The Development of Social Cognition in Filipino Deaf and Hearing Individuals

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Originality Statement

The work presented in this thesis is, to the best of my knowledge, original except where due acknowledgement is made in the text. I, hereby, declare that ethical clearance was secured for this work and I have not submitted this material, either in full or in part for a degree at this or any other institution. Any contribution made to the research by others is explicitly acknowledged in the thesis. I also declare that the intellectual content of this thesis is the product of my own work and all the assistance from others received in preparing this thesis and sources have been acknowledged.

Signed Maria Regina L de Grandi

Date: 31/3/17

Abstract

The overall purpose of this thesis was to examine the nature and pattern of development of social cognition in deaf and hearing individuals from the Philippines. Additionally, predictive factors and social consequences of social cognitive understanding were examined. Previous research has established that deaf children experience significant delays in social cognition compared to typically developing hearing children (e.g., Dyck, Farrugia, Shochet, & Holmes-Brown, 2004; Ketelaar, Rieffe, Wiefferink, & Frijns, 2012; Peterson & Siegal, 1995, 1999). However, prior studies are restricted due to the focus on specific skills, the poverty on work in deaf samples from non-Western cultures, and the limited understanding of the relationship between conceptual knowledge of social cognition and real world social functioning. The present thesis contributes to the current understanding of social cognition by (a) systematically and comprehensively examining the performance of Filipino deaf and hearing individuals, in Theory of Mind (ToM), emotion understanding, and affective recognition and labelling; (b) examining the sequence of acquisition across a range of social-cognitive tasks to establish if the nature of development is the same for Filipino hearing and deaf individuals, irrespective of any delays; (c) investigating the influence of language and the communicative environment on the development of social cognitive understanding; and, lastly, (d) exploring the associations between the concurrent influence of these three key areas of social cognition and their consequences to classroom behaviour.

To establish parity with extant literature, the five studies reported in this thesis examined the abilities of deaf individuals aged 8 to 22 years and typically developing children aged 3 to 14 years from the Philippines on well-established measures of theory of mind and emotion knowledge. Specifically, in study 1, group differences in the rate and order of acquisition of ToM understanding of *n* = 250 deaf and hearing participants were examined using the ToM scale by Wellman and Liu (2004). In study 3, group differences in emotion

understanding and affective recognition and labelling of *n* = 184 deaf and hearing participants were, likewise, investigated using the Test of Emotion Competence (Pons, Harris, & de Rosnay, 2004) and the Diagnostic Analysis of Non-Verbal Accuracy-2 (Nowicki, 2013), respectively. Additionally, the sequence of acquisition of emotion understanding was similarly assessed. Studies 2 and 4 investigated individual differences in language ability and factors related to the communicative environment in relation to ToM and emotion knowledge, respectively. Lastly, in study 5, the predictive strength of ToM, emotion understanding, and affective recognition and labelling on teacher ratings of social competence in the classroom of *n* = 101 deaf individuals was explored. It is important to note that the different studies described above employ a largely overlapping sample.

Results revealed that, and in keeping with extant literature, typically developing Filipino hearing children outperformed the deaf in ToM and emotion understanding. Yet, on tasks measuring affective recognition and labelling, the performance of deaf and hearing samples was comparable. These findings suggest that delays in ToM extend to the understanding of emotions signalling a general impairment in mentalistic skills and not an additional discrete deficiency in evaluating emotion stimuli.

Findings also showed that the nature of development of ToM is the same between deaf and hearing children. Filipino children, regardless of hearing status, developed ToM in the same predictable pattern as children from Western cultures such that their ToM understanding follows the following sequence: diverse desires > diverse beliefs > knowledge access > false belief > hidden emotions. In contrast, two somewhat different patterns of acquisition of emotion understanding constructs emerged, albeit with notable similarities. Specifically, both groups found emotion labelling and the link between morality and emotions easy to accomplish. In contrast, emotion tasks such as understanding belief based emotions and hidden emotions were remarkably difficult to achieve.

In keeping with extant literature, language ability was robustly associated with ToM, emotion understanding, and affective recognition and labelling. However, the development of ToM was qualified by the mode of communication used by parent. In particular, parents' predominant use of signed communication, compared to predominantly oral communication, led to poorer ToM performance in the deaf. Interestingly, parents' predominant use of signed communication also seemed to be linked to better verbal abilities in deaf individuals.

Finally, emotion understanding and language ability were found to be predictive of teacher ratings of prosocial actions. Emotion understanding, however, was not predictive of peer social maturity, nor was it related to social difficulties. In addition, neither ToM nor affective recognition and labelling had any significant predictive influence on the social functioning of deaf individuals.

These findings were thought to be linked to certain cultural values and parenting practices that influence the kinds of interpersonal interactions Filipino deaf children experience. Additionally, results also seemed to indicate that deafness modifies the familial communicative environment in ways that shape deaf children's understanding of mind. Whereas current findings provide a window into these associations, the manner and degree these factors influence social and communicative exchanges in families with deaf children still require further clarification. Further research is needed to examine closely specific cultural variables that define how Filipino parents interact with their deaf children and the naturally occurring discourse that could potentially impact deaf children's understanding of mind and emotions.

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In omnibus amare et servire Domino.

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Ad Majorem Dei Gloriam

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List of Publications and Presentations

Part of the findings from Study 1a has been published:

de Gracia, M. R. L., Peterson, C. C., & de Rosnay, M. (2016). A cultural conundrum: Delayed false belief understanding in Filipino children. *Journal of Cross Cultural Psychology, 47* (7), 929-940. doi: 10.1177/0022022116655790

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Chapter 1: Introduction and Literature Review

"…difference in outcome has less to do with being deaf than with what others do about it…"

(Stokoe, 2001, p. 6)

1.1 Introduction

Like adults, children make concerted efforts to understand others' behaviours, and to give accounts of their own behaviour in the past, or likely behaviour in the future. These kinds of activities, commonly referred to as folk psychology, draw upon children's capacity to conceptualise people and social interactions in psychological terms or their social cognition (Fiske & Taylor, 2013). Through their social cognitions, children make sense of the environment of human behaviour, thus rendering others, "more understandable, predictable, and interesting" (Lillard, 1997, p. 268). To illustrate this point, imagine that a child goes to the public library to borrow the latest Harry Potter book. This action generally implies that the child wants to read the book. She probably enjoys reading about magical characters and believes that the book that she wants is available in the library. This series of inferences – sometimes described as a belief-desire psychology (Bartsch & Wellman, 1989) – provides a simple demonstration of how people account for others' actions in terms of their thoughts, feelings, and intentions in relation to their desires. Of course, the reasons for her going to the library may have been different and her motivations for choosing Harry Potter may have been otherwise determined, but these commonplace assumptions about her desires, motives, and beliefs are easily understood by all those who participate in a shared folk psychological explanatory framework and though a different account of her action might be presented, such an explanation still needs to fit within the belief-desire psychological framework.

Developmental aspects of social cognition have been subject to extensive research in recent decades, much of which has been conducted with typically developing children from Western cultures. It has been found that different aspects of social cognition emerge early in life and continue to broaden throughout childhood. Importantly, it has also been shown that these aspects of development have important implications for children's social competence such that, generally speaking, children with more advanced social cognitive capacities relative to their peers also tend to show superior social and emotional adjustment (e.g., Bosacki & Astington, 1999; Ketelaar et al., 2012; Ketelaar, Wiefferink, Frijns, Broekhof, & Rieffe, 2015; Peterson, Slaughter, Moore, & Wellman, 2016). As well as providing a clear understanding of the course of normative development, including its antecedents and sequelae, the extant research has also established that social cognition, to some extent, develops differently in different cultures. Whereas, some have argued that children's social understanding develops in a strikingly similar manner across many cultural groups (e.g., Callaghan et al., 2005; Wellman, Cross, & Watson, 2001), there is, nonetheless, mounting evidence that important culture-based differences do, in fact, exist. First, there appears to be variation in terms of age of mastery in key social cognitive constructs, in particular false belief understanding, as exhibited in certain language and cultural groups (e.g., Mayer & Träuble, 2015; Naito & Koyama, 2006; Vinden, 1999). Second, important distinctions in the pattern of development have also emerged in members of some individualistic and collectivistic cultures (e.g., Tenenbaum, Visscher, Pons, & Harris, 2004; Wellman, Fang, Liu, Zhu, & Liu, 2006). Furthermore, intra-cultural differences have also been revealed. For instance, Chinese children from mainland China have been shown to master false belief understanding 2 years prior to Chinese children from Hong Kong (Liu, Wellman, Tardif, & Sabbagh, 2008). Similarly, Japanese children who have grown up in provincial areas have also been found to develop false belief mastery a year later than Japanese children who have grown up in urban areas (Naito & Koyama, 2006).

Against this backdrop, the deaf[1] population represents an intriguing area of social cognitive research. Early research on atypical samples, which had thus far been dominated by work on children with autism (e.g., Baron-Cohen, 2000; Baron-Cohen, Leslie, & Frith, 1985), revealed that deaf children experience profound difficulties in important domains of social understanding (Peterson & Siegal, 1995, 1999, 2000). Yet, these deaf children had no other intellectual and social handicaps apart from hearing loss. Additionally, deaf children raised by deaf parents do not display the same delays as deaf children of hearing parents (Courtin & Melot, 1998; Peterson & Siegal, 1999, 2000). Thus, deafness perse could not have been the sole reason for their social cognitive difficulties. Rather, researchers argue, their "social-interactive experiences" could have influenced their development (Wellman, 2017, p. 2). Surprisingly, despite these ground-breaking insights, there has been comparatively little investigation on the development of social cognition of deaf individuals.

Despite comparatively sparse available data on deaf children, there is solid research evidence based on studies with typically developing children to provide a good foundation to begin to conceptualise the social cognitive development of deaf children and examine links between these developments and social behaviour. Similarly, insights from existing studies of deaf children from Western cultures such as Australia provide an important backdrop against which current findings can be appreciated. However, there are important caveats that must be considered. First of all, although there is an accumulating literature indicating that deaf children from Western cultures have poorer social cognitive understanding than typically developing children, the existing literature tends to focus on one or two key skills, such as

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[1] Marschark (1997) describes that the term *Deaf* (with a big D) refers to deaf people who identify themselves as part of a linguistic cultural minority with their own unique culture and language such as Filipino Sign Language; associated with the cultural view of deafness. The term *deaf* (lower case d), on the other hand, general term used to refer to people who have hearing loss and may not necessarily affiliate with members of the Deaf culture; associated with the more medical view of deafness. Throughout the thesis, the term *deaf* was used to refer to participants with varying degree of hearing loss, regardless of ideology. Throughout the paper, the term *deaf* is used for simplicity's sake. It does not constitute any bias towards a particular view of deafness (i.e., medical vs. cultural) nor a lack of respect for the individuals who participated in the research who may consider themselves Deaf.

false belief understanding or the recognition of emotion in faces. Furthermore, these skills have generally been assessed using a narrow set of tasks and on deaf children of a limited age range. It is also important to note that while there is compelling evidence to show that deaf children experience substantial problems in their social functioning compared to hearing children, there is currently limited knowledge about how deaf children's social cognition is related to their real world behavioural skills in different social contexts. Finally, whereas important cross-cultural variations have emerged in studies of typically developing children in terms of the rate and sequence of social cognitive development, there is a poverty of studies on deaf children from non-Western cultures, so it is currently not possible to be able to establish any cross cultural inferences for this population. Therefore, it would be valuable not only to compare the growth of social cognition between deaf and hearing children but also to do so in a culture that has yet to be examined.

The current thesis has three over-arching goals, namely, (a) to systematically and comprehensively investigate the social cognitive skills of deaf and hearing children from the same cultural background using well-established tasks and, as outlined in a later section, the Filipino culture was chosen for this purpose; (b) to assess the consistency of the pattern of acquisition across a range of well-validated social cognitive domains to establish if the nature of development is the same for hearing and deaf children within a single cultural group in these key areas, irrespective of any delays; and, lastly, (c) to examine evidence for the links with known predictors and real-world behavioural skills to clarify antecedents and social consequences, respectively, of their social cognitive development. In keeping with prior literature, this thesis is driven by the broad expectation that deaf children will have less well-developed social cognitive understanding than hearing children but whether the pattern of social cognitive growth will be the same between deaf and hearing children is currently undetermined. In addition, insights from studies with typically developing hearing children drive the expectation that children’s social cognitive understanding influences their social behaviours.

Across five empirical studies, this thesis examined two important domains in children’s social cognition in a relatively large sample of Filipino deaf and hearing participants; a group for which research evidence has been thus far been lacking. The first component of the thesis (studies 1 and 2) involved the examination of the development of children’s theory of mind (ToM) as it has been traditionally defined in narrow terms; that is, the early appearing ability of children to explain and predict behaviour in terms of inner (mental) states. The second component involves the development of children’s emotion knowledge (studies 3 and 4). In this thesis, emotion knowledge involves two related but arguably separate areas namely, affective recognition and labelling and emotion understanding. Study 5 explored the consequences of developments in ToM and emotion knowledge in the social functioning of the deaf.

To sum, it is widely accepted that understanding both mental states and emotions plays a critical role in understanding human interaction (Harris, 1989; Wellman, 1990). While the current consensus for deaf children is that they experience profound delays in theory of mind and emotion knowledge (e.g., Dyck et al., 2004; Ketelaar et al., 2012; Peterson & Siegal, 1995, 1999), and experience problems with social functioning (e.g., Barker et al., 2009; Wauters & Knoors, 2008), these conclusions have been largely based on deaf samples of Western cultures. Surprisingly, however, very little is known about the development of these domains in deaf children who grow up in non-Western contexts. Thus, despite evidence from typically developing samples to suggest that the development of theory of mind and emotion knowledge is sensitive to cultural influences, it remains to be determined whether such relations entail in deaf children from non-Western cultural groups.

The present chapter begins with a review of the past literature on social cognitive development as it unfolds in typically developing children and among deaf children. Initially, an overview of three distinct but related domains to be examined in this thesis is presented; namely, (i) theory of mind, (ii) emotion understanding, and (iii) affective recognition and labelling. It is important to note that substantial reviews of these literatures already exist (e.g., Elfenbein & Ambady, 2002; Liu et al., 2008; Milligan, Astington, & Dack, 2007; Wellman et al., 2001) and it is not the purpose of this thesis to be exhaustive, but rather to describe well-established findings relevant to the current thesis. Following this overview, different antecedents and covariates as well as social consequences of children's theory of mind and emotion knowledge are examined. Against this backdrop, the cultural traditions and parenting practices in the Philippines that could potentially influence children's understanding of mental states and emotions are discussed. A profile of the Filipino deaf community and the associated issues surrounding them are also provided. Lastly, this chapter ends with an overview of the present thesis.

The empirical work presented in this thesis is based on a core sample of n = 101 deaf children, adolescents and young adults (8 to 22 years of age), and appropriate hearing control samples. Given the complexities of gathering rich individual differences data on such a large sample of deaf individuals, many of whom come from very modest circumstances, the core sample was used to address the key questions of the thesis, which are presented in chapters 3 through 7 as separate empirical studies. However, it is important to note that the subjects of these studies are not independent. For this reason, chapter 2 describes the methodology used throughout the thesis. It includes a thorough discussion about the core sample of deaf children upon which the thesis is centred. Chapters 3 through 7 present five empirical studies addressing the development of social cognition in Filipino deaf, and relations with important correlates as identified in the extant literature. The thesis concludes with a summary of the current findings, implications of results, limitations of the studies, and a general conclusion section in chapter 8.

1.2 Components of Social Cognition

1.2.1 Theory of mind

The concept of theory of mind (ToM) was first introduced by Premack and Woodruff (1978) in their seminal paper on chimpanzees' understanding of intentional behaviour in humans. They found that upon watching videotaped scenes of an actor navigating different problems, chimpanzees accurately forecasted the actor's succeeding actions presumably by recognizing the actor's goals and intentions. Premack and Woodruff concluded that, "one infers states that are not directly observable and one uses these states anticipatorily, to predict the behaviour of others as well as one's own" (p. 525). Essentially, this description implies that the nature of one's understanding of people and behaviours is mentalistic; that is, one understands that other people are engaged in intentional acts which are directed or influenced by their inner mental states (Bartsch & Wellman, 1995; Wellman, 2017). While debate is still continuing as to whether chimpanzees make similar interferences about others' behaviour as humans do, or whether human infants infer mental states in others, current research on preschool aged children clearly shows that they are not only able to infer that another person will act on the basis of what they think or believe, but they can also engage in an explanatory framework in which they show an appreciation of the role of mental states in guiding and shaping a person's behaviour. Admittedly, these young children's explanation are not yet very elaborate, but they show the essential features of the belief-desire framework that will characterize their informational exchanges with others and their sense-making of others actions and predispositions throughout the lifespan. The information people have (or don't have) about others' beliefs, wishes, intentions, feelings, and so on, represents a critical aspect of one's social existence and, broadly speaking, it is one's capacity to infer, seek, use, and share this information that epitomizes theory of mind.

Conceptualisation and measurement of ToM. As already alluded to above, beliefs play a central role in theory of mind understanding. Wellman (2014) argued that to understand why people are motivated to engage in particular behaviours, one has to know something of their beliefs and desires. However, a person's beliefs can be true or false. Consequently, what people do can be motivated by true or mistaken beliefs. In particular, how children understand actions based on false beliefs has been the subject of extensive scientific endeavours because, it is argued, to understand false beliefs implies that one must hold in mind a representation of another person's belief (or one's own beliefs under different conditions) that conflicts with current reality. If it can be shown, the argument continues, that children can genuinely hold such a representation in their mind when making sense of another's behaviour (or their own behaviour under different conditions), then we can say that they have a theory of mind.

Children's acquisition of ToM understanding has been routinely indexed by successful performance on standard false belief tasks. False belief tasks typically require children to predict a protagonist's actions or thinking based on his/her false beliefs or mistaken expectations about a situation. Revisiting the Harry Potter example from the start of this chapter, imagine the child putting the book on a nearby table while she goes to get a drink. Unbeknownst to the child, a librarian spots the book on the table and returns it to the shelf. When the child returns, if she wants to read the Harry Potter book, one can assume that she will go straight to the table despite the fact that the book is not there. What prompts this behaviour? It is likely that the child goes straight back to the table because she was unaware that the book had been returned to the shelf. That is, it can be said that the child in the story operates on a false belief. Two of the more commonly used false belief tasks are the change of location, on which the previous example is based on (e.g., Baron-Cohen et al., 1985; Wimmer & Perner, 1983), and the unexpected contents (e.g., Gopnik & Astington, 1988) false belief tasks.

A large body of research has found robust improvement in false belief performance of typically developing children with increasing age. Indeed, data reveal that the majority of young children shift from reliably failing false belief tasks at 3 years of age to consistently passing them from 5 years of age and onwards (Callaghan et al., 2005; Wellman et al., 2001). Studies also show that although the exact timetable of acquisition fluctuates across different cultural groups studied (e.g., China, Hong Kong, United States, Canada, Thailand, India, Peru, Samoa), children show the same pattern of change or developmental trajectory – from below- to above-chance performance – within the same narrow age range i.e., 4 to 6 years (Callaghan et al., 2005; Liu et al., 2008; Wellman et al., 2001). In fact, the remarkable stability of this pattern across various cultural and linguistic groups has been taken to support the claim of synchrony in the age of false belief acquisition. Consequently, Wellman et al. (2001) have concluded that, "understanding of belief, and relatedly, understanding of mind, exhibit genuine conceptual change in the preschool period" (p. 655).

Despite the robust meta-analytic evidence in the timing of false belief acquisition as described above, there have been notable exceptions. In fact, a growing number of studies from different cultural and language groups provide evidence of the onset of false belief reasoning beyond preschool years. For instance, Vinden (1996, 1999) found children from Papua New Guinea performed poorly on standard false belief tasks; as children only passed false belief by 6 to 7 years of age. In Japan, likewise, Naito and Koyama (2006) found that children who grew up in provincial areas only mastered false belief between 6 to 7 years. Lastly, Samoan children appear to demonstrate more profound false belief delays (Mayer & Träuble, 2013, 2015). In a recent study by Mayer and Träuble (2013), results suggested that it was only at 8 years of age that a small majority of Samoan children (55%) passed false belief tests. Further, Samoans seemed to have persistent difficulty with the concept of false belief into the teens. Indeed only 70% of the 12- to-14 year old Samoans in the Mayer and Träuble (2013) sample managed to pass the false belief task. This delay was replicated in a subsequent study on 5- to 7-year-old Samoan children using true and false belief tasks (Mayer & Träuble, 2015).

The evidence presented above relies on the false belief tasks because of the central place it has held in the development of the research on theory of mind. However, solely relying on the false belief task would be too narrow a view of theory of mind development. While the importance of false belief understanding in social cognition is not by any means diminished, there is a “danger in letting a single task become a marker for complex development” (Astington, 2001, p. 687). Indeed, Wellman (2014) contends that theory of mind reasoning involves the interrelations of different mental concepts such as desires and emotions, and not just beliefs, and their joint impact on a person’s actions. Thus, examining various milestones of theory of mind development such as the understanding of desires, knowledge, emotions, and other inner experiences can demonstrate a more detailed picture of children’s true developmental ToM competence (e.g., Perner, Frith, Leslie, & Leekam, 1989; Weimer, Sallquist, & Bolnick, 2012).

ToM sequences. There is evidence to suggest that children’s understanding of some mental states may emerge earlier than others. For instance, between ages 2 ½ and 4 years, children appear to be able to elucidate the propositional nature of thinking and reason appropriately using mental states such as beliefs and desires to explain own and others’ behaviour (e.g., Bartsch & Estes, 1996; Bartsch & Wellman, 1995; Montgomery, 1992; Wellman & Bartsch, 1988). Indeed, research over the past 12 years has revealed that acquiring an understanding of mind progresses through a specific set of steps (e.g., Kuntoro, Saraswati, Peterson, & Slaughter, 2013; Wellman, Fang, & Peterson, 2011). Identifying developmental sequences in the acquisition of ToM understanding could have important implications in terms of detecting which processes are responsible for ToM deficiencies and delays (Peterson, Wellman, & Liu, 2005).

To examine ToM gains using a wider lens, Wellman and Liu (2004) devised a ToM scale that assessed conceptual gains in five key ToM areas, arranged in increasing level of difficulty based on existing experimental investigations of children's social understanding. The scaling approach allows researchers to systematically assess different domains in ToM simultaneously and generate an over-all index of ToM understanding. Similarity in terms of procedure, language structure, task demands, materials, and format render this approach convenient and effective with the same ease and elegance of the false belief test.

The scaling tasks assess five distinct areas. Diverse desires involve the recognition that two individuals may hold opposing preferences. Diverse beliefs involve understanding that two people may hold different, equally potentially true, perceptions about a given situation. Knowledge access involves the recognition that perception (i.e., seeing) leads to knowledge and the absence of perception (i.e., not seeing) leads to ignorance. False belief tests the understanding of how mistaken beliefs can result in various behavioural responses. Lastly, hidden emotion explores the understanding that external expressions of emotions may not be consistent with one's inner feelings.

An important feature of these various domains of ToM is that they appear to be sequentially and hierarchically organized; that is, children's performance along the scale advances in a specific order and the successful completion of a later step is contingent on the mastery of the previous step. Indeed, Guttman and Rasch analyses have both demonstrated that typically developing preschoolers in the United States (Wellman & Liu, 2004), Jakarta (Kuntoro et al., 2013), Germany (Lindquist, Barrett, Bliss-Moreau, & Russell, 2006), and Australia (Peterson & Wellman, 2009) mastered the steps in the following, predictable sequence: diverse desires, diverse beliefs, knowledge access, false belief, and hidden emotions. However, while preschoolers in China and Iran have been shown to progress through the ToM scale at the same rate as Australian and US children, but a slightly different pattern has emerged such that knowledge access was mastered prior to diverse belief (Shahaeian, Nielsen, Peterson, & Slaughter, 2014; Shahaeian, Peterson, Slaughter, & Wellman, 2011; Wellman, Lopez-Duran, LaBounty, & Hamilton, 2008).

Sequential scaling progression and its cross-cultural variations have several important implications. It provides a more comprehensive view of ToM competencies as it may reveal gains in some areas but not others. Additionally, it highlights that learning follows a particular order and is subject to cultural influences (Wellman, 2017). Wellman further posits that this sequential view suggests that conceptual knowledge affects a person's learning. Thus, the ToM scale provides an empirical tool to better assess not only the timing of the onset of children's mastery of several mental state concepts, but also to examine whether the nature of the development in specific cultures or atypical groups has distinctive characteristics (such as order of mastery) when examined in relation to existing samples and findings.

In sum, current literature on normative ToM development show important gains in mental state understanding during the preschool and early school years but have largely focussed on false belief reasoning. Recent work using the broader Wellman and Liu (2004) ToM scale evidence a hierarchical and sequential relationship among different ToM domains. Importantly, cross-cultural findings suggest key variations in sequence of ToM development.

Deafness and theory of mind. Findings of severe deficits in false belief reasoning among children with autism (e.g., Baron-Cohen et al., 1985) prompted researchers to examine ToM development in other atypical groups. From an empirical point of view, deaf children have proven to be an important comparison to children with autism because, apart from their hearing loss, they have otherwise normal cognitive functions. However, this natural experiment has revealed that deaf children also have profound and enduring difficulties with false belief understanding. In a landmark study, Peterson and Siegal (1995) examined a group of n = 26 severely and profoundly deaf Australian children between 8 and 13 years of age, the majority of whom were born to hearing parents. Using a well-validated test of false belief understanding, they found that a majority (65%) of the deaf children failed false belief at a mean age of 10 years, almost twice the age of typically developing preschoolers. Notably, the two deaf children in their sample who were born of deaf parents passed the false belief task. Following that, in a study with n = 59 deaf children, 11 of whom were born to deaf parents, Peterson and Siegal (1999) again found evidence of false belief delays in deaf children of hearing parents. Importantly, the authors did not find any significant difference in false belief scores among second-generation deaf children, oral deaf, and typically developing preschoolers.

Findings of false belief delays in the deaf have since received support in subsequent investigations with deaf children from various cultures and different backgrounds, including Australia (e.g., Peterson & Siegal, 1995, 1999), United States (Schick, De Villiers, De Villiers, & Hoffmeister, 2007), France (e.g., Courtin, 2000), Nicaragua (e.g., Morgan & Kegl, 2006), and the urban children from the United Kingdom (e.g., Steeds, Rowe, & Dowker, 1997). More recent research (e.g., Hao & Su, 2014; Jones, Gutierrez, & Ludlow, 2015; Meristo, Strid, & Hjelmquist, 2016; Ziv, Most, & Cohen, 2013) continues to demonstrate the significant lag in false belief mastery of deaf children compared to typically developing children. In fact, Russel et al. (1998) revealed that significant gains in deaf children's false belief understanding only occur between the ages of 13 and 16 years.

Despite the consistency of these findings, deaf children represent quite a heterogeneous group and this has prompted Remmel, Bettger, and Weinberg (2001) to suggest that, "an accurate account of theory of mind development in deaf children must consider some of the ways in which deaf children differ from one another” (p.119). One such distinction is based on deaf children’s parental hearing status and, critically, their method of communication. Indeed, Peterson and Siegal’s (2000) review of 11 individual false belief studies with deaf children from various cultures (Australia, France, USA, Scotland, and England) indicate that a consistent pattern of false belief deficits among signing deaf children who grew up in exclusively hearing households. Called late signers, these children acquired sign language in school and grew up in households with no signing family members. In contrast, deaf children who were born to deaf parents, called native signers, grew up in a signing environment and developed false belief on par with hearing preschoolers. Oral deaf children or those who rely on spoken rather than sign language, on the other hand, display inconsistent false belief performance which is likely linked, Peterson and Siegal (2000) surmise, to their level of fluency in spoken language.

Although deaf children of hearing parents do demonstrate significant delays in their false belief performance, it is perhaps worthy to consider the type of task used and their language demands. For example, Jones et al. (2015) found no significant differences between deaf children of hearing parents and hearing children’s performance on unexpected location tasks but significant differences on unexpected contents and second-order false belief tasks, in which children need to be able to take into account both false beliefs and the recursive nature of mental state understanding (e.g., he thinks she thinks …). Similarly, deaf children have been shown to perform near ceiling on non-verbal false belief tasks such as the false-photo task but did not do as well in the perception nor false belief tasks, the latter of which is thought to require some level of linguistic proficiency which deaf children might lack (Falkman, Roos, & Hjelmquist, 2007). The false-photo task by Zaitchik (1990) involves children being asked to take a photograph of a teddy bear carrying a banana using a Polaroid camera. The photo was hidden and, meanwhile, the banana was replaced by an apple and children were asked to predict which of two ready-made photos matched the one they had taken. In an interesting variation on theory of mind research methods, Marschark, Green, Hindmarsh, and Walker (2000) used a narrative methodology where children told stories based on one of two randomly determined fantasy themes, to examine how deaf children were using mental state terms in natural discourse. Their findings showed that deaf children between 9 and 15 years of age made more frequent mental state attributions including, belief, doubt, feeling/desire, purpose/goals, knowledge, liking, or thinking in their stories compared to hearing children of the similar age. Although these studies raise important implications about deaf children's ToM abilities, there are important caveats. First, these findings do not elaborate to what extent deaf children are capable of applying mental states in explaining and predicting other people's behaviours and not just their own. Second, if deaf children's performance is hindered by the linguistic demands of standard false belief tests, then it would be expected that they would perform near ceiling on non-verbal perceptual tests which they did not (Falkman et al., 2007). Third, Marschark et al. (2000) posit that their findings could have revealed a more implicit rather than explicit theory of mind understanding and that their narrations were reflective of learned scripts rather than conscious mental state understanding. Thus, to clarify these uncertainties, it would be beneficial to examine more closely if deaf children do possess a full understanding of a range of mental states and if these skills can be applied to understand others' behaviours.

Tom Sequences and deafness. Compared to false belief mastery, much less is known about ToM sequences in deaf children, particularly from non-Western cultures. In Table 1.1, eight studies that examined ToM sequences in deaf children using the Wellman and Liu (2004) scale have been identified. They can be divided into three cultural groups, all of which are industrialized Western cultures: Australia, United States, and Sweden. The majority of these investigations have been conducted among Australian deaf children by Peterson and her colleagues (e.g., Peterson & Slaughter, 2006; Peterson et al., 2005). Among Australian deaf children, a reliable sequence pattern similar to those of typically developing children from the same culture has emerged i.e., diverse desires > diverse beliefs > knowledge access > false belief > hidden emotions (e.g., Peterson & Wellman, 2009), albeit delayed. In contrast to the Australian studies is the work by Holmer, Heimann, and Rudner (2016) on n = 16 Swedish deaf children. Their findings revealed that Swedish children (mean age 10.1 years), scored lower than typically developing children in line with the Australian findings. They also showed that the Swedish children failed to display a definitive sequence as they had equivalent scores on diverse belief and knowledge access. While these findings are thought provoking, it should be noted that the Swedish sample, in particular, was small, and that certain aspects of the sequence (diverse desires, false belief, and hidden emotion) were in fact the same as the Australian sample in terms of order of emergence.

Table 1.1 *Sequences of ToM Understanding in Studies with Deaf Children*

Authors	Sample	Mean age	ToM Sequence
Peterson, Wellman, & Liu (2005)	11 Australian deaf native signers	10.7 years	DD>DB>KA>FB>HE
	36 Australian deaf late signers	10 years	
Peterson & Wellman (2009)	33 Australian late signing deaf children	9.8 years	DD>DB>KA>FB>HE
Wellman, Fang, & Peterson (2011)	31 Australian deaf children of hearing parents	8.3 years	DD>DB>KA>FB>HE
Peterson, Wellman, & Slaughter (2012)	31 Australian late signing deaf children	9.6 years	DD>DB>KA>FB>HE
Remmel & Peters (2009)	15 US deaf children with CI	5.7 years	DD>DB>KA>HE>FB
	15 US deaf children with CI	9.4 years	DD>DB>KA>HE>FB
Peters, Beer, Remmel, & Guest-Williams (2011)	12 US deaf children with CI	5.6 years	DB>DD>KA>FB>HE
Sundqvist, Koch, Holmer, & Heimann (2014)	16 Swedish deaf children of hearing parents	10.2 years	DD>DB=KA>FB>HE

Note. CI = cochlear implants. DD = diverse desires. DB = diverse beliefs. KA = knowledge access. FB = false belief. HE = hidden emotions.

Further exceptions to the aforementioned studies are those conducted among American deaf children. Based on Remmel and Peters (2009), a different pattern of understanding in the final two steps (i.e., hidden emotions came before false belief) emerged among US deaf children with cochlear implants, which not only differs from Australian deaf children but, perhaps more significantly, contrasts with US children in prior studies (e.g., Wellman & Liu, 2004). Additionally, US deaf children with cochlear implants fared better with over-all total scores and were on par with typically developing children. Similarly, Peters et al. (2011) found no significant differences between total ToM scores of 12 US deaf children with cochlear implants (mean age 5.6 years) and similar aged typically developing children. However, the authors found another divergent pattern of acquisition; that is, diverse belief was mastered before diverse desires, while the last steps remained unchanged. In sum, there appears to be mixed evidence to support the claim that sequences between deaf and hearing children of the same cultural group will demonstrate the exactly same ToM progression, although there is relatively little evidence from which to make this conclusion, and sample sizes are very small. Nevertheless, poor performances evident in both Australian and Swedish deaf samples, but not the North American deaf children with cochlear implants, suggest that delays initially observed in false belief likely extend to over-all ToM understanding.

Section summary. In sum, studies among deaf children reflect similar trends in the work done among typically developing children in terms of the focus on false belief understanding and the sequential, hierarchical acquisition of ToM skills. Based on available data, deaf children were seen to demonstrate significant deficits in theory of mind both in terms of false belief understanding and over-all ToM mind. However, these delays appear to be limited to late signing deaf children of hearing parents while native signing deaf children of deaf parents perform on par with hearing children (Courtin, 2000; Courtin & Melot, 1998;

Peterson & Siegal, 1999, 2000). In terms of sequence of ToM understanding, evidence from studies of Australian children demonstrate a progressive mastery of ToM skills that mimic that of typically developing children from the same culture although findings from US deaf children with cochlear implants do not support this same conclusion. An important caveat worthy of consideration is that these findings come out of research on predominantly deaf children from Western cultures. Evidence from typically developing children suggest that there are cultural variations in terms of rate and sequence of mastery of theory of mind reasoning but further work is needed to examine this possibility in deaf children from non-Western cultural groups.

1.2.2 Emotion knowledge

Another key domain of social cognition is emotion knowledge. Like desires and beliefs, emotions are known to engender certain action responses. For example, a child who dislikes spiders will prompt him/her to avoid spiders or someone who loves dogs would likely encourage having a dog as a pet. Significantly, like their theory of mind, children's knowledge of emotions has important implications for their social functioning (Hobson, 1993; Izard, 1971; Izard et al., 2001; Ketelaar et al., 2012; Wiefferink, Rieffe, Ketelaar, & Frijns, 2012). In the current thesis, the term 'emotion knowledge' is, henceforth, used to refer to two related but distinct domains, namely affective recognition and labelling and emotion understanding. In this section of the literature review, affective recognition and labelling is first explained then emotion understanding. Development among typical samples is first discussed followed by insights from studies with deaf children.

1.2.3 Affective recognition and labelling

Affective recognition involves discriminating among different facial, bodily, and/or vocal expressions to determine particular emotion states (Ekman, 1992; Walker-Andrews, 1997). A related concept is affective labelling where these emotion expressions are matched with appropriate labels. It is important to anchor the discussion on children's emotion knowledge on their ability to recognise and label different emotion states because it, "represents one of the earliest manifestations of children's emotional understanding and may help to 'bootstrap' their understanding of more complex emotional states…and more sophisticated forms of emotional reasoning" (Hosie, Gray, Russell, Scott, & Hunter, 1998, p. 309).

Affective recognition and labelling in typical populations. Empirical evidence suggests that affective recognition and labelling emerges early. Previous studies have found that whilst the ability to recognise emotions begins around two years of age, accurately labelling different emotions comes later. For example, Denham and Couchoud (1990) asked children 2 to 4 years of age to identify and label facial expressions of happiness, sadness, anger, and fear by pointing or naming images made of felt material, respectively. Results showed that children were significantly better at naming versus pointing at the different facial expressions. Additionally, divergent performance between these two response modalities was most evident for the expression of fear. Izard (1971), similarly, asked 140 French and 286 American children ages 2 ½ to 9 years to identify emotions on different images of adult faces while they were asked to spontaneously verbalise the kind of emotion the person on target photographs was feeling. Results show that although both groups of children performed similarly in the emotion recognition task, American children performed better than the French on the labelling task, especially between 2 to 5 years. Delayed acquisition of labelling skills, Izard surmises, is likely due to its dependence on children's cognitive and linguistic competence more so than emotion recognition. Although, Lewis (1989) contends that failure of young children to verbally name emotions do not necessary imply that they do not understand them. Nevertheless, performance on both affective recognition and labelling tasks significantly improve by age (e.g., Bormann-Kischkel, Hildebrand-Pascher, &

Stegbauer, 1990; Bullock & Russell, 1984, 1985; Gross & Ballif, 1991; Widen & Russell, 2003, Vicari et al., 2000). In fact, by preschool age, the majority of children can correctly identify emotions based on short stories in faces and use verbal labels (Camras & Allison, 1985).

Compelling evidence from several cross-cultural (e.g., Ekman et al., 1987) and meta-analytic studies (e.g., Elfenbein & Ambady, 2002; Gross & Ballif, 1991; Russell, 1994) claim that certain affective states are accurately recognised across various cultures. Indeed, so-called “universal” cross-cultural recognition of emotions is particularly evident in the judgement of facial expressions of happiness, anger, sadness, fear, disgust, contempt, and surprise (e.g., Biehl et al., 1997; Russell, 1994). Cross-cultural findings on studies assessing emotion labelling skills using forced choices also demonstrate fairly consistent trends when using the same names of different facial expressions (Russell, 1994). There are, however, important cross cultural differences in terms of judgment of intensity of expression (Gross & Ballif, 1991), use of culture-specific emotion categories (Russell, 1991), and when viewing stimuli of people from the same culture as compared to other cultures (Elfenbein & Ambady, 2002); all of which are important areas of research but are beyond the scope of the current thesis.

In examining emotion recognition in other contexts, previous work on body-based expressions suggests that emotions are as efficiently translated though various body postures as effectively as facial expressions (e.g., Coulson, 2004; McHugh, McDonnell, O’Sullivan, & Newell, 2010). Indeed, distinct pattern of body movements and postures illustrate specific affective states and its various intensities (Wallbott, 1998). For example, when the upper body is collapsed and the head is tilted backwards, it is commonly understood as a sign of boredom. However, when the body is collapsed but the head is tilted downwards, it usually signifies shame. Importantly, studies examining affective recognition and labelling of body postures demonstrate a high degree of convergence among observers (e.g., Atkinson, Dittrich, Gemmell, & Young, 2004; de Meijer, 1989; Dittrich, Troscianko, Lea, & Morgan, 1996; Wallbott, 1998). Although, in their second study, Gross, Crane, and Fredrickson (2010) found that the majority of the study participants failed to recognise the target emotions demonstrated by other actors. Nevertheless, it seems that when body postures are viewed with occluded faces or faces are assessed in isolation, judgement is equivocal, albeit response rates were faster on facial images which would suggest that participants found it easier to recognise faces than body postures (Meeren, van Heijnsbergen, & de Gelder, 2005).

In sum, findings among typically developing children show that the ability to recognise and label emotions emerge as early as the preschool years. Furthermore, cross-cultural data suggests that all children are able to demonstrate these skills equally. Current findings on judgements of body expressions suggest that although performance is just as accurate, recognizing emotions in body postures is possibly more difficult than in faces, at least among normative samples.

Deafness and affective recognition and labelling. Findings on studies examining deaf children's emotion recognition skills are, meanwhile, intriguing. On one hand, there is evidence that deaf children are deficient in recognizing emotions on faces (e.g., Bachara, Raphael, & Phelan, 1980; Dyck et al., 2004; Gray, Hosie, Russell, & Ormel, 2001; Most, Weisel, & Zaychik, 1993; Odom, Blanton, & Laukhuf, 1973; Schiff, 1973). On the other hand, some studies claim that there are no meaningful differences on over-all performance of deaf children and typically developing children on different emotion recognition tasks (e.g., Hosie et al., 1998; Most & Aviner, 2009; Rieffe & Terwogt, 2000; Weisel, 1985). Recent studies continue to reflect these contrasting findings (e.g., Ketelaar et al., 2012; Ludlow, Heaton, Rosset, Hills, & Deruelle, 2010; Most & Michaelis, 2012; Rieffe, 2012; Wang, Su, Fang, & Zhou, 2011; Ziv et al., 2013). For instance, Ludlow et al. (2010) examined emotion recognition of n = 26 UK deaf children using facial images of happy, sad, and angry expressions. Deaf children showed significantly lower scores compared to hearing participants. In contrast, Hopyan-Misakyan, Gordon, Dennis, and Papsin (2009) did not find any significant differences in the performance of 7 to 13 year old deaf children with cochlear implants compared to typically developing children when identifying emotions based on photographs of children's faces.

One possible way to clarify these findings is to examine deaf children's ability to recognize emotions in body postures. However, there is little available data on how deaf children assess body expressions. There is one study by Hao and Su (2014) where n = 22 deaf Chinese children, ages 9-11 years, compared emotion recognition in bodies with occluded faces versus just faces. Results revealed that there were no meaningful differences in scores of deaf and hearing children.

In sum, current findings on deaf children's ability to recognise and label emotions are inconclusive. They are either on par or poorer than typically developing children. Extant work has been dominated by studies on facial expressions and little is known of their performance body postures.

1.2.4 Emotion understanding

The second domain of emotion knowledge examined in this thesis is emotion understanding. Compared to the more perception based affective recognition and labelling, emotion understanding involves a more mentalistic set of skills with emotions as the object of thought; that is, emotion understanding refers to the ability to identify, predict, explain, and regulate in themselves and others (Harris, 1989).

Emotion understanding competencies emerges gradually from toddlerhood and across late childhood in normal populations. For instance, young infants have demonstrated sensitivity to their caregiver's facial expressions and vocalizations (Flavell, 2004). The ability to successfully recognise emotions on faces emerges around 2 years of age (Izard, 1971). By around 3 years old, children can communicate about their emotions and identify contexts that produce specific emotions (Brown & Dunn, 1996; Denham, Zoller, & Couchoud, 1994). At around 7 years of age, they begin to understand the mentalistic functions surrounding emotions, such as beliefs and thoughts and, subsequently, between 9 and 11, children are able to reflect and link complex concepts including mixed emotions (Pons et al., 2004). Thus, by around 12-13 years of age, children are expected to have mastered a range of emotion understanding competencies, at least among typically developing children.

One of the main limitations of previous studies is they tend to examine only one or two emotion understanding competencies at a time. It has been argued that this constricted view limits discernment about children's emotional perspective taking skills in two ways (De Rosnay, Pons, & Harris, 2008). First, while extant literature provide ample information about specific abilities such as affective recognition and labelling and emotion attribution, much less is known about the nature of children's over-all emotion understanding. Second, it limits the extent to which individual differences can be understood. For example, language abilities could be linked to some aspects of emotion understanding but not with others. Thus, to have a full appreciation of children's true competence, it is important to conduct a more comprehensive assessment of children's understanding of emotions.

Conceptualisation and measurement of emotion understanding. Based on an extensive review of emotion understanding literature, Pons et al. (2004) identified nine distinct components of emotion understanding and created a measure to assess these components called the Test of Emotion Comprehension (TEC). Component I (emotion labelling) explores children's ability to identify basic emotions on cartoon drawings featuring iconic facial expressions and accurately label them. Component II (external cause) assesses the child's the ability to recognise resultant emotions based on stereotypical emotion-eliciting situations. Component III (desire) refers to the children's understanding of desire-based emotions. In this task, the child determines the story characters' emotional reactions based on the characters' stated preferences. Component IV (belief) assesses understanding how beliefs, whether true or false, effect different emotional reactions. Component V (reminder) explores the relationship between memory and emotions. This task assesses the child's understanding of how recalling certain events may trigger different emotional states. Component VI (regulation) aimed to determine different strategies children use to deal with certain emotional events. In Component VII (hiding), the child distinguishes between true feelings and how emotions are externally expressed. Component VIII (mixed emotions) requires the child to decide which two emotions were simultaneously evoked in the situation. Component IX (morality) examines the relationship between morality and emotions.

Sequences of emotion understanding. Developed throughout childhood, these nine components are also said to be organized in three hierarchical, sequential phases, namely external, mentalistic, and reflexive (Pons et al., 2004). The simplest phase (accomplished between 3-4 years), external, involves an understanding of the public components of emotions including, labelling emotions in facial expressions, recognizing common causes, and the role of memory in different affective states. The second phase (accomplished between 4-6 years), mentalistic, involves an understanding of the role of mental states in emotions. This includes the understanding of the roles of belief and desires in different affective reactions as well as difference between expressed and felt emotions. Lastly, acquired between 6 to 9 years, the reflexive phase includes an understanding of the moral basis of emotions, understanding mixed emotions, and regulation of emotions. It is important to note that there is no absolute ranking among the components within each phase.

Table 1.2 displays the percentages of mean scores and the rank ordering of the different TEC components from select Western and non-Western cultures. Research, at least among typically developing children from Western cultures, revealed that these components appear to follow a fairly uniform pattern of acquisition that is, external > mental > reflexive , although, as mentioned, the actual rank order of the components within each phase may somewhat differ from each other (Molina, Bulgarelli, Henning, & Aschersleben, 2014; Pons et al., 2004; Pons, Harris, & Doudin, 2002). Yet, studies from predominantly non-Western cultures suggest otherwise. For example, in a study by Tenenbaum et al. (2004), Quechua children from an agro-pastoralist village in Peru seemed to follow a different pattern. Specifically, compared to British children (Pons et al., 2002), Quechua children understood mixed emotions as well as belief-based emotions earlier, and memories-emotions later in the sequence. Brazilian street children were, likewise, found to demonstrate a slightly different ordering where more children understood desire-based emotions first and reminders later (Minervino, Dias, Silveira, & Roazzi, 2010). This latter pattern is similar to the rank order among German children (Molina et al., 2014). It is important, therefore, to examine sequences in other cultures to clarify these abovementioned findings.

