioning/commenting-dog	52.2%	1	81.8%	2	25.0%	60%	50%	57.1%	60.0%	60.0%	50.0%
Questioning/commenting-caregiver/sibling	78.3%	2	90.9%	2	66.7%	80.0%	75%	78.6%	80.0%	93.3%	25.0%
Responding/explaining-Therapist/trainer	39.1%	36	54.5%	44	25.0%	33.3%	50%	35.7%	40.0%	46.7%	0.0%
Responding/explaining- dog	52.2%	2	9.1%	0	91.7%	53.3%	50.0%	57.1%	40.0%	46.7%	75.0%
Responding/explaining-caregiver/sibling	69.6%	4	100%	8	41.7%	73.3%	75.0%	78.6%	60.0%	86.7%	25.0%
Initiation- Therapist/trainer	43.5%	3	45.5%	0	41.7%	40.0%	50.0%	50.0%	20.0%	40.0%	50.0%
Initiation- dog	87.0%	0	72.7%	0	100%	86.7%	75.0%	85.7%	80.0%	80.0%	100%
Initiation- caregiver/sibling	87.0%	0	81.8%	0	91.7%	93.3%	75.0%	92.9%	80.0%	93.3%	75.0%
Expression of Needs/Cues-Therapist/trainer	52.2%	2	27.3%	1	75.0%	33.5%	100%	35.7%	80.0%	46.7%	50.0%
Expression of Needs/Cues-dog	52.2%	2	90.9%	6	75.0%	53.3%	50.0%	50.0%	60.0%	66.7%	0%
Expression of Needs/Cues-caregiver/sibling	95.7%	0	90.9%	0	100%	93.3%	100%	92.9%	100%	93.3%	100%
Positive Verbal Behaviour Total:	62%		62.8%		61.1%	58.9%	62.5%	60.1%	58.3%	63.3%	45.8%
Positive Non-Verbal Behaviour:											
Eye Contact-Therapist/trainer	34.8%	8	18.2%	5	50.0%	33.3%	75.0%	42.9%	40.0%	40.0%	50.0%
Eye Contact- dog	30.4%	0	36.4%	1	25.0%	33.3%	50.0%	21.4%	40.0%	33.3%	0%

Eye Contact- caregiver/sibling	69.9%	0	36.4%	1	100%	73.3%	50.0%	71.4%	60.0%	60.0%	100%
Following Instruction- Therapist/trainer	39.1%	6	27.3%	8	50.0%	33.3%	25.0%	28.6%	40.0%	26.7%	50.0%
Following Instruction- caregiver/sibling	82.6%	0	100%	0	66.7%	80.0%	75.0%	78.6%	80.0%	86.7%	50.0%
Imitation- Therapist/trainer	82.6%	0	81.8%	0	83.3%	86.7%	75.0%	92.9%	60.0%	86.7%	75%
Imitation- dog	87.0%	0	100%	0	75%	86.7%	100%	85.7%	100%	93.3%	75.0%
Imitation- caregiver/sibling	100.0%	0	100%	0	100%	100%	100%	100%	100%	100%	100%
Affection- Therapist/trainer	95.7%	0	90.9%	0	100%	93.3%	100%	92.9%	100%	93.3%	100%
Affection- dog	34.8%	9	63.6%	11	8.3%	40.0%	25.0%	35.7%	40.0%	46.7%	0%
Affection- caregiver/sibling	95.7%	0	100%	0	91.7%	93.3%	100%	92.9%	100%	93.3%	100%
Positive Non-verbal Total:	68.4%		68.6%		68.1%	68.5%	70%	67.5%	69.1%	69.1%	63.6%
Play Behaviours:											
Turn Taking- Therapist/trainer	73.9%	0	54.5%	0	91.7%	86.7%	50%	85.7%	60.0%	73.3%	100%
Turn Taking- dog	87.0%	0	72.7%	0	100%	86.7%	100%	85.7%	100%	86.7%	100%
Turn Taking- caregiver/sibling	100.0%	0	100%	0	100%	100%	100%	100%	100%	100%	100%
Initiating- Therapist/trainer	65.2%	0	45.5%	0	83.3%	80.0%	50.0%	78.6%	60.0%	73.3%	75.0%
Initiating- dog	65.2%	0	63.6%	0	66.7%	73.3%	50.0%	71.4%	60.0%	73.3%	50.0%
Initiating- caregiver/sibling	100.0%	0	100%	0	100%	100%	100%	100%	100%	100%	100%
Participation Frequency- Therapist/trainer	73.9%	4	81.8%	4	66.7%	80.0%	50.0%	78.6%	60.0%	80.0%	50.0%
Participation Frequency- dog	39.1%	2	54.5%	1	25.0%	33.3%	75.0%	42.9%	40.0%	53.3%	100%
Participation Frequency- caregiver/sibling	82.6%	0	100%	0	66.7%	86.7%	75.0%	85.7%	80.0%	93.3%	50.0%
Participation Frequency- Individual	78.3%	0	63.6%	0	91.7%	86.7%	75.0%	92.9%	60.0%	86.7%	75.0%
Participation Duration- Therapist/trainer	8.7%	806	9.1%	107	25.0%	6.7%	25.0%	7.1%	20.0%	0%	50.0%

Participation Duration- dog	21.7%	157	36.4%	474	8.3%	26.7%	00.0%	21.4%	20.0%	26.7%	0%
Participation Duration- caregiver/sibling	82.6%	0	100%	0	66.7%	86.7%	75.0%	85.7%	80.0%	93.3%	50.0%
Participation Duration- Individual	73.9%	0	72.7%	0	75.0%	80.0%	75.0%	78.6	80.0%	86.7%	50.0%
Play Behaviours Total:	68.6%		68.2%		69%	72.4%	64.8%	72.5%	65.7%	73.3%	67.9%
Negative Behaviours:											
Negative Non-Verbal Behaviour Frequency	69.6%	2	36.4%	0	100%	66.7%	75.0%	71.4%	60.0%	60.0%	100%
Negative Non-Verbal Behaviour Duration	65.2%	6	27.3%	0	100%	60.0%	75.0%	64.3%	60.0%	53.3%	100%
Negative Verbal Behaviour Frequency	95.7%	0	100%	0	91.7%	100%	75.0%	92.9%	100%	93.3%	100%
Negative Verbal Behaviour Duration	91.3%	0	100%	0	83.3%	93.3%	75.0%	85.7%	100%	86.7%	100%
Avoidance Behaviours Frequency	65.2%	0	100%	0	33.3%	73.3%	50.0%	64.3%	80.0%	80.0%	25.0%
Avoidance Behaviours Duration	60.9%	0	100%	3	25.0%	66.7%	50.0%	57.1%	80.0%	73.3%	25.0%
Self-Stimulatory Behaviours Frequency	95.7%	0	90.9%	20	100%	93.3%	100%	92.9%	100%	93.3%	100%
Self-Stimulatory Behaviours Duration	91.3%	0	81.8%	0	100%	93.3%	75.0%	92.9%	80.0%	86.7%	100%
Total Negative Behaviours:	79.3%		79.5%		79.2%	80.8%	71.9%	77.6%	85.0%	78.3%	81.3%

*Missing data from the four raters who did not complete the survey (n=19).

1. Total percentage agreement across both sessions for the first session rating (n=23)

2. Experience

3. No Experience

4. All percentages reported to 0.1

Author Note

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