The TEC has important advantages namely, (a) it includes different tasks with similar procedures, linguistic demands, and format; (b) it concurrently measures various components of emotion understanding; and (c) it generates an over-all index of emotion understanding and a sequence of acquisition of components that may reflect some cultural influences.

Table 1.2 *Percentage of Correct Scores and Rank by Component of Emotion Understanding*

Phases	TEC Component	British urban 3 -11 years[a] (*n* = 100)		Italian urban 3 to 6 years[b] (*n* = 100)		German urban 3-7 years[b] (*n* = 108)		Brazilian street children 3 -11 years[c] (*n* = 67)		Peruvian rural 4 -11 years[d] (*n* = 39)	
		%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
External	I (Labelling)	84	1	71.9	1	75.9	1	77	2	49	1
External	II (Cause)	79	3	50.0	2	56.5	2	80	1	44	3
Mentalistic	III (Desire)	66	5	43.0	4	44.4	3	64	3	26	6
Mentalistic	IV (Belief)	68	4	36.8	6	27.8	6	47	5.5	46	2
External	V (Reminder)	81	2	42.1	5	35.2	4	47	5.5	23	7.5
Reflexive	VI (Regulation)	39	8.5	29.8	8	26.9	7.5	41	7	15	9
Mentalistic	VII (Hiding)	59	6	48.2	3	29.6	5	55	4	41	4
Reflexive	VIII (Mixed)	39	8.5	13.2	9	10.2	9	19	8	33	5
Reflexive	IX (Morality)	40	7	35.1	7	26.9	7.5	2	9	23	7.5

Note. There is no prescribed order of components within each phase. However, it is expected that external items are mastered first before mentalistic items, then reflexive items.

[a]Pons et al. (2004). [b]Molina et al. (2014).[c]Minervino et al. (2010).[d]Tenenbaum et al. (2004).

Deafness and emotion understanding. Extant literature on deaf children's understanding of emotions demonstrates competencies in some areas but difficulty in others. The problem with previous studies on deaf samples is they often focus on just one or two domains of emotion understanding. Outright comparisons among different studies are problematic given the variations in sample, methodology, and components measured. Thus, at present, there is a fragmented view of deaf children's level of emotion understanding competencies.

In identifying common causes of basic emotions or predicting typical affective reactions to certain situational events, current findings are, so far, inconclusive. Some claim that deaf children appear to be as capable as typically developing children. For example, Rieffe and Terwogt (2000) asked 6- and 10- year old deaf and hearing Dutch children to predict emotion reactions of story protagonists based on different vignettes. Both deaf and hearing children were able to accurately predict the typical emotions. Dyck et al. (2004), likewise, examined n = 49 deaf Australian children and adolescents (ages 6 to 18 years) on a battery of emotion understanding tasks and found that when matched on verbal ability, deaf children and adolescents were on par with hearing controls on emotion attribution and emotion consequences but not emotion vocabulary. Still others claim that deaf children have problems linking emotions and situational causes (e.g., Wiefferink et al., 2012; Ziv et al., 2013). For instance, in a study by Gray, Hosie, Russell, Scott, and Hunter (2007), results revealed that hearing children were better able to match emotions displayed on faces with emotion-provoking scenarios compared to deaf children.

In dealing with more complex emotion understanding tasks, deaf children demonstrated less advanced skills. For instance, in examining multiple emotions elicited by different scenarios, Rieffe, Terwogt, and Smit (2003) found 9-12 year old deaf children to be as capable of acknowledging a multiple emotional perspective as typically developing hearing children when stories concern emotions of opposite valence (i.e., positive and negative) but not with two simultaneous negative emotions. As regards emotion regulation, Rieffe (2012) found deaf children demonstrated a comparable amount of approaching strategies as hearing children but significantly less avoidant strategies which the author suggests implied that deaf children utilized less effective emotion regulation strategies than hearing children.

So far, one study has assessed deaf children's understanding of emotions using the comprehensive TEC measure by Pons et al. (2004). Mancini et al. (2016) examined the emotion understanding of *n* = 72 Italian deaf children with cochlear implants (4-12 years old) using the TEC and compared their scores with a normative sample of Italian hearing children (3-11 years old) reported by Albanese and Molina (2008). Results revealed that when matched on age, deaf children aged 4 to 6, scored higher on over-all emotion understanding compared to a normative sample of Italian children. However, between the ages of 9 to 11, typically developing children showed slightly higher mean scores than the deaf children. Still, when considered jointly, the deaf children (*M* = 6.8) had higher mean scores than the hearing (*M* = 5.8) but it was not reported if scores were significantly different from each other. Examination of the pattern of acquisition of the different components suggest a slightly different pattern of acquisition between Italian deaf and hearing children, particularly in terms of the components of belief (IV), hiding (VII), and regulation (VI) (see Table 5.5). Although, when compared to the original sequence by Pons, Lawson, Harris, and De Rosnay (2003), the Italian hearing children were a similar match, whilst there was an inversion between the reminder (V) and desire (III) components for the Italian deaf children. This study has important implication in terms of the TEC's utility with deaf samples. Importantly, it provides an insight in terms of their over-all emotion understanding performance and the nature of their development. However, this study needs to be replicated with other deaf samples, including those from non-Western cultures, to confirm conclusions.

In sum, much like their ToM abilities, extant research revealed that there are pockets of competence and areas of difficulties in deaf children's understanding of emotions which need to be clarified through further study. In particular, the ability to attribute emotions to situations is mixed while complex understanding appears less developed. Nevertheless, current available research on deaf children's over-all emotion understanding suggests higher mean performance and a sequence of development different from typically developing children of the same community.

Section summary. Deaf children appear to demonstrate competence in a few and impairment in other areas of emotion knowledge. This is largely a result of the fragmented approach in emotion research with deaf samples. Based on available data, deaf children demonstrate either poorer or equivalent performance in basic skills such as affective recognition and labelling and emotion attribution. However, they do appear to be limited in more complex emotion understanding tasks. In terms of a more comprehensive assessment of their emotion understanding, prior findings suggest that deaf children have poorer understanding of emotions and the nature of development of this understanding varies from typically developing children of the same community.

1.3 Factors that influence social cognition

Harris (1996, 1999) presents a theoretical framework, the Discourse Model, that shows the nexus between children's conversational environments and their social cognition. He argued that children learn about the mind and emotions primarily via conversational discourse with significant others. Indeed, participation in everyday conversations with family members and peers provide opportunities to converse about inner mental states such as thoughts, feelings, and beliefs and develop an understanding how these are related to human actions. This is consistent with Saarni's (1999) claim that children's real life exposure to particular emotion eliciting circumstances help evolve their notions about emotions. Additionally, in separate key papers, Happé (1995) and Cutting and Dunn (1999) proposed that the child's own language skills may further promote children's social cognition. Taken together, children's language competence and their access to conversations are replete with psychological references that likely engender better understanding of mind and emotions (de Rosnay, Fink, Begeer, Slaughter, & Peterson, 2014; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Harris, 2006; Harris, 2005). Conversely, other factors proximal (e.g., level of spoken/signed communication, family history of deafness, severity of hearing loss, parental sign language instruction) and distal (e.g., socio-economic status) to the child may also work to strengthen or weaken his/her social cognitive understanding. The selection of specific variables in the present research was primarily guided by an evaluation of their theoretical significance to the development of social cognition in deaf children. Additionally, limitations brought about by challenges in data collection of the current sample further informed the choices of the study variables. The following section broadly discusses key variables that may explain individual variation in children's social cognition based on prior studies.

1.3.1 Language abilities and social cognition

Research among typically developing children has established the robust role of language competence in the development of theory of mind and emotion knowledge. However, currently there is no consensus on which aspects of language competence actually help (Harris, de Rosnay, & Pons, 2005). To clarify this issue, Baird and Astington (2005) discussed the distinction between the communicative and representative functions of language. Whereas the former comprises the more pragmatic features of language (i.e., its use in discourse), the latter refers to the more structural components of language.

At the structural level, Baird and Astington (2005) explain, the debate is between the acquisition of lexical semantics such as specific mental terms (e.g., Bartsch & Wellman, 1995) and comprehension of syntax such as sentential complements (e.g., de Villiers & Pyers, 2002). Based on meta-analytic studies, language scores, as a measure of lexical semantic competence, have been found to correlate highly with and significantly predict false belief understanding among typically developing children and children with autism (e.g., Happé, 1995; Milligan et al., 2007). Cross-sectional and longitudinal evidence, likewise, support this claim (e.g., Dunn, Brown, & Beardsall, 1991; Dunn, Brown, Slomkowski, et al., 1991; Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003). Similarly, better verbal ability has also been linked to better emotion understanding (e.g., Bosacki & Moore, 2004; Cutting & Dunn, 1999; de Rosnay & Harris, 2002; De Stasio, Fiorilli, & Di Chiacchio, 2014; Pons et al., 2003) and affective recognition and labelling (e.g., Lindquist et al., 2006). Proponents of this general language ability account argue that language is the framework that allows children to represent, code, and manipulate information. Children, in turn, develop a repertoire of lexical terms that refer to unobservable mental concepts which they can use to conceptualise and explain their own and others' actions (Baird & Astington, 2005). This may then draw children's attention to focus on how mental states are linked to theirs and others' behaviours and cognitions.

Still others contend that ToM reasoning is related to more sophisticated linguistic representations, over and above general language ability and knowledge of specific mentalistic terms. Specifically, de Villiers and colleagues (De Villiers & De Villiers, 2000; de Villiers & Pyers, 2002; de Villiers & de Villiers, 2012) propose that the comprehension of sentential complements underlies false belief understanding. From this perspective, proponents argue that the ability to embed propositions or sentential complements is akin to the skills that underlie false belief understanding. An example of an embedded proposition is the clause in CAPS, "She thought THE HARRY POTTER BOOK WAS STOLEN."

In the deaf, linguistic abilities were similarly linked to false belief reasoning (de Villiers & Pyers, 2002; Jackson, 2001; Levrez, Bourdin, Le Driant, D'Arc, & Vandromme, 2012; Peterson, 2002; Remmel & Peters, 2009; Schick et al., 2007; Tomasuolo, Valeri, Di Renzo, Pasqualetti, & Volterra, 2012). However, as regards emotion knowledge, findings are less consistent. For instance, Gray et al. (2001) report that language ability was significantly correlated with emotion labelling on faces. Yet, Wang et al. (2011) did not find any significant associations between emotion recognition and verbal ability, after controlling for age and hearing status. Similarly, Wiefferink, Rieffe, Ketelaar, De Raeve, and Frijns (2013) and Dyck et al. (2004) did not find any meaningful associations between language and emotion recognition in deaf children not unlike the hearing children in their sample. As regards components of emotion understanding, Gray et al. (2001), again, report significant associations between language ability and emotion comprehension but not hidden emotions. While Wiefferink et al. (2013) and Dyck et al. (2004), meantime, found that language skills were significantly related to emotion attribution for deaf and hearing participants alike. When using the TEC, Mancini et al. (2016) found normalised total TEC scores were significantly associated with verbal ability in the deaf. Since various tasks undoubtedly require different levels of linguistic ability, the strengths of the association between language ability and various indices of social cognition could be expected to vary depending on the task under examination. Alternatively, restricted linguistic skills, such as reported in the deaf, could limit the language effects on *all* domains of social cognition.

In sum, extant literature has revealed a consistent profound impact of verbal ability on social cognition, at least among typically developing children. Previous findings on deaf samples, however, are less consistent, particularly between language and emotion knowledge. Although there is a lack of agreement on which aspect of language is most privileged in relation to social cognition, nonetheless, these abovementioned studies suggest that a certain level of linguistic competency is needed for the development of social cognitive understanding (Astington & Jenkins, 1995; Jenkins & Astington, 1996).

1.3.2 Discourse and social cognition

Children's knowledge about emotions is mediated by different socio-cultural contexts including parent-child conversations (Kitayama, Markus, & Matsumoto, 1995). Conceivably, over the course of communication, parents' discourse could include topics about inner mental states which is beneficial for children's understanding of mind and emotions and their behavioural consequences (Dunn, Brown, & Beardsall, 1991; Harris, 1999). For example, parents who frequently talk about mental states bring these topics to children's awareness and, in turn, mental state talk has been routinely linked to successful social cognition (Adrián, Clemente, & Villanueva, 2007; Brown, Donelan-McCall, & Dunn, 1996; Ruffman, Slade, & Crowe, 2002). Similarly, parents who recognise that interlocutors are "psychological agents" (Hughes & Devine, 2017, p. 45) possibly make regular mind-minded comments in conversations with their children, family members, and peers. This penchant to make internal state-related comments or *mind-mindedness* is positively associated to children's social cognition (de Rosnay, Pons, Harris, & Morrell, 2004; Hughes & Devine, 2017; Lundy, 2013; Meins, Fernyhough, Arnott, Leekam, & de Rosnay, 2013; Meins et al., 2002; Peterson & Slaughter, 2003). Whilst the content (mental state discourse) and manner (mind-mindedness) of parents' conversations with their deaf children have been robustly related to the development of deaf children's social cognition (e.g., Moeller & Schick, 2006), due to the challenges in recruiting the current sample, it was not possible to secure actual recordings of parents' conversations with their deaf children to measure the amount of mental state talk or degree of mind-mindedness. Thus, attention is turned towards the other factors that could possibly influence the communicative environment of families with deaf children.

Undoubtedly, deafness impacts social communication in families. For instance, deaf parents are likely more cognizant of the impact of their hearing loss on the dynamics of daily communication and, more importantly, have a shared mode of communication i.e., sign language with the deaf child (Erting, Prezioso, & O'Grady Hynes, 1990; Vaccari & Marschark, 1997). In contrast, deaf children of hearing parents' are exposed to fewer mental state terms from their parents, are less likely to overhear family conversations, experience fewer chances for incidental learning, and are more likely to be excluded in family conversations, depending on the presence of an interpreter or a fluent conversational partner (Calderon & Greenberg, 2003; Evans, 1995; Lundy, 2002; Morgan et al., 2014). In short, deafness modifies the way families communicate with each other and hence, this deserves closer consideration.

In light of the fact that more than 95% of deaf children are born to hearing families (Mitchell & Karchmer, 2004), this thesis focusses on variables that were thought to influence the communicative environment in these kinds of households. In particular, based on previous research as well as educational and communicative practices in the Philippines, the current thesis explores six indirect measures that could potentially impact the conversational interactions of hearing families with deaf children and could stand in for more direct assessments of conversational discourse in these kinds of families. They are as follows:

Degree of hearing loss. The severity of hearing loss has been linked to late identification, delayed access to intervention programmes, problems with spoken language facility, and frequency of sign language use by parents. Children with mild or unilateral hearing loss are at greater risk of delayed access to hearing amplifications or late participation in early intervention programmes than those with more severe or profound hearing loss (Alyami, Soer, Swanepoel, & Pottas, 2016; Harrison, Roush, & Wallace, 2003; Tran et al., 2016; Walker et al., 2014). Yet, a number of studies have indicated that the increasing level of hearing loss negatively affects the deaf person's linguistic development and spoken production (Fitzpatrick, Crawford, Ni, & Durieux-Smith, 2011; Wake, Hughes, Poulakis, Collins, & Rickards, 2004). It has also been suggested that more severe hearing loss results in poorer spoken language comprehension and restricted access to familial conversations in oral households (Marschark, 1993; Vaccari & Marschark, 1997). Lastly, it has been found that mothers tend to use sign language more with severely deaf children which implies that spoken language use is likely more prevalent among children with minimal hearing loss (Kluwin & Gaustad, 1991, 1994).

Thus, with increasing severity of hearing loss, a less than ideal communicative environment emerges where developing social cognitive understanding can likely be challenging. Parents of deaf children with profound to severe hearing impairment likely find that their children develop poorer language competence, and that they need to rely less on spoken language during communicative exchanges. Having said that, previous studies have not fully examined how varying levels of hearing loss affect their social cognitive development. There was also some indication that oral deaf children with moderate to severe hearing loss performed on par with second generation deaf children and typically developing 4 year olds compared to signing deaf children with hearing parents on false belief tasks (Peterson & Siegal, 1999). In contrast, several studies did not find any significant correlations between severity of hearing loss and emotion recognition and/or emotion understanding (Dyck & Denver, 2003; Ludlow et al., 2010; Mancini et al., 2016; Most & Aviner, 2009; Most & Michaelis, 2012). Yet, Dyck and Denver (2003) found significant effects of degree of hearing loss with pre- and post-treatment emotion attribution scores and only post-treatment emotion recognition scores.

Mode of communication. It is important to recognise that the linguistic input deaf children receive throughout their lifetime varies across different contexts i.e., home, school, and community. Indeed, early social communication would be influenced by their parents’ chosen mode of communication which is predicted by their respective primary language (Lederberg, Schick, & Spencer, 2013). That is to say, deaf parents would typically choose to communicate using signs and, conversely, hearing parents would opt to communicate using spoken language. Interestingly, it has been found that there is congruence in the communication mode across family members where the majority of mothers, fathers, and siblings were found to either *all* speak or all sign (see Figure 1; Kluwin & Gaustad, 1991). Yet, in a later study, the same authors found that deaf children's use of sign and/or spoken communication exerts a significant influence on mothers' mode of communication (Kluwin & Gaustad, 1994). Furthermore, there is anecdotal evidence indicating that *one* member of the family often serves as an interpreter/a primary communication partner and conversations are typically coursed through these individuals (e.g., Evans, 1995). What these studies are implying, therefore, is that characterising the configuration of spoken and sign language used within families is a complex endeavour (Kluwin & Gaustad, 1991, 1994) and likely varies between families. However, an important extrapolation can be made that having deaf children modifies how families members elect to communicate with each other.

This thesis is guided by a broad expectation that signing deaf children would benefit more from a signing home environment (Stinson, 1994; Vaccari & Marschark, 1997). Indeed, when families communicate in sign language there are important benefits in terms of over-all communication and social interactions. For example, the signing deaf member becomes more involved in the interactions within the family (Evans, 1995; Henderson & Hendershott, 1991). An efficient shared mode of communication also provides the opportunity for deaf children to gather more knowledge about behaviours including its antecedents and its consequences (Calderon & Greenberg, 2003). Conversely, poor communication in the families with deaf children results in restricted discourse about feelings and other important issues (Greenberg, Kusche, & Speltz, 1991). However, it is also acknowledged that hearing parents could have difficulty expressing themselves fluently in sign given that this is not their primary language.

Parents' level of formal sign language instruction. In the current thesis, level of formal sign language instruction is used as a proxy measure for sign language competence in light of the absence of any standardised measure of sign language proficiency in the Philippines. The willingness to learn appropriate signed vocabulary could motivate parents to talk about specific topics (Moeller & Schick, 2006). However, even with the best of intentions, personal competence in sign language impacts how well parents convey their message during sign language discourse. Indeed, with limited sign language competence, parents would possibly choose to limit their conversations to topics that are pragmatic, have visual reference, and are simple to explain. Furthermore, parents have been found to modify the level of complexity of conversations due to a perceived sense that the deaf child is incapable of understanding complex discourse (Calderon & Greenberg, 2000). Thus, in the absence of a fully accessible conversational discourse at home, deaf children are unable to take advantage of any incidental learning opportunities and are deprived of the opportunity to learn about others' mental states, viewpoints, coping strategies (Hauser, O'Hearn, McKee, Steider, & Thew, 2010). Additionally, insufficient communication skills could result in parents' lack of sensitivity to deaf children's communicative, intellectual, and social needs (Hauser et al., 2010; Vaccari & Marschark, 1997).

Intuitively, communicative interactions between signing deaf children and parents who have acquired good signing skills are likely efficient and thought provoking. Therefore, parents with more formal sign language instruction are expected to provide a more accessible communicative environment which may benefit social cognitive development. Interestingly, however, it has been found that, despite advanced signing skills, the level of fluency of hearing parents will never match those of native signing deaf parents (Marschark, 1997).

Nevertheless, there is evidence to suggest that maternal sign language competency is correlated to both level of sign language classes completed and false belief performance in deaf children (Moeller & Schick, 2006).

Family history of deafness. Siblings or extended family members who are deaf can transform the familial communicative environment. For one, deafness influences the different modalities family members use to communicate with each other (Mallory, Zingle, & Schein, 1993). Second, deaf children develop highly complex signed linguistic skills in the context of families with deaf family members (Newport & Supalla, 1980). Taken together, these studies suggest that the presence of deaf family members provide greater opportunities for deaf children to engage in elaborate conversation *and* develop better linguistic competence; either of which are related to better social cognition (Milligan et al., 2007; Peterson & Siegal, 2000). Current empirical evidence differentially supports this claim. Like deaf parented families, Moeller and Schick (2006) found that deaf children with signing siblings scored better in the false belief task than those with non-signing siblings, albeit equivalent with children without siblings. Yet, the presence of deaf family members was not significantly associated with deaf children's emotion recognition (Ludlow et al., 2010).

Age entered deaf school. Earlier entry to a deaf school implies longer exposure to sign language and earlier contact with mature signers. Additionally, deaf children can be introduced to a greater community of deaf people earlier as well as access to conversational partners in the form of teachers and other deaf students who can provide them access to sign language, the deaf culture, and knowledge about a variety of topics (Arevalo & Kusanagi, 1995; Calderon & Greenberg, 2003). Prior to school entry, young deaf children's early sign language acquisition is reliant on input from parents (Marschark, 1997). Thus, early enrolment in a deaf school implies that deaf children will acquire sign language in a more advanced timeframe compared to late entry. Furthermore, this will provide them an opportunity to engage in perspective taking and participate in an extended discourse on a variety of topics, including mental states. Not surprisingly, early exposure to sign language was positively associated with false belief performance and greater use of mental state references among Nicaraguan deaf samples (Morgan & Kegl, 2006).

1.3.3 Other family based factors

Other family based factors such as socio-economic status and family size have also been found to influence the development of social cognition (Hughes & Devine, 2017). Socio-economic status (SES) is a multi-faceted concept that has been indexed in terms of parental occupation, income, educational background, etc. Considerable research has established the important role of SES in social cognition in deaf and typical children (Cutting & Dunn, 1999; Hughes & Devine, 2017; Ruffman et al., 2002; Stanzione & Schick, 2014). For example, low SES results in limited access to resources which can lead to a number of negative consequences including, poor socio-emotional wellbeing, greater health problems, and lower levels of cognitive and academic achievement (e.g., Bradley & Corwyn, 2002; Currie, Elton, Todd, & Platt, 1997). More germane to social cognition, lower SES has also been associated with poorer language skills and low frequency of mental state talk between siblings (Brown et al., 1996; Fernald, Marchman, & Weisleder, 2013; Gathercole, Kennedy, & Thomas, 2016; Lundy, 2013; Rowe & Goldin-Meadow, 2009). Although not examined in the current thesis, family size has also been implicated in better false belief understanding (e.g., Jenkins & Astington, 1996; Perner, Ruffman, & Leekam, 1994). Older/younger sibling of childhood age were thought to provide the opportunity for someone to play and converse with which is beneficial to children’s understanding of others’ mental states (Peterson, 2000).

1.3.4 Culture and social cognition

Variations in social cognition of children from different cultural groups could imply that “culturally shaped differences in input are at work” (Wellman et al., 2006, p. 1080).

Indeed, factors such as language and communication are not detached from cultural influences. They are, in fact, mechanisms that are grounded in the knowledge and practices of a distinct cultural context (Haslett, 1989). In previous studies, cultures have been commonly defined in terms of their adherence to characteristics within the individualism-collectivism dimension (Hofstede, 1983). Hofstede (2001) found that countries such as the United States, Australia, and Great Britain tend to be particularly high on individualism and countries such as those in Asia and Latin America tend to be particularly low on individualism (or more collectivistic). High individualism is related to characteristics such as concern for own (and his or her immediate family's) welfare, emotional independence, emphasis on leadership, self-initiative and personal achievement, autonomy, and individual decision making, amongst others. Importantly, within individualistic families, children are raised to speak their own mind and dissent can lead to the discovery of truth. In contrast, Hofstede (1983, 2001) suggest that people who are low on individualism (or more collectivistic) tend to exhibit filial piety, be loyal to an in-group of whom the members of the immediate and extended family, form a group based identity, emphasize belongingness and membership to groups and organisations, and often rely on group decision making, amongst others. Finally, some researchers have shown links between different parenting styles (Baumrind, 1991a, 1991b) and these cultural dimensions. For instance, authoritarian i.e., demanding and directive parenting style has been linked to individualism while collectivism has been linked to more authoritative parenting style i.e., demanding and responsive (e.g., Herz & Gullone, 1999; Julian, McKenry, & McKelvey, 1994).

Against this backdrop, certain cultural and parenting practices could be linked to children's social cognitive performance in different ways. First, cultural norms can expose children to consider specific kinds of notions more than others which may have implications for the development of their understanding of mind and emotions (Lillard, 1997). For instance, there is evidence to suggest that parents from collectivistic cultures (e.g., Cameroon) tend to inhibit children from expressing contrasting views and emphasize dependence on the group rather than personal autonomy. This could limit their experience with perspective taking and curb assertion of personal opinions which may result in “less exposure to interactional conversational contexts which foster the development of mentalistic abilities” (Chasiotis, Kiessling, Hofer, & Campos, 2006, p. 258). Second, culture could influence the kinds of discourse between members. For instance, in the Japanese culture which is collectivistic, actions are largely explained to children by adults using contextual and behavioural cues (Naito & Koyama, 2006). In contrast, in individualistic cultures, when explaining what impels individual action, parents often refer children to individual choices such that actions are independent of others (e.g., This is what I want. This is what I believe is the right/wrong way to do things.) which reflect a more independent, autonomous sense of self. In this context, mental state references such as thoughts, preferences, and intentions would likely be more prevalent and this has been linked to better social cognition (e.g., Adrián, Clemente, & Villanueva, 2007; Brown, Donelan-McCall, & Dunn, 1996; Ruffman, Slade, & Crowe, 2002). Lastly, childrearing practices and parenting styles could directly affect how children reflect on their behaviours. For instance, Vinden (2001) examined parenting styles and ToM performance of Korean American and Anglo-American parents and children, respectively. Results revealed that more authoritarian parenting attitudes were associated with children’s lower theory of mind scores, at least for the Anglo-American children. Yet, there was no relationship between authoritative parenting and theory of mind reasoning. Similarly, Ruffman, Perner, and Parkin (1999) found that parents whose disciplinary strategies involved asking children to reflect about their victim’s feelings (versus simply reprimanding or just a general discussion of the transgression) were linked to children’s better false belief scores.

Section summary. Extant literature is replete with evidence of child and environmental factors that influence social cognition. Children's language skills and different conversational factors, including mental state language and mind-mindedness, have been shown to demonstrate robust associations with theory of mind and emotion knowledge. Socio-economic status and family size are similarly been implicated. Lastly, it has been argued that cultural norms and parenting practices justify some cross-cultural variations in social cognition observed among children from Western and non-Western cultures.

1.4 Social consequences of social cognitive understanding

Many argue that the relationship between social cognition and social behaviours has ecological validity, such that performance in laboratory tests can account for individual differences social behaviours in the real world (e.g., de Rosnay, Harris, & Pons, 2008; Watson, Nixon, Wilson, & Capage, 1999). However, research among typically developing children is divided on the claim that social cognition contributes to social competence (Hughes & Devine, 2015). Astington (2003) contends that social cognition is sometimes necessary but never sufficient to explain variations in children's social functioning. Indeed, there is experimental evidence to suggest that ToM affects social competence such as teacher ratings of children's social skills (Watson et al., 1999) and social competence (Lalonde & Chandler, 1995), and peer ratings of social interaction (Bosacki & Astington, 1999). Similarly, based on concurrent and longitudinal evidence, different aspects of children's emotion knowledge has been seen to robustly predict children's social functioning including, peer acceptance (Cassidy, Parke, Butkovsky, & Braungart, 1992) and social competence (Denham et al., 2003). The same is true for deaf samples. For example, ToM was positively correlated with teacher ratings of deaf children's peer social maturity and popularity but negatively associated with social isolation (Peterson, O'Reilly, & Wellman, 2016; Peterson, Slaughter, et al., 2016). Meanwhile, better emotion recognition abilities are related to better social competence (a combined score of children’s prosocial behaviour and lack of social difficulties), interpersonal relations, and self-control (Ketelaar, Rieffe, Wiefferink, & Frijns, 2013; Weisel & Bar-Lev, 1992).

However, despite these aforementioned findings, Astington (2003) highlights the paradox between preschool children’s evident competence in social interactions and failures in ToM tasks, particularly with false belief. For example, Frith (1994) found that for typically developing 4 year old children, failing the standard false belief tasks did not have any significant impact on some of the social behaviours (e.g., interactive sociability) measured by classroom teachers. Furthermore, there is some empirical evidence that show a lack of significant association between social cognition and social behaviour. For instance, in their study of preschool children, Newton and Jenvey (2011) did not find any significant associations between ToM and parent rated social competence. Similarly, level of emotion recognition was not correlated with or predictive of social competence in deaf children with cochlear implants (Wiefferink et al., 2012). Ketelaar et al. (2015), likewise, did not find any significant associations between understanding moral emotions and social competence.

Bosacki and Astington (1999) suggest that one of the key reasons why the purported relationship between social cognition and social competence remains ambiguous is due to the multi-faceted nature of these concepts. Against this, it is possible that different aspects of social cognition could be differentially linked to particular aspects of social competence. For instance, Dunn (1995) found that emotion understanding, measured in terms of emotion labelling and attribution skills, was linked to positive perception of school while false belief understanding was related to negative perception of school and sensitivity to teacher’s criticisms in typically developing preschool children. Still others suggest that, instead of the attribution of mental states, successful social functioning relies on other factors such as language and the social interactions (Astington, 2003; Newton & Jenvey, 2011). Finally, in their meta-analysis, Slaughter, Imuta, Peterson, and Henry (2015) resolves this paradox by acknowledging that social cognition *is* significantly associated to social competence, at least in terms of ToM and peer popularity. However, authors qualify, the overall relationship is small (r = .13) and unless study samples are sufficiently large, researchers will fail to find significant associations.

In sum, there is an assumption that social cognition is related to children's social functioning. However, current literature is inconclusive. The ambiguous relationship has been linked to the complex nature of both constructs.

1.5 A case for the Philippines

In order to investigate the social cognitive development of deaf and hearing persons in the Filipino context, it is necessary not only to consider the current evidence regarding deafness and social cognition (as already reviewed), but also the broader cultural practices and conventions that characterise the Philippines. Most notably, some cultural values and parenting practices which are prominent in the Filipino culture could possibly impact children's social cognitive development; including the common perception that young children are not independently minded. In addition, it is apparent that Filipino deaf children are often confronted by a disconnection between the language of the home and the communicative practices of their classroom, which are very diverse.

1.5.1 The Philippines

The Philippines is an archipelago in Southeast Asia comprised of 7,107 islands with a total land area of 343,448 km2 (Official Gazette, 2017). There are three major island groups: Luzon, Visayas, and Mindanao. The term "Filipino" refers to both the people and the language. Although Filipino is the national and official language, English is also considered as one of the country's official languages. In fact, English and Filipino are the official languages of instruction in the private and public school classroom at the secondary level, and where English is used at least 70% of the time (Republic of the Philippines, 2006). For the primary level, whereas the mother tongue is the official language of instruction, English is considered as the second language starting in Grade 1 (Republic of the Philippines, 2008). Yet, based on the 2000 Census of Population and Housing by the National Statistics Office (Republic of the Philippines, 2003), 94.34% of the families in Metro Manila speak in *Tagalog*/Filipino at home. Regional dialects such as *Ilocano, Bisaya*, and *Bicolano* make up less than 2% of the languages spoken at home. A further 0.41% uses a foreign language, although there is no mention on which foreign language is used most frequently. According to the PEW Research Centre's Global Christianity study (2011), the Philippines is made up of 93.1% Christians. The Philippines is home to 100.98 million Filipinos, 12.88 million (~ 13%) of whom live in Metro Manila or the National Capitol Region (Republic of the Philippines, 2016). The thesis was conducted in several key cities in Metro Manila namely, Quezon City, Manila City, and Pasay City.

First implemented in school year 2011-2012, the Philippines adopted a new educational program called K to 12, meaning Kindergarten to Year 12 (Republic of the Philippines, 2017a). Implemented in both public and private educational institutions, the K to 12 programme covers 13 years of basic education replacing the previous 10 year pre-university cycle. During their senior high school (years 11 and 12), students, in addition to a core curriculum, choose to attend subjects that are grouped under a specific discipline. These disciplines include, (1) academic, (2) technical-vocational-livelihood, (3), sports, and (4) arts and design. Filipino hearing children typically begin kindergarten at 5 years of age (Republic of the Philippines, 2017b).

1.5.2 Parenting values and childrearing in the Philippines

The Philippine society is described as a largely collectivist culture, valuing strong family ties, filial piety, group conformity, and avoidance of conflict (Chao & Tseng, 2002;

Hofstede, 2001). Not surprisingly, the Filipino child is best understood in the context of his family (Jocano, 1998). Within the Filipino culture, a child's actions as well as future success or failures are seen as a reflection of the family and its reputation (Medina, 2001) . As such, parents of young children endeavour to instil in their children values that the family and society, as a whole, considers acceptable. The strong link between family and the society is clearly reflected in Miralao's (1997) statement, "the goal of social acceptance and the value of smooth interpersonal relations are generally congruent with the values inculcated in the family where members are taught to recognise (or accept) one another and to maintain good relations with the kindred" (p.195).

Research among urban Filipino parents revealed that local parenting practices reflect more authoritarian attitudes where values of respect and obedience towards elders are widely regarded (Alampay & Jocson, 2011). Having said that, some studies of parents from southern communities showed more authoritative attitudes of Filipino parents towards their children (e.g., Harper, 2010; Hindin, 2005). Nonetheless, there is greater endorsement of and compliance with parental authority, greater rule-making and influence in decision making, and less personal autonomy among Filipino adolescents compared to US counterparts (Darling, Cumsille, & Alampay, 2005). In fact, good conduct, academic proficiency, concern for family members, and good peer relationships were the top competencies valued by Filipino mothers from a rural fishing village (Durbrow, Pena, Masten, Sesma, & Williamson, 2001).

How parents relate to their children maybe partly influenced by how capable parents think their children are at certain points in their development. Based on focus group discussions with 87 parents, de la Cruz, Protacio, Balanon, Yacat, and Francisco (2001) found that Filipino parents often think that young children do "not have a mind of their own" (p. 104) and that they are not yet capable to understand the complexities of their environment.

Indeed, it is not uncommon for Filipino parents to wait until their child is around 6 years of age to consider them as '*may isip na*', literally meaning 'has own mind' (Guthrie & Jacobs, 1967). At this point, the Filipino child is now viewed as developmentally ready for instruction, is allowed to assume more responsibilities at home, and begins to receive guidance about societal and cultural norms (Guthrie & Jacobs, 1967; Liwag, de la Cruz, & Macapagal, 1998). Indeed, in a review of different ethnographic studies among indigenous and rural communities in the Philippines, Alampay (2014) concluded that children "lack the knowledge, sense, or understanding necessary to behave competently in their environment" (p. 110).

Evidence from preceding studies also supports the claim that children are not developmentally ready for complex conversations. For instance, based on a survey conducted by the National Coordinating Centre for the Study and Development of Filipino Children and Youth (NCCSDFCY: 1976), Filipino mothers seem to be quite dismissive of the child's inquisitiveness and need for interpretation and explanation of, among other things, other peoples' feelings and actions. Indeed, strikingly, results of the NCCSDFCY's comprehensive national survey showed that only 26% of Filipino mothers of pre-schoolers reported that they would usually try to answer their children's questions and inquiries (see Table 3 on p. 35 of their article). The remaining 74% reacted dismissively to questions from the preschool child via strategies like avoidance, evasion, distraction or pretending not to hear. Their predominant response was to attempt to discourage the child's questioning and divert his/her attention to television or play. Whilst these national findings are somewhat dated, more recent research suggests that the pattern is still present in the Philippines. An ethnographic study conducted by Aguilar (2009) in a rural upland village in Southern Luzon discusses a cultural notion called '*bait*' --- the "the ability to think referentially in terms of the needs as well as feelings of others" (p. 229). Young children are considered *wala pang bait* (to mean the absence of *bait*) which is manifested in their penchant for impulsivity, mischief, and lack of lack of moral discernment. Around age 11 to 12, preadolescents' proclivity to rebel against figures of authority and susceptibility to developing vices are evidence of an approaching-but-not-complete possession of *bait,* a developmental stage called *alanganin* (lacking). Full acquisition of *bait* is not thought to be achieved until 18 or 19 years of age when the individual is expected to think and display appropriate behaviours, although some adults may not fully develop this aspect.

Against this, a core feature in Filipino social interactions is an interpersonal value called *pakikiramdam*. *Pakikiramdam* or shared inner perception is defined as the "act of sensing the situation, including the feelings and thoughts of others and an anticipation of action" (Rungduin & Rungduin, 2013, p. 19). Derived from the root work *damdam* or feelings, *pakikiramdam* enjoins one to be sensitive to another's feelings and thoughts when determining his or her own actions towards the other (Mataragnon, 1988). It is envisaged to serve as an internal guide to a person's interpersonal behaviours. Although not unique to the Filipino culture, there are indications of *pakikiramdam*'s pervasive influence in the local language and everyday relations. For example, it has been implicated in certain behaviours such as forgiveness. In a review of six indigenous studies, Rungduin and Rungduin (2013) found that *pakikiramdam* relates to the process of seeking and granting forgiveness. On the one hand, the transgressor evaluates when it is appropriate to seek forgiveness. To ensure success, the transgressor needs to assess what the aggrieved party is thinking or feeling and determine the "right time" when to admit his/her culpability and seek absolution for (mis)actions. On the other hand, the aggrieved party is tasked to intuit if the offender is indeed sincere and genuine in his/her desire to seek forgiveness for his/her act(s) of transgression. This entails a judgement on the transgressors' feelings and thoughts about the event at a very young age.

In sum, the studies reviewed above suggest that Filipino parents may not communicate with young children in ways that promote social cognition believing that, lacking an independent mind, they are not yet suitable interlocutors for discussions of mental states. However, children's implicit understanding of the parent's commands, through *pakikiramdam*, could also indicate a nascent form of social cognition. Indeed, these cultural attitudes could have profound implications on children's access to family discourse, especially about inner mental states, and ultimately impact the development of their social cognition given that there is no other efficient access to others' thoughts, feelings, mistaken expectations, and false beliefs other than conversational interactions and explanations.

1.5.3 The Filipino deaf

According to the 2015 United Nations report on persons with disabilities in Asia and the Pacific, 12.9% of the 1,442,586 reported persons with disabilities in the Philippines are classified with hearing disability (United Nations Economic and Social Commission for Asia and the Pacific, 2016). This is very similar to the data reported in the 2000 population census where out of the 942,098 reported persons with disability, 121,598 (13%) are classified as hard of hearing, partially deaf, or totally deaf (Republic of the Philippines, 2000).

In providing a description of hearing loss among Filipino children, it is important to note that newborn hearing screening was only introduced fairly recently in the Philippines. Indeed, the Universal Newborn Hearing Screening (UNHS) Act was only signed into law in 2009 and the implementing guidelines were only released in 2014 (Republic of the Philippines, 2014c). Although in a study by Chiong et al. (2007) of 724 Filipino babies tested over a 2 year period, 2.2% (n = 16) were found to have some level of hearing loss, this Act, nonetheless, has important implications for early diagnosis of hearing loss before the introduction of the UNHS. As regards school aged deaf persons, based on the 2000 national data, 27, 458 (~22%) are between 5 to 24 years of age (Republic of the Philippines, 2000).

The common causes of hearing loss among school age deaf persons in the Philippines are impacted cerumen and otitis media (Perez, 1998).

A profile of Filipino deaf users of hearing technologies (HT), meanwhile, is difficult to establish. Apart from a handful of medical studies (e.g., Chiong et al., 2013; Chiong & Villianueva, 2012), no definitive prevalence rates have been established for hearing aid and cochlear implant users in the Philippines (T.Yarza, personal communication, June 16, 2017). Against this, cochlear implantation is expensive given the costs for the actual technology, surgery, and any associated therapies (Garcia, 2015, February 23; Laguyo, 2014, August 5) which make it difficult to avail for average to low income families. Hearing aids, on the other hand, are comparatively easier to obtain as there are many donor agencies that provide them free of charge for qualified families. However, consistent use of hearing aids is similarly constrained by high maintenance costs (e.g., replacement of batteries, refitting of new hearing aids every few years) and reported pain by the users. As a result, hearing aids are either used irregularly or deaf children stop using them altogether. Hence, given the high incidence of national poverty (Republic of the Philippines, 2015), coupled with associated costs of HT, *and* the likelihood of delayed diagnosis of hearing loss, it is argued that only a limited deaf individuals would likely avail of HT, particularly cochlear implants.

Based on the list maintained by the Manila Christian Computer Institute for the Deaf, as of 2013, there are 17 public schools and 51 private schools offering programmes for deaf students all over the Philippines, majority of which are based in Metro Manila (Manila Christian Computer Institute for the Deaf College of Technology, 2013). The Department of Education recorded a total of 21,440 deaf students enrolled in the public school for school year 2016-2017, 3,674 of whom are based in Metro Manila alone (Republic of the Philippines, 2017c). As regards classroom settings, some schools provide self-contained (all deaf) classes such as the Philippine School for the Deaf, some provide mainstreamed classes where deaf students are combined with other hearing classmates such as Quirino High School, and others are specialised programmes for deaf studies within a larger hearing institution like the De La Salle College of St. Benilde. In 2012, inclusive education where the schools accommodate the learning needs of deaf students was introduced (R. Domingo, personal communication, June 20, 2017).

The Filipino deaf community is described as, "a vibrant and dynamic assemblage of communities throughout the archipelago bound by their visual language" (Martinez & Cabalfin, 2008, p. 438). Furthermore, Martinez and de Guzman (2002) explain that the social customs that define the Filipino deaf community combine general Filipino cultural practices and deaf norms that akin to various deaf communities in other countries.

Filipino Sign Language or FSL is widely regarded as the language of the deaf community in the Philippines (final approval pending;Republic of the Philippines, 2014b). FSL is a visual language with its unique hierarchy of linguistic structures, including manual signs and non-manual facial and bodily signals (Martinez, 2012). As it exists today, it is amalgamation of indigenous and regional signs, Manually Coded English, and American Sign Language (ASL). Strong links with ASL are largely due to historical and educational traditions of American educators having establishing the first deaf schools in the country (Martinez & de Guzman, 2002). Nonetheless, research on FSL has revealed that it has its own structure and vocabulary (e.g., Philippine Deaf Resource Center & Philippine Federation of the Deaf, 2004).

Based on a report by the Status Report on the Use of Sign Languages in the Philippines by the Philippine Federation of the Deaf (2007), in most formal education and community based programmes in the Philippines, teachers and classroom interpreters employ Simultaneous Communication (SimCom) in the classroom. SimCom refers to the concurrent use of spoken and signed language (Mayer, 2015). Among Filipino teachers and interpreters of the deaf, 90% of the spoken language component is either English or a combination of English and another language/dialect such as Cebuano or Filipino (Philippine Federation of the Deaf). Additionally, Arevalo and Kusanagi (1995) conducted a survey among teachers of varying signing proficiency from the largest deaf school in Metro Manila. Findings revealed that the majority of the teachers (92%) used SimCom followed by manual communication (44%). Arevalo and Kusanagi (1995) further report that inside the classroom, teachers' preferred sign language variety is SEE-2 or Signing Exact English (74%) and closely followed by ASL (63%). It is acknowledged that some Filipino institutions state that they employ Total Communication. However, the Philippine Federation of the Deaf report also acknowledges that teachers/interpreters confuse the adoption of the Total Communication or TC philosophy (i.e., the use of a variety of strategies to communicate with the deaf including but not limited to the use of assistive devices, oral communication, speechreading, reading, writing, fingerspelling, manual signing) to mean SimCom. This confusion between TC and SimCom is not unlike trends noted by Mayer (2015) among hearing signers in other schools for the deaf.

In a survey conducted among *n* = 116 deaf individuals from Metro Manila (Yap, Reyes, Albert, & Tabuga, 2009), findings show that the deaf are more knowledgeable of the English language than *Tag-lish* (a mix of *Tagalog*/Filipino and English). Additionally, 63% can write in English while only 17% can write in Filipino. As regards their spoken language abilities, respondents reported that only 17% can communicate in spoken Filipino and an even smaller number (2%) can communicate using spoken English. In addition, 18% reported than they can communicate in both written and spoken English while 16% can communicate in written and spoken Filipino. In contrast, as reported earlier, hearing parents often communicate in spoken *Filipino* at home (Republic of the Philippines, 2003). Additionally, Arevalo and Kusanagi (1995) reports that with hearing family and friends, the deaf uses a variety of modes including oral, manual language, home signs, gestures, and interactive writing. Thus, there is a discrepancy between the languages that the deaf children are exposed to at school (i.e., signs and predominantly spoken/written English) and at home (i.e., predominantly spoken Filipino).

In sum, Filipino deaf represent a sizeable group of individuals with numbers above 100,000. The deaf community is largely defined by its language and norms. Filipino Sign Language is influenced by American Sign Language but also incorporates local and regional signs. Communication issues of the deaf are complex. At school, a combination of signed and spoken language---typically English---is used. At home, communication is largely dependent on spoken Filipino, with an intermittent use of gestures and signs.

1.6 Overview of the present thesis

1.6.1 Rationale

Considerable research to date has been devoted to the social cognition of deaf children from predominantly Western cultures. Thus, there is now a well-established body of evidence showing that children with deafness have significant deficits in their understanding of mind and emotions. In particular, signing deaf individuals appear to have a slower rate of social cognitive development when they do not have access to native signers from early in development.

Notwithstanding the progress that has been made in this field to date, a number of key gaps are apparent in current evidence regarding the development of social cognition in deaf children. First, most previous studies have focussed on one or two components of social cognition, such as false belief understanding and emotion recognition. Current work in the domain of social cognition recognises that the domains of theory of mind and emotion understanding include a wide range of related processes. Thus, a full understanding of true competence in social cognition should not be reliant on the performance of just one or two skills. Second, related to the first point, prior work use a narrow set of tasks. As explained earlier, the ToM scale (Wellman & Liu, 2004) and the Test of Emotion Comprehension (Pons et al., 2004) address methodical limitations by assessing several aspects simultaneously using a largely uniform set of methods and procedures. Third, little research has been done among deaf children from non-Western cultures. Research from typically developing children demonstrate important cross-cultural differences in the development of theory of mind and emotion understanding (e.g., Cole, Bruschi, & Tamang, 2002; Lillard, 1997). However, there is a paucity of research examining the social cognition of deaf children from non-Western contexts and their comparative performance with typically developing children from the same community. Lastly, there is limited understanding of the predictors and sequelae of social cognition in deaf samples.

The research presented in this thesis examined the nature and sequence of development of theory of mind and emotion knowledge among deaf persons in the Filipino context. Additionally, known predictors of social cognition and consequences for social behaviour were explored. The work was informed both by current evidence regarding deafness and social understanding, as well as literature regarding relevant cultural practices and conventions of the Philippines. Unfortunately, there are limited studies done with Filipino deaf samples. Of those available, they are largely confined in the area of education, communication, socio-emotional development, and linguistics (Philippine Deaf Resource Center & Philippine Federation of the Deaf, 2004; Sanchez & Kusanagi, 1997). Thus, the present thesis contributes a landmark empirical investigation by using well-established measures to assess the development of social cognition of Filipino deaf persons.

1.6.2 Overall aims and research questions

The over-all aims of this thesis are to investigate the nature and sequence of development of social cognition in deaf Filipino individuals, and examine the extent to which such understanding is related to their age, verbal development, their communicative environment, and social competence. The thesis is comprised of five studies in which well-validated instruments were used to examine core domains in social cognition – theory of mind and emotion knowledge – in deaf individuals raised in the Philippines. Furthermore, their development is compared with typically developing hearing children from similar backgrounds, as well as the existing cross cultural literature. Given the cultural context and the existing literature on deafness and social cognition, there is a broad expectation that deaf individuals will have very poor social understanding in the domains of theory of mind and emotion knowledge. It is important to note that there is a substantial overlap in the participants included in the different empirical chapters. Detailed information about each study's sample are provided in their respective sections.

The specific aims and hypotheses of the aforementioned studies are outlined in detail across chapters 3 to 7. In broad terms, however, these studies addressed the follow topics:

Study 1. This study is comprised of two parts, the first of which examined the group differences in the development of ToM in a sample of deaf children, ages 8 to 14, vis-à-vis age matched hearing individuals as well as a younger sample of hearing children, ages 3 to 7. The literature shows that whist most typically developing children from international samples start to pass all these scaling ToM items by 6 or 7 years of age, deaf children suggests they don't reliably pass scaling tasks until 13 or 14 years of age (e.g., Wellman et al., 2011). Hearing children were selected to make meaningful developmental comparisons with the deaf group. The sequence of acquisition of ToM understanding is also examined. Part 2 of this study then investigates age-related improvements in an older deaf sample, ages 15 to 22.

Study 2. This study is similarly comprised of two parts. The first part examines the relations between individual differences deaf and hearing participants' language competencies and ToM development. In the second part, together with language ability, indirect measures of the communicative interactions in families with deaf children are examined. The study sought to determine whether language and the communicative environment, individually or jointly, influenced ToM development of deaf individuals.

Study 3. This study examines group differences in the development of two aspects of emotion knowledge (i.e., emotion understanding and affective recognition and labelling) in deaf and hearing individuals. More comprehensive assessments of affective recognition and labelling as well as emotion understanding are used to broaden the current understanding of deaf children's emotion knowledge. Additionally, the sequence of acquisition of component of emotion understanding is explored.

Study 4. This current study essentially replicates study 2 in that it examines whether language and the communicative environment play critical roles in the development of social cognition but, this time, in terms of emotion knowledge. This study also is comprised of two parts. The first part focusses on language ability in deaf and hearing participants. The second part explores different factors that influence communicative environment as a determinant of emotion knowledge in deaf individuals.

Study 5. This study investigates the associations between emotion understanding, theory of mind, and affective recognition and labelling on the social functioning of deaf individuals. In particular, this study examines the concurrent effects of these social cognitive predictors together with age and verbal ability. Based on teacher reports, three different indices of children's social competence are used including, peer social maturity, prosocial behaviour, and social difficulties.

Chapter 2: Overview of Methods

This chapter describes the participants and methodologies used in the studies presented in Chapters 3 to 7 of this thesis. Information regarding the specific participants included in each study, exact measures, and assessment procedures are additionally provided in the relevant chapters (see Table 2.1). It is important to note that the thesis featured a core sample of deaf participants who formed the focal comparison group discussed in the studies. In addition, sub-samples were introduced in some of the studies to address specific research questions of interest, or to provide a suitable comparison group for the variables of interest. This approach has been adopted so that there is clarity around the inclusion of subjects for each study, and so that there is no ambiguity surrounding the independence of the samples in the various studies.

2.1 Participants

The studies included in this thesis were conducted with a largely overlapping sample. Initially, n = 101 Filipino deaf participants aged between 8 and 22 years (referred to as the core sample), and n = 83 Filipino hearing participants aged between 4 and 14 years were recruited for this research. With the exception of one private tertiary institution with sizeable cohort of deaf students, all participants were recruited from public schools in urban Metro Manila, Philippines.

Table 2.1 *Sample Breakdown for the Separate Studies*

Study	Total (*N*) participants	Hearing status (*n*)	Age group	Notes	Measures used
1a	209	deaf (59) hearing (150)	8-14 yrs 3-14 yrs	Hearing children were further divided into two groups: 3-7 & 8-14 yrs	ToM scale EVT-2 SES
1b	42	deaf only	15-22 yrs	Older deaf sample only	ToM scale EVT-2
2a	251	deaf (101) hearing (150)	8-22 yrs 3-14 yrs	Hearing children were combined to form a single group Older and younger deaf participants were combined to form a single group	ToM scale EVT-2 SES
2b	100	deaf only	8-22 yrs	Core sample, excluding participant with hearing parents	ToM scale EVT-2 Parent interview
3	184	deaf (101) hearing (83)	8-22 yrs 4-14 yrs		TEC DANVA-2 EVT-2 SES
4a	184	deaf (101) hearing (83)	8-22 yrs 4-14 yrs		TEC DANVA-2 EVT-2 SES
4b	100	deaf only	8-22 yrs	Core sample, excluding participant with hearing parents	TEC DANVA-2 EVT-2 Parent interview
5	101	deaf only	8-22 yrs	Core sample	TEC DANVA-2 ToM scale EVT-2 PSMAT SDQ

Note. ToM = Theory of mind. TEC = Test of emotion comprehension. DANVA = Diagnostic analysis of nonverbal accurancy. EVT = Expressive vocabulary test. PSMAT = Peer social maturity scale. SDQ = Strengths and difficulties questionnaire. SES = Socio-economic status.

As mentioned, the research was conducted using a core sample comprised of $n = 101$ deaf individuals aged between 8 to 22 years, which was used either in its entirety or divided into younger versus older groups for theoretical reasons across the studies herein (see Table 2.1). Based on the pure tone average of the better ear, 72 were profoundly deaf (loss of 91 *db* or more), 20 were severely deaf (loss of 76-90 *db*), 8 were moderately deaf (loss of 46-60 *db*), and one had missing data. According to the Better Health Channel (State of Victoria Better Health Channel, 2017), a person with *moderate hearing loss* would have difficulty hearing normal conversations; a person with *severe hearing loss* would be unable to hear conversational speech, especially with background noise; while most sounds are rendered inaudible for someone with *profound hearing loss*. There were 10 deaf participants who never possessed any HT, 81 used hearing aids/body aid at one point but have subsequently stopped, and 3 frequent users --- 2 have hearing aids and 1 used cochlear implants.

There were 79 participants who had no deaf family members, 17 who had deaf relatives of varying degrees of consanguinity who were either deaf or hard of hearing, and 5 who had no family data. Based on school records or parent reports, the majority (80%) of the participants were pre-lingually deafened (i.e., lost hearing by or was diagnosed by 3 years of age). Only 6% were reported to have been diagnosed with deafness after the age of three or post-lingually deafened. There were missing data on 14% of the participants. The majority ($n = 77$) were enrolled in an all-deaf school with deaf or signing hearing teachers. There were 11 who attended mainstreamed classes with hearing classmates. In these mainstreamed settings, the teacher/interpreter translates lessons delivered orally by the main teacher into sign language for the deaf students in the classroom. In both the all deaf and the mainstreaming institutions, teachers used a simultaneous combination of signs and speech or SimCom. The rest ($n = 13$) were enrolled in a deaf program within a predominantly hearing college where deaf and hearing teachers used Filipino Sign Language. The reader is directed to §1.5.3 for a related discussion on the language associated issues for the Filipino deaf.

As noted above, the youngest deaf child recruited to the sample was 8 years of age. This relates to the realities of assessing deaf children in the Philippines. First of all, there are constraints of schooling and early years care of preschool aged deaf children. Due to a myriad of possible causes (e.g., late diagnosis), deaf children between 3 to 6 years of age mostly stay at home making identification and recruitment of potential participants challenging. Secondly, the majority of deaf children would have very basic language skills when they start school. Although tasks chosen had minimal language demands, testing required participants to have workable language skills for efficient transmission of instructions and vignettes. Lastly, sign language competence below 8 years would still be in its early stages. This means that communication with deaf participants less than 8 years of age, even with the help of an interpreter, would be problematic. Conversely, at 8 years of age, the participants were at least in their second year of primary school. This implied a minimum of one year of formal sign language instruction prior to testing. Taken together, these factors meant that the recruitment and assessment of very young deaf children was too difficult and unlikely to yield valid data on the development of social cognitive understanding using current standard methods for typically developing preschoolers. Thus, recruitment efforts were directed to school-aged deaf children.

The deaf participants were chosen based on existing literature on false belief understanding, the erstwhile litmus test of theory of mind. Difficulties in false belief among deaf children have been widely documented. For instance, the majority of deaf children do not pass classic false belief tests until after 13 years of age (Russell et al., 1998). Further delays were observed among cross-cultural samples such as Nicaraguan deaf adults (Pyers & Senghas, 2009). Thus, the recruitment of a substantial number of deaf adolescents and adults was deemed necessary to examine developmental effects.

Apart from the final study (study 5) which uses only the core deaf sample, the comparison sample of $n = 83$ typically developing hearing children and adolescents (28 males) used in the different studies were between the ages of 4.75 to 14.83 years (M_{age} = 9.78; *SD* = 2.86). The hearing children were selected to provide meaningful comparisons in terms of (a) age, (b) verbal ability, (c) socio-economic status, and (d) the existing literature on typical development. Indeed, theory of mind and emotion understanding were robustly associated with socio-economic status, verbal ability, and age among typically developing children (e.g., Cutting & Dunn, 1999). Hearing participants were, likewise, matched on non-verbal ability to ensure that the deaf sample was not cognitively behind the hearing controls, $t(171) = -1.02$, $p = .31$. Although suitable for the overall study, a consequence of this sampling strategy was that it did not yield a sample of hearing children well-suited to examine ToM development. The initial sampling only yielded a handful of children (n=10) recruited below the age of 6 whereas, the ToM literature shows that most typically developing children have mastered false belief understanding prior to 6 years of age (Wellman et al., 2001). Thus, an additional sub-sample of $n = 67$ hearing children, ages 3 to 6 years, were further recruited specifically to examine normative performance on the scaling ToM task. Accordingly, this supplementary sample only completed the scaling ToM and verbal ability tasks and is thus relevant only for studies 1 and 2.

2.2 Common measures

Table 2.1 also reports on the measures used in each of the studies included in this thesis. Among the six child measures, three were common in all of the studies. These measures are described below.

2.2.1 Verbal ability

Children's general language ability was measured using the Expressive Vocabulary Test – 2nd edition (EVT-2; Williams, 2007). There were some considerations in relation to scoring the test. Each correct response was given one point. Based on the acceptable answers provided in the test manual, a list of valid responses in Filipino was created in consultation with other native language speakers. A list of acceptable signed answers was, likewise, generated based on consultation with sign language interpreters and deaf adults. For instance, there are two acceptable answers for the word “nest.” As an example of a response using initialisation common among SEE2 users, an acceptable response for nest is described as the hands forming the letter “n” then moving upwards in shape of a basket. As an example of a natural sign commonly used by FSL users, an acceptable response for nest was described as the combined signs of “bird” and “basket.” An additional discussion regarding sign language variety used during testing is discussed in §2.3.2. Lastly, due to difficulties of real time sign language interpretation/translation, there were a few items that were incorrectly administered or for which the administrators inadvertently revealed the answer. These errors were very infrequent (proportional error rate for 268 subjects = .0014). Nevertheless, children’s raw verbal scores were converted to proportion correct scores (comprised of the number of items answered correctly divided by the number of items presented) to produce an index of verbal competence. The EVT has been successfully used in studies with deaf samples (e.g., Cullington, Hodges, Butts, Dolan-Ash, & Balkany, 2000; Ertmer, Strong, & Sadagopan, 2003; Geers, Moog, Biedenstein, Brenner, & Hayes, 2009).

2.2.2 Non-verbal ability

Used to match the deaf and hearing core comparison groups, non-verbal ability was captured using the Raven’s progressive matrices (Raven, Raven, & Court, 1998; Raven, 1956). According to the test manuals, the Raven’s Coloured Progressive Matrices (CPM; Raven, 1958) is appropriate for children between the ages of 5 to 11 years while the Raven’s Standard Progressive Matrices (SPM; Raven et al., 1998) is recommended for administration for participants between the ages of 6 to 80 years. Of the 251 participants, the majority (*n*=125) completed the SPM, 48 answered the CPM, and 78 had missing scores.

This scale has been used extensively among deaf samples (Armfield, 1985; Blennerhassett, Strohmeier, & Hibbett, 1994; Peterson & Siegal, 1995). However, there are no published norms with Filipino samples. Since some of the participants completed the CPM while the others answered the SPM each of which had a different total number of items, the non-verbal IQ score was computed by averaging scores based on the total number of test items completed.

2.2.3 Socio-economic status

In assessing the family's socioeconomic status (SES), the 4 item Family Affluence Scale by Currie et al. (2008) was used. Parents or older participants were asked 1) does your family own a car, van, or truck; 2) does your child have his/her own bedroom for himself/herself, 3) during the past 12 months, how many times did your family travel away on holiday, and 4) how many computers and laptops does your family own. This scale, developed as part of the WHO Health Behaviour in School-aged Children Study (see http://www.hsbc.org) by Currie et al. (1997), has been shown to have good criterion validity (Boyce, Torsheim, Currie, & Zambon, 2006). In addition, this scale was used due to brevity and ease in administration. Item 1 (car) was scored as 0 = none; 1 = yes, 1 car; and 2 = yes, 2 or more cars. Item 2 (bedroom) was scored as 0 = No; 1 = Yes. Item 3 (holidays) was scored as 0 = Not at all; 1 = Once; 2 = Twice; 3 = More than twice. Item 4 (computers) was scored as 0 = none; 1 = one; 2 = two; 3 = more than two. Scores can range from 0 to 9.

2.3 Procedures

2.3.1 Recruitment

Through the classroom teachers, participants were recruited via an invitational letter and information package sent either to the parents (for those below 18 years) or given directly to the student (for those 18 years and above) (see Appendix A). For the older deaf students in the college level, potential participants were invited to attend a recruitment session arranged through the school. During this session, pertinent information regarding the studies were provided and explained, including informed consent.

Ethics approval was gained for this research from the University of Sydney Human Research Ethics Committee (Project No: 2013/1060) and all participants had signed written informed consent prior to testing (see Appendix A). A token worth P100 (~A$2.50), either in cash or gift certificate, was given to study participants. Participants were recruited from public and private (fee-paying) schools in urban Metro Manila (also known as the National Capital Region), Philippines. Endorsements to conduct research among public school students were secured from the Department of Education (see Appendix B).

2.3.2 Testing procedure

Each child was tested individually in a designated area at the school by the researcher. She is a native speaker of Filipino but was unknown to the child prior to testing. At the start of testing, the researcher introduced herself and the aims of the study. Then, information regarding the testing session including consent, duration, and breaks were explained and concerns clarified. Sessions were recorded in audio and video format, unless otherwise precluded in the consent form. Responses were recorded on the data sheets.

Testing was performed based on the participant's preferred mode of communication. Hearing participants were given an option to be tested in Filipino or English. For the majority of the hearing participants, tests were administered in Filipino. Prior to testing with the typically developing children, the test protocols were back-translated into English to check Filipino versions. Accuracy of translations was independently confirmed by another native Filipino speaker. Disagreements were minor and readily resolved by discussion.

For the deaf participants, they were given an option to be tested orally or in sign language. All of the participants requested for the use of a sign language interpreter. The variety of sign language system used varied depending on the school. Majority of the participants matriculated from schools that used Simultaneous Communication or SimCom and were subsequently tested using Signing Exact English or SEE2 with predominantly English as the spoken component. On the other hand, those in the more natural sign settings, the interpreter incorporated more natural signs (i.e., Filipino Sign Language) in her discourse. Care was taken to ensure that the interpreters did not inadvertently provide the correct response or change the nature of the questions. Although the use of interpreters using standardised tests (e.g., EVT-2, CPM/SPM) have not been examined in the Filipino context, previous research comparing deaf and hearing children's scores on the standardised Wechsler Intelligence Scale for Children-III did not reveal any significant differences when administered by a sign language interpreter or by a fluent American Sign Language clinician or with oral-only directions (Sullivan & Montoya, 1997). Nevertheless, it is duly noted in the General Discussion that the use of interpreters may affect the validity of the testing procedure and results (see §8.4). Instructions and vignettes were given orally by the researcher. The interpreters then simultaneously translated the experimenter's spoken instructions, stories, and questions into sign language. Both adults ensured that narratives were understood clearly and the participant's attention was appropriately directed to the interpreter or materials (e.g., drawings or dolls) before continuing each part of the procedure. All signed responses were, likewise, simultaneously translated into oral language.

All responses in Filipino were translated into English for data coding and analysis. Reliability of translations was established independently on 67 (out of 150) hearing and 15 (out of 101) deaf participants. There was an agreement of 73 (out of 82) or 89% of the translations. Disagreements were minor and were readily resolved by discussion.

As regards the physical arrangement, the experimenter was seated either on the left or right hand side of the participant, depending on the venue provided by the school. For the deaf children, the interpreter was seated directly across the participant. This seating arrangement provided the deaf participant an unobstructed view of the interpreter's signs whilst having complete visual access to the researcher and vice-versa (see ***Figure 2.1***).

There was a fixed order in the administration of the tasks based on perceived complexity and level of difficulty. The session started with the theory of mind scale (Wellman & Liu, 2004) then the affective recognition and labelling task (Nowicki & Carton, 1993; Nowicki & Duke, 1994), followed by the emotion understanding scale (Pons et al., 2004), and the non-verbal IQ measure (Raven et al., 1998). The last task administered was the verbal ability test (Williams, 2007). Each task took approximately 10-15 minutes to complete, depending on age and hearing status of participant. Older participants tended to complete the tasks quicker while the deaf participants had a tendency to have longer testing times on each task due to delays caused by the interpreting.

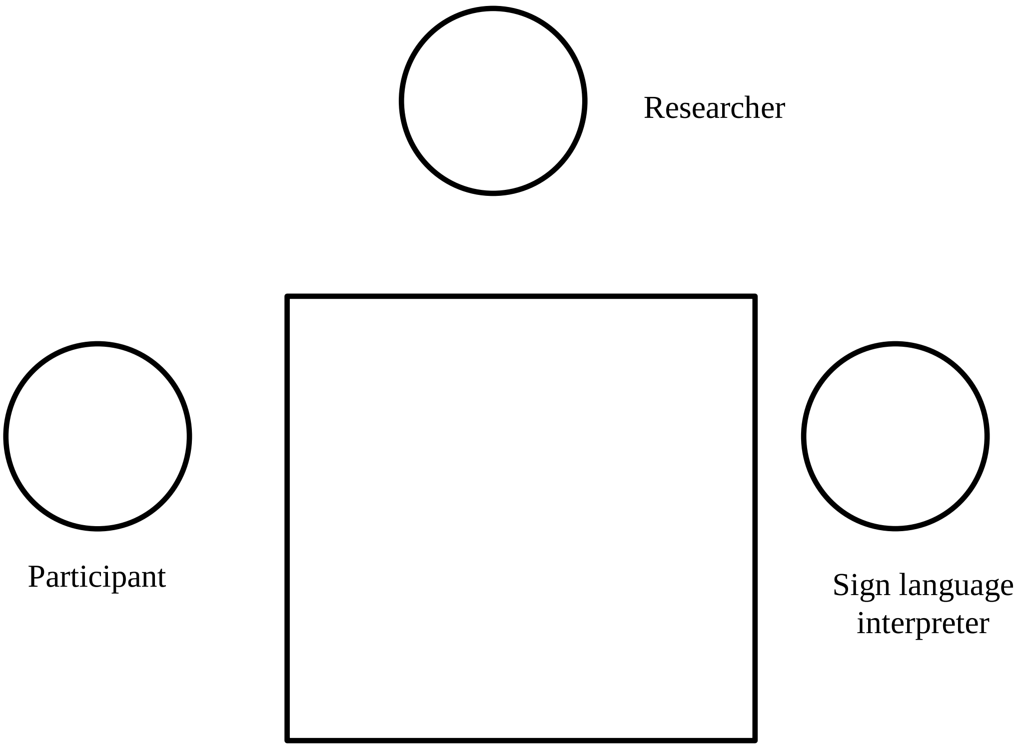

Figure 2.1 Sample seating arrangement during testing with deaf participants

Chapter 3: Studies 1a and 1b

Theory of Mind Development in Filipino Deaf and Hearing Individuals

3.1 Introduction

There are well-documented and profound delays in the understanding of mind amongst Western samples of deaf children of hearing parents relative to hearing children of hearing parents in their own communities. Such research has shown that delays in mental state understanding contribute to the social and behavioural difficulties both in hearing children (e.g., Bosacki & Astington, 1999; Fink, Begeer, Hunt, & Rosnay, 2014; Hughes & Leekam, 2004; Peterson, Slaughter, & Paynter, 2007) and the deaf (e.g., Peterson, Slaughter, et al., 2016). By contrast, there has been comparatively limited research investigating these associations among the deaf in non-Western cultures, and where such studies have been conducted they have almost exclusively focused on one aspect of mental state understanding: false belief mastery.

Importantly, it has also been established that different cultural norms can influence how individuals engage with each other in ways that either foster or hinder children's understanding of the mind. Whilst many contend that there is a high degree of uniformity in the development of mental state understanding across different cultures (e.g., Callaghan et al., 2005; Wellman et al., 2001), important differences have emerged in certain respects. First, there is a growing consensus that the age at which most typically developing children achieve false belief mastery is somewhat sensitive to culture, and a few language/cultural groups have been identified in which acquisition of false belief occurs very late in development (i.e., after 7 years of age). Second, while typically developing children within a broad cultural group acquire mental state constructs in a very predictable manner, and the same is true for deaf children in Australia for example, there have emerged some subtle but consistent differences in the pattern of acquisition between so-called *individualistic* and *collectivistic* cultures (see §

1.2.1) and it is not yet clear whether the acquisition sequences are consistent between hearing and deaf children from the same cultural groups. Therefore, in order to understand how deafness relates to mental state understanding in an as-yet unexamined cultural context, it is critical to establish not just the age and order in which deaf children master mental state constructs, but also how they compare to typically developing hearing children within the same culture. Currently, there is insufficient evidence to assume that the order of mental state construct acquisition will be the same for deaf and hearing children in the same culture, and it is also unclear whether the absolute lag between hearing and deaf children will be consistent across cultures.

Therefore, across the two studies presented in this chapter, ToM development of Filipino deaf participants was examined. First, the ToM performance of a group of deaf Filipino children and adolescents (aged 8 to 14) was compared to two groups of typically developing hearing children; one matched in age and another younger sample representing the age-window in which typical samples pass the scaling ToM tasks in the international research literature. Then, with an older deaf sample (ages 15 to 22), the possibility of further age-related improvements in ToM development were explored.

3.2 Study 1a

As described in the Introduction, there has been a pervading notion of a cross-cultural synchrony in the development of false belief understanding between 3 to 6 years of age, at least for typically developing samples (e.g., Callaghan et al., 2005; Wellman et al., 2001). Yet, a handful of studies have revealed important differences in false belief onset among typically developing children from different cultures and suggest that children in some contexts may not achieve false belief mastery until approximately 7 years of age or older (see Mayer & Träuble, 2013; Naito & Koyama, 2006; Vinden, 1996). In the deaf, findings from international samples converge in support of the claim that deaf children of hearing parents are significantly delayed in the acquisition of false belief, and that this delay may extend into adolescence (Morgan & Kegl, 2006; Russell et al., 1998).

While false belief tasks are the most widely accepted and best understood measures of children's theory of mind, more recent research has examined the acquisition of children's theory of mind reasoning in multiple conceptual domains. So-called *scaling ToM* assessments (see §1.2.1 for a discussion) have shown that, within a cultural group, children acquire mental state constructs in a predictable sequence that appears to be hierarchically organized. Interestingly, when international samples are compared, there have emerged some small differences in the order of construct mastery among typically developing children. Thus, in cultures such as Australia, United States, and Germany, children master the sequence in the following manner: diverse desires, diverse beliefs, knowledge access, false belief, and finally, hidden emotions (e.g., Kristen, Thoermer, Hofer, Aschersleben, & Sodian, 2006; Peterson & Wellman, 2009). By contrast, children from cultures such as Iran and China have been shown to follow an alternative sequence such that knowledge access is mastered prior to diverse beliefs; in other respects the sequence is the same (e.g., Shahaeian et al., 2011; Wellman et al., 2006).

Given the robust nature of the ordering of ToM development in typically developing children within a cultural group, it is of importance to determine whether deaf children adhere to the same sequence as hearing children in their cultural group despite any delays, or whether they follow a distinctive sequence. While current evidence is limited, those studies which have examined theory of mind scaling in deaf children in Australia suggest that deaf and hearing children adhere to the same sequence despite considerable delay in the deaf (O'Reilly, Peterson, & Wellman, 2014; Peterson et al., 2005; Wellman et al., 2011). In Swedish and US samples, the findings are less clear, and there are some notable inconsistencies between hearing and deaf children within the same culture (Holmer et al., 2016; Remmel & Peters, 2009).

Systematic variations that occur between cultures in theory of mind acquisition and differences that emerge between hearing and deaf children are both instructive because they point to mechanisms or practices that may help us understand the very nature of theory of mind development. Thus, for example (see §1.2.1 for a discussion), research with hearing children from different cultures alerts us to the social cognitive consequences of differing practices that characterize collectivistic and individualistic cultures (e.g., Shahaeian et al., 2014; Wellman et al., 2006). Similarly, individual differences research with hearing children (LaBounty, Wellman, Olson, Lagattuta, & Liu, 2008; Ruffman et al., 2002) and research with the deaf (e.g., Moeller & Schick, 2006; Peterson & Siegal, 1995; Peterson & Siegal, 1999; Schick et al., 2007), have alerted the research community to the profound impact of the communicative environment for theory of mind development (de Rosnay & Hughes, 2006).

Against this backdrop, there are some cultural values and parenting practices that are very prominent in the Filipino culture that could potentially impact children's understanding of mind. For instance, in the Philippines there is a common perception that young children are not independently minded (e.g., de la Cruz et al., 2001) and it has also been shown that Filipino parents endorse more authoritarian childrearing attitudes (Alampay & Jocson, 2011). Such practices could lead Filipino parents to engage in simpler, less mentalistic conversations or suppress any dissenting opinion, which constrains the importance of perspective taking. Taken together, these factors might have negative implications for the development of the Filipino child's understanding of the mind because of the documented association between parents' willingness to engage with their children's mentalistic perspective and the child's developing understanding of mind (e.g., Meins et al., 2013; Ruffman et al., 1999; Vinden, 2001). It is important, therefore, to establish whether growing up in the cultural context such as the Philippines is related to ToM performance of Filipino children; a question which can be initially approached by simply comparing the performance of Filipino children on standard ToM tasks with the well-documented performance of children from other countries and language groups on these same measures. This initial information will also provide a foundation for understanding the nature and extent of delay in theory of mind understanding that can be expected to emerge, based on previous literature, in the Filipino deaf.

In study 1a, ToM performance of deaf children and adolescents, ages 8 to 14, was examined vis-à-vis two samples of typically developing children. The choice of these two hearing groups was theoretically motivated based on the existing literature which shows the importance of both age and, more critically, the development of language ability and communicative competence on children's ToM development. Thus, an *age comparison group* of hearing children and adolescents was selected to test how ToM performance in Filipino deaf children compares with Filipino hearing children of the same chronological age. Based on the existing literature showing that most typically developing children have mastered the core ToM constructs prior to 8 years of age (e.g., Wellman & Liu, 2004), there was reason to expect, *a priori*, that the age comparison group would be approaching ceiling on the traditional ToM constructs assessed in the literature **(hypothesis 1)**. By contrast, it was expected that deaf children's theory of mind would be delayed compared to age comparison hearing children and that deaf children in the selected age range would still not be at ceiling on the scaling theory of mind tasks **(hypothesis 2).**

The second comparison group consisted of younger hearing Filipino children and was selected to correspond to the age ranges in which the international research literature has consistently shown children mastering the core scaling ToM constructs, as described above. This comparison group, which consisted of hearing children between 3 and 7 years of age, was termed the *ToM comparison group* because it was expected that, developmentally speaking, this age range would provide a more appropriate comparison of ToM performance for deaf children. Importantly, it was expected that language development in this younger group would also more closely resemble the deaf sample. With regard to this latter ToM comparison group, deaf children were expected to perform similarly to these younger children on the overall ToM scale (**hypothesis 3**). Given the lack of existing data on theory of mind in Filipino children, more precise predictions were not warranted.

The study design also allowed a broader comparison between ToM development in Filipino children (hearing and deaf) and other international samples based on previous independent research using the same ToM scale. This cultural dimension is important because current evidence suggests that cultural influences are important for ToM development and any delays in the deaf, if present, need to be understood both in terms of universal and cultural influences. Thus, whilst the Filipino children were expected to be relatively delayed in theory of mind acquisition based on the parenting and cultural norms described above (**hypothesis 4**), due to the close adherence to more collectivistic parenting practices, the order of understanding of the different ToM concepts of typically developing Filipino children was expected to progress in a sequence mirroring non-Western cultures such as China (Wellman et al., 2006) and Iran (Shahaeian et al., 2014; Shahaeian et al., 2011) **(hypothesis 5)**. The order of mastery for deaf children, as discussed above, was of theoretical importance because of the implications for understanding the nature of the delay in this population.

3.3 Method

3.3.1 Participants

Two hundred and nine Filipino children between 3 and 14 years of age participated in the current study. Summary statistics are presented in Table 3.1 for each group; deaf, age-comparison, ToM comparison. The reader is referred to chapter 2 for a full description of the sample and the association between the sample reported here and the other studies of this thesis (see Table 2.1).

Table 3.1 *Characteristics of Participants in Each Group in Study 1a*

	Deaf	**Hearing**	
		Age comparison	ToM comparison
No. of participants	59	53	97
Mean Age (*SD*)	12.21 (1.87)	11.66 (1.57)	5.33 (1.07)
Age range	8 to 14.58	8.75 to 14.83	3.33 to 7.92
Gender (male, female)	(30,29)	(18,35)	(42,55)
Socio-economic status (*SD*)	1.29 (1.43)[a]	2.38 (1.39)	1.66 (1.31)
Verbal ability (*SD*)	.30 (.05)[b]	.49 (.10)	.23 (.06)

Note: N = 209. SD = Standard deviation.
[a]n= 58. [b]n=56.

3.3.2 Measures

Theory of Mind Understanding. Children's theory of mind understanding was tested using the theory of mind scale developed by Wellman and Liu (2004). Children were presented with five tasks measuring different domains in ToM, including false belief. The different items are briefly described in Table 3.2. Conceptually, each task asked the child to judge between two specific contrasts. For example, between two characters' respective inner states such desires or beliefs or between an inner mental state and reality (e.g., expressed emotions). All tasks involved a focal test question and at least one control question, a pre-test question, or both. To assist comprehension, each task was accompanied by a coloured line drawing and/or toy. For the younger children, dolls were used to represent the protagonists in the story while the older participants were presented with drawings of people in lieu of the dolls.

Table 3.2 *Description of the Scaling ToM tasks (Wellman & Liu, 2004)*

Task	Brief task description
Diverse desires (DD)	The child chooses between two snack options (i.e., cookie and carrot). The child judges the snack choice of another character who has an opposite preference from the child.
Diverse beliefs (DB)	The child chooses between two possible locations (i.e., bushes or garage) where a pet maybe hiding and is informed that the character thinks that the pet is in the opposite location. Without knowing the true location of the pet, s/he must judge where the other character will search.
Knowledge Access (KA)	The child is shown a toy dog inside a drawer and is asked if a character will know what is inside the closed drawer without having opened it before.
False Belief (FB)	The child is shown a toy pig inside a Crayola box. S/he must then judge what someone else will think is inside the box without having seen the box's contents.
Hidden emotions (HE)	The child is told that a character is being teased by friends. The child is asked to judge how a boy will feel and what emotion it will show on his face.

The tasks were administered in the format described by Peterson et al. (2005), which had been slightly modified from the original Wellman and Liu (2004) version to match the language needs of deaf participants. In the present investigation, a few minor changes were made to the wording or stimuli used to make them more familiar to Filipino children. In particular, 'tea' was substituted with 'snack' and 'lady' with 'woman', and the box of Band-Aids was substituted with a box of crayons (see Appendix C for the exact wording of the narrative, procedures, and illustrations used during the experiment).

Following Wellman and Liu (2004), correct responses to the test questions and the associated control questions were required to be considered a pass. Children were awarded a score of '1' for each task passed. Like Peterson et al. (2005), a 'Why?' question was also included following the picture-pointing responses for the apparent emotion test question in the Hidden Emotion task. This was to guard against mistakenly giving children a pass.

Likewise, Shahaeian et al.'s (2011) strict scoring scheme was adopted to ensure that the child truly recognized the difference between the character's true feelings and the emotion he displayed on his face. Thus, to be given a pass at the Hidden Emotion task, children were required to provide an appropriate justification to demonstrate a clear understanding of the discrepancy between the outward expression and the internal feelings of the story character. An example of a correct justification was "he doesn't want to show his real feelings." Responses that did not indicate story comprehension (e.g., "I don't know") or were irrelevant to the story (e.g., "he was bored") were considered incorrect. Reliability for the hidden emotion responses was established on 68 children (33%) of the participants by an independent coder and there was an agreement of 66 (out of 68) or 97%. Disagreements were minor and were readily resolved by discussion. The remaining sample was coded by the current author.

Other measures. Verbal ability was assessed using the Expressive Verbal Test – 2nd edition (EVT-2; Williams, 2007). Socio-economic status (SES) was measured using 4-item scale by Currie et al. (2008) which has been widely employed in developing countries. For a full description of these tasks, see methods §2.2.1 and §2.2.3, respectively.

3.3.3 Procedure

See §2.3 for a full description of the procedure.

3.3.4 Analytic plan

The initial analyses in this study focussed on group differences between deaf and hearing (age comparison and ToM comparison) children in ToM understanding as measured on the scaling ToM tasks. Individual tasks were compared descriptively (see Table 3.3) and the number of tasks passed by children were examined by group and compared with previous findings in Table 3.4. Mean performance on the scaling ToM tasks (/5) were examined using a 3(group) X 2(gender) ANOVA to establish whether group differences were significant and whether they were moderated by gender. Follow up analyses were conducted with verbal ability and SES as covariates to establish whether group differences between deaf and hearing children are due to covariation in these variables, which have been shown in the literature to be associated with ToM development. Chronological age was not used as a covariate because the hearing children were grouped by age. Following these analyses on children's overall performance, the sequence of ToM understanding for both groups was examined using Guttman scalogram analyses; Green's (1956) methods were used to establish if the items conformed to a perfectly ordered scale. See Appendix G for the syntax.

3.4 Results

Results are presented in two parts. First, differences in ToM performance (on each task and total ToM) are examined. This is followed by an examination of the sequence of ToM task mastery in keeping with Wellman and Liu (2004).

3.4.1 Group differences in ToM

Numbers and percentages of children in each group who passed each ToM scaling task, as well as a ToM total (mean) score representing the sum of the tasks each child passed (/5), are shown in Table 3.3. Inspection of task scores showed that hearing children in the age comparison group were approaching ceiling for the individual tasks, consistent with expectations (**hypothesis 1**). There was, however, a perceptible dip in performance for the last task, hidden emotions. In contrast, the ToM comparison children only approached ceiling performance on diverse desires. These children performed relatively well on diverse beliefs and knowledge access but very poorly on false belief and hidden emotion. The profile of responding for the deaf was somewhat similar to ToM comparison but there were also some notable differences. Deaf children were not as competent as their hearing counterparts on diverse desires and knowledge access, but like ToM comparison children, were very poor on false belief and hidden emotion (**hypothesis 2**). Regarding false belief understanding specifically, there was clearly a developmental shift between the ToM comparison group (7% passed) and the age comparison group (96%). This pattern of findings confirms that Filipino hearing children, like children from Samoa, are very late to pass false belief compared to most international samples.

Table 3.3 *Numbers (%) and Total Mean Scores of Children passing ToM tasks by Group*

	Deaf	Hearing	
		Age comparison	ToM comparison
Tasks	8 to 14 years old (*n*=59)	8 to 14 years old (*n*=53)	3 to 7 years old (*n*=97)
Diverse desires	46 (78)	49 (93)	90 (93)
Diverse beliefs	44 (75)	49 (93)	58 (60)
Knowledge access	6 (10)	51 (96)	48 (50)
False belief	4 (7)	51 (96)	7 (7)
Hidden emotions	3 (5)	41 (79)[a]	8 (8)[b]
Mean total (*SD*)	1.75 (.86)	4.58 (.64)[a]	2.17 (.91)[b]
Range of mean total scores	0 to 4	3 to 5	0 to 5

Note. SD = Standard deviation.
[a]*n*=52. [b]*n*=96.

To allow a clearer comparison between the performance of Filipino deaf and hearing (ToM comparison) children on the scaling ToM tasks and other samples, Table 3.4 presents the mean age for each incremental ToM total score and equivalent data for the seminal paper by Wellman et al. (2011). Table 3.4 shows that, within the Filipino context, deaf children were delayed in all of the steps in comparison to the hearing children (**hypothesis 3**). In fact, on average, deaf children only passed at least one scale item after 11 years of age. In contrast, hearing children were able to complete most (at least 3 out of 5) at an average of 5.6 years. In addressing **hypothesis 4**, comparison with the data from Wellman et al. (2011) shows that Filipino deaf children were not only delayed compared to Filipino hearing children but they were also behind deaf children from the Australian sample. Similarly, Filipino hearing children were shown to be behind other typically developing children from the US and China.

Table 3.4 *Average Ages of Children Passing Incremental Total Scores on the ToM Scale*

	0/5	1/5	2/5	3/5	4/5	5/5
	Participants in the current study					
Mean deaf (n=59)	11.6	12.0	12.3	12.6	13.6	–
SD	2.5	2.0	1.9	1.1	–	–
(No. of children)	(6)	(12)	(33)	(7)	(1)	–
Mean hearing (n=96)[ab]	5.8	4.8	5.2	5.6	6.9	7.3
SD	2.6	0.7	1.1	0.9	0.4	–
(No. of children)	(2)	(20)	(40)	(29)	(4)	(1)
	Data from Wellman, Fang, and Peterson[c]					
Mean US hearing (n=31)	–	4.1	4.2	4.4	5.1	5.5
SD	–	0.2	0.4	0.6	0.6	0.4
Mean Chinese hearing (n=31)	–	3.6	3.6	3.9	4.9	5.3
SD	–	0.5	0.3	0.5	0.7	0.7
Mean Australian deaf (n=31)	7.1	6.9	8.0	11.0	11.6	13.6
SD	2.0	3.1	2.0	2.3	1.2	1.4

Note. SD = Standard deviation.
[a]ToM comparison hearing group. [b]There was 1 child who had missing total TEC score. [c]Table adapted from Wellman et al. (2011, p. 787).

A 3 (group) X 2 (gender) ANOVA with ToM total as the dependent variable was conducted to examine group and gender differences. Results revealed there was no main effect for gender in ToM total scores, $F(1,201) = .05$, $p = .83$, nor was there a significant gender by group interaction, $F(2,201) = 1.25$, $p = .29$. By contrast, there was a significant main effect for group, $F(2,201) = 167.63$, $p < .001$, partial η^2=.63. Post-hoc Tukey tests showed that age comparison group significantly outperformed both the deaf, $M_{\text{diff}} = 2.83$, $p < .001$, and ToM comparison groups, $M_{\text{diff}} = 2.41$, $p < .001$. However, contrary to expectations, the ToM comparison group also outperformed the deaf group, $M_{\text{diff}} = .42$, $p = .01$.

A follow up 3(group) x 2(gender) ANCOVA was conducted to examine if group differences between deaf and hearing children remained when covariation in language ability and SES, two known predictors of ToM (Cutting & Dunn, 1999; Hughes & Devine, 2017), were accounted for. As expected based on previous research, verbal ability emerged as a significant covariate, which independently contributed to children's ToM performance, $F(1,195) = 10.75$, $p = .001$, $\eta^2 = .05$. However, this effect of verbal ability on ToM did not explain the poor performance of deaf children on the scaling ToM task relative to hearing children. Thus, the main effect of group remained significant, $F(2,195) = 54.46$, $p < .001$, partial $\eta^2 = .36$. Post-hoc multiple comparisons with Bonferroni adjustment showed that age comparison significantly outperformed both the deaf, $M_{\text{diff}} = 2.31$, $p < .001$, and ToM comparison groups, $M_{\text{diff}} = 1.71$, $p < .001$. The ToM comparison group also outperformed the deaf group, $M_{\text{diff}} = .60$, $p < .001$. There was no significant main effect for gender and SES was not a significant covariate.

The ANCOVA described above shows a strong association between hearing status and ToM exists even after controlling for the effects of age and SES. Given the strong association between language and ToM, another approach is to match the deaf sample with a typically developing sample of the same level of verbal ability. Thus, a post hoc ANOVA was conducted on a sample of deaf children and a group of typically developing children who were matched on verbal ability first then as close as possible to age and sex. Results revealed that over and above SES and age, hearing status still continued to have a huge impact on ToM even when samples were verbally matched, $F(1,107) = 108.22$, $p < .001$ partial $\eta^2 = .50$.

3.4.2 Scaling ToM in Filipino deaf and hearing

For the scaling analyses, hearing and deaf children were evaluated independently. The age and ToM comparison groups were combined to form a single group of hearing children. Table 3.5 presents the scaling ToM tasks based on increasing level of difficulty as determined in the original study conducted by Wellman and Liu (2004); i.e., diverse desires > divers beliefs > knowledge access > false belief > hidden emotion. Guttman scalogram techniques by Green (1956) were used to determine if the observed frequencies for each item fit the theoretical prediction of a perfectly ordered scale. Using this method, a correct answer in one item, predicted to be more difficult, presupposes that a person would have successfully responded to all easier items.

Table 3.5 also presents the Guttman sequences for both the original Western and the alternative non-Western patterns. The majority of the deaf and hearing children ascribed to the original sequence. In fact, examination of frequencies for each pattern by hearing status revealed that 47 (80%) of the 59 deaf children matched the original scale sequence reported by Wellman and Liu (2004). Likewise, 113 (76%) of the typically developing hearing children conformed to same pattern. These findings are consistent with those of Australian deaf children and adolescents (Peterson et al., 2005) and typically developing US and Australian preschoolers (Shahaeian et al., 2011; Wellman & Liu, 2004). The coefficient of reproducibility or the goodness of fit of a sample's data to a predicted Guttman sequence was computed following Green's (1956) methods where values greater than .90 are deemed significant. In the current sample, the data for the deaf and hearing children yielded indices of reproducibility of .96 and .95, respectively. Thus, on the basis of Green's (1956) methods, the sequences of the deaf and hearing were significantly scalable and that Filipino children progressed through the five steps in a sequence following the original pattern observed for US and Australian children (**hypothesis 5**).

Table 3.5 *Guttman Scalogram for the Five ToM Tasks by Group*

Original Western sequence:

Task/Pattern	Pattern of success (+) and failures (-)						Guttman total
	1	2	3	4	5	6	
Diverse desires	-	+	+	+	+	+	
Diverse beliefs	-	-	+	+	+	+	
Knowledge access	-	-	-	+	+	+	
False belief	-	-	-	-	+	+	
Hidden emotions	-	-	-	-	-	+	
Guttman totals							
Deaf (*n*=59)	6	7	30	4	0	0	47 (80%)
Hearing (*n*=148)[a]	2	18	24	24	10	35	113 (76%)

Note. ToM = Theory of mind. Diverse beliefs item comes before knowledge access.
[a]Two participants were excluded due to missing hidden emotion scores.

Alternative Non-Western Sequence:

Task/Pattern	Pattern of success (+) and failures (-)						Guttman total
	1	2	3	4	5	6	
Diverse desires	-	+	+	+	+	+	
Knowledge access	-	-	+	+	+	+	
Diverse beliefs	-	-	-	+	+	+	
False belief	-	-	-	-	+	+	
Hidden emotions	-	-	-	-	-	+	
Guttman totals							
Deaf (*n*=59)	6	7	0	4	0	0	17 (29%)
Hearing (*n*=148) [a]	2	18	12	24	10	35	101 (68%)

Note. ToM = Theory of mind. Knowledge access item comes before diverse beliefs.
[a]Two participants were excluded due to missing hidden emotion scores.

3.5 Discussion

The current study was designed to examine group differences in ToM understanding in a sample of Filipino deaf and hearing children, and explored if the sequence of acquisition of ToM concepts of Filipino children was similar to previous findings. The novel contribution of the current research was to investigate ToM development of deaf and hearing children in an erstwhile unexplored non-Western cultural sample using scaling ToM tasks that have been used with deaf and hearing children from Western cultures, and to examine how deaf children compare to two groups of typically developing hearing children--- a ToM comparison group and an age-matched group---from the same community. Consistent with expectations, age-matched typically developing children, ages 8 to 14, were approaching ceiling in all of the scaling ToM tasks **(hypothesis 1).** As predicted, Filipino deaf children were severely impaired in their ToM performance compared with age matched typically developing children overall **(hypothesis 2)**, and they only performed relatively well on the simplest tasks (diverse desires and diverse beliefs) typically mastered by preschool children in international samples. However, contrary to predictions, the deaf performed poorer than the ToM comparison children, ages 3 to 7 **(hypothesis 3)**. Possible explanations for this are addressed later. As expected, Filipino children were delayed compared to children from other cultures **(hypothesis 4)**.

Regarding the ToM sequence **(hypothesis 5)**, results of the Guttman analyses confirmed that deaf Filipino children demonstrate a reliable sequential development of ToM understanding similar to Filipino hearing children, albeit delayed. Contrary to expectations, deaf and hearing Filipino children demonstrated an understanding of diversity in beliefs prior to knowledge access, which is consistent with the ordering found with children from individualistic cultures like the United States (Wellman & Liu, 2004) and Australia (Peterson et al., 2012), rather than collectivistic cultures like China (Wellman et al., 2006) and Iran

(Shahaeian et al., 2014; Shahaeian et al., 2011). Whilst this finding was not expected, it is interesting to note that children from Indonesia, which is also a more collectivistic culture than Australia or the US, also show the same ordering of items as Filipino children (Kuntoro et al., 2013). In light of such findings, it seems that a crude individualistic–collectivistic distinction cannot explain cultural influence on ToM development and may need to give way to a more nuanced cultural interpretation that emphasises the actual practices and communicative behaviours that distinguish these different communities. The implications of these findings are dealt with in the General Discussion (Chapter 8).

There is a sharp distinction between the performance of the ToM comparison group and the age comparison group, such that the former performed very poorly on false belief and hidden emotions, but that delay, in comparison with other international samples (see Wellman et al., 2011), is not apparent in the older comparison group. Given the performance of the Filipino deaf children, these findings from the hearing samples suggest that apparent ToM delays in the deaf may also be overcome in an older sample. Thus, in study 1b, ToM understanding is examined with an older sample of Filipino deaf using the same scaling ToM tasks.

3.6 Study 1b

Study 1a yielded three important insights on deaf children's ToM performance. First, deaf children followed the same sequence of ToM understanding as hearing children. Second, deaf children experienced profound delays in theory of mind understanding compared to typically developing children. Lastly, examination of individual item scores showed that deaf children did well in tasks measuring diversity in desires and beliefs but even at 14 years of age, deaf children had particular difficulties in understanding knowledge-ignorance, false beliefs, and intentional concealment of emotions. Initially, typically developing children (ToM comparison group) also displayed poor performance in the false belief and hidden emotions tasks, contrary to expectations. However, scores of older Filipino hearing children (age comparison group) helped clarify these delays. By around 7 years of age, Filipino hearing children were able to successfully complete the ToM scale (see Table 3.4). Thus, the main aim of this smaller follow up study was to examine the extent to which similar age-related gains are found in older deaf Filipino individuals, particularly with regard to improvement in the performance on the knowledge access, false belief, and hidden emotion tasks.

Current studies on ToM growth of deaf individuals beyond adolescence have been few in number and limited in scope. Prior literature suggested that there are minimal improvements in ToM among deaf children below 8 years old (Courtin, 2000; Courtin & Melot, 1998; Woolfe, Want, & Siegal, 2002). In contrast, work among older deaf individuals show significant advances in ToM performance during late childhood, adolescence, and well into their adult years. For instance, in testing *n* = 32 4 to 16 year old deaf children from the United Kingdom, Russell et al. (1998) found that only 17% of deaf children aged 4 to 7 years passed while the majority (60%) of the 13 to 16 year olds correctly answered the false belief tasks. Likewise, a study among *n* = 54 deaf children and adolescents (ages 6 to 19 years) from Spain showed an increasing pass rate in false belief tests from almost none of the 6-10 year olds to 90.9% of the 14-19 year old participants (González, Quintana, Barajas, & Linero, 2007). Even work on the wider range of ToM concepts using the Wellman and Liu (2004) scale showed that deaf children prior to 10 years of age did not demonstrate much gains in ToM understanding, beyond diverse desires and beliefs. Nevertheless, Wellman et al. (2011), using a longitudinal design testing children at three time points, found that Australian deaf children demonstrate significant improvements in ToM understanding between ages 10 to 13 years --- with deaf children only demonstrating an understanding of hidden emotions after 11 years of age. These results, whether on the narrow false belief task or the wider ToM scale suggest that deaf children's early ToM difficulties will be resolved over time. Having said that, there appears to be at least one culture (i.e., Nicaragua) where there was some indication that deaf adults still experienced delays in false belief understanding during adulthood (e.g., Morgan & Kegl, 2006).

The current study investigated developmental effects of ToM growth in older deaf individuals, aged 15 to 22 years. More specifically, the present study aimed to evaluate the relationship between age and ToM understanding. To achieve these, direct comparisons were made with the performance of the younger deaf sample in study 1a to reveal any improvements in ToM growth within deaf individuals from the same cultural group. In line with age trends observed in previous literature (e.g., Ruffman et al., 1999), it was hypothesised that older deaf sample will perform better than the deaf children in study 1a.

3.7 Method

3.7.1 Participants

Forty-two deaf individuals (*M* = 18.58 years; *SD* = 2.22; range 15.25 to 22.17) participated in the study. There were 31 males. With the exception of one participant, the rest had hearing parents.

3.7.2 Measures and procedure

The testing procedure and measures were the same as in study 1a.

3.7.3 Analytic plan

A *t*-test was conducted to assess for gender differences. Then, descriptive statistics were examined. Differences in proportion scores were then subsequently compared. Finally, *t*-tests were used to compare total mean scores of both groups. See Appendix G for the syntax.

3.8 Results

Gender differences were first examined. There were no significant differences in ToM based on gender, t (40) = -.10, p = .92. Therefore, in all further analyses, gender was collapsed.

Table 3.6 shows participants' mean scores and standard deviations on the individual tasks as well as total ToM score. For purposes of comparison, scores of the 8 to 14 year old deaf children in study 1a were also included. Examination of raw scores showed that the majority of the older deaf passed the first two steps (i.e., diverse desires and diverse beliefs). Almost half passed knowledge access, less than a quarter passed false belief, and only a few understood hidden emotions. Total mean scores showed that the older deaf did better than the younger deaf from study 1a.

Table 3.6 *Numbers (%), Total Mean Scores, and Proportion Differences*

		Study 1a			
Tasks	Deaf 15 to 22 (*n*=42)	Deaf 8 to 14 (*n*=59)	Absolute proportion difference	z-score for the difference	*p*-value (two tailed)
Diverse desires	28 (67)	46 (78)	.11	1.27	.21
Diverse beliefs	30 (71)	44 (75)	.03	.35	.72
Knowledge access	18 (43)	6 (10)	.33	3.80	<.001
False belief	13 (31)	4 (7)	.24	3.20[a]	.001[a]
Hidden emotions	5 (12)	3 (5)	.07	1.25[a]	.21[a]
Mean total (*SD*)	2.24 (1.30)	1.75 (.86)	–	–	–
Range	0 to 5	0 to 4	–	–	–

Note. SD = Standard deviation.
[a]Calculated using Social Science Statistics calculator. The rest was calculated using VassarStats.

To examine differences between groups more closely, differences in proportion scores were calculated using the VassarStats online tool[2] and the Social Science Statistics online tool[3]. Table 3.6 presents the results of the differences in proportion values. Results revealed that there were no significant differences in the proportion of participants who passed the

[2] http://vassarstats.net/ (see Significance of the Difference Between Two Independent Proportions)
[3] http://www.socscistatistics.com/ (see Z Score Calculator for 2 Population Proportions)

diverse desires, diverse beliefs, and hidden emotions tasks in studies 1a and 1b. Around 30% of the older deaf group continued to demonstrate problems with the first two tasks. Differences in the proportion of deaf individuals passing knowledge access and false belief, however, were significant. Although, despite significant findings, results for the false belief and hidden emotions should be interpreted carefully since they violate one of the assumptions in computing for proportions i.e., samples must have equal to or greater than 5 units (Lowry, 2017).

In order to examine whether the current sample performed better than the deaf children from study 1a overall, an independent samples *t*-test was conducted. This analysis revealed that the scaling ToM mean score of the current sample was significantly higher than the deaf children from study 1a, $M_{diff} = -.49$, $t(66) = -2.14$, $p = .04$, although it is notable that the overall mean difference was not large. This is in line with past evidence of age-related trends in ToM performance (Wellman et al., 2011). Nevertheless, the older deaf children were still far from the accomplishments of the hearing 8- to 14-year-olds in study 1a, $M_{diff} = 2.34$, $t(57) = 10.65$, $p < .001$.

3.9 Discussion

The current study was designed to examine ToM development in a group of older deaf individuals. The novel contribution of the current investigation was to compare ToM performance of older and deaf individuals from the same community, in terms of individual scaling ToM tasks as well as overall ToM. Results showed that the older deaf in the current sample had significantly better ToM understanding overall than the 8 to 14 year old deaf children in study 1a. Despite this, they seemed to demonstrate persistent difficulty at the individual task level.

3.10 General discussion

There is presently no question as to *whether* the deaf possess a theory of mind, yet key questions remained as to *when* deaf children from non-Western cultures master mental state understanding (not just false belief), *what* the order of progression of ToM understanding is like, and *how* this sequence compares with hearing children in the same cultural context. Overall, based on current findings, there was evidence of impaired ToM development of Filipino deaf individuals, aged 8 to 22 years, compared to typically developing children from the same community. This converges neatly onto previous evidence of profound delays in deaf children of hearing parents from other cultures (e.g., Courtin, 2000; Peterson & Siegal, 1995; Peterson & Siegal, 1998; Schick et al., 2007).

In study 1a, not only did Filipino deaf children perform poorly compared to typically developing children from the same culture, but they were worse than deaf children from Australia in terms of over-all performance in the scaling ToM tasks (e.g., Wellman et al., 2011). There are two possible explanations for this finding. First, the joint effects of cultural parenting practices and communication difficulties experienced by Filipino deaf children have a profound impact on deaf children's ToM understanding. As discussed in chapter 1, deafness results in limited access to conversations, a restriction in topics during conversational interactions, and less exposure to mental state language (Marschark, 1993; Morgan et al., 2014). One could argue that mothers may attempt to overcompensate in the kinds of conversational interactions, in light of their children's hearing loss. In fact, Filipino mothers of children with disabilities often see their roles as facilitators of their children's growth by providing opportunities and experiences for play, including responding to children's actions (Santos & Mccollum, 2007). However, in the context of mental states, this scenario is unlikely given that Filipino mothers are less inclined to engage young children in mentalistic conversations, likely due to the belief that they lack the maturity to comprehend their complex environment (de la Cruz et al., 2001). Second, in light of the complex nature of communication in the Philippines, communication difficulties of Filipino deaf individuals are likely enhanced. Based on a report by the Philippine Federation of the Deaf (2007), there are important variations in the spoken language component used to accompany signs in deaf classrooms that use simultaneous communication. Indeed, the majority of the study respondents said that teachers often use spoken English or a combination of English and Filipino in combination with signs. Yet, the majority (94%) of families from Metro Manila where the current sample is from communicate in Filipino at home (Republic of the Philippines, 2003). Thus, even in the unlikely chance that the deaf person is fluent in lip-reading and/or spoken communication, the spoken language they are exposed to in school is not the same as the language commonly used at home. Thus, even if, for example, a family member attempts to engage the deaf person in a mentalistic conversation, the discourse brought about the use of multiple spoken language used will be, at best, confusing and likely ineffective.

Analysis of individual task performance showed three interesting points to consider. First, deaf individuals appear to be better in understanding diversity in desires and beliefs. These findings provide converging evidence on possible universal childrearing practices that support perspective taking skills in children, irrespective of barriers to communication (e.g., Peterson et al., 2005; Rieffe & Terwogt, 2000; Steeds et al., 1997). Second, delays in false belief and hidden emotions are not altogether surprising given their known difficulties in these areas as evidenced by previous studies (e.g., Courtin, 2000; Hosie et al., 2000; Pyers & Senghas, 2009; Russell et al., 1998). However, persistent difficulty with understanding knowledge access was unexpected. These findings are not in agreement with Peterson et al. (2012) although consistent with Peterson and Wellman (2009). Three possible explanations are raised. First, previous research has revealed that typically developing Filipino children are able to understand that knowledge is linked to perceptual access as early as 5 years of age (Liwag & Tiangco, 1999). However, it is possible that this understanding develops later in deaf children because, due to communication difficulties, they receive limited explanations for how events take place. Thus, observed difficulties may not necessarily reflect an inability to deal with mentally representing two competing ideas (i.e., what the child can perceive versus knowing what the protagonist knows/doesn't know), rather, they may lack the knowledge to recognise and comprehend the apparent contradiction between these two events. Second, deaf children appear to have difficulty applying knowledge gained beyond specific examples provided by educators or experiences learned firsthand. Thus, it could be that deaf children lack the knowledge and understanding of the link between knowledge arising from perception and ignorance arising from the absence if they have never encountered the same experience before. Third, it is also possible that in conversation with parents and family members, deaf children are often directly asked about their preferences and their thoughts. Thus, they are well versed in articulating things from their point of view. It can also be that when their opinion/desires is opposite to what their parents believe/want, parents either just give in or the child's opinion is disregarded. Either way, there is possibly little opportunity for deaf children to practice perspective taking. Thus, they are unaware that the other person may know something that they do not personally know. Further research is needed to confirm these hypotheses.

In study 1a, it was also observed that despite delays, the sequence of progression of ToM understanding is similar across both deaf and typically developing Filipino and mirrors that of previous findings with deaf and hearing children from Australia (Peterson et al., 2005; Peterson et al., 2012) but not children from China and Iran (Shahaeian et al., 2014; Shahaeian et al., 2011; Wellman et al., 2006). To understand these findings, two possible interpretations were considered. First, possible changes in the dynamics and structure of Filipino families could come about as a consequence of the diaspora largely due to economic and political factors. This may explain the gradual shifting of Filipino parenting values from those of "dependency to independence, from restrictiveness to permissiveness, from extreme control to autonomy, and from authoritarianism to liberalism and individuality" (Medina, 2001, p. 237). As a result, many children learn to be more independent and self-reliant compared to children from previous generations similar to children raised in Western cultures. For example, in the case where parents leave to work overseas, older children are tasked with taking care of younger siblings and young children possibly taking over household management with the allowance sent from parent/s living abroad. With the increased sense of responsibility and independence, children are given more opportunities to think for themselves and appreciate diversity in opinion. Another possibility revolves around current Filipino's understanding of the concept of interdependence. In early studies on Filipino culture, the value of interdependence, commonly used to describe non-Western cultures, was understood in the context of establishing smooth interpersonal relationships. In this regard, individual beliefs and desires, assumed to be dissenting, are thought to be suppressed in favour of group harmony. However, local researchers of indigenous cultures propose than in lieu of smooth interpersonal relationships, interdependence among Filipinos is better understood as an orientation and commitment to the other or "*pakikipagkapwa*" (Enriquez, 1977). This implies that interdependence is not so much a surrendering of personal sentiments in favour of another person's rather, it is the respect for the other individual as an equal in the context of being together. In this context, children may express dissenting opinion towards elders but do so in a gentle, respectful manner (Guthrie & Jacobs, 1967).

The study limitations include the use of one task for each domain of ToM. By testing children using several parallel tasks measuring the same concept, say false belief, delays in performance can be confirmed. A second limitation pertains to the upper limit of the age of the older participants. A further group of deaf participants in their mid to late 20s could be helpful to examine extent of ToM delays during adulthood. Through the course of testing, it was revealed that a good number of deaf students enrolled in post-secondary levels are older than 22 years. Whereas 22 years of age is reflective of when typically developing individuals finish their first degree, it appears to be less the case for deaf students. Thus, including an even older sample during testing could be beneficial for future work.

In conclusion, this current chapter has revealed that Filipino deaf individuals aged 8 to 22, as assessed using the ToM scale, are significantly delayed compared to typically developing children aged 3 to 14. This is the first attempt to examine systematically the development of ToM among Filipino children. The findings support the observed delays between deaf and typically developing children in Australia using the same ToM tasks. Furthermore, results replicate the sequence of ToM understanding displayed in Australia, the US, Germany, and Indonesia but not China and Iran. Given that certain Filipino values and practices could influence communicative patterns between parents and children, these studies suggest that a closer examination of familial conversations, especially for families with deaf children, as a means to further understand deaf children’s ToM development.

Chapter 4: Studies 2a and 2b

The Influences of Language Ability and the Communicative Environment on ToM Development in Filipino Deaf and Hearing Individuals

4.1 Introduction

The results reported in the preceding chapter (study 1) provide evidence that deaf children in the Philippines demonstrate significant delays in their ToM understanding compared to typically developing hearing children, but that the sequence of acquisition of ToM concepts does not differ markedly between Filipino deaf and hearing. Thus, even though Filipino deaf adolescents and young adults continued to display profound difficulty in ToM understanding in contrast to hearing children, they showed a similar overall pattern of improved ToM competence over time. Furthermore, like their younger hearing counterparts, they struggled in particular with false belief understanding and hidden emotion. Importantly, as in previous research with children from other countries, the results also showed that there was a strong positive association between verbal ability and ToM in the Filipino sample, and that deaf children had much lower scores on the measure of verbal ability compared to similarly aged hearing children. Nevertheless, the observed group differences in ToM understanding between deaf and hearing were not fully accounted for by group difference in verbal ability. That is to say, on the basis of the finding presented in chapter 3 (see study 1b), slower development in the verbal domain alone did not fully explain why deaf children struggle so much with their ToM understanding.

In keeping with previous research, chapter 3 focused on the existence of ToM difficulties and the nature of ToM acquisition in Filipino deaf children when compared to typically developing counterparts (Peterson et al., 2005; Peterson et al., 2012; Remmel & Peters, 2009; Wellman et al., 2011). While it is certainly noteworthy that ToM delays were profound, even when verbal ability was controlled for, it is nonetheless important to also examine the nature of the relationship between ToM and children’s language competence in more detail. Both studies of deaf and hearing children have consistently shown that their language competence is one of the most reliable correlates and predictors of social cognition (de Rosnay & Hughes, 2006; de Villiers, 2005; Milligan et al., 2007), but also that *language competence* needs to be understood and examined in different ways (Baird & Astington, 2005; Harris et al., 2005).

As outlined in the Introduction (see §1.3.1), the most widespread approach to assessing the influence of language competence on ToM is to examine how individual differences in ToM are associated with assessments of child language acquisition or competence in core features of linguistic development (see Milligan et al., 2007). Broadly speaking, this literature has both shown that (a) individual differences in ToM are robustly associated with and longitudinally predicted by such assessments of language development, but also (b) no specific feature of language development (vocabulary, syntax, etc.) has been identified as privileged in predicting children's social cognitive or ToM development (see de Villiers & Pyers, 2002; Milligan et al., 2007). Against this backdrop, it is instructive to establish whether, within the Filipino context, linguistic development is associated with ToM development in a similar manner across deaf and hearing children. Thus, study 2a capitalises on the relatively large sample of deaf and hearing children presented in this thesis – who have been selected to capture variation across the development span in linguistic development and ToM – to establish whether language development, as indexed on the most ubiquitous measure of linguistic development used in ToM research (i.e., lexical semantics), exerts the same influence on ToM development in Filipino deaf and hearing.

A complementary perspective on the importance of language competence for ToM development has its origins in the study of ToM in the deaf. In their ground-breaking work on false belief understanding in deaf children, Peterson and Siegal (see 2000, for an overview) showed that deaf children raised by non-signing parents – that is, deaf children without access to a natural language environment throughout early development – were profoundly delayed in their understanding of mind. Deaf children raised by a signing parent, by contrast, showed a level of mental state understanding at parity with typically developing hearing children. These stark findings strongly pointed to the importance of the early communicative environment for the development of children's understanding of mind and emotion. The simplest and most compelling conclusion from these findings is that access to ordinary, everyday language interactions put children in a position to build up an understanding of different viewpoints and engage in communicative practices or social interactions consistent with or requiring perspective taking (de Rosnay & Hughes, 2006; Harris, 2005). In study 2b, no children with a fluent signing parent were included in the analyses but, on the basis of existing research, it was reasoned that there would be profound variations in the extent to which home environments were facilitative of ordinary communicative interactions. Given the diversity of the current sample, it was possible to assess various features of the early communicative environment via parental interview that could plausibly exert such an influence. Thus, detailed interviews were conducted with parents and guardians, and where unavailable, the deaf participant himself/herself, to establish the severity of the child's hearing loss, the family's communicative mix between spoken and signed languages, family history of deafness, when the child was introduced into a community of deaf persons at a deaf school, and parental history of formal sign instruction. This is the focus of study 2b, in which relations between ToM, verbal ability, and the communicative environment are examined.

Finally, it is important to note that a large body of individual differences research, predominantly with typically developing children, has drawn attention to specific features of the communicative environment and, more precisely, the content (e.g., inner- or mental-state discourse) and manner (e.g., connected, responsive or elaborated communications) of interlocutors' interactions with children have been shown to predict their social cognitive development; including ToM and emotion understanding (de Rosnay & Hughes, 2006; Moeller & Schick, 2006). Given the constraints of the current study, it was not possible to sample conversational interactions in the home environment or in a structured situation, and thereby examine the influence of this important feature of children's communicative interactions on the development of ToM. While this study does not address this influence on ToM directly, the importance of such a perspective is addressed later in the General Discussion (chapter 8).

In sum, this chapter reports on two studies that examine two known factors that influence ToM development. Specifically, the relationship between language development and ToM in deaf and hearing Filipino children is the focus of study 2a. In study 2b, the influence of the family communicative environment on ToM development in families with deaf children is addressed.

4.2 Study 2a

As discussed in the Introduction, it is widely accepted that individual variation in language competency plays a key role in children's understanding of the mind. For instance, prior meta-analyses have shown that language ability – including measures of receptive and expressive vocabulary, syntactic ability, general linguistic development, etc. – is significantly positively related to false belief understanding among typically developing children and children with autism, accounting for a sizeable proportion of variance in ToM task performance (Happé, 1995; Milligan et al., 2007). However, there is no consensus on exactly how language influences social cognition. As a result, there is a wide variation in data reported about links between language ability and different aspects of social cognition; from strong, significant associations to weak, non-significant relationships (Milligan et al., 2007). In the current investigation, children's vocabulary (i.e., lexical semantic knowledge) was used as a proxy for their level of overall language development. Whilst this is in some respects a crude measure, it is the most ubiquitous measure of linguistic development in the ToM literature, it has been shown to robustly tap children's overall language development (Lee, 2011; Milton & Alexiou, 2009), and it has the added advantage of relative consistency in measurement across deaf and hearing children.

Research among deaf children on a range of language assessments has shown similar trends in that various indices of language development have been associated with ToM (Levrez et al., 2012; Remmel & Peters, 2009; Schick et al., 2007). Indeed, prior research shows that deaf children have late language acquisition and they demonstrate profound delays in ToM development (e.g., Moeller, Osberger, & Eccarius, 1986; Osberger, Moeller, Eccarius, Robbins, & Johnson, 1986; Peterson et al., 2012; Siegal & Peterson, 2008). However, the research on deaf children has focused almost exclusively on false belief understanding (e.g., Jackson, 2001) and it is not currently clear whether and how individual differences in language ability relate to a more comprehensive assessment of ToM competencies among deaf children. It could be, for example, that the normal close association between language development and ToM observed in the preschool years among typical samples is somewhat interrupted for deaf children. This, in turn, affects the extent to which ToM skills, when they do develop, are dependent on current linguistic abilities. That is to say, the pace of development in the linguistic and mental state understanding domains may become decoupled such that current linguistic abilities are no longer a robust correlate of current ToM skills. Alternatively, it may be that deaf children, over time, learn more about mental states outside of normal language environments than typically developing children. In both of these possible scenarios, the nature of the association between linguistic ability and ToM understanding would be different in typically developing hearing children and their deaf counterparts. It is, therefore, important to establish, within a single cultural group, whether the influence of language development on ToM is similarly robust for deaf and hearing children.

Therefore, the main aim of Study 2a was to investigate associations between individual differences in children's language development and their ToM, as measured on the same ToM scale used in study 1. Additionally, the influence of hearing status on individual differences in ToM understanding was also examined using the full sample of participants from studies 1a and 1b. In keeping with previous studies, it was predicted, first, that Filipino children's language ability would be positively associated with ToM success for both deaf and hearing participants (**hypothesis 1**). Second, it was also expected that hearing status and language ability would each uniquely predict ToM abilities (**hypothesis 2**).

4.3 Method

4.3.1 Participants

The same sample of N = 251 deaf and hearing individuals in study 1 served as participants in the current investigation (see Table 2.1). Additional demographic information is presented in Table 4.1.

4.3.2 Measures and procedures

The measures and procedures are identical with those reported in study 1.

4.3.3 Analytic plan

Descriptive statistics were first reported. Then, *t*-tests were conducted to examine differences based on hearing status. Afterwards, correlational analyses were conducted to examine associations between variables (**hypothesis 1**). To examine the unique contributions of hearing status and verbal ability (**hypothesis 2**), hierarchical linear regressions were performed. Age and socio economic status (SES) were entered as control variables in step 1 while hearing status and verbal ability, as the main predictors of interest, and were subsequently entered in step 2. ToM was the dependent variable. Simple slopes were calculated for significant interaction results. See Appendix G for the syntax.

4.4 Results

Table 4.1 shows mean scores and standard deviations on the different measures. Inspection of mean scores shows comparable verbal ability and SES for deaf and hearing children, while there were stark discrepancies in ToM scores and age. A comparison of the children based on hearing status indicated no significant difference in verbal ability ($t(232) = -.44$, $p = .66$) and SES ($t(158) = .56$, $p = .58$). In contrast, there were significant differences in ToM understanding, $t(244) = -6.68$, $p < .001$, and age, $t(249) = 16.29$, $p < .001$. Despite these differences in age (see Table 4.1), there was a large overlap in the deaf and hearing groups between 8 to 14 years of age which, whilst not ideal, gave a firm basis for comparison between these two groups within a regression framework. Given the theoretical concerns of the current study, it was necessary to have profound overlap in verbal ability in order to make valid inferences across deaf and hearing sub-groups. For this reason, the age differences were inevitable.

Table 4.1 *Descriptive Characteristics of Participants in Study 2a*

	Deaf (n=101; 61 male)		Hearing (n=150; 60 male)	
	M (*SD*)	Range	*M* (*SD*)	Range
Theory of mind scores	1.95 (1.09)	0 to 5	3.01 (1.42)[c]	0 to 5
Verbal ability	.32 (.07)[a]	.20 to .61	.32 (.14)	.05 to .73
Age	14.86 (3.74)	8 to 22.17	7.57 (3.29)	3.33 to 14.83
Socio economic status	2.04 (1.97)[b]	0 to 8	1.91 (1.38)	0 to 6

Note. From the original 251 participants in study 1, 6 had missing verbal ability or ToM scores. M = mean. SD = Standard deviation.
[a]n=97. [b]n=98. [c]n=148.

Across the whole sample, correlation analyses revealed that verbal ability was significantly associated with ToM (r^2= .62, p < .001), age (r^2= .46, p < .001), and SES (r^2= .23, p < .001), but not hearing status (r^2= .03, p = .70). Considering the groups separately by hearing status (refer to Table 4.2), bi-variate associations showed that, in the deaf, verbal ability was significantly correlated with ToM and age but not SES. In contrast, for the hearing children, ToM, verbal ability, SES, and age were significantly associated with each other. In keeping with the hypothesis 1, the strength of the bi-variate correlation between verbal ability and ToM was compared for hearing and deaf children. This analysis showed that the strength of the association observed in hearing children was considerably stronger than the deaf, z = 5.95, p < .001.

Table 4.2 *Summary of Correlations for ToM, Age, VA, and SES in Study 2a*

	1	2	3	4
1. Theory of mind	---	.21*	.24*	.14
2. Age	.81***	---	.34***	.38***
3. Verbal ability	.77***	.88***	---	.10
4. Socio-economic status	.17*	.29***	.33***	---

Note. Above the diagonal are the bi-variate correlations for the deaf children (n = 101). Below the diagonal are the bi-variate correlations for hearing children (n = 150).
VA = Verbal ability.
*p < .05. **p <.01. ***p <= .001.

To clarify these relationships further given the additional sources of variation between hearing and deaf children, a hierarchical linear regression analysis was performed. Results are reported in Table 4.3. In step 1, the control variables age and socio-economic status were entered. Model 1 was not significant, $F($ 2,239) = 2.54, p = .08. The entry of hearing status and verbal ability in step 2 provided a statistically significant increment in prediction, ΔF(2, 237) = 132.77, p < .001. This time, the second model was significant, $F($ 4,237) = 69.05, p <

.001. Hence, even after controlling for the effects of age and socio-economic status, children's hearing status and language ability both made significant independent contributions to ToM reasoning. Hearing status and verbal ability both significantly predicted ToM. However, these significant main effects need to be qualified in reference to the interaction effects which are suggested in Table 4.2. Thus, at the final step, the interaction term between hearing status and language ability was entered and provided a further significant increase in variability explained, $\Delta F(1, 236) = 8.38$, $p = .004$. This final model was, likewise, significant, $F(5,236) = 58.64$, $p < .001$. Inspection of the final beta weights showed that the interaction of verbal ability and hearing status was a significant predictor of ToM, $t = 2.89$, $p =.004$, and that verbal ability no longer made a significant independent contribution to ToM. Thus, hearing status moderated the relationship between language ability and ToM understanding within the model. A simple slope analysis for the interaction of hearing status and language ability on ToM was tested for deaf and hearing participants. Results showed that the association was significant among typically developing children, $b_1 = 5.69$, $SE = 0.77$, $t = 7.39$, $p < .001$, but not for the deaf, $b_1 = 1.75$, $SE = 2.11$, $t = .83$, $p = .41$. ***Figure 4.1*** revealed that enhancing effect of better language ability on ToM performance appears to be more evident for hearing children than for the deaf participants. For the deaf, better language ability made a less dramatic impact on ToM performance.

Table 4.3 *Regression Analyses for Hearing Status, Language Ability, and ToM*

Predictor	ΔR^2	β
Step 1	.02	
Age		.06
Socio-economic status		.12
Step 2	.52***	
Age		.32***
Socio-economic status		-.04
Hearing status		.60***
Verbal ability		.46***
Step 3	.02**	
Age		.31***
Socio-economic status		-.04
Hearing status		.60***
Verbal ability		.15
Hearing status x verbal ability		.35**
Total R^2	.55***	

Note. $N = 241$.
$^{**}p < .01$. $^{***}p <= .001$.

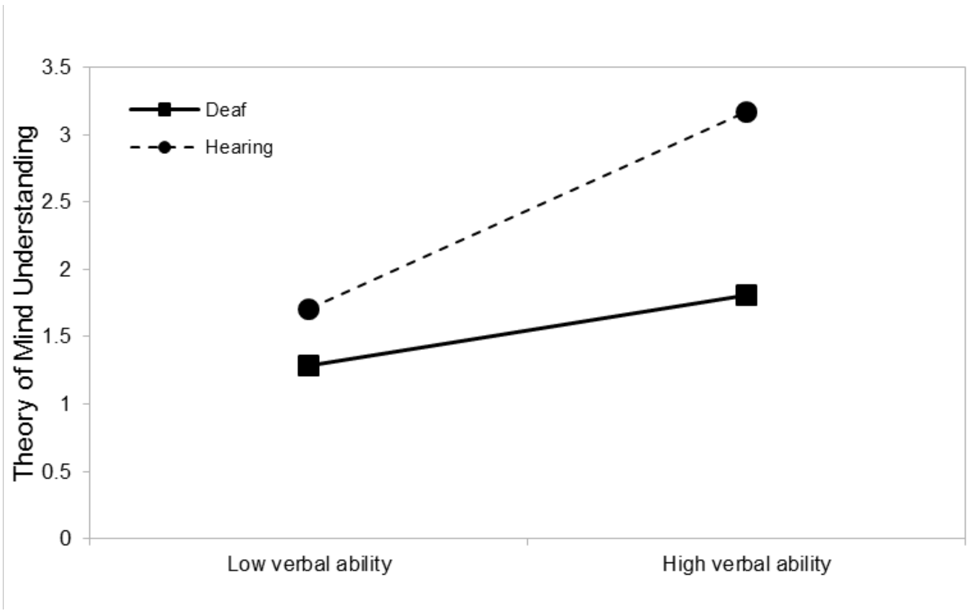

Figure 4.1 Relationship between verbal ability and ToM scores

4.5 Discussion

The main aim of the current investigation was to examine the influences of language ability and hearing status in explaining individual differences in ToM understanding. Significant interaction effects confirmed the strong influence of language ability on the understanding of mind, particularly for hearing children. These findings extend and reinforce past cross-sectional and longitudinal evidence that language ability is robustly related to ToM reasoning on typically developing children (e.g., Figueras-Costa & Harris, 2001; Milligan et al., 2007; Schick et al., 2007; Woolfe et al., 2002).

Although significantly correlated, language was not predictive of ToM for the deaf once the influence of other variables was accounted for in the regression model. Findings were inconsistent with prior literature demonstrating significant links between language competence and ToM understanding in deaf children (de Villiers, 2005; Jackson, 2001; Schick et al., 2007). Possibly, for the deaf, some aspects of language ability are only related to one or two specific ToM domains. For instance, Ruffman et al. (2003) found that language ability, specifically semantics, predicted belief understanding but not desire understanding. Thus, in assessing ToM performance using scaling ToM tasks, the stronger relationship with specific ToM domains such as false belief understanding compensated for other weaker associations like diverse desires. However, in light of the deaf participants' marked difficulties with false belief understanding, their current level of ToM performance would possibly not have been sufficient to demonstrate any robust associations with language.

A second alternative relates to the role of the communicative environment in the ToM development (Astington & Baird, 2005). For instance, some authors have shown that mental state language during conversational interactions between mothers (and siblings) and their children improve children's awareness of thoughts, beliefs, and feelings (de Rosnay & Hughes, 2006; Dunn, Brown, & Beardsall, 1991; Hughes & Devine, 2017; Lundy, 2013;

Meins et al., 2013; Taumoepeau & Ruffman, 2006). Further, Morgan et al. (2014) found that hearing parents generate fewer mental state terms with their deaf children compared to hearing parents with hearing children. However, it is quite difficult to interpret findings from the deaf group given that they have significant challenges in their access to communication *as a whole* and not just in terms of parental mental state references or mind-mindedness. The exception to this is the relatively small number of deaf children raised in native signing environments which has led some to raise the possibility that access to ordinary, everyday communicative exchanges provide children the opportunity to learn about inner states and participate in social and communicative interactions that allow them to learn about perspective taking (de Rosnay & Hughes, 2006; Harris, 2005; Peterson & Siegal, 2000). Thus, in study 2b, different factors that may influence the communicative exchanges in families with deaf children are examined.

4.6 Study 2b

Research reviews have established that the unfettered access to regular, fluent conversational exchanges underlie ToM success (Harris, 2006; Hughes & Devine, 2015; Peterson & Siegal, 2000). Empirical evidence that deaf children with deaf parents are at parity with typically developing children and, more importantly, that they are superior than deaf children of hearing parents in standard ToM tasks provides compelling evidence in support for this claim (e.g., Courtin, 2000; Courtin & Melot, 2005; Peterson & Siegal, 1999; Woolfe et al., 2002). Still, investigations on the variables that impact the communicative environment in families with deaf children, and especially in relation to ToM, are scarce so as to prompt the conclusion that, “there is a need to explore how the actual quality of communication between the deaf and their conversational partners influences their ToM understanding” (Woolfe et al., 2002, p. 775).

Families vary markedly in the kinds of communication environments they provide for their deaf children. For the current study, several measures of the communicative environment were identified in the hope that they would preview important aspects of family communication and shed light on whether family communicative practices influence deaf children’s ToM development. The choice of factors to include were tailored to the educational and communicative practices of deaf children in the Philippines (see §1.5.3 for a discussion) as well as based on available literature.

Based on a number of sources, and as discussed in §1.3.2, social communication in families with deaf children needs to be disentangled from a number of related variables. In general, this study is guided by the expectation that factors that improve communicative discourse within the family would likely promote ToM development. First, the *severity of the child’s hearing loss* negatively impacts the linguistic development of deaf children (Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007). Critically, degree of hearing loss also dictates the degree to which parents use more spoken or sign language in communication. For example, studies have shown that increasing level of hearing loss results in a greater likelihood of mothers using sign language during discourse (Kluwin & Gaustad, 1991, 1994) and poorer speech-language outcomes (Fitzpatrick et al., 2011). Thus, it is to be expected that the severity of hearing loss would be inversely related to facility in communicative interactions. Interestingly, in prior studies, oral deaf children with moderate to severe hearing loss were as good as second generation deaf children and typically developing 4 year olds in false belief understanding compared to signing deaf children with hearing parents (Peterson & Siegal, 1999). Akin to parental hearing status, variations in the configuration or blend of spoken and signed communication (i.e., *mode of communication*) used in family discourse would have important repercussions in terms of the fluency and depth of conversational interactions. It has been found that more visually orientated communication are more supportive of social interactions in hearing households with deaf children (Vaccari & Marschark, 1997). However, as Kluwin and Gaustad (1991) revealed, although the majority of the families in their sample either all sign or all speak, the configuration of signed or spoken language used in families is complex and difficult to typify. Intuitively, when the deaf child communicates frequently in sign language, communication is likely to improve when hearing parents also use sign language more frequently. Against this intuitive assumption, however, is the problem that signing hearing parents are generally not fluent users of this sign language which they have predominantly picked up or learned in real time. Another closely associated concept, *level of formal sign language instruction* can be used as a proxy measure for parental level of sign language competency; as there are no available standardised tests for sign language competence in the Philippines. Personal confidence in signed discourse could affect how well parents express themselves especially on complex topics such as mental states, and less skilled parents will likely limit conversational topics to those that are pragmatic and require less elaboration, unless they are fluent singers themselves. Furthermore, insufficient communication skills could result in a lack of sensitivity to deaf children's communicative, intellectual, and social needs (Hauser et al., 2010; Vaccari & Marschark, 1997), and missed opportunities for incidental learning (Hauser et al., 2010). Interestingly, it has been found that maternal sign language competency, level of sign language classes completed, and successful false belief performance are positively associated in deaf children (Moeller & Schick, 2006). It is expected, therefore, that more advanced formal sign language instruction leads to better signing skills and, in turn, create more effective talk exchanges between signing deaf children and parents.

Another important factor that may determine the dynamics of familial communication is *family history of deafness*. To assist conversational interactions, families with deaf members have likely established different ways of communicating with each other (Mallory et al., 1993). Furthermore, deaf children with deaf family members have also been found to have more developed signed linguistic skills (Newport & Supalla, 1980). Taken together, it is possible that the presence of other deaf family members ensures that families are better equipped to communicate with their deaf child and may also provide deaf children with a regular conversational partner, which in turn may result in earlier acquisition of language, better linguistic skills and, ultimately, richer conversations. Therefore, it was reasoned that access to a deaf family member such as a sibling or a close relative outside the home is likely to improve ToM performance (Milligan et al., 2007; Peterson & Siegal, 2000). In support of this claim, it has also been found that in families with signing siblings, deaf children scored better in the false belief task than those with non-signing siblings although their scores were equivalent with singletons (Moeller & Schick, 2006). Lastly, the *age a child entered a deaf school* is deemed as an indirect measure of the degree of child's sign language competency and level of exposure to other deaf models. One of the key consequences of deaf schooling is children acquire sign language. Prior to this, sign language acquisition would depend on parental input (Marschark, 1997), assuming no other family member is deaf. Thus, late entry would likely result in delayed language acquisition. This is of particular relevance given that early exposure to sign language has been positively associated with false belief performance and greater use of mental state references among Nicaraguan deaf samples (Morgan & Kegl, 2006). Additionally, in school, deaf children are provided the opportunity to learn, communicate, and socialise within a shared signing environment among teachers and older deaf students (Arevalo & Kusanagi, 1995). Contact with other deaf students may allow deaf children to have greater access to information on a variety of topics, including mental states, as well as practice perspective taking. Taken together, early entry to a deaf school could make the deaf a better and more knowledgeable conversationalist.

The primary purpose of the present study was to examine the influence of language and the communicative environment on ToM development of deaf individuals. There is a broad expectation that the aforementioned variables will affect ToM performance inadvertently by enhancing the communicative interactions in the family. However, it is currently unclear how these communicative variables will impact the relationship between language and ToM.

4.7 Method

4.7.1 Participants

From the original *n* = 101 deaf participants in the core sample (refer to Table 2.1), the lone deaf participant born to deaf parents (i.e., fluent users of sign language) was excluded in the current study. Thus, a total of *n* = 100 Filipino deaf individuals participated in the present study, all of whom had hearing parents. Additional demographic information is provided in Table 4.4.

4.7.2 Measures and procedure

The child measures were the same as in study 2a. See §2.3 for a full description of the procedure. Parents/Guardians were interviewed (either face to face or over the telephone) to shed light on the kind of communicative interactions that occur in families with deaf children and young adolescents. For the majority of the older deaf participants, information was provided by the participants themselves prior to testing. Details on how each variable was operationalised are provided below:

Degree of hearing loss. According to parent reports and/or school records, participants' severity of hearing loss (based on the pure tone average in decibels or *db* of the better ear) was categorised in increasing level of severity with 1 = moderate (46-60 *db*); 2 = severe (76-90 *db*); and 3 = profound (>91 *db*). In the current sample, 8% of the participants had moderate hearing loss, 19% had severe hearing loss, and 73% had profound hearing loss.

Family history of deafness. To measure family history of deafness, parents were asked, "Are there any family members who are deaf?" Only 17 subjects reported having a deaf/hard of hearing family member, which included aunts, uncles, cousins, and some siblings. Given these small numbers, responses were coded as 0 = no deaf relations and 1 = with deaf relations.

Age child entered a deaf school. Based on parent/self-report or school records, age entered a deaf school was calculated by dividing date of birth with a standard 1 June of the year they started at a deaf school. This is a continuous variable reported in years.

Mode of communication. Typifying the mode of communication used in families was adapted from the scales developed by Nussbaum, Scott, Waddy-Smith, and Koch (2004) for deaf children at the Laurent Clerc National Deaf Education Centre in the United States. Initially, the interview respondents were asked about the mode of communication in relation to (a) how the parent communicates with the child and (b) how the deaf child communicates with his/her parents. On the basis of responses to these initial questions, communicative patterns were classified separately for parent and child as predominantly sign (1), mixed environment of sign and oral (2), and predominantly oral (3). Understandably, there was a close correspondence between these two perspectives, X^2 (88) = 35.02, $p < .001$. On this basis, it was decided that parents' mode of communication was the variable that best captures the communicative environment experienced by the child in the family, and child's mode of communication was dropped from all further analyses. The thesis makes the assumption that given that there are no participants with native signing parents included in the current sample (i.e., all from hearing parented families), then a purely native signing communicative environment is highly improbable. Importantly, no assumption was made about the relationships among the three parent communication categories, which arguably represent different communicative contexts that cannot be easily scaled. In the current sample, 35% of the parents used predominantly sign, 46% used the mixed mode, and 19% used predominantly oral communication.

Parent sign language instruction. In the current study, responses were coded as follows: 1 = no formal sign language class; 2 = enrolment in basic sign language; and 3 = enrolment in advanced sign language classes. In the current sample, 33% of the parents had no formal sign language instruction, 59% had formal basic signed instruction, and 9% had advanced formal sign instruction.

4.7.3 Analytic Plan

Descriptive statistics were first examined. *T*-tests were then conducted to assess for any gender differences. Then, bi-variate analyses were conducted. Based on the correlations, hierarchical linear regressions were performed. In performing the multivariate analyses to be described in the next section, parent communication was dummy coded as recommended by Field (2009). With 'predominantly oral' communication as the base/reference category, the process of dummy coding resulted in two separate variables namely, ‘parent communication – sign’ to refer to a predominantly signing environment and ‘parent communication – mixed’ to refer to a combined use of signs and oral communication. See Appendix G for the syntax.

4.8 Results

Descriptive statistics are presented for the main study variables in Table 4.4. Initially, gender differences were examined on all study variables. Results show there were no significant gender differences on verbal ability and all communicative environment variables, all *t*s < .87 and all *p*s > .39. Thus, data were collapsed across gender in all further analyses.

Table 4.4 *Descriptive Statistics for the Main Variables in Study 2b (N=100)*

	M	*SD*	Range
Age (years)	14.80	3.71	8 to 22.17
Verbal ability[a]	.32	.07	.20 to .61
Age started deaf school[a]	6.07	2.03	2 to 11
Degree of hearing loss[b]	2.65	.63	1 to 3
Family history of deafness[c]	.17	.38	0 to 1
Parents’ sign language training[d]	1.76	.60	1 to 3
Theory of mind scores	1.95	1.10	0 to 5

Note. M = Mean; SD = Standard deviation.
[a]*n* = 96. [b]*n* = 99. [c]*n* = 95. [d]*n* = 94.

Bi-variate analyses (see Table 4.5) show that theory of mind understanding had positive significant correlations with age, verbal ability, and family history of deafness. Verbal ability, on the other hand, was also significantly positively correlated with age but not with any of the communicative variables. Inter-correlations between communicative variables are presented in Table 4.5.

Relations between parent communication and the key variables of verbal ability and

ToM are represented in Figures 4.2 and 4.3, where it can be seen that parent communication is differentially related to verbal ability and ToM. Thus, to further understand the relationship between language, ToM, and the communicative environment, regression analyses were conducted. Based on the bi-variate results, age, verbal ability, and family history of deafness were simultaneously entered in step 1. Then, the two variables for parent communication were entered in step 2. Lastly, the interaction terms between language ability and parent communication were entered in step 3. Summary of the regression analyses are presented in Table 4.6.

Table 4.5 *Correlations Among Theory of Mind and the Main Variables in Study 2b*

Variables	1	2	3	4	5	6	7
1. Age	---	.21*	.33***	.43***	-.24*	-.02	-.26*
2. Theory of Mind		---	.24*	-.03	-.03	.25*	-.01
3. Verbal ability			---	-.09	.12	.05	-.07
4. Age started deaf school				---	-.10	-.005	-.22*
5. Degree of hearing loss					---	.12	.10
6. Family history of deafness						---	-.15
7. Parent's level of sign language training							---

Note. *p < .05. ***p <=.001.

Table 4.6 *Regression Analyses for ToM, Age, VA, and Parent Communication*

Variables		ΔR^2	β
Step 1		.15*	
Age			.19
Verbal ability			.17
Family history of deafness			.23*
Step 2		.09*	
Age			.12
Verbal ability			.26*
Family history of deafness			.21*
Parent communication – sign[a]			-.39**
Parent communication – mixed[a]			-.15
Step 3		.01	
Age			.13
Verbal ability			.13
Family history of deafness			.23*
Parent communication – sign[a]			-.35*
Parent communication – mixed[a]			-.12
Verbal ability x Parent communication – sign			.03
Verbal ability x Parent communication - mixed			.17
Total R^2	.25**		

Note. n = 87. VA = Verbal ability.
[a]Dummy coded variable with predominantly oral communication as the reference category.
*p < .05. **p <.01.

Hierarchical linear regressions were conducted to examine more closely the relationships between the language, parent communication, and theory of mind understanding. The first model with age, verbal ability, and family history of deafness was significant, $F(3, 84) = 4.77$, $p = .004$. However, only family history of deafness predicted ToM, $t = 2.28$, $p = .03$. Verbal ability and age did not significantly predict ToM. The second step with the two variables of parent communication (predominantly sign and mixed sign and oral) was also significant, $F(5,82) = 4.94$, $p = .001$ and the variables significantly explained additional variance in ToM, $\Delta F(2, 82) = 4.59$, $p = .01$. Parent communication – sign significantly independently predicted poorer ToM, $t = -2.78$, $p = .007$. Interestingly, with the introduction of parent communication in the model, verbal ability emerged as a significant independent predictor of ToM, $t = 2.11$, $p = .04$. Conger (1974) states that when, "a variable … increases the predictive validity of another variable … by its inclusion in a regression equation" (p. 36-37), the presence of a suppressor variable in the regression is suspected, which will be explored in full below. Finally, step 3 with the interaction variables of verbal ability and the two parent communication variables was also significant, $F(7, 80) = 3.73$, $p = .002$. However, the interaction variables were not significant predictors of ToM, and their inclusion did not improve the over-all model. Thus, they are not further analysed.

To clarify if parent communication - sign indeed functioned as a suppressor within the model, Conger's (1974) method was employed. In the first regression model, parent communication was taken out of the analysis which resulted in an R value of .24. The model was significant, $F(1,94) = 5.78$, $p = .02$, and verbal ability had a regression coefficient of $\beta = .24$, $t = 2.40$, $p = .02$. However, when parent communication was added in the second regression model, it resulted in a substantial increase in total R value (.40). This second model was also significant, $F(2,85) = 7.89$, $p = .001$, with considerable increase in the regression coefficient of verbal ability, $\beta =.31$, $t = 3.02$, $p = .003$. Thus, the inclusion of parent communication – sign increased the predictive validity of verbal ability. Therefore, on basis of Conger's (1974) methods, the results appear to confirm that parent communication was a suppressor variable within the regression model.

To help understand the role of parent communication with ToM and verbal ability, Figures 4.2 and 4.3 are instructive. Recall that, due to its categorical nature, no assumptions are made about the relationship among the three parent communication categories. However, based on visual inspection of the data in Figure 4.2, it shows that predominantly oral communication appears to have the greatest effect on ToM understanding. Yet, in Figure 4.3, it illustrates that verbal ability is improved with the predominant use of sign communication. That is to say, the parental communicative environment has essentially opposite associations with children's verbal ability and their ToM.

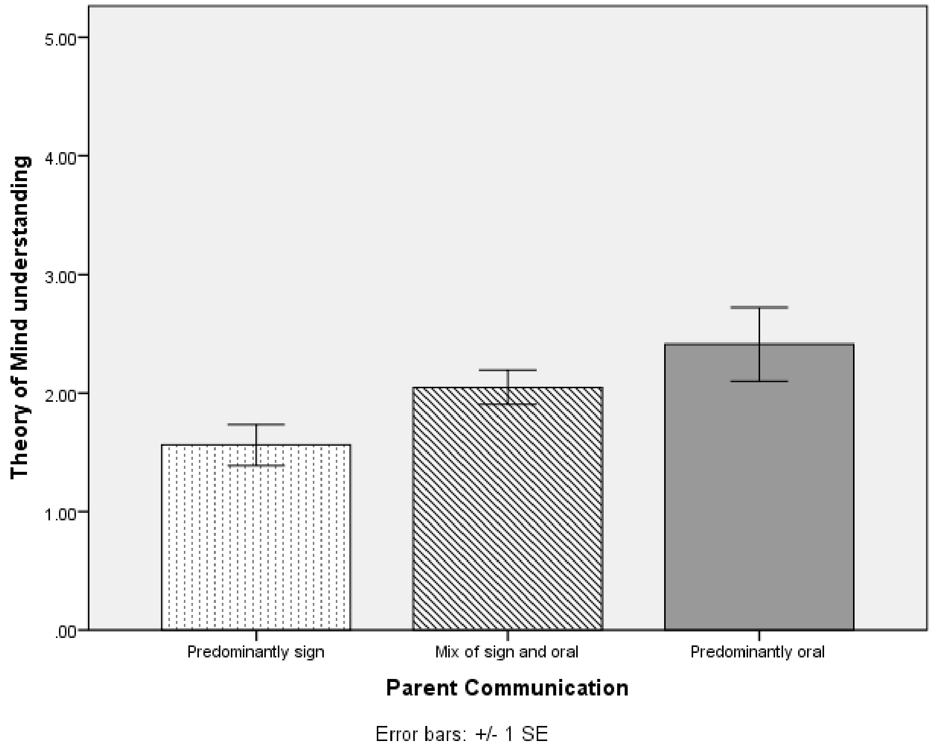

Figure 4.2 Relationship between parent communication and ToM

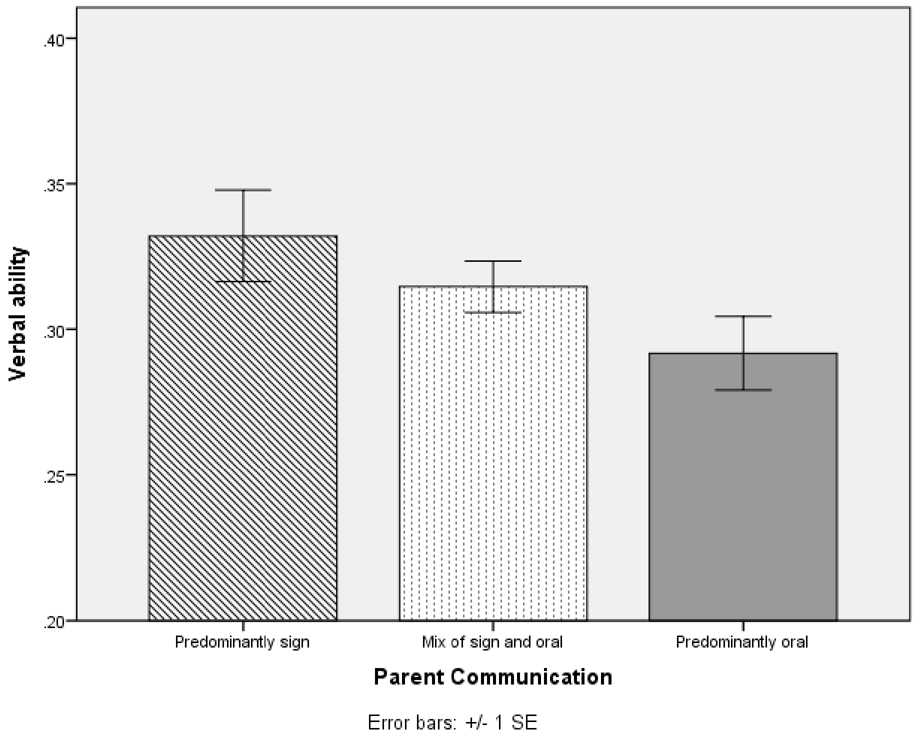

Figure 4.3 Relationship between parent communication and verbal ability

4.9 Discussion

The main aim of the current study was to examine, together with verbal ability, the relationship of ToM with variables thought to directly or indirectly influence the communicative environment of families with deaf children. Results revealed an intriguing relation between family communicative practices, children’s linguistic skill, and ToM. First, and most understandably, having a deaf person in the wider family seems to provide some family readiness to accommodate a deaf child as this variable was associated with improved ToM in quite a simple fashion. It seems that in families with a history of deafness, a deaf child’s ToM development is better supported. Studies on families adapting to deaf family members show that individuals and families use strategies to address communication difficulties and resolve intrapersonal problems and facilitate interaction (Evans, 1995; Mallory et al., 1993). Additionally, deaf children with deaf family members develop a highly complex set of signed linguistic skills (Newport & Supalla, 1980). Thus, with better language skills and access to knowledge through increased social interactions, the deaf are able to learn about others’ inner mental states which may promote their understanding of mind. Second, there was a meaningful relationship between family communicative practices and deaf children’s ToM that, to a great extent, explained why stronger associations were not initially observed between language and ToM in study 2a. Essentially, parents’ reliance on signed communication influenced both children’s linguistic development and their ToM but in different ways and, as such, acted as a classic *suppressor* variable. Thus, for parents of equivalent spoken language usage, the commonly observed positive relationship between verbal ability and ToM was apparent for typically developing individuals (refer to study 2a). However, for the deaf whose parents used sign communication predominantly, compared to those who used predominantly spoken language, they were found to have poorer ToM scores. Yet, and somewhat confusingly, predominant use of sign communication appears to have a positive influence on the child's linguistic abilities. Broadly speaking, these findings are in line with previous studies that suggest restricted access to conversations undermines ToM development in the deaf (Courtin & Melot, 1998; Peterson & Siegal, 1999, 2000). Findings from previous studies have been taken to mean that in a signing environment, such as the ones provided by *deaf* parents, deaf children have access to daily conversations, including mental states. However, what these current findings qualify is that the communicative interactions that the deaf now have access to, through the *hearing* parents' predominant use of sign language, may not be the kinds of discourse that actually facilitate their mental state understanding even if it does support their burgeoning vocabulary. It could be, for example, that with parents' predominant use of sign language, it increases frequency of conversations about general, everyday topics but not necessarily mentalistic ones which are decidedly more complex. Thus, current results implicate that there is a tenuous relationship between the parents' ability to express themselves fully in a language they are familiar with (i.e., oral) and the kinds of discourse that the deaf need to genuinely participate in for them to learn about inner mental states that could eventually foster their ToM. The implications of these findings are discussed further in the next section.

4.10 General discussion

The purpose of the studies in the current chapter was two-fold. First, it examined the relationship between language development and ToM in Filipino deaf and hearing individuals. Second, it explored the influence of the family communicative environment, together with verbal ability, on ToM development in families with deaf children. Studies in this chapter are novel because (a) they examined not only the direct link between language and ToM but also clarified the role of hearing status in this relationship; and (b) unlike previous studies which focussed only on children's language ability and/or the degree of mental state talk or parental mind-mindedness, the current investigation qualified variations in the communicative environment within families of deaf children with hearing parents. This is of import given that the vast majority (95%) of deaf children are born to hearing parents (Mitchell & Karchmer, 2004).

Findings of the studies reported in this chapter confirm the importance of children's language ability and conversational interactions in ToM development. Focally, it has been found that for typically developing children, better verbal abilities predicted higher ToM performance. Indeed, through language, typically developing children have the means to participate freely in conversations where they learn about mental states as well as comprehend and manipulate the information that they receive. Yet, in the context of deaf children, hearing loss transforms the way families communicate with each other such that language abilities *per se* do not seem to be sufficient to account for individual differences in ToM understanding. In other words, at least for the current sample of deaf individuals, the communicative environment plays a simultaneous role in the development of ToM and language abilities that cannot be understood in isolation.

Woolfe et al. (2002) states that, "ToM is not simply a matter of vocabulary and syntax, but is the end result of social understanding mediated by early conversational experience." (p. 776). Indeed, one of the key findings of this chapter is that there is a meaningful relationship between the parents' choice of communication and the deaf person's ability to genuinely participate in conversational interactions which could undermine a mentalistic understanding of human action. Present findings indicate that when parents' communicate predominantly in sign, compared to using oral language predominantly, their deaf children's ToM is poorer. There are two possible explanations for this finding. First, when parents claim that they are using signs, it is unclear to what extent they are using formal signs or to what extent they use home signs or gestures. Indeed, many hearing parents incorporate gestures without sign language input in their communicative interactions with their deaf children (Da Cunha Pereira & De Lemos, 1990). Home signs, on the hand, refer to idiosyncratic gestural systems created within the home when the standard sign form is unavailable and when deaf children are raised apart from other deaf signers (Mayberry, 2003; Von Tetzchner, 1984). Although incorporating home signs and gestures may, to some degree, facilitate communication with hearing family members, they may not be helpful during extended discourse, particularly about mental states. Second, based on current data, there is no indication of which sign words parents actually use. Moeller and Schick (2006) suggest that mothers of signing deaf children likely choose to learn the signs to talk about topics they want to discuss. Yet, signs for mental state terms may not readily accessible unless parents engage in further formal sign language instruction. However, recall that in the Introduction (see §1.5.2), it was argued that Filipino mothers may not actively encourage children to discuss about mental states believing that young children are not developmentally ready to do so. Thus, it is possible that since Filipino mothers are less inclined to consider children as psychological agents, they are also less motivated to learn how to effectively communicate about topics surrounding mental states, especially in sign language. Future studies can further explore parents' mental state signed vocabulary and home signs and examine how these relate to children's ToM scores.

One thing to think about on the basis of the current findings is that just as parents' predominant use of signed communication undermines ToM when the parents are not fluent users of sign, it also appears to promote children's verbal abilities. This may seem odd at first but recall that all of the study participants in study 2b are first generation deaf persons. Thus, hearing parents may be making an effort to bridge the communication gap by incorporating signs into their daily discourse. However, possibly due to poor sign language competence or lack of confidence in their signing skills, hearing parents were less efficient in communicating their message across using signs. Additionally, parents who use predominantly signs at home with their children are likely to be severely limited in what they can express as they are not native signers (Marschark, 1997). Indeed, recall that parents' sign language competency was associated with greater frequency of maternal mental state talk which, in turn, is linked to children's successful ToM understanding (Moeller & Schick, 2006). Thus, the deaf may be developing better vocabularies due to their parents' use of signed communication predominantly. However, in using predominantly signed communication, hearing parents are less able to engage in the kinds of discourse, such as those involving mental states, that fosters ToM development in their deaf children. There is clearly a need to examine *how* parents are communicating with their deaf children and understanding *what* they are talking about, including their use of psychological discourse and connected communications.

The current study is limited by the reliance on parent descriptions of the familial communicative environment. Siblings, particularly someone who has been tasked to be the primary communicative partner for the deaf family member, could have a different perspective on the communicative environment in the family. In addition, the lack of a substantial number of deaf children of hearing parents to serve as a comparison group limits the generalisability of the present findings. Clearly, growing up with deaf parents provide a very different communicative environment than hearing parents. Thus, although recruiting a substantial number of deaf parents of deaf children would be challenging, it would definitely be a worthwhile endeavour for future investigations. Lastly, given that the overwhelming majority of participants have profound hearing loss, it is noted that current findings may not be generalisable to the greater population. Further studies would benefit from a more balanced distribution of participants to increase representative reliability of the data across different levels of hearing loss.

In conclusion, the studies reported in this chapter provide for the support for the roles of children's language ability and the familial communicative environment in the development of ToM. The findings support the claim that language ability plays a causal role in typically developing children's ToM scores. Furthermore, this is the first investigation that confirms the negative impact of hearing parents' predominant use of sign language in deaf children's ToM performance when compared to parents' predominant use of spoken communication. It remains, however, to be fully examined what is the exact content of Filipino parents' discourse with their deaf children --- regardless whether it is in sign or using spoken language. In the meantime, it is reasonable to draw the practical conclusion that language *and* discourse play important roles in the understanding of ToM performance of deaf persons from the Philippines.

Chapter 5: Study 3

The Development of Emotion Knowledge in Filipino Deaf and Hearing Individuals

5.1 Introduction

Like theory of mind, emotion understanding captures children's conceptualisations surrounding the attribution of inner mental states to human actions, specifically about emotions. Recall that one of the main findings in study 1 was that deaf individuals exhibited profound delays in ToM development compared to typically developing hearing children. Furthermore, their acquisition of ToM concepts follows a pattern identical with typically developing Filipino children and preschool children from the US, Germany, Australia, and Indonesia. Prior literature has, likewise, revealed that deaf children have delays in their understanding of emotions (Wiefferink et al., 2013). Taken together, these findings could be indicative of deaf children's difficulties in mentalising abilities, over-all. Yet, it is also plausible that problems in deaf children's understanding of emotions are symptomatic of a discrete further impairment in understanding conventions surrounding emotions and not mentalising abilities *per se*. One way to resolve this contention is to examine group differences in children's knowledge of emotions using tasks that measure various domains in the study of emotions, including mentalistic and non-mentalistic aspects. Therefore, the current study, study 3, was designed to examine the performance of Filipino deaf and hearing individuals in two related but distinct areas of emotion knowledge ---one dealing more with the mentalistic emotion understanding, and the other addressing more their perception-based affective recognition and labelling.

5.2 Affective recognition and labelling

As discussed in §1.2.3, extant literature revealed a somewhat different picture of affective recognition and labelling skills between deaf and hearing children. Whilst accuracy in affective recognition and labelling of facial expressions was suggested to emerge early among typically developing children (Camras & Allison, 1985), findings from research on age matched deaf and hearing samples are mixed (Bachara et al., 1980; Hopyan-Misakyan et al., 2009; Ludlow et al., 2010; Most & Aviner, 2009). That is, some studies claim that the majority of deaf children are able to recognise emotions as well as hearing children (Most & Aviner, 2009; Weisel, 1985) whereas others argue that deaf children are comparatively deficient (Dyck et al., 2004; Ludlow et al., 2010).

To clarify this, attention is turned towards children's assessment of emotions in other contexts, such as body postures. Research among typically developing children suggest that they are, likewise, adept in identifying emotions in body postures as they are with facial expressions (e.g., Coulson, 2004; McHugh et al., 2010). Unfortunately, there is limited available information on deaf children's performance on body postures to establish an unequivocal claim that they will do as well as hearing children in this context. There was one study by Hao and Su (2014) who found equivalent scores between deaf and hearing children when evaluating emotions in faces and body postures.

Mayberry (2003) suggests that sign language use enhances deaf children's visual skills. It could be that deaf children, due to their frequent sign language use, have developed unique processing mechanisms to extract information in faces more efficiently, including emotions. This may have provided the necessary leverage deaf children needed to do as well as typically developing children, at least in terms of affective recognition tasks. Alternatively, it has been argued that emotion recognition develops within a linguistic context (Barrett, Lindquist, & Gendron, 2007; Lindquist et al., 2006). From this latter perspective, deaf children are likely disadvantaged compared to typical populations as a result of their late acquisition of language, particularly those with hearing parents. Therefore, it is important to clarify whether deaf children do as well as typically developing children in affective recognition and labelling; a question that can be initially considered by simply comparing their performance on tasks that examine emotions on faces and body postures. This initial information will also establish any delays in children's emotion perception skills.

5.3 Emotion understanding

As discussed in §1.2.4, emotion understanding is a more mentalistic construct that refers to the comprehension of different domains surrounding affective states; including, attribution, regulation, antecedents, behavioural consequences, amongst others. A mature ToM bolsters children's understanding of emotions given that much of emotion understanding presupposes an ability to accurately infer mental states in others' behaviours; only in this case, the object of thought is a person's emotions. Unfortunately, prior research in emotion understanding typically only examines one or two areas at a time (e.g., emotion recognition and attribution of emotions to situations) making it difficult to fully appreciate the extent of children's emotion understanding skills.

There is evidence to suggest that children's true competence may be captured by examining various milestones of emotion understanding development concurrently and that some skills may emerge earlier than others (e.g., Albanese, De Stasio, Di Chiacchio, Fiorilli, & Pons, 2010; Bulgarelli & Molina, 2016; Pons & Harris, 2005; Pons et al., 2002; Tenenbaum et al., 2004). To examine conceptual gains in emotion understanding using a wider lens, Pons et al. (2004) developed a scale--- the Test of Emotion Comprehension (TEC)--- based on a thorough review of the emotion research. Based on a sample of n = 100 British children, authors identified nine different components of children's emotion understanding which emerge in a particular sequence, based on level of difficulty (see §1.2.4 of the Introduction for a more detailed description). Specifically, children understand the external aspects of emotions first (labelling emotions, identifying external causes, and emotions triggered by certain memories), then subsequently, an understanding of the mentalistic aspect of emotions is developed (emotions based on desires and beliefs and the distinction between expressed and felt emotions), and lastly, the more reflexive aspects of emotions is formed (regulation of emotions, simultaneous mixed emotions, and morality based emotions). Cross-cultural research has shown a general similarity in the ranking, predominantly for typically developing children from Western cultures (Molina et al., 2014; Pons et al., 2004; Pons et al., 2002) but not for children from non-Western cultures (Minervino et al., 2010; Tenenbaum et al., 2004). It is important to note that there is no prescribed order of the components within each phase.

In the deaf, previous studies have also been limited by the focus on one or two aspects of emotion understanding and where such data is available, it suggests intriguing findings. Studies suggest that deaf children have difficulties with some aspects of emotion knowledge but proficiency in other aspects. For instance, Rieffe and Terwogt (2000) found that both deaf and hearing children were able to attribute correct emotions to typical situations. In contrast, Wiefferink et al. (2012) found that deaf children were not as proficient as hearing controls in similar emotion attribution tasks. Still, on more complex tasks like identifying multiple emotions, for example, deaf children were found to be as capable as typically developing children only when situations engender emotions of *opposite* valence but not with two *simultaneous negative* emotions (Rieffe et al., 2003). Unfortunately, comparisons across studies are problematic given the differences in sample ages, methods, and emotion understanding domains examined. Thus, a simultaneous assessment of several domains of emotion understanding with a similar methodology across tasks, such as the TEC, could be beneficial.

Very little is known about the rate and order of acquisition of the different components of the TEC in deaf children, even from non-Western cultures. One such study by Mancini et al. (2016) examined the development of emotion understanding of 72 Italian deaf children (4-12 years old) with cochlear implants. Results show that the deaf children had higher mean scores than a normative sample of typically developing Italian children (Albanese & Molina, 2008). As regards the sequence of the components, deaf and hearing Italian children displayed different patterns from each other, particularly in belief (IV), hiding (VII), and regulation (VI) (see Table 5.5).

Thus, based on extant research, there is some indication that the deaf demonstrate competence in some but not other aspects of emotion understanding, and it is unclear, however, the extent of deaf children's delay on a broader assessment of their skills. Furthermore, the development of deaf children's emotion understanding appears to follow a divergent pattern to typically developing children of the same culture. Currently, it is remains unconfirmed how well Filipino deaf children will perform using a comprehensive assessment of emotion understanding, and how they compare to typically developing children from the same community. It is also unclear what the order of the acquisition of emotion understanding skills and if it will be consistent between deaf and hearing children from the Philippines. It is important to examine these group differences as they will establish any delays in deaf children's emotion understanding, akin to their delays in ToM, but distinct from their emotion perception based skills.

In sum, the overall purpose of the current study is two-fold. First, it seeks to establish if delays in ToM extend to emotion understanding such that it indicates a global problem with mentalising abilities. Additionally, it also attempts to clarify if there are delays in emotion understanding *and* affective recognition and labelling which would then represent a discrete impairment in the evaluation of emotion stimuli, in addition to ToM. To achieve this, the current study has various aims. Initially, differences on the affective recognition and labelling abilities on facial and body expressions are examined between deaf and hearing groups. Based on previous studies, it was expected that deaf children would demonstrate either poorer or equivalent affective recognition and labelling skills when weighed against typically developing children **(hypothesis 1)**. This study also provided an investigation of deaf and hearing children's understanding of emotions using a comprehensive assessment of emotion understanding. Critically, unlike the assessment of affective recognition and labelling, the Test of Emotion Comprehension (Pons et al., 2004) does not rely on children's capacities to recognise real emotion expressions. Rather, the TEC focuses on children's capacities to *infer* emotional outcomes, which are not revealed in expressive behaviour. Based on previous findings, and also the findings with ToM findings from chapter 3 which many emotion understanding insights depend, it was expected that deaf children would perform much more poorly than the hearing controls **(hypothesis 2)**. Lastly, the sequence of progression of the different components of emotion understanding is examined. It is currently undecided if the order of acquisition will be the same between Filipino hearing and deaf children **(hypothesis 3)**.

5.4 Method

5.4.1 Participants

The participants were the same as the sample described in chapter 2 (see Table 2.1). Current literature suggests that emotion knowledge develops across childhood and adolescence. Therefore, unlike for theory of mind understanding, there was no a priori reason to recruit additional younger aged children in the current study to establish developmental trajectories. For additional information about the sample, see §2.1.

5.4.2 Measures

Emotion understanding. The Test of Emotion Comprehension (TEC) was used to assess the participants' level of emotion understanding using nine different components, including labelling (I), external cause (II), desires (III), beliefs (IV), reminder (V), regulation (VI), hiding (VII), mixed (VIII), and morality (IX) (for a full description of each scenario, read Pons et al., 2004). The TEC consists of an A4 size picture book depicting a series of nine scenarios illustrated with a simple cartoon scenario (frame = 16cm x 11cm) on the top of each page. Below each cartoon scenario were 4 possible emotional outcomes, typically depicted as facial expressions. There were two negative emotions (sad/scared, sad/angry, or scared/angry) and two non-negative emotions (happy/alright) among the emotional outcomes. With the exception of Component I (labelling), for which children only needed to match basic expression labels to canonical cartoon expressions (which all children were expected to find quite easy), the remaining components consisted of a cartoon scenario and an accompanying story was read out by the main researcher. The faces of the main character(s) was/were intentionally kept blank. Afterwards, the participant pointed to an appropriate facial expression in response to a question posed about the main character in the scenario. At times, control questions were asked to check story comprehension. See Appendix D for a sample item. The order of the stories was fixed. Following Pons et al. (2004), one point was assigned for each component answered correctly. Close effort was made to follow the method and procedures outlined in Pons et al. (2004) as regards to scoring the individual TEC items, however for the current study, the control question was used to qualify if the answer will be considered correct or erroneous in component IV (Belief). The decision to use the control question as a marking criterion is consistent with previous studies as well as the scoring procedure of the scaling ToM tasks (de Rosnay et al., 2004; Fink et al., 2014; Wellman & Liu, 2004). Additionally, for component III (Desire), an answer that indicated a change of affect from either alright/sad to happy or sad to alright in items 4c and 4d, was considered correct. For component IV (Belief), likewise, the answer alright was also considered correct. It was decided that a qualitative shift in the valence of the emotion took into consideration the fact that different cultural values and practices influence the extent to which emotions are expressed publicly. Indeed, collectivistic cultures have been found to endorse emotional expressivity less than those from more individualistic cultures (Matsumoto, Yoo, & Fontaine, 2008). The total level of emotion understanding was computed by summing the correctly answered components. There was a minimum of 0 points and a maximum of 9 points.

Affective recognition and labelling. Affective recognition and labelling was assessed using two subtests — Receptive Facial Expressions and Receptive Posture — from the Diagnostic Assessment of Nonverbal Accuracy-2 (DANVA-2; Nowicki, 2013). The receptive facial expressions (faces) subtest includes 24 adult and 24 child multicultural images of real faces displaying happy, sad, angry, and fearful facial expressions of varying intensity (Nowicki & Carton, 1993). The receptive posture subtest includes 24 images of real adults displaying different postures pertaining to specific emotions (happy, sad, angry, and fearful) but with their faces masked. The photographs were programmed and presented using the INQUISIT 4 lab program (Millisecond Software, 2013) and displayed on either a 13.3-inch or 14-inch Acer Aspire laptop monitor. Each of the images was presented in the middle of the screen. Four emotion labels (i.e., happy, sad, angry, and fearful) were presented under each image. Each image was displayed for two seconds after which it disappears. To answer, the child needed to click on one of these emotion words displayed on the screen. Thereafter, the next image came up on the screen. There was no time limit set for each response but they were unable to go back and re-view the picture once the 2 second limit had passed. Each correct label was given a score of 1. A total affective recognition and labelling score represents a sum of all the scores in each subtest with a possible range of 0 to 72. See Appendix E for the protocol used and sample item.

Language ability and socio-economic status served as control variables in the current study. General *language ability* was measured using the Expressive Vocabulary Test, 2^{nd} edition (Williams, 2007) previously described in §2.2.1. *Socio-economic status* was measured using the Currie et al. (2008) scale as described in §2.2.3.

5.4.3 Procedure

The details of the procedure are identical with those reported in §2.3.

5.4.4 Analytic plan

Bivariate analyses were first performed to examine relationships between variables. Then, to address **hypotheses 1 and 2**, separate ANCOVAs were performed to examine the effects of hearing status on emotion knowledge outcomes, whilst controlling for the effects of age, verbal ability, and socio-economic status. Particular to the sequences of components of emotion understanding (**hypothesis 3**), percentages of correct responses were subsequently rank ordered. Finally, chi-square tests were conducted to examine differences based on hearing status on each of the components. See Appendix G for the syntax.

5.5 Results

Descriptive statistics are displayed in Table 5.1. Visual inspection of the mean scores revealed that deaf children, compared to hearing children, had higher total mean score in total affective recognition and labelling but lower total mean scores in emotion understanding. However, differences in scores based on hearing status need to be further examined.

Table 5.1 *Descriptive Statistics for the Main Variables in Study 3*

	Deaf 8 to 22 years (*n*=101; 61 males)			EU comparison 4 to 14 years (*n*=83; 28 males)		
Measures	*M*	*SD*	Range	*M*	*SD*	Range
Age	14.86	3.74	8 to 22.17	9.78	2.86	4.75 to 14.83
Verbal ability	.32[a]	.07	.20 to .61	.41	.13	.24 to .73
Socio-economic status	2.04[b]	1.97	0 to 8	2.11	1.44	0 to 6
EU total	4.43	1.57	1 to 8	6.46[d]	1.87	2 to 9
ARL total	48.66[c]	8.49	21 to 64	45.80[e]	8.81	16 to 61

Note. M = mean. SD = standard deviation. EU = emotion understanding. ARL = affective recognition and labelling.
[a]*n*=97. [b]*n*=98. [c]*n*=100. [d]*n*=82. [e]*n*=81.

Bi-variate analyses in Table 5.2 revealed that emotion understanding was significantly positively correlated with affective recognition and labelling, verbal ability, and SES and hearing status but not with age. Affective recognition and labelling, on the other hand, was positively significantly correlated with age, verbal ability, and SES but significantly negatively correlated with hearing status.

Table 5.2 *Correlations Among the Main Variables in Study 3*

	1	2	3	4	5	6
1. EU total	---	.30***	.64***	.01	.24***	.51***
2. ARL total		---	.35***	.55***	.16*	-.16*
3. Verbal ability			---	.10	.20**	.44***
4. Age				---	.28***	-.60***
5. Socio-economic status					---	.02
6. Hearing status						---

Note. EU = Emotion understanding. ARL = Affective recognition and labelling.
**p* < .05. ***p* < .01. ****p* <=.001.

Two separate ANCOVAs were conducted to examine if group differences emerged between deaf and hearing participants even when the effects of age, language ability, and socio-economic status were accounted for. Affective recognition and labelling and emotion understanding served as separate dependent variables. As seen on Table 5.3, results revealed that there was no significant main effect for hearing status on affective recognition and labelling, $F(1,169) = .003$, $p = .96$, partial $\eta^2 < .001$. In contrast, as shown on Table 5.4, there was a significant main effect for hearing status on emotion understanding, $F(1,171) = 24.39$, $p < .001$, partial $\eta^2 = .13$. Age and verbal ability were significant covariates while SES was not significant for both affective recognition and labelling and emotion understanding.

Table 5.3 *Summary of Analysis of Covariance in ARL by Hearing Status while Controlling for Age, Verbal Ability, and Socio-Economic Status*

Source	*SS*	*df*	*MS*	*F*	η^2
Age	1427.75	1	1427.75	30.98***	.16
Verbal ability	749.75	1	749.75	16.27***	.09
Socio-economic status	9.68	1	9.68	0.21	.001
Hearing status	0.13	1	0.13	.003	.000
Error	7788.05	169	46.08		

Note. ARL = Affective recognition and labelling. SS = Sum of squares. MS = Mean square.
***$p < .001$.

Table 5.4 *Summary of Analysis of Covariance in EU by Hearing Status while Controlling for Age, Verbal Ability, and Socio-Economic Status*

Source	*SS*	*df*	*MS*	*F*	η^2
Age	11.55	1	11.55	5.82*	.03
Verbal ability	61.23	1	61.23	30.84***	.15
Socio-economic status	4.39	1	4.39	2.21	.01
Hearing status	48.43	1	48.43	24.39***	.13
Error	339.48	171	1.99		

Note. EU = Emotion understanding. SS = Sum of squares. MS = Mean square.
*$p < .05$. ***$p < .001$.

To confirm the findings described above, post hoc analyses were conducted using an age-matched 8 to 14 year old sample of n = 112 deaf and hearing children (59 deaf). ANCOVA results revealed that in this age-matched sample, hearing status continued to make an independent contribution for emotion understanding over and above SES and verbal ability, $F(1,104) = 48.75$, $p < .001$, partial $\eta^2 = .32$. Furthermore, it still did not make an independent contribution to affective recognition and labelling, $F(1,103) = .11$, $p = .74$, partial $\eta^2 = .001$.

Sequence of Components of Emotion Understanding. Table 5.5 shows the percentage of correct scores vis-à-vis the rank ordering of responses on the nine components of the TEC. The components were ranked according to the percentage of participants who passed each component. Included in the table are data from Mancini et al. (2016) study of deaf Italian children and the normative sample of Italian children by Albanese and Molina (2008). Examining the rank ordering revealed a somewhat different pattern of responses when comparing the Filipino deaf and hearing participants, although they do share some similarity (**hypothesis 3**). For instance, both deaf and hearing children had good understanding of emotion labels (I). The deaf were also found to accurately identify causes for basic emotions (II) and understand moral emotions (IX) in a relatively similar order to the hearing children. At the other end of the spectrum, both deaf and hearing children found understanding belief based emotions and hidden emotions to be most difficult. This is consistent with difficulties on the false belief and hidden emotions item in the scaling ToM tasks (see study 1). It is interesting to note, however, that when comparing the rank ordering between the Filipino and Italian deaf samples, both had relatively different rankings over-all except for labelling (I), external cause (II), reminders (V), and regulation (VI). As regards the hearing children, with the exception of labelling (I), there were vastly differing patterns of acquisition between the Filipino and Italian children for the rest of the components.

As a further test, chi-square tests were conducted to examine differences between deaf and hearing groups in each of the components. Results revealed that there were no significant differences in the scores on labelling (I), causes (II), hiding (VII), and mixed emotions (VIII). In contrast, there were more typically developing hearing children who passed components desires (III), beliefs (IV), reminders (V), regulation (VI), and moral-based emotions (IX) than the deaf.

Table 5.5 *Percentage of Correct Scores by Component of Emotion Understanding*

TEC Component	Current sample: Filipino Deaf 8 to 22 years (*n*=101)		Current sample: Filipino Hearing 4 to 14 years (*n*=83)		Current sample: Test of difference	Italian deaf 4 to 12 years[a] (*n* = 72)		Italian hearing 3 to 11 years[b] (*n* = 967)	
	%	Rank	%	Rank	X^2	%	Rank	%	Rank
I (Labelling)	95.0	1	97.6	1	0.80	100.0	1	89.0	1
II (Cause)	78.2	2	80.7	4	0.34	99.0	2	77.0	2
III (Desire)	37.6	6	84.3	2	41.01***	97.0	3	67.0	4
IV (Belief)	19.8	9	66.3	7	40.73***	84.0	4	48.0	6
V (Reminder)	46.5	5	71.1	6	11.24***	82.0	5	67.0	4
VI (Regulation)	33.7	7	73.5	5	28.94***	63.0	6.5	42.0	8.5
VII (Hiding)	32.7	8	37.3	9	0.44	63.0	6.5	67.0	4
VIII (Mixed)	47.5	4	51.8	8	0.33	48.0	9	42.0	8.5
IX (Morality)	51.5	3	81.9	3	18.61***	49.0	8	60.0	7

Note. [a]Mancini et al. (2016). [b]Albanese and Molina (2008) as reported in Mancini et al. (2016).
****p* <= .001.

5.6 Discussion

The present study examined group differences in emotion understanding and affective recognition and labelling of Filipino deaf and hearing individuals. The present study contributes to the extant literature in three ways. First, it extends current understanding of the affective recognition and labelling abilities of the deaf to include not just an assessment of emotions on facial expressions but also with body postures, which has been largely neglected in past studies. Second, it broadens extant data on the emotion understanding of Filipino deaf and hearing individuals, not only in terms of an over-all index of their competence across several domains but also with regard to the sequence of acquisition of different components of emotion understanding. Lastly, and most importantly, it confirms that observed difficulties by deaf samples are limited to tasks requiring mentalistic skills and there is no separate additional impairment in evaluating emotion stimuli, as a whole.

At the onset, results appear to indicate that deaf individuals have a specific impairment in mentalising skills and not an additional global problem of dealing with emotion stimuli. Specifically, consistent with expectations, current findings revealed that deaf and hearing children had equivalent scores on affective recognition and labelling, after controlling for age, socio-economic status, and verbal ability. These are in line with previous findings on equivalent performance of deaf and hearing children on tests of emotion recognition of facial expressions and body postures (Hao & Su, 2014; Hopyan-Misakyan et al., 2009; Most & Aviner, 2009; Weisel, 1985). That the deaf performed as well as hearing controls might have to do with the fact that there are specific signs to refer to basic emotions (e.g., happy, sad, angry, scared/afraid) and these are often taught at the basic level of sign language instruction. Thus, hearing parents even with a rudimentary knowledge of sign language can begin to incorporate these signs in their interactions with their deaf children early on. In contrast, signs for more advanced affective states (e.g., envy, shame, contempt, etc.) are more complex and likely require more advanced sign language instruction. Having said that, the current sample of deaf participants may also be adept with recognising and labelling basic emotions but this may not necessarily translate to more advanced emotional states. This claim, evidently, needs to be examined further. Additionally, formal schooling, beginning at the kindergarten level, for most Filipino children starts around 5 years of age (Republic of the Philippines, 2017b). Whether the deaf child is first enrolled in a regular school or straight into a deaf school, children are likely to be exposed to images on classroom walls displaying expressions of basic emotions as well as their associated labels. This may support the development of a nascent understanding of the link between labelling basic emotions and particular expressions.

Results also showed that hearing status had a profound influence on the development of emotion understanding, after controlling for age, socio-economic status, and verbal ability, consistent with expectations. These results correspond with Mancini et al.'s (2016) findings using the same methodology with Italian deaf children and consistent with extant literature on deaf children's emotion understanding in general. Importantly, Filipino deaf participants were not only delayed in emotion understanding skills in relation to the typically developing children from the same community but they were also behind other deaf children from other cultures, specifically Italy (Mancini et al., 2016). The deaf group's low level of achievement cannot be explained by their poorer language skills, given that the analyses controlled for expressive vocabulary. It can neither be attributed to maturity, as indexed by age, having found significant associations between hearing status and emotion understanding even in the age matched sample. Rather, their low performance may derive from poor critical thinking skills. Specifically, elementary and secondary education in the Philippines is marked by an intense focus on knowledge acquisition as opposed to the development of skills and competencies among its students. Indeed, in a report for the United Nations Educational, Scientific and Cultural Organization (UNESCO) International Bureau of Education, Mariñas and Ditapat (2000) recognized the, "…need for students to develop higher critical, logical thinking skills…" (p.112) as part of the reforms agenda for the national basic educational curriculum. Unfortunately, these difficulties appear to be on-going. Quite recently, according to the National Education Testing and Research Centre, graduating high school students scored lowest on critical thinking on the school year 2012-2013 National Achievement Test (UNESCO, 2015). Unfortunately, this could negatively impact deaf children's ability to critically evaluate information, appraise one's own and others' perspectives, and engage in reflective thinking. Any one of these abilities could conceivably inhibit the development of social cognitive competences in general and of understanding emotions in particular. This poor critical thinking can also imply that the deaf could have difficulties in extracting important information from different life experiences thus have limited comprehension of the link between situational events and emotions. But why does this not seem to impact the performance of typically developing Filipino children? Plausibly, unlike the deaf, unfettered access to conversations provide hearing children an opportunity for an extended discourse on emotions. This allows them to understand and reason with emotions more efficiently, regardless of potential problems brought about by underdeveloped critical thinking skills. Additionally, recall that it was mentioned that the majority of the Filipino deaf are exposed to SimCom. It has been said that in SimCom, critical pieces of information (e.g., grammatical markers, concepts etc.) are sometimes left out of the conversation even if they were mentioned in oral speech (Vernon & Andrews, 1990; Luetke-Stahlman, 1988; Marmor & Petitto, 1979). Additionally, speech produced during SimCom is somewhat distorted due to temporal changes and reduced naturalness (Cokely, 1990; Schiavetti, Whitehead, & Metz, 2004). Taken together, these imply that the deaf, as a recipient of SimCom, could be afforded an impoverished version of the message. Thus, it could be that people around the deaf person (e.g., parents, teachers) are attempting to teach the deaf about emotional consequences/ antecedents but the information is filtered due to the use of SimCom which results in pieces of knowledge being missed or inadvertently left out. Indeed, the quality of notes taken by students were better when the teacher used only signs or used an interpreter rather than when the teacher used SimCom (Cokely, 1990). In a similar vein, only 74.5% of teachers of the deaf surveyed by Arevalo and Kusanagi (1995) perceived that their students understood what they were signing. Certainly, as Mayer (2015) suggests, it is important to determine to what extent the deaf person is able to access and understand the conversational input. Interestingly, the use of simultaneous communication in the classroom was seen to enhance learning of cochlear implant users than learning in speech-only environments (Blom & Marschark, 2015). Furthermore, together with findings from study 1, it appears the deaf individuals evidence proficiency in some but not all components of emotion understanding as well as ToM. This implies that maybe, a more nuanced way of addressing the question of whether deaf children are delayed in mental state understanding needs to factor in their equivalent performance on some tasks when compared to normative samples. This point is further explored in the General Discussion (chapter 8).

In general, the sequence of acquisition of both of the Filipino and deaf children varied quite remarkably to previous studies of children from Western and non-Western cultures (see Table 1.2). However, notable similarities in response patterns between the Filipino deaf and hearing samples which stand in direct contrast to other cultures strengthens the previous proposition that certain cultural values and practices with the Filipino culture impact their social cognitive development. Specifically, Filipino children were found to understand the link between moral principles and emotions relatively easily and they seem to experience notable difficulties with belief-based emotions and hidden emotions. The first issue concerns their advanced morality-emotions understanding. One possible explanation is that the development of moral judgement emerges early in Filipino children. In a study with *n* = 216 Filipino children from Metro Manila, Jimenez (1976) found that Filipino children as young as 6-7 years are able to formulate judgements on the moral behaviours of story characters based on the protagonists' motives and not the consequences of their behaviours. This nascent sense of morality could have come about due to parental disciplining methods, presence of older siblings, exposure to media, early socialisation, religious practices, amongst others. Second, the influence of the practices and principles of the Roman Catholicism is quite pervasive. Recall that the Philippines is a predominantly Christian country, of whom the majority are Roman Catholics (Republic of the Philippines, 2014a). Thus, to many Filipinos, their attitudes and perspectives regarding moral and social issues are a reflection of their Catholic identity (Cornelio, 2016). It is not the present contention that religiosity engenders more morally responsible individuals (see Sablosky, 2015; Decety et al., 2015) rather, it is argued that certain cultural practices guide children's attention to blame and guilt as responses to certain behaviours. That is to say, young Filipino children would more likely apply their knowledge of the teachings of the Catholic Church in everyday situations compared to children raised in cultures that are less inclined towards religious influences. Lastly, there is empirical evidence to suggest that young children are able to construct moral judgements independent of the full development of their ToM abilities (e.g., Malti, Gasser, & Gutzwiller‐Helfenfinger, 2010; Ross, Recchia, & Carpendale, 2005). Thus, even in the context of profound delays in their ToM understanding among the deaf participants, Filipino children are well placed to make moral judgements on situations. Future studies should attempt to examine the relationship between religious attitudes and emotion understanding to confirm these hypotheses. The second issue concerns the groups' comparable difficulties with understanding how a person's beliefs determine his/her emotional reactions to particular situations. These findings are consistent with ToM delays noted in study 1, particularly for the deaf group and the ToM comparison groups, and previous studies showing impaired results on other belief tasks (Jones et al., 2015; Peterson & Siegal, 1995, 1998; Ziv et al., 2013). The third issue concerns the delayed understanding of display rules or hidden emotions. Prior research has shown that age matched deaf and hearing children have comparable knowledge of the conventions regarding the expression or concealment of emotions, although reasons *why* feelings are concealed seem to be less understood by the deaf children (Hosie et al., 2000). Furthermore, previous cross-cultural research in normative samples suggests that display rules surrounding emotions are mediated by one's cultural background. Specifically, collectivistic cultures such as Hong Kong, Indonesia, and Malaysia are less likely to endorse emotional expressivity than more individualistic cultures such as Australia and the US (Matsumoto et al., 2008). Additionally, authors found that individuals, regardless of culture, endorsed expression towards members of their in-group compared to out-group. Especially for Filipino children, this latter finding might be an important factor to consider. Some studies have examined the concept of *hiya* or sense of shame as an indigenous notion of controlling children's behaviours. For instance, acting inappropriately or being confrontational with others may cause *hiya* for the family or oneself (Miralao, 1997). Conversely, the absence of *hiya* implies one disregards the impropriety and/or continues to behave inappropriately results in group (i.e., family or community) inclusion (Roces & Roces, 2000). In this context, Filipino children's understanding of display rules maybe framed in consideration of the consequences to the self or members of their in-group (i.e., family or parents) and not in reference to others' feelings (i.e., out-group). This implies that the understanding of display rules is not necessarily intended to protect others' feelings, rather, concealment of emotions is important so as not to create a situation that will not bring shame to the family/oneself. Currently, the TEC does not assess how emotions are expressed in relation to the reactions of the members of the in-group versus protagonist's/victim's feelings. Future studies can explore if Filipino children's emotion responses are mediated by their desire not to cause *hiya* to the family.

There are a few limitations that need to be raised. First, the DANVA-2 used static images on a plain background which could have implications on the children's performance. Indeed, evaluating emotional expressions in different contexts or during movement could produce vastly different results. Particularly for the body posture images, movement can help contextualise the actions, thus improving performance. Second, the DANVA featured 48 facial images and 24 body postures. Although the task did not take more than 15 minutes to complete, young children could have considered it too long and tedious a task and there could have been a tendency to answer randomly towards the end of the task which could result in an underestimation of their performance. However, this was unlikely given that the children who had suspicious patterns of responses (e.g., the same answer for a sub-test) were invalidated. Third, the use of forced choice response items may have affected children's responses by choosing answers which they may not have decided on spontaneously (Russell, 1994). Thus, succeeding studies should opt to use spontaneous labels in lieu of forced choices to address this concern (e.g., Widen & Russell, 2003).

Emotion understanding, like ToM, is an important developmental phenomenon shown to encompass several related domains. This extended view of emotion understanding has been scarcely examined in Filipino children, especially the deaf. Systematic investigation of Filipino participants' emotion understanding alongside their more basic affective recognition and labelling skills are critical in establishing the nature of their emotion knowledge, and establishing the extent of delays experienced by deaf individuals as compared to typically developing children from the same cultural background. It further establishes if deaf children have a particular difficulty in understanding mind and emotions and/or possess a discrete impairment in processing emotions.

Chapter 6: Studies 4a and 4b

The Influences of Language Ability and the Communicative Environment on the Development of Emotion Knowledge in Filipino Deaf and Hearing Individuals

6.1 Introduction

In study 3, it was revealed that, like ToM, Filipino deaf individuals aged 8 to 22 years exhibit profound delays in their emotion understanding in comparison to typically developing children. In contrast, their performance on tasks measuring their affective recognition and labelling was on par with hearing controls, after controlling for the influences of age, verbal ability, and socio-economic status. Additionally, the sequences of acquisition of components of emotion understanding were different between Filipino deaf and hearing samples, albeit with some areas of correspondence. Hence, not only are Filipino deaf individuals delayed in their understanding of emotions compared to typically developing Filipino children but that the nature of development of either groups are essentially unique. Critically, as evidenced in previous studies, findings also showed a robust positive association between verbal ability and emotion knowledge. Nonetheless, observed variance in emotion understanding, but not affective recognition and labelling, between deaf and hearing participants could not be fully explained by group differences in their verbal scores or age. Therefore, on the basis of findings presented in study 3, poorer verbal ability could not fully account for deaf participants' difficulties with emotion understanding. On the other hand, language ability significantly predicted affective recognition and labelling independent of age and SES, although there were no meaningful differences between deaf and hearing individuals.

If the reader recalls, results in study 2a revealed that better language abilities predicted successful theory of mind reasoning for Filipino hearing children but not the deaf. Results of study 2b, on the other hand, revealed that family history of deafness and parents' predominant use of sign language predicted lower ToM scores in the deaf. These findings are noteworthy given that they qualify variations in the communicative environment in hearing families with deaf children and demonstrate how the communicative environment plays a critical role in understanding ToM development in Filipino deaf individuals.

One question that remains to be answered is how language ability and the communicative environment relate to the development of emotion knowledge in Filipino deaf and hearing samples. Like ToM understanding, typical developing children's language ability is linked to their emotion understanding (e.g., Cutting & Dunn, 1999; de Rosnay, Harris, et al., 2008; Pons et al., 2003; Wellman, Harris, Banerjee, & Sinclair, 1995) and their affective recognition and labelling (e.g., Barrett et al., 2007; Lindquist et al., 2006). In comparison, findings are less consistent among studies with deaf children. As explained in §1.2.3 and §1.2.4, current understanding of children's emotion knowledge is largely based on studies that examine a limited number of emotion constructs. Thus, it could be argued that the observed relationship between language and emotion knowledge depends on the domain being examined, at least for deaf samples. Relatedly, inherent language demands of the different tasks could drive the relative degree of these associations. That is to say, language ability is *more* important for *complex* components (e.g., hidden emotions, mixed emotions) and *less* important for *simpler* domains (e.g., emotion labelling). In either of the above scenarios, it would be valuable to determine to what extent linguistic abilities are associated with emotion understanding and affective recognition and labelling in Filipino children *and* if this relationship is qualified by children's hearing status. This is the focus of study 4a.

Unlike ToM understanding, the impact of the communicative environment to emotion knowledge in the deaf is less well understood or researched, although likely similar (de Rosnay, Harris, et al., 2008). There is some evidence regarding the impact of severity of hearing loss in their performance on emotion related tasks, however, findings are mixed (Dyck & Denver, 2003; Dyck et al., 2004; Mancini et al., 2016). Research has also linked poor communication, as a result of insufficient sign language skills and fear of miscommunication, to deaf children's limited access to discourse and social interactions within the family and restricted knowledge about transgressions and their behavioural and affective consequences (Evans, 1995; Greenberg et al., 1991). Consistent with the role of communicative practices in the development of the child's emotion understanding as espoused by the Discourse Model (Harris, 1999; see §1.3) and as evidenced by some previous studies, there is sufficient justification to claim that understanding of mental states in the deaf unavoidably needs to be understood in terms of the communicative environment that deaf children are raised. This is the subject of study 4b.

Therefore, this chapter reports on two studies, akin to study 2, that were designed to extend the line of inquiry by examining the origins of individual differences in children's emotion knowledge through a systematic assessment of the linguistic characteristics of the children (study 4a) and that communicative environment (study 4b) in relation to the development of emotion understanding and affective recognition and labelling in Filipino deaf and hearing individuals.

6.2 Study 4a

Although there is previous evidence for the link between language and emotion knowledge, it is not clear whether language is as strongly associated with children's affective recognition and labelling skills as is their emotion understanding. One can argue that the way language ability affects children's performance could vary depending on the assessment measures used and since there is a verbal component present in all testing procedures, language will likely be associated to different outcome variables in varying degrees. In the case of affective recognition and labelling skills, some argue that emotion words provide a context for which to perceive emotion stimuli (Barrett, Mesquita, & Gendron, 2011). Thus, performance is more accurate on experiments where emotion labels are provided compared to tasks where children are asked to match emotional content of images based on facial structural similarities alone (Izard, 1971; Roberson, Davidoff, & Braisby, 1999). The presence of emotion terms in affective recognition tasks, proponents argue, provide necessary information as well as orients the perceiver to take note of meaningful facial structures which would otherwise be ignored thus bolstering test performance (Barrett et al., 2007; Fugate, Gouzoules, & Barrett, 2010). As regards emotion understanding tasks, success is contingent on the comprehension of different scenarios/vignettes as well as test questions. Like theory of mind tasks, language may help provide a means for children to mentally represent story details and work out how the protagonist will feel in that situation. In addition, for most tasks, they also need to be able to express verbally (or in sign) their response to test questions. In this context, children with better language skills would perform better.

Language and emotion knowledge could also be associated differently based on hearing status. As discussed in §1.3.1, evidence from typically developing children indicates that language ability is related to emotion knowledge. Indeed, better verbal ability are associated with emotion understanding (e.g., Cutting & Dunn, 1999; de Rosnay & Harris, 2002; De Stasio et al., 2014; Pons et al., 2003; Ruffman et al., 2003) and affective recognition and labelling (e.g., Cutting & Dunn, 1999; Lindquist et al., 2006). For example, Bosacki and Moore (2004) tested 53 typically developing preschool children and results show that understanding simple and complex emotions was positively associated with their scores on a standard vocabulary task. Similarly, Cutting and Dunn (1999) tested over a hundred preschool aged children and findings revealed that receptive vocabulary and expressive narrative abilities were related to both affective recognition and labelling as well as emotion attribution. Comparatively, there has been little study on what these relationships entail for deaf children and where available, findings are mixed. For instance, Gray et al. (2001) found that language ability was significantly correlated with emotion labelling on faces and emotion comprehension but not knowledge of display rules. Yet, Wiefferink et al. (2013) found language skills were significantly related to emotion attribution but not emotion recognition. These inconsistent findings could have resulted from the choice of which emotion domain was examined. Although, on the TEC, Mancini et al. (2016) found normalised TEC scores were significantly associated with verbal ability in the deaf.

Therefore, there are three key questions that need to be addressed: (a) Is there a relationship between language and affective recognition and labelling?; (b) Is there a relationship between language and emotion understanding?; and (c) Is the influence of language development on affective recognition and labelling and/or emotion understanding, if any, different for deaf and hearing individuals? Based on prior literature, it was expected that higher language scores would be related to better affective recognition and labelling (**hypothesis 1**). It was also predicted that better language ability would be associated with better emotion understanding (**hypothesis 2**). Despite the mixed findings in current literature, based on findings of study 2a, hearing status is expected to moderate the relationship between language ability and emotion understanding (**hypothesis 3**). Conversely, hearing status is not expected to moderate the relationship between language and affective recognition and labelling (**hypothesis 4**).

6.3 Method

6.3.1 Participants

The participants were the same as those of study 3 (see Table 2.1). A full description of the sample is provided in §2.1.

6.3.2 Measures

Like study 3, children's level of *emotion understanding* was captured using the TEC (Pons et al., 2004) and *affective recognition and labelling* was assessed using the faces and postures subtests of the DANVA-2 (Nowicki, 2013). Both measures are described in §5.4.2.

Verbal ability was assessed using the EVT-2 (Williams, 2007), as described in §2.2.1.

6.3.3 Procedure

The same procedure as study 2 was used in the current study (see §2.3 for a full description).

6.3.4 Analytic plan

Descriptive statistics were first reported. *T*-tests were then conducted to examine differences based on hearing status. Separate correlational analyses were conducted for deaf and hearing children. Lastly, separate regression analyses were conducted with affective recognition and labelling and emotion understanding as dependent variables while age was entered in step 1. Hearing status and language ability were entered in step 2. In the final step, the interaction of language ability and hearing status was entered. Simple slopes analysis was conducted on the significant interactions. See Appendix G for the syntax.

6.4 Results

Table 6.1 displays the descriptive statistics on focal variables. *T*-test analyses revealed that there were significant differences between deaf and hearing participants on verbal ability, $t(124) = -6.23$, $p < .001$, and age, $t(181) = 10.42$, $p < .001$. There were no significant differences in socio-economic status, $t(175) = -.27$, $p = .79$.

Table 6.1 *Descriptive Statistics for the Main Variables in Study 4a*

	Hearing status					
	Deaf 8 to 22 years (*n*=101; 61 males)			Hearing 4 to 14 years (*n*=83; 28 males)		
Measures	*M*	*SD*	Range	*M*	*SD*	Range
Age	14.86	3.74	8 to 22.17	9.78	2.86	4.75 to 14.83
Verbal ability	.32[a]	.07	.20 to .61	.41	.13	.24 to .73
Socio-economic status	2.04[b]	1.97	0 to 8	2.11	1.44	0 to 6
Total emotion understanding	4.43	1.57	1 to 8	6.46[d]	1.89	2 to 9
Total affective recognition and labelling	48.66[c]	8.49	21 to 64	45.80[e]	8.81	16 to 61

Note. N = 184. M = mean. SD = standard deviation.
[a]n=97. [b]n=98. [c]n=100. [d]n=82. [e]n=81.

Bi-variate correlation analyses showed that verbal ability was significantly correlated with all study variables: emotion understanding ($r(179) = .64$, $p < .001$), affective recognition labelling ($r(177) = .35$, $p < .001$), socio-economic status ($r(177) = .20$, $p = .007$), and hearing status ($r(180) = .44$, $p < .001$) except age, $r(180) = .10$, $p = .17$. Correlations for deaf and hearing children are considered separately in Table 6.2.

In the deaf, results show that verbal ability scores were significantly correlated with emotion understanding, affective recognition and labelling, and age but not SES. For hearing children, verbal ability was significantly correlated to emotion understanding, affective recognition and ability, age, and socio-economic status. To clarify these relationships, regression analyses were conducted.

Table 6.3 reports on the results of the regression analyses. Two separate hierarchical linear regressions were conducted, one for affective recognition and labelling and another for emotion understanding. In both regression analyses, age and socio-economic status were entered as control variables in step 1. Verbal ability and hearing status were entered in step 2. Lastly, the interaction of verbal ability and hearing status was entered in step 3.

Table 6.2 *Correlations Among the Main Variables in Study 4a*

	1	2	3	4	5
1. Total emotion understanding	---	.33***	.27**	.24**	.32***
2. Total affective recognition and labelling	.57***	---	.32***	.48****	.20*
3. Verbal ability	.69***	.63***	---	.34***	.10
4. Age	.74***	.73***	.78***	---	.38***
5. Socio-economic status	.22	.11	.36***	.32**	---

Note. Bi-variate correlations for the deaf participants are reported above the diagonal line. Bi-variate correlations for the hearing participants are reported below the diagonal line.
*p < .05. **p <.01. ***p <=.001.

Table 6.3 *Results of Regression Analyses in Study 4a*

	Affective recognition and labelling		Emotion understanding	
Variables	ΔR^2	β	ΔR^2	β
Step 1	.30***		.06**	
Age		.54***		-.08
Socio-economic status		.03		.25***
Step 2	.10***		.44***	
Age		.52***		.21*
Socio-economic status		-.03		.09
Verbal ability		.32***		.40***
Hearing status		-.01		.45***
Step 3	.001		.01*	
Age		.53***		.21*
Socio-economic status		-.03		.08
Verbal ability		.26		.19
Hearing status		.001		.48***
Verbal ability X hearing status		.06		.22*
Total R^2	.40***		.51***	
N	173		175	

Note. *p < .05. **p < .01.***p <= .001.

As regards the regression model with affective recognition and labelling as the outcome variable, the model with age and socio-economic status was significant, $F(2,171) = 36.69$, $p < .001$. In step 2, the model with hearing status and verbal ability was also significant, $F(4,169) = 27.72$, $p < .001$. The variables jointly provide a significant additional increment in variance explained, $\Delta F(2,169) = 13.42$, $p < .001$. However, only verbal ability was a significant predictor of affective recognition and labelling based on the beta values, $t = 4.03$, $p < .001$. On the third step, with the interaction term, the over-all model was significant, $F(5, 168) = 22.13$, $p < .001$ but the interaction variable did not significantly explain any additional variance of the dependent variable, $\Delta F(1,168) = .27$, $p = .61$. Based on the beta values, the interaction of hearing status and verbal ability was not a significant predictor of affective recognition and labelling, $t = .52$, $p = .61$. Thus, as expected, language ability was a significant predictor of affective recognition and labelling (**hypothesis 1**) *and* that the relationship between language and affective recognition and labelling is not affected by hearing status (**hypothesis 4**).

A second hierarchical linear regression was conducted where level of emotion understanding was the dependent variable. In step 1, the model with age and socio-economic status was significant, $F(2, 173) = 5.51$, $p = .005$. In step 2, the model with verbal ability and hearing status was also significant, $F(4, 171) = 42.90$, $p < .001$. The addition of hearing status and language ability accounted for an additional significant increase in variance explained, $\Delta F(2,171) = 75.55$, $p < .001$. Both hearing status ($t = 4.94$, $p < .001$) and verbal ability ($t = 5.55$, $p < .001$) had significant effects on variation in the level of emotion understanding after controlling for the effect of age and socio-economic status (**hypothesis 2**). However, the significant main effects need to be clarified in consideration of the interaction effects. In step 3, the model with the interaction term of hearing status and verbal ability was also significant, $F(5,170) = 35.78$, $p < .001$, and it accounted for a significant increase in variance explained, $\Delta F(1,170) = 4.15$, $p = .04$. The interaction of hearing status and verbal ability was a significant predictor of emotion understanding, $t = 2.04$, $p = .04$. In short, hearing status moderates the relationship between language ability and emotion understanding (**hypothesis 3**). This implies that hearing children who have better language skills have better emotion understanding abilities. Simple slopes analysis for the interaction effect of hearing status and language ability on emotion understanding was conducted. Simple slope test was significant for hearing children, $b_1 = 8.12$, $SE = 1.23$, $t = 6.60$, $p < .001$, but not for the deaf, $b_1 = 3.51$, $SE = 3.21$, $t = 1.09$, $p = .28$. ***Figure 6.1*** revealed an enhancing effect such that the independent predictive influence of language ability on emotion understanding only appears to be evident for hearing children but not for the deaf.

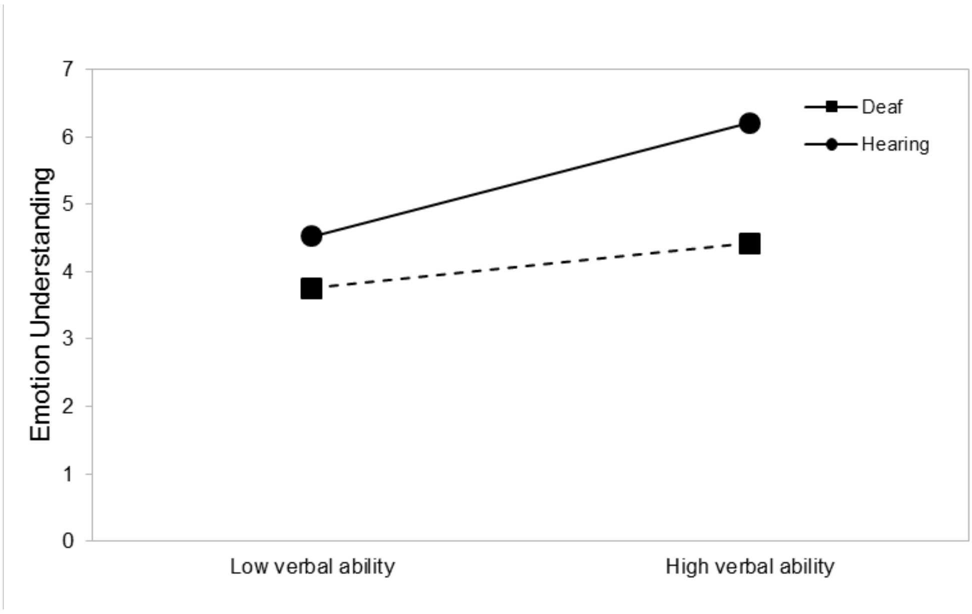

Figure 6.1 Level of emotion understanding and verbal ability by hearing status

6.5 Discussion

The first key question addressed in this study was, '*Is there a relationship between language and affective recognition and labelling?*' As predicted, current findings found that language ability predicted affective recognition and labelling, after controlling for age and

SES. These are in line with previous findings (e.g., Cutting & Dunn, 1999; Lindquist et al., 2006). The second key question was, '*Is there a relationship between language and emotion understanding?*' Results also found that language did predict emotion understanding, after controlling for age and SES. This is, likewise, consistent with extant literature (Bosacki & Moore, 2004; Cutting & Dunn, 1999; de Rosnay & Harris, 2002; De Stasio et al., 2014; Pons et al., 2003; Ruffman et al., 2003). In addressing the third question, '*Is the influence of language development on either affective recognition and labelling or emotion understanding, if any, different for deaf and hearing individuals?,*' current findings suggest that hearing status is differentially related to emotion outcomes. Specifically, hearing status was not predictive of affective recognition and labelling whereas, hearing status moderated the relationship between language and emotion understanding. These findings are broadly consistent with findings from previous studies on hearing children (e.g., Cutting & Dunn, 1999; de Rosnay et al., 2014; de Rosnay & Harris, 2002; Pons et al., 2003) and partially supported by some studies on the deaf (Dyck et al., 2004; Wiefferink et al., 2013).

There are several possible explanations for current findings. First, tasks assessing children's affective recognition and labelling have minimal linguistic requirements. It is plausible that the required level of language competency has been sufficiently achieved by both deaf and hearing children in the sample. Thus, despite significantly lower verbal scores, there were no meaningful differences between the deaf and hearing in terms of the level of language skills needed for this task. Secondly, the language measure used for the current study, the EVT-2 (Williams, 2007), examined children's lexical knowledge which could have been more beneficial for the successful completion of the emotion understanding task. Indeed, apart from understanding relevant emotion terms (i.e., happy, sad, angry, and fearful), successful task performance in the DANVA-2 was not contingent on a wide vocabulary. In contrast, emotion understanding, as assessed with the TEC, requires a substantial level of linguistic competence and wider vocabulary to understand the instructions and the stories which the hearing children may have acquired but the deaf, at least in the current sample, lack. Lastly, current findings could result from the fact that whereas hearing children are able to directly access information regarding feelings and mental states through interpersonal exchanges, deaf children's acquisition is less direct and one that is facilitated by the conversational environment they are exposed to while growing up. In the current context, deaf children could *recognise and label* what other people are feeling but they lack an *understanding* of the circumstances surrounding this affective state, likely due to the restricted access to conversations (Peterson & Siegal, 1995, 1999, 2000). Thus, communicative environments where deaf children have greater access to conversational discourse would likely be beneficial for the development of their emotion understanding. This is addressed in the next study.

6.6 Study 4b

There are two important takeaways from study 4a namely, (a) whist language is a robust predictor of affective recognition and labelling, there are no significant group differences between deaf and hearing participants; and (b) the predictive influence of language on emotion understanding is evident for hearing children but not for the deaf. Although there has been an attempt to explain these findings in terms of the complexity and linguistic demands of the individual tasks, an alternative account would be to examine language in relation to the communicative environment that deaf children grow up in.

Recall that in study 2, the communicative environment was shown to have a profound impact on the relationship between language ability and ToM. Specifically, in study 2b, parents' use of sign language predominantly led to lower ToM scores. Additionally, family history of deafness predicted better ToM. Thus, bolstered by findings in study 2b as well as evidence from spontaneous family discourse about emotions in typically developing children (e.g., Dunn, Brown, & Beardsall, 1991), study 4b was designed to examine closely if individual differences in emotion knowledge can be explained by, together with language ability, factors related to the communicative environment of families with deaf children.

As described in §1.3.2, several factors have been identified to possibly impact the development of social cognition in the family including, degree of hearing loss, family history of deafness, degree of spoken and signed communication, level of formal sign language instruction, and age entered deaf school. Although there is far less empirical evidence to directly support such associations with emotion knowledge, it is nevertheless argued that the communicative environment helps shape the development of emotion understanding and affective recognition and labelling in the deaf (Harris, 1999). The factors are individually discussed below but have been previously presented in chapter 4 and §1.3.2.

Degree of hearing loss. Severity of hearing loss, as previously argued, affects spoken language production. Thus, it is expected that with greater hearing loss, communicative exchanges will be less smooth and the transfer of information, less efficient. Severity of hearing loss was found to be significantly associated with the understanding of emotional consequence of different situations (or emotion attribution) and emotion vocabulary but not emotion recognition (Dyck & Denver, 2003). However, after a training intervention, post-test scores revealed that profoundly deaf children did poorer than severely deaf children on all emotion tasks. Most and Aviner (2009) and Most and Michaelis (2012) did not find any significant associations between severity of hearing loss and emotion recognition. Mancini et al. (2016), likewise, did not find any significant associations between degree of hearing loss and emotion understanding using the TEC. Therefore, to what extent severity of hearing loss is directly related to the development of emotion knowledge is unclear. Yet, previous findings of links between degree of hearing loss and language difficulties (e.g., Bess & Tharpe, 1984; Fitzpatrick et al., 2011; Tharpe, 2008) could suggest a more indirect effect.

Family history of deafness. As a result of their issues with communication, hearing parents report that they socialise less with their deaf children and they are likely to react with avoidance and physical punishment when resolving disputes (Calderon & Greenberg, 2003). Yet, in the presence of other deaf family members, deaf children would likely acquire language earlier, develop a more complex signed vocabulary and be able to genuinely participate in conversations in the home (Meadow, Greenberg, Erting, & Carmichael, 1981; Newport & Supalla, 1980). Indeed, with early acquisition of language, children are able to express and reason about internal states, including emotions earlier and likely more efficiently (Calderon & Greenberg, 2000). Thus, it is expected that the presence of family members creates a more conducive environment for richer conversations and greater participation in communicative discourse. Interestingly, Ludlow et al. (2010) did not find any significant correlations between presence of deaf family members and deaf children's emotion recognition .

Mode of communication. Sign language use in familial conversations, as is the presence of a deaf family member, positively impacts deaf children's involvement in communicative and social interactions in the family (Evans, 1995; Henderson & Hendershott, 1991). Importantly, a shared mode of communication provides the means for the deaf children to learn about actions including its antecedents and its consequences (Calderon & Greenberg, 2003). Unsurprisingly, poor communication in the families with deaf children results in restricted discourse about feelings and other important issues (Greenberg et al., 1991). Thus, when parents use predominantly signed communication with their signing deaf child, it would likely create a more efficient communicative environment which could be related to the development of the emotion knowledge.

Level of formal sign language instruction. Moeller and Schick (2006) suggest that mother's proclivity to engage in conversation with their deaf child about specific topics is as much as reflection of their willingness to discuss these topics as their ability to do so. That is to say, should mothers want to talk about specific topics, say emotions, they will intentionally learn the necessary (sign) vocabulary to assist in this endeavour. Given that discourse involving emotions are likely more complex than more pragmatic themes, more formal sign language instruction is needed to bolsters maternal sign language skills in these topic areas. Conversely, due to insufficient skills or fear of misunderstanding or being misunderstood, parents are likely to engage in linguistic overprotection or motherese where the language that adults use with deaf children frequently is modified to be appropriate for the presumed language capabilities of the younger interlocutor (Calderon & Greenberg, 2000; Marschark, 1997). This may limit deaf children's understanding of different concepts and restrict their abilities to participate in higher level discourse.

Age of entry into the deaf school. With early admission to a deaf school, children would have immediate access to alternative role models (e.g., teachers and deaf classmates) who can help expand children's knowledge and understanding of behaviours and its associated predictors such as mental states (Calderon & Greenberg, 2003). Furthermore, teachers will instruct and demonstrate novel ways to deal with conflict and problem solve. This is important given that, in the deaf, better problem solving skills have been found to be positively correlated with their emotion understanding abilities (Greenberg et al., 1991). Importantly, early exposure to fluent communicators will allow deaf children to develop larger vocabularies which will allow them to engage in more complex forms of discourse (Calderon & Greenberg, 2000). Taken together, early entry into a deaf school provides the deaf access to an environment where they can access information easily and develop better communication skills. Indeed, early language deprivation has important negative repercussions in terms of deaf children's ability to interpret and conceptualise different emotion experiences (Kusché, Garfield, & Greenberg, 1983)

Therefore, similar to study 2b, the primary purpose of the present study was to examine the influence of the conversational environment, together with language ability, on the development of emotion knowledge in deaf samples. There are three possible outcomes. First, the communicative environment would directly influence emotion knowledge, independent of language abilities (**hypothesis 1**). Second, if current findings show that the communicative environment had no influence on the relationship between language ability and emotion knowledge *or* is contextually differentiated, it will suggest that the development in emotion understanding and/or affective recognition and labelling occur independent of conversational input (**hypothesis 2**). Third, if, however, the relationship between language and emotion knowledge were affected by variations in the communicative environment, then, the lack of associations for deaf individuals in study 4a in emotion understanding will be more likely attributed to how the influence of verbal ability is, to some extent, reliant on how families communicate with each other (**hypothesis 3**).

6.7 Method

6.7.1 Participants

The participants in the current study are comprised of the deaf sample in study 2b.

6.7.2 Measures and procedure

The details of the procedure are identical with those reported in study 2b. In addition to the communicative environment variables (see §4.7.2 for a full description), for the current study, participants were asked to complete the Test of Emotion Comprehension (TEC; Pons et al., 2004) and the Diagnostic Analysis for Non-Verbal Behaviour – 2 (DANVA-2; Nowicki, 2013), as described in §5.4.2.

6.7.3 Analytic plan

Descriptive statistics were first presented. Then, bi-variate correlations were conducted to examine the associations between variables. Lastly, hierarchical linear regressions were conducted to examine the roles of language as well as parent communication in predicting affective recognition and labelling and emotion understanding, separately. See Appendix G for the syntax.

6.8 Results

Descriptive statistics are presented on Table 6.4. Table 6.5 shows the correlations between main study variables. Age, verbal ability, affective recognition and labelling, and emotion understanding were significantly correlated with each other. Amongst the different communicative interaction variables, only age started deaf school (positively correlated) and parents' level of sign language training (negatively correlated) were significantly related to affective recognition and labelling whilst none of the communicative variables correlated with emotion understanding. The relations between parent communication and emotion understanding as well as affective recognition and labelling are represented in Figures 6.2 and 6.3, respectively. Visual inspection of the graphs shows that there are no perceptible differences among the groups in reference to both emotion understanding and affective recognition and labelling.

Table 6.4 *Descriptive Statistics for the Main Variables in Study 4b*

	M	*SD*	Range
Age	14.80	3.71	8 to 22.17
Verbal ability[a]	.32	.07	.20 to .61
Age started deaf school[a]	6.07	2.03	2 to 11
Degree of hearing loss[b]	2.65	.63	1 to 3
Family history of deafness[c]	.17	.38	0 to 1
Parents' sign language training[d]	1.76	.60	1 to 3
Emotion understanding	4.43	1.58	1 to 8
Affective recognition and labelling[b]	48.53	8.42	21 to 64

Note. *N* = 100. M = Mean; SD = Standard deviation.
[a]*n* = 96. [b]*n* = 99. [c]*n* = 95. [d]*n* = 94.

Table 6.5 *Correlations Among the Main Variables in Study 4b*

	1	2	3	4	5	6	7	8
1. Affective recognition and labelling	---	.34***	.47***	.31**	.21*	.04	.15	-.22*
2. Emotion understanding		---	.28**	.26**	-.02	-.07	.12	-.04
3. Age			---	.33***	.43***	-.24*	-.02	-.26*
4. Verbal ability				---	-.10	.12	.05	-.07
5. Age started deaf school					---	-.10	-.005	-.22*
6. Degree of hearing loss						---	.12	.10
7. Family history of deafness							---	-.15
8. Parent's level of sign language training								---

Note. *p < .05. **p <.01. ***p <=.001.

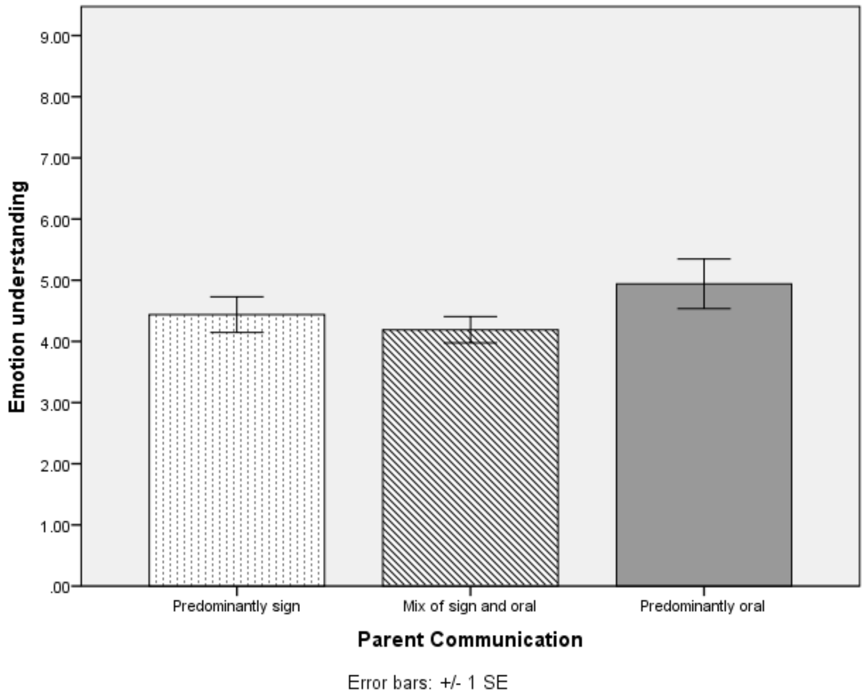

Figure 6.2 Relationship between parent communication and emotion understanding

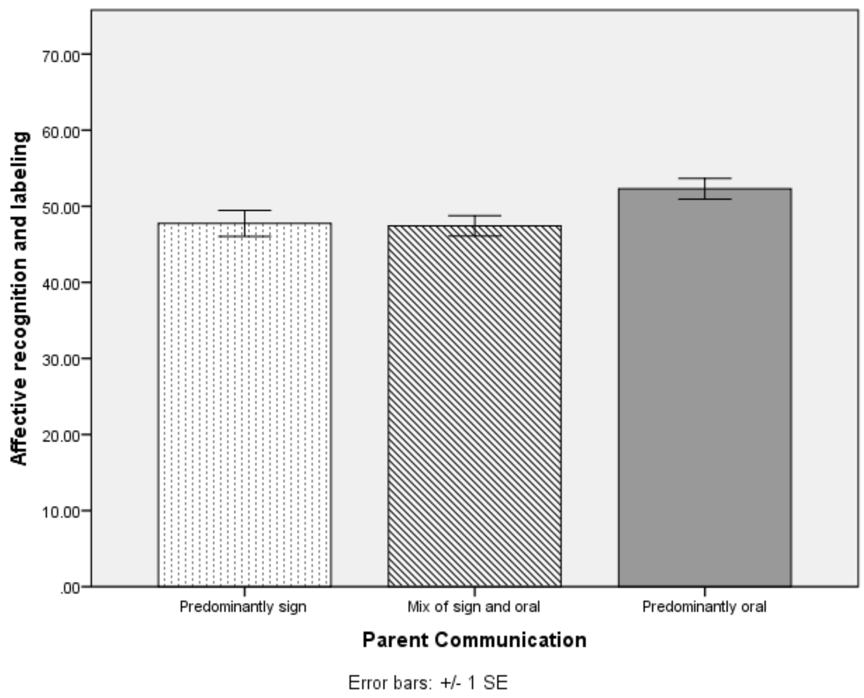

Figure 6.3 Relationship between parent communication and affective recognition and labelling

In order to explore further the links between emotion knowledge, language ability, and the communicative environment, a series of hierarchical linear regressions were conducted. Two initial regression models were conducted with language ability and communicative environment factors as the independent variables and affective recognition and labelling and emotion understanding as separate outcome variables. Results revealed that with the exception of verbal ability, none of the variables were predictive of either emotion understanding or affective recognition and labelling.

Therefore, to examine if the relationships between language, parent communication, and theory of mind observed in study 2b extends to emotion knowledge, these variables were purposely entered in the regression models. Table 6.6 presents the findings of the two regression analyses, one for affective recognition and labelling and the other for emotion understanding. Like the regression models in study 2b, age and language ability were first entered in step 1 parent communication was then entered in step 2, and lastly, the interaction terms for parent communication and verbal ability were entered in the last step 3.

Affective recognition and labelling was the first outcome variable to be examined. The first model with age and verbal ability was significant, $F(2,84) = 14.04$, $p < .001$. Based on the beta values, age ($t = 3.76$, $p < .001$) and verbal ability ($t = 2.25$, $p = .03$) were significant predictors of affective recognition and labelling. The second model with parent communication was also significant, $F(4,82) = 8.13$, $p < .001$. However, the addition of parent communication did not significant explain any additional variance of the outcome variable, $F\Delta(2, 82) = 1.91$, $p = .16$. Parent communication was not a significant predictor of affective recognition and labelling. Lastly, the model with the interaction terms was also significant, $F(6,80) = 6.31$, $p < .001$, but it did not significantly explain any additional variance, $F\Delta(2, 80) = 2.19$, $p = .12$. Inspection of the beta values showed that the interaction terms did not significantly predict affective recognition and labelling.

The second hierarchical linear regression analysis with parent communication had emotion understanding as the dependent variable. The first model with age and verbal ability was significant, $F(2,85) = 5.46$, $p = .006$. Based on the beta values, only verbal ability ($t = 2.23$, $p = .03$) significantly predicted emotion understanding. In step 2, the model with the two parent communication variables was also significant, F $(4,83) = 3.46$, $p = .01$, but parent communication did not account for any additional significant variance in the dependent variable, $F\Delta(2, 83) = 1.40$, $p = .25$. The third model with the interaction terms is also significant, F $(6,81) = 2.76$, $p = .02$. Neither of the interaction terms predicted emotion understanding.

Table 6.6 *Results of Hierarchical Linear Regression Analyses for Age, Language, and Parent Communication in Study 4b*

	Affective recognition and labelling		Emotion understanding	
Variables	ΔR^2	β	ΔR^2	β
Step 1	.25***		.11**	
Age		.38***		.17
Verbal ability		.23*		.24*
Step 2	.03		.03	
Age		.32**		.11
Verbal ability		.28**		.29*
Parent communication - sign[a]		-.22		-.22
Parent communication - mixed[a]		-.25		-.23
Step 3	.04		.03	
Age		.34***		.09
Verbal ability		.25		.06
Parent communication - sign[a]		-.19		-.20
Parent communication - mixed[a]		-.24		-.19
Verbal ability x PComm- sign		-.10		.29
Verbal ability x PComm – mixed		.17		.04
Total R^2	.32***		.17*	
N	86		87	

Note. PComm = Parent communication.
[a]Dummy coded variables with predominantly oral communication as the reference category.
*p < .05. **p <.01. ***p <= .001.

6.9 Discussion

In relation to the expectations laid out in the introduction of this study, the current study revealed some interesting findings. First, the communicative environment appears to be less directly involved in the development of emotion knowledge than ToM. This suggests that, by and large, emotion knowledge can be successfully navigated with sufficient language skills and it does not fully rely on conversations with others. This is partially supported by previous findings suggesting a lack of association between severity of hearing loss and emotion knowledge (Dyck & Denver, 2003; Ludlow et al., 2010; Mancini et al., 2016; Most & Aviner, 2009; Most & Michaelis, 2012). In fact, only age entered deaf school and parents' sign language training completed were correlated with affective recognition and labelling (**hypothesis 1**). Additionally, there was no direct causal relationship that emerged between the communicative environment and emotion knowledge (**hypothesis 2**) nor did the communicative environment significantly influence the relationship between language and emotion knowledge (**hypothesis 3**). As proposed earlier, early entry into a deaf school provides the deaf access to sign language at an earlier timeframe as well as introduces him/her to a community of signers. In this environment, not only is the deaf person able to hone his/her sign language skills, s/he also has access to information and clarify any misconceptions arising from this knowledge from alternate role models such as teachers (Calderon & Greenberg, 2003; Kusché et al., 1983). In addition, sign language incorporates body language and facial expressions when attempting to convey meaning. Within the signing environment afforded by the deaf school, the deaf person engages in signed communication for extended periods. Arguably, the deaf are probably more expressive with their body movements as well as their facial expressions compared to those who do not use sign language. Thus, within this enriched environment, deaf children are prone to pay close attention to the body language and facial expressions in others which could inevitably enhance their affective recognition and labelling skills. On the other hand, parents' sign language training is negatively associated with affective recognition and labelling. It could be possible that with more advanced sign language training, parents feel that they can express themselves sufficiently through the use of signs that they do not to need to depend as much on their facial expressions to convey what they are thinking and feeling. Thus, although advanced sign language training should have taught parents to utilise their body and their facial expressions *in conjunction* with their signs, it could be the case that parents thought they are simply replacing spoken words with signs. As a result, they fail to utilise sign language to teach the deaf about the how certain expressions of emotions are linked to particular labels. Conversely, better affective recognition and ability skills are related to less formal sign instruction. Maybe parents who do not attend formal sign language ensure that their expressions can be plainly conveyed and easily interpreted without needing sign language.

Current results confirmed findings from study 4a that verbal ability was predictive of affective recognition and labelling and emotion understanding in this current sample of deaf participants. Recall that in study 4a, hearing status moderated the relationship between language ability and emotion understanding prompting the conclusion that the association only emerges for typically developing children. However, current findings clarify this by providing evidence that language *also* exerts a causal influence on emotion understanding for the deaf. It is possible that this relationship in the normative population was of greater magnitude compared to the deaf and that explains why stronger associations were not initially observed between language and emotion understanding in study 4a. These findings are consistent with previous studies demonstrating the relationship between language and emotion knowledge in the deaf (Gray et al., 2001; Mancini et al., 2016; Wiefferink et al., 2013).

6.10 General discussion

Henderson and Hendershott (1991) state that, “The family’s natural language is the medium of this interaction; it facilitates the socialization and enculturation processes.” (p. 326). This statement implies that language ability enables the social and communicative interactions within the families to occur. It is the means by which knowledge, values, and traditions are transmitted between parent and child.

Outcomes of the present chapter represent an initial step in understanding how language influences emotion knowledge. Specifically, findings across both studies provide evidence that language is significantly associated with and predictive of the development of emotion knowledge. That linguistic competence was directly associated with both affective recognition and labelling and emotion understanding highlights the fact that it plays a more central role in the development of emotion knowledge beyond that of the language requirements of the different assessment measures. Indeed, language is important because it will allow the deaf to, "…spontaneously mediate experience with linguistic symbols and label aspects of inner emotional states…" which has positive implications for their social emotional development (Calderon & Greenberg, 2003, p. 178). In short, language provides the means to understand and communicate about emotions.

Results indicate that the association between the communicative environment and emotion knowledge is not as evident as was expected. Indeed, by and large, the predictive influence of the communicative environment could not be fully disentangled from the effects of verbal ability. Some argue that the ability to recognise and label different emotion states develop in a linguistic environment (Barrett et al., 2007; Barrett et al., 2011). From this perspective, language provides cues for the perceiver to concentrate on specific features of the face or the body that can help decode expressions of emotions (Barrett et al., 2007; Fugate et al., 2010). Additionally, language provides the means to reason about different emotion concepts. Conceivably, language allows children to accumulate relevant terms to allow them to conceptualise inner mental states and be able to explain to others how they and others' feel (Baird & Astington, 2005). With sufficient language skills, children are better able to engage in talk interactions and may help them linked to theirs and others' behaviours to different affective states. Importantly, this link is independent of the input from conversations within the family. It could be that with sufficient language skills, the deaf already able to access the information they need to learn about emotions. Language competence serves as a link between communication and information about emotions provided during social interactions. Additionally, the close link between emotion understanding and social competence allows for the deaf to develop an understanding of emotions through other means such as social interactions with friends (Dunn, 1995; Weisel & Bar-Lev, 1992; Wiefferink et al., 2013). Lastly, because the kinds of conversational input deaf children receive in the family are affected by interlocutors' perception of the deaf person's level of understanding (Calderon & Greenberg, 2000; Marschark, 1997) , it could lead to simpler conversations. From this perspective, the familial conversational environment may not be the appropriate context in which to understanding the development of emotion knowledge. Further studies may endeavour to examine more closely the role of emotion language, particularly knowledge about emotion signs, and emotion knowledge. In addition, additional research on actual discourse between deaf signers could provide some insight on how the deaf communicate with each other about emotions and how this may foster their emotion knowledge.

There are some limitations of the studies reported in this chapter that need to be acknowledged. Parents and guardians who agreed to be interviewed could be a biased group. They are probably more invested in their children's educational and psychological development and would likely participate in school programmes, including sign language classes. Thus, results may not be reflective of the experience of other less involved parents. The majority of the deaf who participated in the study came from deaf schools or specialised classes with deaf students. Thus, although public schools have limited resources, deaf school likely have provide more intervention programmes geared, for example, to the socio-emotional development of deaf students than other public schools that have a similarly restricted budget but fewer number of deaf students.

In sum, the two studies reported in this chapter establishes the role of verbal ability in emotion understanding and affective recognition and labelling for typically developing and deaf Filipino participants. Additionally, results also suggest that various factors that influence the communicative environment of families with deaf children do not appear to demonstrate any clear relationship with emotion knowledge. This draws attention to the importance of the developing of children’s language skills and its relation to building children’s emotion knowledge among hearing and deaf children alike.

Chapter 7: Study 5

Social Cognition and Social Competence in Deaf Individuals

7.1 Introduction

The results of studies 1 and 3 revealed that Filipino deaf individuals have profound delays in ToM and emotion understanding, respectively, compared to typically developing children from the same culture. In contrast, there were no meaningful differences between deaf and hearing participants in their affective recognition and labelling, after controlling for age, SES, and language ability. Nevertheless, there were still considerable individual differences in each of these domains for the core deaf sample. In this chapter, therefore, the consequences of these individual differences for deaf children's social functioning are examined.

Extant literature has revealed that deaf children have impaired social skills, which is consistent with the profound delays they have in language development, ToM, and emotion understanding (e.g., Barker et al., 2009; Charlson, Strong, & Gold, 1992; Dammeyer, 2010; Farrugia & Austin, 1980; Foster, 1989; Meadow-Orlans, 1980; Rachford & Furth, 1986; Stevenson et al., 2010; Vostanis, Hayes, Du Feu, & Warren, 1997; Wauters & Knoors, 2008). These major deficits in social cognition have been described in the preceding chapter and elsewhere (e.g., Dyck et al., 2004; Peterson, 2016; Schick et al., 2007; Wiefferink et al., 2013; Woolfe et al., 2002). Yet, despite such findings, there has been surprisingly little investigation examining the link between individual differences in social cognition and social competence among deaf samples. That is to say, the presence of the deficit aside, do the relationships that have been observed in typically developing samples between individual differences in social cognition and social competence (Bosacki & Astington, 1999; Lalonde & Chandler, 1995; Watson et al., 1999) also entail in deaf samples?

As discussed in §1.4, evidence from studies linking social cognition to social behaviour among typically developing children are complicated and domain specific (Bosacki & Astington, 1999; Dunn, 1995; Hughes & Dunn, 1998; Hughes et al., 2005; Laghi et al., 2014; McCabe & Altamura, 2011; Slaughter, Dennis, & Pritchard, 2002). For example, in typically developing children, ToM has been found to be significantly associated with children's peer popularity and teacher ratings of social skills and prosocial behaviour (Slaughter et al., 2002; Watson et al., 1999), but not parent rated social competence (Newton & Jenvey, 2011). Different components of emotion understanding have also been found to predict peer acceptance and general social competence in young children (Cassidy et al., 1992; Denham et al., 2003). Additionally, emotion recognition and understanding the causes of emotions has been shown to be associated with prosocial behaviour (Denham, McKinley, Couchoud, & Holt, 1990).

Where they have been examined, similar trends in the association between social cognition and social competence have been found in deaf samples, but the literature is small and uneven. For example, Wiefferink et al. (2012) found that, for their sample of deaf children with cochlear implants, level of emotion recognition was not correlated with and not predictive of social competence, measured in terms of prosocial behaviour and peer problems. Similarly, Ketelaar et al. (2015) did not find any significant associations between understanding moral emotions and social competence. Yet, Ketelaar et al. (2013) found that among their group of deaf children with cochlear implants, better emotion recognition abilities were linked to better social competence, which was derived from a combined score of children's prosocial behaviour and lack of social difficulties. In a similar vein, Weisel and Bar-Lev (1992) found that emotion recognition is related to interpersonal relations and self-control but not planning skills nor dealing with stress. Additionally, in two recent studies, Peterson and colleagues found that deaf children's theory of mind scores were significantly correlated with teacher rated peer social maturity and peer popularity, social isolation (negative), and positive dispositions (Peterson, O'Reilly, et al., 2016; Peterson, Slaughter, et al., 2016).

In addition to clarifying inconsistent findings as described above, an important gap in the current literature that needs to be addressed is that very little research has examined the concurrent influence of various indices of social cognition on social functioning, especially on deaf samples. There has been some work that assessed the effects of ToM and emotion knowledge on social functioning simultaneously on other populations. For example, Dunn (1995) found that emotion understanding at 40 months was related to positive perception of school during kindergarten, understanding mixed emotions, and moral sensibility. Additionally, she found that false belief understanding was related to later negative perception of school and child's report of negative response to criticism. Findings suggest that false belief and emotion understanding are associated with different aspects of children's social functioning at a later age. Brüne (2005), in a sample of patients with autism, found that ToM, but not emotion recognition, was a significant predictor in over-all community functioning.

In sum, prior studies examining the social implications of ToM, emotion understanding, or affective recognition labelling needs clarification. In addition, there is insufficient evidence to establish if one social cognitive domain exerts more social influence than the other largely because these social cognitive domains have been examined in isolation. Despite these complications, there is nevertheless some evidence from extant literature to provide an initial basis to examine links between social cognition and positive aspects of social functioning; there is far less evidence which speaks to negative indices of social functioning such as behaviour problems.

Therefore, the over-all purpose of the study is to examine individual differences in social competence of Filipino deaf individuals, ages 8 to 22, vis-à-vis individual differences on ToM, affective recognition and labelling, and emotion understanding. For the current study, three measures of social competence are included. *Peer social maturity* was examined as a general construct of social functioning. *Prosocial behaviour* was included as an index of a specific social behaviour displayed in the classroom which has previously been associated with ToM and emotion understanding. Lastly, *social difficulties* were measured to serve as a comparison manifestation of social behaviour, which is also measured by the same informant (i.e., teacher). Based on previous literature, it is expected that ToM, emotion understanding, and affective recognition and labelling are related to peer social maturity (**hypothesis 1**) and prosocial behaviour (**hypothesis 2**). In contrast, the relationship between social cognition and social difficulties is unclear. Although children who have difficulty recognising emotions would likely experience social difficulties, there are no specific hypotheses for relations between social difficulties, theory of mind, and emotion understanding.

Method

7.1.1 Participants

The deaf participants in the current study are identical to the core sample described in chapter 2 (see Table 2.1). For a full description of the sample, please refer to §2.1. Additionally, Table 7.1 provides information regarding the descriptive statistics of the sample.

7.1.2 Measures

Participants' *emotion understanding* and *affective recognition and labelling* were captured using the TEC (Pons et al., 2004) and DANVA-2 (Nowicki, 2013), respectively; both of which are described in detail in §5.4.2. *Theory of mind* competencies were assessed using the Wellman and Liu (2004) ToM scale; described in §3.3.2. *Verbal ability* was measured using the EVT-2 (Williams, 2007); described in §2.2.1.

In addition to these participant variables, classroom teachers provided ratings on three measures of social competence, including peer social maturity, prosocial behaviours, and social difficulties (see Appendix F for a copy of the scales). These scales are described below:

Prosocial behaviour and social difficulties. The well-established Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is a 25-item scale that measures an individual's degree of social functioning. Teachers rated each participant on a three point scale from 0 = '*not true*', 1 = '*somewhat true*', to 2= '*certainly true*'. Two sub-scales were used for the current study, namely (1) social difficulties (20 items of the original Emotional Symptoms, Conduct Problems, Hyperactivity, and Peer Problems subscale items) and (2) prosocial skills (5 items). Social difficulties (SD) scores can range between 0-40 where a higher score implied greater social problems. The prosocial items can range from 0 to 10 where a higher score meant greater prosocial tendencies. In the present sample, the Cronbach's alpha was good (.82 and .74 for the social difficulties and prosocial behaviour scales, respectively). This compares favourably to previous results among German deaf samples (Hintermair, 2007). In Hintermaier's (2007) study, the reliability of the social difficulties and prosocial behaviour subscales were .82 and .69, respectively.

Social Maturity. The seven-item Peer Social Maturity Scale (PSMAT; Peterson et al., 2007) measures behaviours that contribute to peer sociability. Teachers were instructed to rate the social skills of each student in relation to an average child of that age. Responses ranged from 1= '*very much less mature than the average child this age*' through 4= '*about average for children this age*' to 7= '*very much more mature than the average child this age*'. The total PSMAT score was comprised by the sum of all individual items. Scores can range from 7 to 49. Higher scores imply greater social maturity. The scale has excellent internal consistency ($\alpha = .96$).

7.1.3 Procedures

The details of the testing procedure of the participants are identical with those reported in §2.3. In addition, teachers were given a letter explaining the study as well as copies of the instruments through the school officials. They were returned promptly through the same channels. A token worth at least P100 (~A$2.50), depending on the number of students scored, was given to participating teachers.

7.1.4 Analytic plan

Descriptive statistics were first presented. *T*-tests were then carried out to determine any gender differences in the outcome variables. Then, bi-variate analyses were conducted. Afterwards, in three separate multiple linear regression analyses were conducted. Age, verbal ability, emotion understanding, affective recognition and labelling, and theory of mind were entered together in the model. Peer social maturity, prosocial behaviour, and social difficulties were treated as separate dependent variables. See Appendix G for the syntax.

7.2 Results

Table 7.1 reports on the participants' scores on main variables of the study. There were significant gender differences on total difficulties, t (99) = 2.19, p = .03, but none on peer social maturity, t (94) = -1.45, p = .15, and prosocial behaviour, t (99) = -1.42, p = .16. For reasons of consistency, data was collapsed across gender in all further analyses.

Table 7.2 lists the correlations between the study variables. It demonstrates that peer social maturity and prosocial behaviour were positively related to each other, and both were negatively associated with social difficulties; as would be expected. Theory of mind and affective recognition and labelling were also found to be correlated with all study variables but not prosocial behaviour or social difficulties. Emotion understanding, on the other hand, was positively associated with all study variables. In relation to the three major predictors, theory of mind, affective recognition and labelling, and emotion understanding were all correlated with each other, and verbal ability, which was broadly expected based on previous research with typically developing samples (Cutting & Dunn, 1999; de Rosnay et al., 2014).

Table 7.1 *Descriptive Statistics for the Main Variables in Study 5*

	M	*SD*	Range
Age	14.86	3.74	8 to 22.17
Verbal ability[a]	.32	.07	.20 to .61
Emotion understanding	4.43	1.57	1 to 8
Affective recognition and labelling[b]	48.66	8.49	21 to 64
Theory of mind	1.95	1.09	0 to 5
Peer social maturity	29.60	8.47	7 to 46
Prosocial behaviour	6.52	2.02	0 to 10
Social difficulties	10.56	5.65	1 to 26

Note. N = 101. M = Mean. SD = Standard deviation.
[a]n = 97. [b]n = 100.

Table 7.2 *Correlations Among the Main Variables in Study 5*

Variables	1	2	3	4	5	6	7	8
1. PSocMaturity		.61***	-.52***	.22*	.37***	.32***	.36***	.39***
2. Prosocial			-.60***	.007	.19	.29**	.31**	.15
3. SocDifficulty				-.04	-.19	-.22*	-.34***	-.18
4. ToM					.31**	.35***	.24*	.21*
5. ARL						.33***	.32***	.48***
6. EU							.26**	.27**
7. Verbal ability								.34***
8. Age								

Note. PSocMaturity = Peer social maturity. Prosocial = Prosocial behaviour. SocDifficulty = Social difficulties. ToM = Theory of mind. ARL = Affective recognition and labelling. EU = Emotion understanding.
*p < .05. **p < .01. ***p <=.001.

To clarify relationships further, three multiple linear regression were performed to examine the causal influences of age, verbal ability, ToM, affective recognition and labelling, and emotion understanding to the three indices of social cognition separately. Summaries of these regressions are provided in Table 7.3. Results showed that the model with age, verbal ability, ToM, affective recognition and labelling, and emotion understanding were significant for peer social maturity, $F(5,90) = 6.55$, $p < .001$, prosocial behaviours, $F(5,90) = 3.48$, $p = .006$, and social difficulties, $F(5,90) = 3.35$, $p = .008$. However, inspection of beta values revealed that only emotion understanding ($t = 2.03$, $p = .05$) and verbal ability($t = 2.22$, $p = .03$) emerged as significant predictors of prosocial behaviour, while verbal abilities ($t = -2.52$, $p = .01$) also significantly predicted social difficulties. Peer social maturity, on the other hand, was not uniquely predicted by any of the independent variables, which is consistent with the broad scope of this construct.

Table 7.3 *Summary of Regression Analyses in Study 5*

	Peer social maturity		Prosocial behaviour		Social difficulties	
Independent variables	ΔR^2	β	ΔR^2	β	ΔR^2	β
Age		.20		.01		-.05
Verbal ability		.19		.24*		-.27*
ToM		.05		-.14		.10
ARL		.19		.13		-.11
EU		.13		.22*		-.15
Total R^2	.27***		.16**		.16**	
n	95		95		95	

Note. ARL = Affective recognition and labelling. ToM = Theory of mind. EU = Emotion understanding.
* $p < .05$. ** $p <= .01$. *** $p < .001$.

7.3 Discussion

The current study examined the social consequences of social cognitive understanding in Filipino deaf aged 8 to 22 years. Specifically, it assessed how theory of mind, emotion understanding, and affective recognition and labelling, together with age and verbal ability, accounted for individual differences in the peer social maturity, prosocial behaviour, and social difficulties. It contributes to extant literature by examining concurrently the effects of theory of mind, affective recognition and labelling, emotion understanding on social competence.

Correlational findings confirm that the social development of deaf individuals proceed in the expected directions. That is to say, for deaf children, higher scores on positive social behaviours such as peer social maturity and prosocial behaviour were more likely to be associated with low scores on negative social behaviours i.e., social difficulties. Similarly, ToM, affective recognition and labelling, and emotion understanding were found to correlate positively with each other. This is in line with previous findings among normative samples (Brüne, 2005; Cutting & Dunn, 1999; de Rosnay et al., 2014).

One of the key findings of the current study was that, among the three social cognitive predictors, only emotion understanding emerged as a significant predictor of prosocial behaviour. This finding is in line with previous research demonstrating the role of emotion understanding in social behaviour, in typical and atypical samples (e.g., Cassidy et al., 1992; Denham et al., 2003; Ketelaar et al., 2012). Arguably, when children are able to accurately infer emotional outcomes based on different real life experiences, they are better able to regulate their behaviours towards others. The fact that theory of mind did not make an independent contribution to prosocial behaviour is perhaps unsurprising given the likely conceptual overlap with emotion understanding, and the fact that the Test of Emotion Comprehension was more appropriate for the full age range of the sample of deaf children. It may be that additional *advanced* theory of mind tasks may have brought out more meaningful associations between theory of mind and prosociality.

The fact that theory of mind and emotion understanding did not make independent contributions to social difficulties is inconsistent with some previous literature (Bosacki & Astington, 1999; Lalonde & Chandler, 1995; Watson et al., 1999) but in line with others (Frith, 1994; Newton & Jenvey, 2011). Regarding affective recognition and labelling, this variable was not independently predictive of social competence in the deaf, which is consistent with previous findings by Wiefferink et al. (2012) but contrasts with Ketelaar et al. (2013) and Weisel and Bar-Lev (1992). There are a number of explanations for these results. First, it is possible that peer social maturity refers to a more generalised skill that can be developed in a variety of ways. Thus, neither the attribution of mental states nor the recognition and labelling of affect play a privileged role in developing social maturity, but they each play a role in a more holistic manner, along with the child’s developing linguistic skill. Second, while it is possible that the understanding of mental states and the recognition of affect allow children to recognise what the person is feeling as well as comprehend the mental mechanisms behind human actions, Astington (2003) has argued that one needs to have the *sufficient motivation* to behave in appropriate ways, and these variables may not capture such motives. Finally, the underlying association between the variables is small. In their meta-analysis, Slaughter et al. (2015) found that ToM only accounted for 3.6% of the variance in peer popularity and the small effect size is likely the reason why previous studies report inconsistent findings. To test this, a post hoc power analysis was conducted using the software package, G*Power (Erdfelder, Faul, & Buchner, 1996). Calculations were based on a total sample size of N =95, with the standard .05 criterion of statistical significance, and a 5 predictor variable equation used as a baseline. In assessing the effect sizes, the published criteria by Cohen (1992) were used to examine small (f^2=.02) , medium (f^2=.15) and large (f^2=.35) sized effects. Results revealed that the statistical power needed to detect a small effect was .28, for a medium effect was .96, and to detect a large effect was greater than .99. Thus, with the current study’s computed level of power > .99, there is sufficient statistical power to detect small to large effect size levels. Lastly, it is possible that the relationship between ToM/affective recognition and labelling and social competence could be moderated by a third variable. For instance, ToM performance is differentially influenced whether parents are deaf or hearing. Similarly, parental hearing status has also been found to predict psychosocial adjustment in deaf students (Polat, 2003). Skilled signed communication at home was, likewise, anecdotally linked to greater social participation (Evans, 1995). The same is true for parents’ predominant use of sign language and ToM, as shown in study 2b. Future studies could explore other possible third variables to confirm these hypotheses.

One important limitation of the current study is its reliance on teacher reports. Understandably, social competence is viewed differently with peers as it is with family members. Thus, children’s social cognition could affect various relationships in various contexts differentially. Indeed, initial research in this area revealed that children’s use of mental states depend on their relationship with the person such as parent, sibling, peers or teachers (Dunn, 1996, 2000; O'Connor & Hirsch, 1999). Thus, future studies could attempt to compare teacher reports with those of parents and the deaf themselves. Another limitation is, although the wide range of ages of the current sample allows for an overview across different developmental stages, the cross-sectional design limits the understanding of long-term, incremental implications of the present findings. Further research could employ a longitudinal methodology to explore children's maturing social functioning vis-à-vis changes in their social cognitive understanding.

In conclusion, the current study supports the claim that the relationships between social cognition and different indices of social competence require careful examination. Indeed, there was evidence to suggest that emotion understanding exerted a causal influence on the development of social behaviour. ToM and affective recognition and labelling, however, did not demonstrate any significant predictive influence on social functioning. The complex findings highlight the value of exploring different facets of social cognition simultaneously on a range of social competence indices.

Chapter 8: General Discussion

8.1 Overview

The series of empirical studies presented in this thesis were undertaken to explore group and individual differences in the development of social cognitive understanding of deaf and hearing individuals in a new cultural context, the Philippines. Additionally, the sequence of acquisition of ToM and emotion understanding was examined. Furthermore, a systematic assessment of the effects of individual and environmental antecedents as well as social consequences of social cognition was undertaken. With the use of well-established measures assessing a range of social cognitive tasks, the current thesis was able to systematically examine the nature and sequence of development in the domains of theory of mind (ToM), affective recognition and labelling, and emotion understanding. Additionally, by examining a sample of Filipino deaf participants, it addresses the dearth of research on deaf individuals raised in non-Western cultures. Lastly, by exploring antecedents and social consequences, a fairly comprehensive picture of the development of these phenomena in Filipino deaf and hearing individuals is established.

Specifically, in studies 1 and 3, deaf (ages 8 to 22) and hearing (3 to 14) individuals were sampled and assessed using well-established tasks measuring the nature and sequence of development of theory of mind and emotion understanding. Performance on affective recognition and labelling was also examined and compared. In studies 2 and 4, the influence of language and various indices of the communicative environment on the performance of these aforementioned tasks were investigated. Finally, in study 5, the influence of ToM, affective recognition and labelling, and emotion understanding on the social functioning of deaf individuals was investigated. It is important to note that these studies employ a largely overlapping sample. However, careful consideration of the ages children from the normative population typically pass these assessments, based on previous literature, informed the selection of samples for each of the individual studies.

This chapter first presents the main findings of the thesis. Then, a discussion of the study implications is provided. A discussion of the contributions, limitations, and directions for future research follows. Lastly, it ends with a conclusion section.

8.2 Summary of findings

Study 1a was designed to compare and contrast the development of ToM understanding of Filipino deaf children ages 8 to 14 and two groups of typically developing hearing children, ages 3 to 7 years and 8 to 14 years. A follow up study, study 1b, was aimed to assess ToM development in an older sample of deaf individuals, 15 to 22 years, to determine if performance is significantly different from the younger deaf sample in study 1a. Filipino deaf children aged 8 to 14 years were found to be significantly delayed in ToM reasoning compared to age matched typically developing hearing children. Typically developing children aged 3 to 7 years similarly outperformed the deaf cohort. This latter younger group of typically developing children also displayed difficulties in key domains such as false belief and hidden emotions but these were clearly overcome in the older typically developing sample. In contrast, age-related improvements were not evident in the older deaf sample. Indeed, older deaf individuals aged 15 to 22 years continued to display marked difficulty in the domains of knowledge access, false belief, and hidden emotion.

Previous research has shown that children from predominantly individualistic, Western cultures such as the US, Australia, and Germany display a pattern of ToM acquisition in the following sequence: diverse desires > diverse beliefs > knowledge access > false belief > hidden emotions (Lindquist et al., 2006; Peterson & Wellman, 2009; Wellman & Liu, 2004, p. 818). In contrast, children from collectivistic non-Western cultures such as China and Iran (Shahaeian et al., 2014; Shahaeian et al., 2011; Wellman et al., 2008) were found to develop in an alternative sequence such that knowledge access is acquired first before false belief. Irrespective of delays, it was revealed that the nature of development of ToM understanding between Filipino deaf and hearing individuals was the same. That is to say, not only did both deaf and hearing participants acquire the ToM tasks in the same sequence but that their pattern of understanding was the same as preschool children from Australia, US, Germany, and, a non-Western culture, Indonesia (Kuntoro et al., 2013). The effect of hearing status held even after controlling for the effects of language and socio-economic status.

Findings were explained in terms of the cultural traditions and parenting practices that commonly describe Filipino families. Evidence based on previous studies suggests that Filipino parents do not necessarily communicate with their children in mind-minded ways nor do they encourage independent thinking. Additionally, the differences between the languages used at the school (i.e., written English and signs) and the language used at home (spoken Filipino) make it further difficult for the deaf children to genuinely participate in familial conversations and social interactions. Thus, by growing up in a context where parents are less likely to communicate in mentalistic ways *and* where there is restricted access to conversations, Filipino deaf children were thought to have been exposed to an environment that was less conducive to developing ToM reasoning in a timely manner. Lastly, that younger children nowadays are more exposed to Western cultural influences compared to previous generations is not unlikely given the easy access to technology and media. This early exposure to Western ideals was thought to account for the pattern of ToM development akin to the US and Australia but not China and Iran.

Whereas the preceding study examined group differences in ToM development, study 2a assessed individual differences in language ability and how it affected ToM performance in the same sample of participants as study 1. Language was found to be associated with ToM but it was only *predictive* of ToM understanding for hearing children. It was proposed that, where previous findings linked language abilities to false belief understanding, the current deaf sample, the majority of whom failed the false belief task, are less likely to reveal any significant associations between their language and ToM scores.

In study 2b, the influence of the communicative environment, measured in terms of degree of hearing loss, parent communication, family history of deafness, parents' formal sign language training, and age entered the deaf school, on ToM was examined. The hearing parents' predominant use of signed communication led to poorer ToM performance when compared to using predominantly oral communication. Yet, parents' predominant use of signed communication appeared to be related to children's better language scores. It was proposed that, whilst children's vocabularies are improving, parents' use of signed communication maybe restricted the choice of topics they could fluently converse about.

Additionally, family history of deafness was predictive of ToM development. Presence of a deaf family member, it was argued, likely provides an early access to sign language as well as enriched familial conversational exchanges. Additionally, in the presence of a fluent sign conversational partner, deaf children are apt to develop superior sign language skills. Taken together, the presence of deaf family members provides an environment conducive to ToM development.

Like study 1, study 3 was designed to examine differences between deaf and hearing samples but this time, in the context of emotion understanding and affective recognition and labelling. All of the participants in this study were included previously in study 1. There were no significant differences between deaf and hearing participants in affective recognition and labelling. In contrast, hearing children were found to have better emotion understanding than the deaf. Differences based on hearing status on emotion understanding held even after controlling for age, socio-economic status, and verbal ability. It was suggested that delays in the understanding of the mind were similar to the ToM delays reported in study 1 and, importantly, indicate a problem with mentalistic skills as a whole but not a discrete additional problem with evaluating emotion stimuli. Additionally, poor critical thinking skills were thought to undermine the ability to extract necessary information based on real world experiences.

The sequence of acquisition of emotion understanding was not consistent between Filipino deaf and hearing children *and* both patterns differed vastly from all previous studies of Western and non-Western children. There were, however, significant points of similarity between deaf and hearing Filipino individuals, specifically in the relative ease of emotion labelling and understanding the link between morality and emotions as well as the equivalent difficulty with belief-based emotions and hidden emotions. Equivalent performance in emotion labelling was consistent with the lack of differences between deaf and hearing groups in affective recognition and labelling. It was proposed that the presence of specific signs for basic emotions facilitated performance by the deaf group. It was suggested that similarities in the understanding of morality and emotions could be related to a nascent moral understanding due to parenting strategies or early Roman Catholic church teachings. Problems with belief-based emotions were linked to previous ToM findings. Lastly, the problems with hidden emotions were associated with indigenous concepts of *hiya* or sense of shame where intentional concealment of emotions is important to protect the face or reputation of the family/oneself and not necessarily to protect others' feelings.

Study 4, like study 2, examined the impact of language ability and the communicative environment on the development of emotion understanding and affective recognition and labelling in the same sample of deaf participants. Language was predictive of both emotion understanding and affective recognition and labelling. However, unlike emotion understanding, hearing status did not significantly interact with language to affect affective recognition and labelling. In contrast, language was found to be predictive of emotion understanding for hearing children. Findings were linked to the language demands of the individual tasks and, at least for the context of the more complex emotion understanding, unrestricted access to conversations by hearing children.

Yet, language was found to predict affective recognition and labelling as well as emotion understanding in the all deaf sample in study 4b. Findings were explained in terms of an underlying causal relationship between language ability and emotion knowledge in the deaf, albeit weaker in magnitude when compared to associations with typically developing children. Additionally, there were no significant associations between the communicative environment and emotion understanding, although age of entry into the deaf school was positively associated with affective recognition and labelling whereas parents' formal sign language instruction completed was negatively linked to affective recognition and labelling.

Finally, study 5 was designed to see if delays in ToM and emotion understanding as well as normative performance in affective recognition and labelling could explain variance in the social functioning of the deaf. It was understood that, based on a survey of available literature, this was the first time that these three predictor variables were examined concurrently in association with teacher ratings of social competence in the deaf. ToM, emotion understanding, and affective recognition and labelling were significantly correlated with peer social maturity, prosocial behaviours, and social difficulties. Yet, when causal relationships were examined, only language ability and emotion understanding emerged as a significant predictor of prosocial behaviour. The lack of significant causal relations between ToM, affective recognition and labelling, and social functioning were attributed to possible lack of motivation to behave in appropriate ways, small effect sizes, and the presence of a third moderating variable.

8.3 Implications of the results

Performance on social cognitive tasks was differentially revealed, depending on the underlying abilities being examined. On the more mentalistic orientated tasks such as ToM and emotion understanding, Filipino deaf individuals displayed a significant delay compared to typically developing children. Yet, on the more perception based tasks such as affective recognition and labelling, the performance of deaf and hearing participants was equivalent. It can be inferred, based on findings from studies 1 and 3, that deaf individuals have a distinct impairment in mentalising skills while none emerged on the perceptual skills of emotions. Thus, there is no additional distinct incapacity/delayed capacity to comprehend emotion stimuli.

Against this, it is easy to assume that difficulties in mental state understanding observed in deaf individuals are constant across all domains. Yet, as shown in study 1, the deaf have particular difficulty with knowledge access, false belief, and hidden emotions but not diverse desires and diverse beliefs. Additionally, in study 3, the deaf were also shown to do fairly well on identifying common causes of emotions and understanding morality-based emotions. How one conceptualises delays in social cognitive understanding by the deaf, therefore, needs to be qualified in reference to which domain is being examined. Indeed, as Morgan and Kegl (2006) conclude, “The mental states that are understood by late language learners maybe those most accessible through observation coupled with fragmented exposure to language” (p. 818).

That Filipino deaf and hearing individuals acquire ToM understanding in the same sequence as children from predominantly Western cultures (study 1) yet display largely divergent patterns in the acquisition of emotion understanding (study 3) from each other and compared to children from other cultures suggest that factors in the wider Filipino culture and those unique to families with deaf children (to be discussed in the next section) might be at play. As such, perhaps one of the most remarkable finding of this thesis has been the realisation that culture, at least in terms of the simplistic individualistic–collectivistic distinction (Hofstede, 2001) cannot fully account for the cultural influence on ToM development. Markus and Kitayama (1991) have previously raised how it is possible for members of particular a cultural group, say individualistic, may actually characterise themselves as more of the other group i.e., collectivistic. Thus, this dichotomy between different cultural groups, albeit easy and convenient to use, provide limited insight on the cultural factors that may influence social cognitive development. Therefore, it is the present contention that to fully understand how culture impacts the development of mental state understanding, a more detailed, closer examination of actual cultural practices and communicative behaviours that occur in families from a particular cultural group is necessary to clarify any culture-based effects.

Irrespective of cultural differences, however, deafness has a profound impact on how family members communicate with each other (Marschark, 1997, 2007). Oftentimes, access and participation in conversational interactions with household members are restricted. As a result, deaf children miss out on opportunities to learn about everyday topics, including thoughts and feelings of others. Such conversational exchanges are regarded by many to be critical in the development of children’s understanding of the mind and emotions.

The present thesis offers a unique perspective on the conversational dynamics of families with deaf children. By examining several factors that may impact the familial discourse, it has been found that the predominant use of signed communication undermines ToM development. Authors contend that restricted access to conversational interactions in hearing families with deaf children accounts for their delayed performance in social cognitive understanding (Courtin & Melot, 1998; Peterson & Siegal, 2000; Schick et al., 2007). That is to say, providing access to these conversations will help foster social cognitive development.

However, based on findings in the current thesis, communicative exchanges in hearing families with deaf children appear to benefit less from parents using signed communication predominantly. It could be that the use of their primary mode of communication i.e., oral allows hearing parents to freely engage in discourse. However, when using signed communication in an effort to bridge the communication gap, parents tend to be less effective. Thus, the use of full sign communication possible restricts the topics that parents are able to converse about, increased amount of general talk notwithstanding, which has implications on how the deaf access relevant information to develop their understanding of mind.

Finally, extant research is replete with references to significant links between the *content* of family discourse and children's social cognitive understanding. Indeed, mental state talk and the proclivity to communicate with others as psychological agents or 'mind-mindedness' has been robustly associated with children's understanding of mind and emotions, primarily among typically developing samples (Adrián et al., 2007; de Rosnay & Hughes, 2006; de Rosnay et al., 2004; Dunn, Brown, & Beardsall, 1991; Dunn, Brown, Slomkowski, et al., 1991; Hughes & Devine, 2017; Lundy, 2013; Meins et al., 2013; Meins et al., 2002; Peterson & Slaughter, 2003; Ruffman et al., 2002; Taumoepeau & Ruffman, 2006). Nevertheless, there is comparatively less research in this area with deaf children but the conclusions are the same (Moeller & Schick, 2006; Morgan & Kegl, 2006). Unfortunately for the present thesis, examining samples of mental state talk or mind-minded interactions was not possible due to challenges during recruitment. Yet, the fact that it may potentially explain variance in deaf performance is not overlooked. Indeed, current findings of how the conversational environment transforms the association between language and social cognition further highlights the need for additional work on the kinds of conversational inputs deaf children are exposed to and to understand how they may enhance or hinder their social cognitive understanding.

Lastly, the ability to understand other people's emotions appears to play a more significant role in the social interactions of the deaf than deploying a ToM or recognising and labelling others' feelings. The argument that certain cultural values and parenting practices in the Filipino context may negatively impact how parents engage with their children as psychological agents is revisited. However, it can also be argued that norms such as *pakikiramdam* (shared inner perception) and *hiya* (sense of shame) may, otherwise, develop a nascent understanding of emotions which impacts their social interactions even at an early age. Take, for example, a child who is subjected to a stern look by a parent due to some perceived transgression. The child immediately recognises that s/he has incurred the parent's ire but may not fully understand what s/he did wrong. Nevertheless, the behaviour is immediately stopped. Whether the behaviour was discontinued because (a) the child was afraid of the parent or (b) due to a shared understanding that the child should respect the parents' authority to discipline, and/or (c) the parent feels embarrassed by the incident, the over-all effect is the same. Even without a full comprehension of what the parent is thinking or feeling, the child intuitively understands that the behaviour needs to be altered, immediately.

8.4 Contributions, limitations and directions for future research

Overall, the findings of this thesis contribute to extant literature in a number of ways. First, this is the first scientific investigation on the social cognitive development, particularly in the areas of theory of mind, emotion understanding, and affective recognition and labelling of deaf individuals from the Philippines. Research in deaf communities, particularly in Southeast Asia, has a long tradition for examining the linguistic and educational needs of the deaf (e.g., Philippine Deaf Resource Center & Philippine Federation of the Deaf, 2004; Sanchez & Kusanagi, 1997). Thus, the findings of chapters 1 and 3 not only help broaden the scope of international deaf research but also provide a window into different cultural practices and norms that may can help explain the rate and pattern of acquisition of Filipino children's understanding of mind and emotions. Second, the current research comes at an opportune time when institutions for the deaf are slowly making efforts to address the need for psychological programmes to deal with behavioural and mental health related concerns of deaf students. Findings from chapters 2, 4, and 5 make available research-based evidence to provide parents, educators, and policy makers a profile of factors associated with (e.g., poor language abilities) and arising from (e.g., fewer prosocial actions) difficulties in social cognition to help develop more appropriate intervention programmes that are tailored to specific needs of Filipino deaf and hearing individuals. Third, the current thesis extended current understanding of the discourse-social cognition link from a distinction based on the parental hearing status to examining a variety of factors thought to influence the communicative environment of hearing families with deaf children. Fourth, the thesis recruited participants from similar socio-economic backgrounds. Indeed, the majority of the participants (66%) scored less than 3 (out of a possible 9 points) which indicate that participants come from families that belong to lower income households (Boyce et al., 2006). Given that family affluence has been associated with better cognitive and language abilities (e.g., Bradley & Corwyn, 2002; Brown et al., 1996; Currie et al., 1997; Fernald et al., 2013; Gathercole et al., 2016; Lundy, 2013; Rowe & Goldin-Meadow, 2009), this has important implications on children's social cognitive skills. However, given that the vast majority of research in this area of Psychology examines children from Western, educated, industrialised, rich, and democratic (WEIRD) cultures (Jones , 2010; Henrich , Heine, & Norenzayan, 2010), the fact that the data was undertaken in the Philippines with participants from low-to-mid SES environments is a major strength of the work. Lastly, different from previous research that examined the social consequences of social cognition, the current thesis examined ToM, emotion understanding, and affective recognition and labelling concurrently. In doing so, current findings report not only on the direct effects of social cognition on social competence but also account for the influence of the unique variance in each of these social cognitive factors while partialing out their shared variance.

Whilst specific caveats have been addressed in the preceding chapters, more general limitations for further consideration are addressed in this section. Firstly, the opportunistic sampling of deaf participants could limit the generalisability of the current findings. Indeed, the majority of the deaf participants included in this thesis were recruited from the same school that offers self-contained classes with all deaf students. In contrast, only a handful of participants matriculated from mainstreamed programs where deaf students attend classes with hearing classmates with the aid of a sign language teacher/interpreter. The obvious advantages of recruiting from the same institution are convenience and consistency in sign language use. Nevertheless, being educated in an all deaf institution cannot fully account for the variations in social experiences experienced by deaf children in different educational contexts. Indeed, in self-contained classes, sign language is often used inside and outside the classroom. In contrast, in mainstreamed settings or inclusion programmes, classes are taught in orally with a sign teacher/interpreter translating lectures into sign language. Outside of class, students either use sign language with deaf classmates or use other means (e.g., oral, handwritten notes, etc.) to communicate with hearing classmates. Ironically, being surrounded by mostly hearing classmates provides a more similar context to deaf children growing up in hearing households. Previous studies suggest that specific school environments such as bilingual education appear to have a stronger influence on false belief understanding compared to other educational contexts such as using a signing teaching assistant or oral training (Meristo et al., 2007; Tomasuolo et al., 2012). However, due to the challenges in the recruitment of this sample, only a limited number of participants were recruited from mainstreamed programmes and none from oral schools. To confirm if type of school makes a difference for children's understanding of mind and emotions, further studies could include a larger cohort of students educated in other school systems.

Although the deaf participants included in this thesis were all tested using sign language interpreters, they likely had various levels of spoken language competence. There is some evidence to suggest that deaf children whose hearing loss is identified early and who regularly use hearing technologies or HT (e.g., cochlear implants) develop better speech and social cognition than non-HT deaf users (e.g.,Nicholas & Geers, 2007; Remmel & Peters, 2009; Tomblin, Oleson, Ambrose, Walker, & Moeller, 2014). However, in the make up of the current sample, it was not possible to examine these relationships due to low numbers. Thus, future research should endeavour to examine if the language necessary for the development of social cognition can be acquired via exclusive spoken language use (e.g., oral deaf) and/or the use of hearing technologies (e.g., hearing aids or cochlear implants).

Current findings are also constrained by the use of single items to examine concepts in theory of mind and emotion understanding. Although the TEC and the ToM scales all have been widely used in various typical and atypical populations (e.g., De Stasio et al., 2014; Hopyan-Misakyan et al., 2009; Kuntoro et al., 2013; Mancini et al., 2016; Shahaeian et al., 2014), without a chance for further elaboration, pass-fail tasks tend to demonstrate a limited view of children's capacities. Thus, future work could use multi-item measures or short answer questions that provide an opportunity for participants to discuss their responses.

As discussed throughout this thesis, language plays a critical role in the development of social cognitive understanding. For this research, the Expressive Vocabulary Test (EVT-2; Williams, 2007) was used. Given the unique language needs of the participants, translation into spoken Filipino or sign language was warranted during testing. Much effort was made to ensure that the questions were translated as accurately as possible through dialogues with sign language interpreters as well as back-translation of Filipino protocols. Nonetheless, it is acknowledged that translating and signing test items could have important implications for the validity and reliability of standardised assessments. In a related vein, across the five studies, language competence was assessed in terms of semantic linguistic abilities. This is a robust measure of children's expressive vocabulary skills. However, one person may be aware of the words and their associated signs yet, still have difficulty stringing them together to form a coherent sentence/thought. In lieu of these vocabulary tests, future studies can opt to measure children's narrative ability, a more sensitive assessment of deaf children's linguistic abilities. For instance, language samples can based on narratives on wordless picture books such as "Frog, Where Are You?" by Mayer (1969) and scores can be generated based on the Index of Productive Syntax (Scarborough, 1990). Indeed, narrative techniques have been shown to be effective in drawing out children's language and mental state abilities with deaf and hearing children (e.g., Marschark et al., 2000). Measuring sign language ability may also be beneficial but the lack of validated instruments of Filipino Sign Language that can be used for deaf individuals from different signing backgrounds (e.g., American Sign Language; Signed English, Filipino Sign Language, etc.) make sign language competence testing challenging, but not altogether impossible.

Lastly, it is acknowledged that the core findings of this thesis would be stronger if they were independently verified in new samples. However, this claim needs to be balanced against the difficulties of recruiting such complex samples and the efficient use of the data that has been collected. As it stands, the present sample size is larger compared to previous studies (e.g., Hao, Su, & Chan, 2010; Peterson, 2016; Ziv et al., 2013).

8.5 Conclusions

In sum, the current thesis revealed that on tasks that utilise mentalising skills, Filipino deaf children displayed profound delays compared to Filipino hearing children. Yet, on tasks that rely on perception skills, Filipino deaf children are on par with typically developing Filipino children. Interestingly, the nature of development of theory of mind acquisition is the same for the deaf and hearing children not unlike children from Western cultures such as Australia, the US, and Germany yet different patterns emerged in emotion understanding. Furthermore, children's language abilities do impact the development of social cognition, especially for typically developing children. Against this, the communicative environment in families with deaf children needs to be carefully considered. Specifically, parents' use of predominantly signed communication, compared to predominantly oral communication, undermines deaf children's ToM performance yet appears to facilitate the development of their verbal abilities. Lastly, emotion understanding appears to play a bigger role in the social functioning of deaf individuals compared to ToM and affective recognition and labelling.

This thesis, therefore, ends in the same way it began, with a quote from Stokoe (2001) which states, "…the difference in outcome has less to do with being deaf than with what others do about it…" (p. 6). Indeed, great changes can come about when families elect to communicate in ways that provide an opportunity for the deaf to develop their language skills, incur knowledge, participate freely in social interactions, and foster an appreciation of how inner mental states underlie human actions. Consequently, through these enriched communicative exchanges, the deaf person not only becomes a functional member of the family, but one that actively contributes to shared understandings about the world and genuinely, and positively, transforms their relationships with family members, peers, friends, and workmates, with whom they have no shared social history.

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Appendices

Appendix A: Ethics approvals and associated forms

A.1 Human research ethics approval

THE UNIVERSITY OF SYDNEY

Research Integrity
Human Research Ethics Committee

Friday, 2 May 2014

Dr Marc de Rosnay
Psychology; Faculty of Science
Email: marc.derosnay@sydney.edu.au

Dear Marc

I am pleased to inform you that the University of Sydney Human Research Ethics Committee (HREC) has approved your project entitled "**Social Cognitive and Emotion Understanding Among Deaf and Hearing Individuals: Early Childhood to Young Adulthood**".

Details of the approval are as follows:

Project No.: **2013/1060**

Approval Date: **2 May 2014**

First Annual Report Due: **2 May 2015**

Authorised Personnel: **de Rosnay Marc; Begeer Sander; de Gracia Ma Regina;**

Documents Approved:

Date Uploaded	Type	Document Name
15/11/2013	Interview Questions	Sample interview questions
15/11/2013	Other Instruments/Tools	Mindful Conversational Competence Scale
15/11/2013	Other Instruments/Tools	Peer Social Maturity Scale
15/11/2013	Other Instruments/Tools	Sample tasks
15/11/2013	Other Instruments/Tools	Strengths and Difficulties Questionnaire
11/04/2014	Participant Consent Form	Attachment D.1 consent form_parents_children below 18_v4
8/04/2014	Participant Consent Form	Attachment D.2 Consent form_participant_19 and above_v2
8/04/2014	Participant Consent Form	Attachment D.3 Consent forms_parent interviews_v2
5/03/2014	Participant Consent Form	Attachment E.2.1 Filipino_consent form_parents_below18
5/03/2014	Participant Consent Form	Attachment E.2.2 Filipino_consent form_participant_above18
5/03/2014	Participant Consent Form	Attachment E.2.3 Filipino_consent form_parent interviews
15/04/2014	Participant Info Statement	Attachment B.1 Parent Information Statement below 18_deaf_v4
15/04/2014	Participant Info Statement	Attachment B.2 Parent Information Statement below 18_hearing_v4
15/04/2014	Participant Info Statement	Attachment C.1 Participant

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		Information Statement 18 and above_deaf_v3
15/04/2014	Participant Info Statement	Attachment C.2 Participant Information Statement 18 and above_hearing_v4
5/03/2014	Participant Info Statement	Attachment C.2.1 Filipino_Parent Info Sheet_below18_deaf
5/03/2014	Participant Info Statement	Attachment C.2.2 Filipino_Parent Info Sheet_below18_hearing
5/03/2014	Participant Info Statement	Attachment D.2 Filipino_participant info sheet_above18_hear
11/04/2014	Recruitment Letter/Email	Attachment A.1 Letter of Invitation for children 18 and above_deaf_v3
11/04/2014	Recruitment Letter/Email	Attachment A.2 Letter of Invitation for children 18 and above_hearing_v3
11/04/2014	Recruitment Letter/Email	Attachment A.3 Letter of Invitation for children below 18_deaf_v3
11/04/2014	Recruitment Letter/Email	Attachment A.4 Letter of introduction below 18_hearing_v3
5/03/2014	Recruitment Letter/Email	Attachment B.1.1 English_Letter of introduction below18_deaf
5/03/2014	Recruitment Letter/Email	Attachment B.1.2 English_Letter of introduction above18_deaf
5/03/2014	Recruitment Letter/Email	Attachment B.1.3 English_Letter of introduction below18_hear
5/03/2014	Recruitment Letter/Email	Attachment B.1.4 English_Letter of introduction above18_hear
5/03/2014	Recruitment Letter/Email	Attachment B.2.1 Fil_Letter of introduction below18_deaf
5/03/2014	Recruitment Letter/Email	Attachment B.2.2 Fil_Letter of introduction below18_hearing
5/03/2014	Recruitment Letter/Email	Attachment B.2.3 Fil_Letter of introduction above18_hearing
15/11/2013	Recruitment Letter/Email	Letter of introduction for parents/guardians
5/03/2014	Safety Protocol	Attachment A Safety Protocol_v3

HREC approval is valid for four (4) years from the approval date stated in this letter and is granted pending the following conditions being met:

Special Condition/s of Approval

- Please note that provision of independently certified translations of all final versions of amended public documents will be a condition of approval.

Condition/s of Approval

- Continuing compliance with the National Statement on Ethical Conduct in Research Involving Humans.

- Provision of an annual report on this research to the Human Research Ethics Committee from the approval date and at the completion of the study. Failure to submit reports will result in withdrawal of ethics approval for the project.

- All serious and unexpected adverse events should be reported to the HREC within 72 hours.

- All unforeseen events that might affect continued ethical acceptability of the project should be reported to the HREC as soon as possible.

THE UNIVERSITY OF SYDNEY

- Any changes to the project including changes to research personnel must be approved by the HREC before the research project can proceed.
- Note that for student research projects, a copy of this letter must be included in the candidate's thesis.

Chief Investigator / Supervisor's responsibilities:

1. You must retain copies of all signed Consent Forms (if applicable) and provide these to the HREC on request.
2. It is your responsibility to provide a copy of this letter to any internal/external granting agencies if requested.

Please do not hesitate to contact Research Integrity (Human Ethics) should you require further information or clarification.

Yours sincerely

S. J. Assinder

Dr Stephen Assinder
Chair
Human Research Ethics Committee

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2007), NHMRC and Universities Australia Australian Code for the Responsible Conduct of Research (2007) and the CPMP/ICH Note for Guidance on Good Clinical Practice.

From: Human Ethics
To: Marc de Rosnay
Subject: 2013/1060 - Compliance with Special Conditions
Date: Tuesday, September 16, 2014 11:23:00 AM

Dear Dr Marc de Rosnay

Project Title: Social Cognitive and Emotion Understanding Among Deaf and Hearing Individuals: Early Childhood to Young Adulthood

Project No: 2013/1060

Thank you for providing documentation addressing the following special condition of approval:

- Please note that provision of independently certified translations of all final versions of amended public documents will be a condition of approval.

I am pleased to advise that this condition has now been met.

Please retain a copy of this email with your study records.

Kind regards,
Human Ethics Administration

Office of Research Integrity | Research Portfolio THE UNIVERSITY OF SYDNEY Lv 2 | Margaret Telfer Building (K07) | The University of Sydney | NSW | 2006 T +61 2 8627 8173 | F +61 2 8627 8177 E ro.humanethics@sydney.edu.au | W http://sydney.edu.au/ethics

A.2 Sample parent letter of invitation

THE UNIVERSITY OF SYDNEY

School of Psychology
Faculty of Science

ABN 15 211 513 464

Marc de Rosnay *DPhil*
Senior Lecturer

Room BM344
Brennan MacCallum Building A18
The University of Sydney
NSW 2006 AUSTRALIA
Telephone: +61 2 9351 4528
Facsimile: +61 2 9036 5223
Email: marc.derosnay@sydney.edu.au
Web:sydney.edu.au/science/psychology

1 August 2014

RE: Invitation to participate in a study conducted by The University of Sydney

Dear Parent/Guardian,

We would like to invite your child to participate in our study, *Social Cognitive and Emotion Understanding among Deaf and Hearing Individuals: Early Childhood to Young Adulthood*, which is being conducted by Ph.D. candidate, Ms Ma. Regina de Gracia, under the supervision of myself, Dr. Marc de Rosnay, of the School of Psychology at the University of Sydney.

The study involves a visit to a classroom at your child's school where your child will complete some tasks and view short video clips with a researcher (Ms. Ma. Regina de Gracia). There are three types of videos that will be shown (1) short stories, (2) computer animations of shapes, and (3) short movie clips. Pictures displaying various facial expressions and body postures will be shown. Your child will participate by answering some questions related to their understanding of the stories, pictures, and videos. All sessions will be conducted after school hours. Your child's teacher will also be asked to answer a short survey about how your child interacts with his/her classmates.

You or your child's teacher will have access to your child at all times. Participation in this study is entirely voluntary and you are under no obligation to consent. If you do consent, you can choose to withdraw your child from the study at any time. Please find enclosed a Parent/Guardian Information Statement and a Consent Form which outline the details of this study.

If you are interested in volunteering for our study, please complete the enclosed Consent Form and return it to your School Principal. If you would like further information, please feel free to contact Ms Ma Regina de Gracia on +63 925 882 8887 or mdeg1214@uni.sydney.edu.au. You are also welcome to contact Dr. Liane Peña Alampay (Philippines) on +63 2 426 6001 local 5260-63 or lpalampay@ateneo.edu or Dr. Marc de Rosnay (Australia) on +61 2 9351 4528 or marc.derosnay@syndey.edu.au.

Yours sincerely,

Marc de Rosnay

Social Cognitive and Emotion Understanding Among Deaf and Hearing Individuals
Version 3 08-04-2014_hearing

A.3 Sample parent information statement

THE UNIVERSITY OF SYDNEY

School of Psychology
Faculty of Science

ABN 15 211 513 464

Marc de Rosnay *DPhil*
Senior Lecturer

Room BM344
Brennan MacCallum Building A18
The University of Sydney
NSW 2006 AUSTRALIA
Telephone: +61 2 9351 4528
Facsimile: +61 2 9036 5223
Email: marc.derosnay@sydney.edu.au
Web: sydney.edu.au/science/psychology

PARENT (GUARDIAN) INFORMATION STATEMENT

Title: Social Cognitive and Emotion Understanding among Deaf and Hearing Individuals : Early Childhood to Young Adulthood

(1) What is the study about?

This research aims to take a closer look at how deaf and hearing individuals explain other people's behaviours and emotions and in what way this knowledge affects their relationships with their peers. It also looks into how effective communication in early childhood affects development. The implications of this study are wide-reaching and will add to existing research examining how the deaf and hearing process social and emotional information.

(2) Who is carrying out the study?

The study is being conducted by current Ph.D. candidate, Ms. Ma. Regina de Gracia and will form the basis for the degree of Doctor of Philosophy undertaken at The University of Sydney under the supervision of Dr. Marc de Rosnay, Senior Lecturer in the School of Psychology.

(3) What does the study involve?

The study involves a visit to a classroom at your child's school where your child will complete some tasks and view short video clips with a researcher (Ms. Ma. Regina de Gracia). There are three types of videos that will be shown (1) short stories, (2) computer animations of shapes, and (3) short movie clips. Pictures displaying various facial expressions and body postures will be shown. Your child will participate by answering some questions related to their understanding of the stories, pictures, and videos. All sessions will be conducted after school hours. Your child's teacher will also be asked to answer a short survey about how your child interacts with his/her classmates.

Audio and video recordings of your child will be made as part of this study. These recordings will only be accessible to the researchers and yourself. Your child's identity will be strictly protected (see point 6).

(4) How much time will the study take?

The study will take approximately 1.5 hours (including breaks).

(5) Can my child withdraw from the study?

Being in this study is completely voluntary. You are not under any obligation to give consent for your child. Your decision whether or not to permit your child to participate will not prejudice you or your child's future relations with The University of Sydney. If you decide to permit your child to participate, you are free to withdraw your consent and to discontinue your child's participation at any time without affecting your relationship with the University of Sydney. Your child may stop the experiment at any time if they do not wish to continue, the audio and video recordings will be erased and the information provided will not be included in the study.

(6) Will anyone else know the results?

All aspects of the study, including results, will be strictly confidential and only the researchers will have access to information on participants.

A report of the study may be submitted for publication, current findings might be compared with research from other deaf communities in the region or elsewhere, and used in the development of intervention programmes but individual participants will not be identifiable in such a report.

All original materials (e.g., videos) will be destroyed within 7 years of the completion of this study.

(7) Will the study benefit my child?

We do not anticipate that there will be any adverse consequences for your child by taking part in our study. However, there are no assurances that your child will receive any benefits from the study.

If we have any indication that your child is unhappy or dislikes the procedures, which we do not anticipate, the study will be terminated. We will always speak with you in the unlikely event that this occurs.

We will happily provide you with a DVD recording of your child's participation in this study.

As a token of appreciation for your child's participation, we will be giving your child a food voucher from Jollibee restaurant worth P100 after the study.

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

You are more than welcome to tell other people about the study as it will not affect the outcomes of the research.

(9) What if I require further information about the study or my child's involvement?

When you have read this information, Ma. Regina de Gracia at +63 925 882 8887 or mdeg1214@uni.sydney.edu.au is available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Dr. Liane Peña Alampay (Philippines) on +63 2 426 6001 local 5260-63 or lpalampay@ateneo.edu or Dr. Marc de Rosnay (Australia) on +61 2 9351 4528 or marc.derosnay@syndey.edu.au .

(10)What if I have a complaint or any concerns?

Any person with concerns or complaints about the conduct of a research study can contact The Manager, Human Ethics Administration, University of Sydney on +61 2 8627 8176 (Telephone); +61 2 8627 8177 (Facsimile) or ro.humanethics@sydney.edu.au (Email). Alternatively, you may also contact Dr. Liane Peña Alampay (Philippines) on +63 2 426 6001 local 5260-63 or lpalampay@ateneo.edu.

This information sheet is for you to keep

A.4 Sample parent consent form

THE UNIVERSITY OF SYDNEY

School of Psychology
Faculty of Science

ABN 15 211 513 464
Marc de Rosnay *DPhil*
Senior Lecturer

Room BM344
Brennan MacCallum Building A18
The University of Sydney NSW 2006
AUSTRALIA Telephone: +61 2 9351 4528
Facsimile: +61 2 9036 5223
Email: marc.derosnay@sydney.edu.au
Web: sydney.edu.au/science/psychology

PARENTAL (OR GUARDIAN) CONSENT FORM

I, ... [PRINT NAME], agree to permit

.... [PRINT CHILD'S NAME], who is aged, ...

years and .... months, to participate in the research project –

TITLE: Social Cognitive and Emotion Understanding Among Deaf and Hearing Individuals: Early Childhood to Young Adulthood

In giving my consent I acknowledge that:

1. The procedures required for the project and the time involved for my child's participation in the project have been explained to me, and any questions I have about the project have been answered to my satisfaction.

2. I have read the Information Statement and have been given the opportunity to discuss the information and my child's involvement in the project with the researcher/s.

3. I understand that being in this study is completely voluntary – I am not under any obligation to consent to my child's participation.

4. I understand that my child's involvement is strictly confidential. I understand that research data gathered from the results of the study may be published, current findings might be compared with research from other deaf communities in the region or elsewhere, and used in the development of intervention programmes, however, no information about my child nor I will be used in any way that is identifiable.

5. I understand that I can withdraw my child from the study at any time without prejudice to my or my child's relationship with the researcher/s or the University of Sydney now or in the future.

6. I understand that the experiment can be stopped at any time if my child or I do not wish the experiment to continue. The audio and video recording will be erased and the information provided will not be included in the study.

7. I consent to:

• Audio-recording	☐ YES	☐ NO
• Video-recording	☐ YES	☐ NO
• Receiving Feedback	☐ YES	☐ NO
• Use of data in publications, by comparing it with other research, and in the development of intervention programmes	☐ YES	☐ NO

8. If you answered YES to the "Receiving Feedback" question, please provide your details i.e. mailing address, email address.

Feedback Option

Address: ______________________________

____

Email: ______________________________

....
Signature of Parent/Caregiver

....
Please PRINT name

....
Date

For children ages 13 to 17:

....
Signature of Child

....
Please PRINT name

....
Date

Appendix B: Endorsement letters from the Department of Education

Republika ng Pilipinas
(Republic of the Philippines)
KAGAWARAN NG EDUKASYON
(DEPARTMENT OF EDUCATION)
PAMBANSANG PUNONG REHIYON
(NATIONAL CAPITAL REGION)
Daang Misamis, Bago Bantay, Lungsod Quezon
(Misamis St., Bago Bantay, Quezon City)

Department of Education
National Capital Region
RECORDS AND PUBLICATION UNIT
RELEASED
By:
Date: Time: 4:25

February 10, 2014

To: Schools Division Superintendents

Division of Manila
P. Gomez Elementary School
Legarda Elementary School

Division of Quezon City
Batino Elementary School

Division of Pasay City
Philippine School for the Deaf

Dear Sir/Madam:

Attached is the letter of Dr. Marilyn D. Dimaano, Officer-In-Charge, Office of the Director IV, Bureau of Elementary Education, Department of Education, re: letter of Ma. Regina Laya De Gracia requesting endorsement for her research which will involve primary and secondary schools Sped Centers for Children with Hearing Impairment, the content of which is self-explanatory, for appropriate action.

Very truly yours,

Alejandro R. Ibañez

ALEJANDRO G. IBAÑEZ
OIC, Regional Planning Unit
Officer-In-Charge

Regional Letter No. 027

Vhe/rl

Premier region: home of world-class lifelong education

172519

1st Endorsement
January 22, 2014

Respectfully transmitted to ***Dr. Luz S. Almeda***, Regional Director, DepEd NCR, Misamis St., Bago Bantay, Quezon City the attached letter of **Ma. Regina Laya De Gracia**, sent thru email to Undersecretary for Programs and Projects requesting endorsement for her research which will involve primary and secondary schools in Metro Manila with classes/programs for children with hearing impairment, for her appropriate action.

Please inform this Office on the action taken on this matter.

Marilyn D. Dimaano

MARILYN D. DIMAANO
Director IV

Republic of the Philippines
Department of Education
National Capital Region
Division of City Schools
PASAY CITY
P. Zamora Street, Pasay City
831-0331 833-4085 831-7933

1st Indorsement
September 11, 2014

Respectfully referred to the Principals of, **P. Villanueva Elementary School, Jose Rizal Elementary and Pasay City West High School**, this Division, with the information that this Office interposes no objection to the attached letter- request of Ma. Regina de Gracia, Researcher, Endorsed by Marc de Rosnay, DPhil, Senior Lecturer, The University of Sydney, to gather data from One Hundred Fifty (150) hearing students, ages 4-18, that schools, the schedule of which shall be in October 2014 to complete the required information needed, on conditions that:

1. No office materials shall be used for the purpose;
2. The administration of questionnaires will not interfere with the duties of the respondents; and
3. This Office be furnished a copy of the research findings/output after the completion of the study.

Likewise, please be guided of certain rules and policies prescribed by this Office with regard to such related activity particularly the adherence to time- on- task- policy of DepEd.

ALEJANDRO G. IBAÑEZ, Ph.D.
OIC, Asst. Schools Division Superintendent
Officer-In-Charge

cc.: **Marc de Rosnay, Dphil**
Senior Lecturer
The University of Sydney

Appendix C: Protocol for scaling theory of mind

C.1 Scaling Theory of Mind (ToM) protocol

Location:		**ID No:**	
Participant:		**Date of session:**	
Gender:		**Session number:**	
Date of Birth:	(DD-MM-YY)	**Duration of session:**	
Age:	(Years; months)	**Researcher:**	

Scaling of Theory of Mind (Wellman and Liu, 2004; Peterson, Wellman, & Liu, 2005; Peterson, Wellman, & Slaughter, 2012)

Materials

- laminated pictures (garage and bush; carrot and cookie; picnic; back of head of boy, boy's faces with different emotions) , 3 dolls (2 girls and 1 boy), 1 box of crayons (with toy pig), drawers (with toy dog inside)

Introduction

I will tell you some short stories and after each one, I am going to ask you some questions about the story.

Experiment proper

(1) Diverse desires(Peterson, Wellman, & Liu, 2005):

Display adult doll and the pictures of carrot and cookie.

Here is a woman. This woman wants her morning snack. Here are two foods, a carrot and a cookie.

<u>Pretest question</u>

Which do you like best? Carrot Cookie (Circle child's response) **That's a good choice but the woman doesn't like __________. She likes _________. She loves to eat _______ best of all.**

<u>Target question</u>

So now the woman can choose only one food. Which will she choose?
Carrot Cookie (Circle child's response)

If no answer, prompt:

Will she choose a carrot or a cookie?_________

(2) Diverse beliefs(Peterson, Wellman, & Liu, 2005):

Display girl doll and pictures of bushes and garage

> ***This girl wants her cat. The cat is hiding. It could be in the bushes or it could be in the garage.***

Pretest question

> **Where do you think the cat is?** Bush Garage (Circle child's response) **Well, that's a good idea. But the girl thinks the cat is in the ________.**

Target question

> **Where will the girl look for her cat?** Bush Garage (Circle child's response)

If no answer, prompt:

> **Will she look in the garage or the bushes? ______**

(3) Knowledge access(Peterson, Wellman, & Liu, 2005):

Display toy chest with the drawer closed.

> ***Here is a drawer.***

Pretest question

> **What do you think is in it? __________ That's a good guess. Let's open it. Oh, look! There is a dog in it!**

Display toy dog; then close it inside the drawer.

Control question 1

> **So what is in the drawer? _________**

Doll enters

> ***This girl has never seen this drawer before. She has never opened it.***

Control question 2

> **So, has she looked in this drawer?** Yes No (Circle child's response)

Target question

Does the girl know what is in the drawer? Yes No (Circle child's response)

(4) False belief(Peterson, Wellman, & Liu, 2005):

Display closed Crayola box.

Here is a Crayola box. What do you think is in it? ___________

If no answer or answers other than crayons/colour, continue with:

What is usually in a box like this? In the shops, what does a box like this have in it?___________

Open the box and show the child the contents.

Let's look in the box. Oh! There is a pig in it.

Close pig in the box.

<u>Control question 1</u>

Okay, so what was in the box? ______________

Boy doll arrives.

Here comes the boy. He has never looked in this box.

<u>Target question</u>

What does the boy think is in the box? Crayons Pig (Circle child's response)

<u>Control question 2</u>

Did he look in the box? Yes No (Circle child's response)

(5) Hidden emotion: (Peterson, Wellman, & Liu, 2005):

Here is a boy. [Show the picture of the back of the head of a boy] ***The boy and his friends were playing. A girl teased the boy and the others all laughed. The boy did not laugh. He did not think it was funny. But the boy did not want the others to see how he felt. If they saw how he felt, they would call him a baby.***

<u>Real emotion question:</u>

How did the boy really and truly feel when everyone laughed and teased

him? _________

Show pictures of different facial expressions of happy, sad, and okay. Offer the child to point to his/her answer. Answer: happy sad okay (Circle child's response)

If no answer, the experiment points in turn and says:

Did he feel happy? Or okay? Or sad?

Answer: happy sad okay (Circle child's response)

<u>Reality justification control question</u>

Why did he feel [sad/okay/happy]? (Write response in the box)

<u>Apparent emotion test question</u>

How did the boy try to look on his face when everyone laughed at him and teased him?

Show pictures of different facial expressions of happy, okay, and sad. Offer the child to point to his/her answer.

Answer: happy okay sad (Circle child's response)

If no answer the experiment points in turn and says:

Did he try to look happy? Or okay? Or sad?

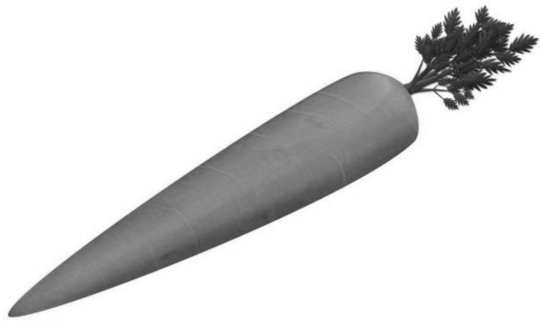
Answer: happy okay sad (Circle child's response)

<u>Appearance justification control question</u>

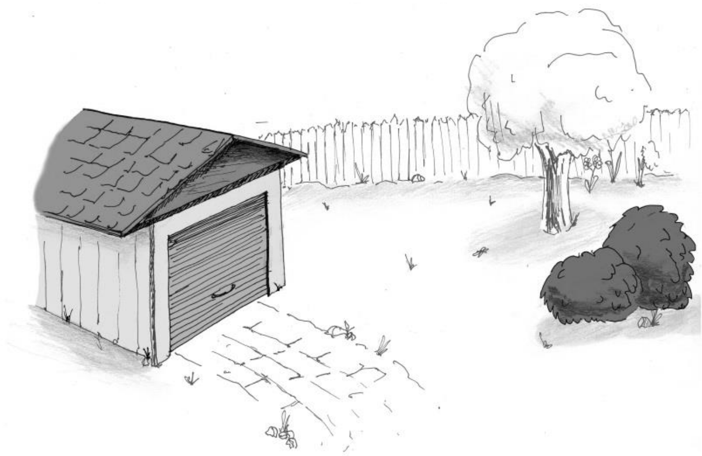
Why did he try to look [sad/okay/happy]? (Write response in the box)

C.2 Pictures for the different scaling tasks

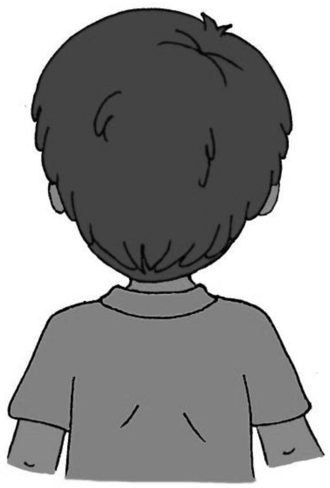
Diverse Desires task



Diverse Beliefs task



Hidden Emotions task



Appendix D: Test of Emotion Comprehension

D.1 Test of Emotion Comprehension (TEC) protocol

Preliminary remarks

- Make sure the child is relaxed and comfortable before you start; it is important not to rush
- The tone of story presentation should be emotionally neutral. Presentation should be engaging and animated but the emotional outcome of the story must not be revealed by the experimenter's vocal, postural or facial cue
- Children should receive positive feedback for all their answers BUT they should NOT be told if they are right or wrong, correct or incorrect (e.g., 'that's a good answer', 'well done')
- Never ask the child to justify his/her answer
- **Component I**: If the child fails to produce a response then the examiner points to each picture in turn (left to right, top to bottom) and asks, while pointing: ***Is this one*** *(target emotion)****?***
- **Component I**: If the child responds positively to two or more of the pictures then the examiner asks, while pointing to the options: ***Choose the best one for*** *(target emotion)*
- **Components II to IX**: Always point to the different characters and objects involved in the story. In the current procedure names have been attributed to the characters (e.g. Tom, Sarah). However, that's optional
- **Components II to IX**: Always point and name the four possible answers
- **Components II to IX**: If the child just names the answer then the experimenter has to ask him/her to point the answer (***Can you show me*** [child's response]). The child <u>does not</u> need to name the answer
- **Components II to IX**: Always reveal the possible answers <u>after</u> the presentation of the story (i.e., do not reveal lower half of page with expressions until story is complete)
- **Component II to IX**: If the child fails to produce a response then the examiner points to each picture in turn (left to right, top to bottom) and asks, while pointing: ***Do you think he (she) is***…?
- **Component II to IX**: If the child responds positively to two or more of the pictures then the examiner asks, while pointing to the options: ***Choose the one that you think is best***

Introduction

Thank you for helping me with my work. I am going to show you some pictures and then ask you some questions. For every question give me the answer that you think is best by pointing to the picture that you choose. If there is something that you don't understand just tell me, okay? (go to page 1)

Component I: Recognition (pp. 1-5)

Let's look at these four pictures. Can you point to the person who feels:
(p.1) ***sad?***
(p.2) ***happy?***
(p.3) ***angry?***
(p.4) ***alright?***
(p.5) ***scared?***

Transition

Okay, now we are going to see some stories. I want you to listen to the whole story and then I'll ask you a question. Wait until I've shown you all the pictures before you point to the answer. (go to page 6)

Component II: External causes (pp.6-10)

(p.6) Turtle
This girl is looking at her little turtle, which has just died.
How is this girl feeling? ***Is she happy, sad, angry or alright?***

(p.7) Birthday
This boy is getting a birthday present.
How is this boy feeling? Is he happy, sad, alright or scared?

(p.8) Brother
This girl is trying to do a drawing but her little brother is stopping her.
How is this girl feeling? Is she happy, alright, angry or scared?

(p.9) Bus
This boy is standing at the bus stop.
How is this boy feeling? Is he happy, sad, angry or alright?

(p.10) Monster
This girl is being chased by a monster.
How is this girl feeling? Is she **happy, alright, angry or scared*?***

Component III: Desires (pp.11-12)

(p.11) Coca-cola
This is Sarah and this is Helen. Sarah and Helen are very thirsty.

Sarah likes Coca-Cola very much and Helen hates Coca-Cola.

<u>Control question</u>

Does Sarah like Coca Cola?

Does Helen like Coca-Cola?

Positive feedback: ***That's right, Sarah likes Coca-Cola / That's right, Helen doesn't like Coca-Cola.***

Negative feedback: ***Well actually, Sarah likes Coca-Cola*** (help) ***/ Well actually, Helen doesn't like Coca-Cola.*** (help)

Can you open the box for me? There is Coca Cola in the box!

How is Sarah feeling when she sees Coca Cola? Is she happy, sad, alright or scared?

How is Helen feeling when she sees Coca Cola? Is she happy, sad, alright or scared?

(p.12) Salad
This is Sarah and this is Helen. Sarah and Helen are very hungry.

Sarah hates lettuce and Helen likes lettuce very much.

<u>Control question</u>

Does Sarah like lettuce?

Does Helen like lettuce?

Positive feedback: ***That's right, Sarah doesn't like lettuce / That's right, Helen likes lettuce.***

Negative feedback: ***Well actually, Sarah doesn't like lettuce*** (help) ***/ Well actually, Helen likes lettuce.*** (help)

Can you open the box for me? There is lettuce in the box!

How is Sarah feeling when she sees lettuce? Is she happy, sad, alright or scared?

How is Helen feeling when she sees lettuce? Is she happy, sad, alright or scared?

Component IV: Beliefs (p.13)

(p.13) ***This is Sarah's rabbit. It is eating a carrot. It likes carrots very much.***

Can you look behind the bushes? It's a fox. The fox is hiding behind the bushes because he wants to eat the rabbit.

Can you put the bushes back on so that the rabbit can't see that the fox is hiding behind the bushes?

<u>Control question</u>

Does the rabbit know the fox is hiding behind the bushes?

Positive feedback: ***That's right, the rabbit doesn't know the fox is hiding behind the bushes***

Negative feedback: ***Well actually, the rabbit doesn't know the fox is hiding behind in the bushes*** ("help")

How is the rabbit feeling?* Is it happy, alright, angry or scared*?

Component V: Reminders (pp.14-17)

(p.14) ***Sarah is very sad because the fox ate her rabbit***…

(p.15) ***… Later on that night Sarah goes to bed. The next day…***

<u>Control question</u>

(p.16) ***… Sarah is looking at her photo album. She is looking at a picture of her best friend.***

How is Sarah feeling when she is looking at the picture of her best friend? Is she happy, sad, alright or scared?

Positive feedback: ***That's right, Sarah is felling happy when she is looking at the picture of her best friend!***

Negative feedback: ***Well actually, Sarah is felling happy when she is looking at the picture of her best friend!*** (help)

(p.17) ***…and now Sarah is looking at a picture of her rabbit.***
How is Sarah feeling when she is looking at the picture of her rabbit ? Is she happy, sad, alright or scared?

Component VI: Regulations (p.18)

(p.18) ***Sarah is looking at a picture of her rabbit. Sarah is very sad because her rabbit was eaten by the fox.***

What is the best way for Sarah to stop herself being sad?

- Can Sarah cover her eyes to stop herself being sad!

- Can Sarah go outside to stop herself being sad!

- Can Sarah think about something else to stop herself being sad!

- Is there nothing Sarah can do to stop herself being sad!

Option (if the child says that Sarah may buy a new Rabbit)

Yes, she can get a new rabbit but Sarah is very sad about losing her rabbit. She liked her rabbit very much. What is the best way for Sarah to stop herself being sad about her rabbit?

Component VII: Appearance & Reality (p.19)

(p.19) ***Sarah and this is Dorothy. Dorothy is teasing Sarah because Dorothy has lots of marbles and Sarah doesn't have any. Sarah is smiling because she doesn't want to show Dorothy how she is feeling inside***.

How is Sarah feeling inside? Is she happy, alright, angry or scared?

Component VIII: Mixed (p.20)

(p.20) ***Sarah is looking at the new bicycle that she just got for her birthday. But at the same time, Sarah thinks she might fall off and hurt herself because she has never ridden a bicycle before.***

So, how is Sarah feeling? Is she happy, sad and scared, happy and scared or scared?

Component IX: Morality (pp.21-23)

(p.21) ***Sarah is visiting her friend Helen. Sarah is waiting on her own in the kitchen. Sarah sees a jar with some chocolate cookies in it. She really wants to eat a chocolate cookie. She loves them.***

Control question

Is it alright for Sarah to eat a chocolate cookie straight away or should she wait to ask Helen's mummy?

Positive feedback: ***That's right, she should wait because it's naughty to take something without asking.***

Negative feedback: ***Well actually, she should wait because it's naughty to take something without asking*** (help).

Sarah touches the lid of the jar but she manages to stop herself from opening it. She doesn't eat a chocolate cookie because she hasn't asked yet.

How does Sarah feel when she stops herself?

- Does she feel happy because she stopped herself?

- Does she feel sad because she stopped herself?

- Does she feel angry because she stopped herself?

- Does she feel just alright because she stopped herself?

(p.22) ***After a little while Sarah can't stop herself from eating a chocolate cookie***.

(p.23) ***Later, Sarah goes home. Sarah remembers that she ate a chocolate cookie without asking. She wonders if she should tell her mummy about it. In the end she never tells her about taking the chocolate cookie.***

How does Sarah feel about that?

- Does she feel happy about not telling her mummy?

- Does she feel sad about not telling her mummy?

- Does she feel angry about not telling her mummy?

- Does she feel alright about not telling her mummy?

D.2 TEC Answer sheet

Location:	**Date of examination:**
Participant:	**Examiner:**
Gender:	**Duration of examination:**
Date of Birth: (DD-MM-YY)	
Age: (Years; months)	

Remarks

Pages	Component	Answers				Remarks
1	Ia Sad	Happy	Sad	Angry	Alright	
2	Ib Happy	Happy	Sad	Alright	Scared	
3	Ic Angry	Happy	Alright	Angry	Scared	
4	Id Alright	Happy	Sad	Angry	Alright	
5	Ie Scared	Happy	Alright	Angry	Scared	
6	IIa Turtle	Happy	Sad	Angry	Alright	
7	IIb Gift	Happy	Sad	Alright	Scared	
8	IIc Brother	Happy	Alright	Angry	Scared	
9	IId Bus	Happy	Sad	Angry	Alright	
10	IIe Monster	Happy	Alright	Angry	Scared	
11	*III control*	*Sarah likes coca (*help*) /* *Helen doesn't like coca (*help*)*				
11	IIIa T. coca	Happy	Sad	Alright	Scared	
11	IIIb P. n-coca	Happy	Sad	Alright	Scared	
12	*III control*	*Sarah doesn't like salad (*help*) /* *Helen likes salad (*help*)*				
12	IIIc T. n-salad	Happy	Sad	Alright	Scared	
12	IIId P. salad	Happy	Sad	Alright	Scared	
13	*IV control*	Rabbit doesn't know (help)				
13	IV Fox Rabbit	Happy	Alright	Angry	Scared	
14-16	V control	Sarah is happy (help if sad, alright, scared)				
17	V Photo	Happy	Sad	Alright	Scared	
18	VI Regulation	Hands	Do	Think	Nothing	
19	VII Marbles	Happy	Alright	Angry	Scared	
20	VIII Mixed	Happy	Sad Scared	Hap. Scar.	Scared	
21	*IX control*	*It's naughty (*help*)*				
22	IXa Resist	Happy	Sad	Angry	Alright	
22-23	IXb Mother	Happy	Sad	Angry	Alright	

Appendix E: Diagnostic Assessment of Nonverbal Accuracy -2

E.1 DANVA-2 Protocol

Location:		**ID No:**
Participant:		**Date of session:**
Gender:		**Session number:**
Date of Birth:	(DD-MM-YY)	**Duration of session:**
Age:	(Years; months)	**Researcher:**

Preliminary remarks

- Make sure the participant is seated comfortably.
- Place the laptop in front of the participant.
- Make sure the light does not produce reflections on the computer screen which would make viewing more difficult.
- Participants are allowed to view the image for no more than 2 seconds.
- If the participant says that he or she didn't see the photograph, do not re-administer the photograph. Instead, urge the participant to make a guess about whether what they did get a chance to see was happy, sad, angry, or fearful and move on to the next stimuli.

Introduction

I am going to show you some peoples' faces and I want you to tell me how they feel.

I want you to tell me if they are happy, sad, angry, or fearful (scared).

Experiment proper

DANVA2-AF Adult Facial Expressions (Nowicki & Carlton, 1993)

Let's start with adults / grownups faces.

Press ENTER to continue

DANVA2-CF Child Facial Expressions (Nowicki & Carlton, 1993)

Let's try children faces.

Press ENTER to continue

DANVA2-POS Adult Posture Test (Nowicki & Duke, 1994)

> ***I'm going to show you some pictures of older people and I want you to tell me how you think they feel.***
>
> ***There will be a black oval covering the people's faces, so you must look at their whole body to decide which emotion they are feeling. Just as before, your choices are happy, sad, angry, and fearful.***
>
> ***Let's get started.***
>
> ***Press ENTER to continue***

E.2 Sample DANVA-2 item

Appendix F: Social competence scales

F.1 Peer Social Maturity Scale (PSMAT)

Directions: Using the criteria set below, please rate the child compared to his peers.

Legend:

1 = very much less mature than the average child this age
2 = less mature than the average child this age
3 = a little less mature than the average child this age
4 = about average for child this age
5 = a little more mature than an average child this age
6 = more mature than an average child this age
7 = very much more mature than an average child this age

1. The child's skill and willingness to make social overtures, join groups, or welcome others into own activities.	1	2	3	4	5	6	7
2. The child's skill at asserting him/herself appropriately to express opinions or convince peers.	1	2	3	4	5	6	7
3. The child's leadership skills with peers.	1	2	3	4	5	6	7
4. The maturity of the child's everyday modes of playing sociably with peers.	1	2	3	4	5	6	7
5. The child's social skills in coping with peers who frustrate or interfere with the group's goals and activities.	1	2	3	4	5	6	7
6. The child's ability to understand the needs of peers who differ from the norm.	1	2	3	4	5	6	7
7. The overall maturity of the child's social skills.	1	2	3	4	5	6	7

F.2 Strengths and Difficulties Questionnaire (SDQ)

Directions: For each item, please mark the box for Not True, Somewhat True, or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give your answers on the basis of the child's behavior over the last six months or this school year.

	Not True	Somewhat True	Certainly True
Considerate of other people's feelings	☐	☐	☐
Restless, overactive, cannot stay still for long	☐	☐	☐
Often complains of headaches, stomach-aches, or sickness	☐	☐	☐
Shares readily with other children (for example toys, food, pencils, etc.)	☐	☐	☐
Often loses temper	☐	☐	☐
Rather solitary, prefers to play alone	☐	☐	☐
Generally well behaved, usually does what adults request	☐	☐	☐
Many worries, often seems worried	☐	☐	☐
Helpful if someone is hurt, upset, or feeling ill	☐	☐	☐
Constantly fidgeting or squirming	☐	☐	☐
Has at least one good friend	☐	☐	☐
Often fights with other children or bullies them	☐	☐	☐
Often unhappy, down-hearted or tearful	☐	☐	☐
Generally liked by other children	☐	☐	☐
Easily distracted, concentration wanders	☐	☐	☐
Nervous or clingly in new situations, easily loses confidence	☐	☐	☐
Kind to younger children	☐	☐	☐
Often lies or cheats	☐	☐	☐
Picked on or bullied by other children	☐	☐	☐
Often offers to help others (parents, teachers, other children)	☐	☐	☐
Thinks things out before acting	☐	☐	☐
Steals from home, school or elsewhere	☐	☐	☐
Gets along better with adults than with other children	☐	☐	☐
Many fears, easily scared	☐	☐	☐
Good attention span, sees tasks through to the end	☐	☐	☐

Signature:___________________ Date: _______________________

Thank you for your kind assistance.

Appendix G: SPSS Syntax

```
**age groupings**

RECODE Age (0 thru 7.99=1) (8.00 thru 14.99=2) (15.00 thru 100=3) INTO Age_groups.
VARIABLE LABELS  Age_groups 'Age_groups'.
EXECUTE.

**groupings for analyses**

IF (Age_groups=2 and HStatus=0) Grouping_all=1.
IF( Age_groups=2 and HStatus=1) Grouping_all=2.
IF (Age_groups=1 and HStatus=1) Grouping_all=3.
IF (Age_groups=3 and HStatus=0) Grouping_all=4.
EXECUTE.

**Studies 1 and 2**

**Theory of mind**

COMPUTE SC_DD_ToT=SC_DD_PQ + SC_DD_TQab.
EXECUTE.

RECODE SC_DD_ToT (1=1) (0=0) (2=0) INTO SC_DD_ToT.
VARIABLE LABELS SC_DD_ToT 'SC_DD_ToT'.
EXECUTE.

COMPUTE SC_DB_ToT=SC_DB_PQ + SC_DB_TQab.
EXECUTE.

RECODE SC_DB_ToT (1=1) (0=0) (2=0) INTO SC_DB_ToT.
VARIABLE LABELS SC_DB_ToT 'SC_DB_ToT'.
EXECUTE.

COMPUTE SC_KA_ToT= SC_KA_CQ2 + SC_KA_TQ.
EXECUTE.

RECODE SC_KA_ToT (0=1) (1=0) (2=0) (3=0) INTO SC_KA_ToT.
VARIABLE LABELS SC_KA_ToT 'SC_KA_ToT'.
EXECUTE.

COMPUTE SC_FB_ToT=SC_FB_TQ + SC_FB_CQ2.
EXECUTE.

RECODE SC_FB_ToT (0=1) (1=0) (2=0) (3=0)  INTO SC_FB_ToT.
VARIABLE LABELS SC_FB_ToT 'SC_FB_ToT'.
EXECUTE.

IF (SC_HE_REab=2 and SC_HE_AEab=1) HEab_Code=1.
EXECUTE.
```

```
IF (SC_HE_REab=2 and SC_HE_AEab=3) HEab_Code=1.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=1) HEab_Code=1.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=1) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=2) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=3) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=4) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=5) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=1 and SC_HE_AEab=6) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=2 and SC_HE_AEab=2) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=2 and SC_HE_AEab=4) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=2 and SC_HE_AEab=5) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=2 and SC_HE_AEab=6) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=2) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=3) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=4) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=5) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=3 and SC_HE_AEab=6) HEab_Code=0.
```

```
EXECUTE.

IF (SC_HE_REab=6 and SC_HE_AEab=6) HEab_Code=0.
EXECUTE.

IF (SC_HE_REab=4 and SC_HE_AEab=2) HEab_Code=0.
EXECUTE.

RECODE SC_HE_AEJ (1 thru 3=1) (4 thru 23=0) INTO SC_HE_AEJ_Code.
VARIABLE LABELS  SC_HE_AEJ_Code 'SC_HE_AEJ_Code'.
EXECUTE.

COMPUTE SC_HE_ToT = HEab_Code + SC_HE_AEJ_Code.
EXECUTE.

RECODE SC_HE_ToT (0=0) (1=0) (2=1) INTO SC_HE_ToT.
VARIABLE LABELS SC_HE_ToT 'SC_HE_ToT'.
EXECUTE.

COMPUTE ToM5_T = SC_DD_Tot + SC_DB_Tot + SC_KA_Tot + SC_FB_Tot +
SC_HE_Tot.
EXECUTE.

**study 1a analyses**

USE ALL.
FILTER BY Filter_1a.
EXECUTE.

USE ALL.
FILTER BY St1a_groups.
EXECUTE.

FREQUENCIES VARIABLES=SC_DD_Tot SC_DB_Tot SC_KA_Tot SC_FB_Tot
SC_HE_Tot ToM5_T
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

SPLIT FILE OFF.

SORT CASES  BY St1a_groups ToM5_T.
SPLIT FILE SEPARATE BY St1a_groups ToM5_T.

FREQUENCIES VARIABLES=Age
  /STATISTICS=STDDEV MEAN
  /ORDER=ANALYSIS.


DATASET ACTIVATE DataSet1.
UNIANOVA ToM5_T BY St1a_groups Sex
```

```
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /POSTHOC=St1a_groups(TUKEY)
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=St1a_groups Sex St1a_groups*Sex.

UNIANOVA ToM5_T BY St1a_groups Sex WITH VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /EMMEANS=TABLES(St1a_groups) WITH(VA=MEAN SES=MEAN) COMPARE
ADJ(BONFERRONI)
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=VA SES St1a_groups Sex St1a_groups*Sex.

USE ALL.
FILTER BY Filter_VM.
EXECUTE.

UNIANOVA ToM5_T BY HStatus WITH Age SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age SES HStatus.

USE ALL.
FILTER BY Filter_1a.
EXECUTE.

SORT CASES  BY HStatus.
SPLIT FILE SEPARATE BY HStatus.

**original scaling 5 step sequence**

IF (SC_DD_Tot=0 and SC_DB_Tot=0 and SC_KA_Tot=0 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ1=1.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=0 and SC_KA_Tot=0 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ1=2.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=0 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ1=3.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ1=4.
```

```
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=1 and
SC_HE_Tot=0) SC_ToM5SQ1=5.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=1 and
SC_HE_Tot=1) SC_ToM5SQ1=6.
EXECUTE.

**alternative pattern scaling 5 step sequence**

IF (SC_DD_Tot=0 and SC_DB_Tot=0 and SC_KA_Tot=0 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ2=1.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=0 and SC_KA_Tot=0 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ2=2.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=0 and SC_KA_Tot=1 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ2=3.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=0 and
SC_HE_Tot=0) SC_ToM5SQ2=4.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=1 and
SC_HE_Tot=0) SC_ToM5SQ2=5.
EXECUTE.

IF (SC_DD_Tot=1 and SC_DB_Tot=1 and SC_KA_Tot=1 and SC_FB_Tot=1 and
SC_HE_Tot=1) SC_ToM5SQ2=6.
EXECUTE.

**Study 1b**

DATASET ACTIVATE DataSet1.
USE ALL.
FILTER BY Filter_1b.
EXECUTE.

RECODE Comm_RComm (3=2) (4=3) (SYSMIS=SYSMIS) (1 thru 2=1) INTO
Comm_Parent.
VARIABLE LABELS  Comm_Parent 'Parent Communication'.
EXECUTE.

RECODE Comm_EComm (SYSMIS=SYSMIS) (1=1) (2=2) (3 thru 4=3) INTO
Comm_Child.
```

```
VARIABLE LABELS  Comm_Child 'Child communication'.
EXECUTE.

RECODE Comm_Parent (1=1) (SYSMIS=SYSMIS) (ELSE=0) INTO CommPD1.
VARIABLE LABELS  CommPD1 'Parent Communication D1 Sign'.
EXECUTE.

RECODE Comm_Parent (2=1) (SYSMIS=SYSMIS) (ELSE=0) INTO CommPD2.
VARIABLE LABELS  CommPD2 'Parent Communication D2 Mixed'.
EXECUTE.

RECODE Comm_Child (SYSMIS=SYSMIS) (1=1) INTO CommCD1.
VARIABLE LABELS  CommCD1 'Child Communication D1 Sign'.
EXECUTE.

RECODE Comm_Child (2=1) (SYSMIS=SYSMIS) (ELSE=0) INTO CommCD2.
VARIABLE LABELS  CommCD2 'Child Communication D2 Mixed'.
EXECUTE.

COMPUTE St2bEVT_CXCommPD1=EVT_2b_Cen * CommPD1.
EXECUTE.

COMPUTE St2bEVT_CXCommPD2=EVT_2b_Cen * CommPD2.
EXECUTE.

COMPUTE St2bEVT_CXCommCD1=EVT_2b_Cen * CommCD1.
EXECUTE.

COMPUTE St2bEVT_CXCommCD2=EVT_2b_Cen * CommCD2.
EXECUTE.

DATASET ACTIVATE DataSet1.
FREQUENCIES VARIABLES=SC_DD_Tot SC_DB_Tot SC_KA_Tot SC_FB_Tot
SC_HE_Tot ToM5_T
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

T-TEST GROUPS=Sex(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=ToM5_T
  /CRITERIA=CI(.95).

USE ALL.
FILTER BY Filter_all.
EXECUTE.

T-TEST GROUPS=Grouping_all(1 4)
  /MISSING=ANALYSIS
  /VARIABLES=ToM5_T
  /CRITERIA=CI(.95).
```

```
T-TEST GROUPS=Grouping_all(3 4)
  /MISSING=ANALYSIS
  /VARIABLES=ToM5_T
  /CRITERIA=CI(.95).

**study 2**

USE ALL.
FILTER BY Filter_2a_new.
EXECUTE.

SORT CASES  BY HStatus.
SPLIT FILE SEPARATE BY HStatus.

FREQUENCIES VARIABLES=ToM5_T VA Age SES Sex
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

CORRELATIONS
  /VARIABLES=ToM5_T Age VA SES
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

SPLIT FILE OFF.

T-TEST GROUPS=HStatus(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=VA Age SES ToM5_T
  /CRITERIA=CI(.95).

CORRELATIONS
  /VARIABLES=ToM5_T Age VA SES HStatus
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER Age SES
  /METHOD=ENTER HStatus EVT_2a_Cen
  /METHOD=ENTER EVT_2a_Cen_X_HS.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
```

```
  /STATISTICS COEFF OUTS R ANOVA BCOV
  /CRITERIA=PIN(.05) POUT(.10)
  /ORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER HStatus EVT_2a_Cen EVT_2a_Cen_X_HS CONSTANT.

USE ALL.
FILTER BY Filter_2b.
EXECUTE.

T-TEST GROUPS=Sex(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=VA Comm_AgeSchool Comm_Degree Comm_Hx Comm__SL_skill
  /CRITERIA=CI(.95).

FREQUENCIES VARIABLES=Age VA Comm_AgeSchool Comm_Degree Comm_Hx
Comm__SL_skill ToM5_T
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

CORRELATIONS
  /VARIABLES=Age ToM5_T VA Comm_AgeSchool Comm_Degree Comm_Hx
Comm__SL_skill
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER Age EVT_2b_Cen
  /METHOD=ENTER CommPD1 CommPD2
  /METHOD=ENTER St2bEVT_CXCommPD1 St2bEVT_CXCommPD2.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER VA Comm_AgeSchool Comm_Degree Comm_Hx CommPD1
CommPD2 Comm__SL_skill.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
```

```
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER Age EVT_2b_Cen Comm_Hx
  /METHOD=ENTER CommPD1 CommPD2
  /METHOD=ENTER St2bEVT_CXCommPD1 St2bEVT_CXCommPD2.


GRAPH
  /BAR(SIMPLE)=MEAN(ToM5_T) BY Comm_Parent
  /INTERVAL SE(1.0).

GRAPH
  /BAR(SIMPLE)=MEAN(VA) BY Comm_Parent
  /INTERVAL SE(1.0).

**for the suppression variable**

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER VA.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ToM5_T
  /METHOD=ENTER VA CommPD1.

**Studies 3 and 4**

**TEC**

RECODE TEC_1a (1=0) (2=1) (3=0) (4=0) (SYSMIS=SYSMIS) INTO TEC_1a_S.
VARIABLE LABELS  TEC_1a_S 'TEC_1a_Score'.
EXECUTE.

RECODE TEC_1b (4=0) (2=0) (1=1) (3=0) (SYSMIS=SYSMIS) INTO TEC_1b_S.
VARIABLE LABELS  TEC_1b_S 'TEC_1b_Score'.
EXECUTE.

RECODE TEC_1c (4=0) (2=0) (1=0) (3=1) (SYSMIS=SYSMIS) INTO TEC_1c_S.
```

```
VARIABLE LABELS  TEC_1c_S 'TEC_1c_Score'.
EXECUTE.

RECODE TEC_1d (2=0) (3=0) (1=0) (4=1) (SYSMIS=SYSMIS) INTO TEC_1d_S.
VARIABLE LABELS  TEC_1d_S 'TEC_1d_Score'.
EXECUTE.

RECODE TEC_1e (2=0) (3=0) (1=0) (4=1) (SYSMIS=SYSMIS) INTO TEC_1e_S.
VARIABLE LABELS  TEC_1e_S 'TEC_1e_Score'.
EXECUTE.

COMPUTE TEC_1_S=TEC_1a_S + TEC_1b_S + TEC_1c_S + TEC_1d_S + TEC_1e_S.
EXECUTE.

RECODE TEC_1_S (5=1) (4=1) (3=0) (2=0) (1=0) (0=0) (SYSMIS=SYSMIS) INTO
TEC_1_SubT.
VARIABLE LABELS  TEC_1_SubT 'TEC_1_SubT'.
EXECUTE.

RECODE TEC_2a (3=0) (1=0) (4=0) (2=1) (SYSMIS=SYSMIS) INTO TEC_2a_S.
VARIABLE LABELS  TEC_2a_S 'TEC_2a_Score'.
EXECUTE.

RECODE TEC_2b (3=0) (4=0) (1=1) (2=0) (SYSMIS=SYSMIS) INTO TEC_2b_S.
VARIABLE LABELS  TEC_2b_S 'TEC_2b_Score'.
EXECUTE.

RECODE TEC_2c (4=0) (2=0) (1=0) (3=1) (SYSMIS=SYSMIS) INTO TEC_2c_S.
VARIABLE LABELS  TEC_2c_S 'TEC_2c_Score'.
EXECUTE.

RECODE TEC_2d (2=0) (1=0) (3=0) (4=1) (SYSMIS=SYSMIS) INTO TEC_2d_S.
VARIABLE LABELS  TEC_2d_S 'TEC_2d_Score'.
EXECUTE.

RECODE TEC_2e (2=0) (1=0) (3=0) (4=1) (SYSMIS=SYSMIS) INTO TEC_2e_S.
VARIABLE LABELS  TEC_2e_S 'TEC_2e_Score'.
EXECUTE.

COMPUTE TEC_2_S=TEC_2a_S + TEC_2b_S + TEC_2c_S + TEC_2d_S + TEC_2e_S.
EXECUTE.

RECODE TEC_2_S (5=1) (4=1) (3=0) (2=0) (1=0) (0=0) (SYSMIS=SYSMIS) INTO
TEC_2_SubT.
VARIABLE LABELS  TEC_2_SubT 'TEC_2_SubT'.
EXECUTE.

IF  (TEC_3c=1 and TEC_3d = 1) TEC_3_SubTcd=0.
EXECUTE.
```

```
IF  (TEC_3c=1 and TEC_3d = 2 ) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=1 and TEC_3d = 3 ) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=1 and TEC_3d = 4) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c = 2 and TEC_3d = 1) TEC_3_SubTcd=1.
EXECUTE.

IF  (TEC_3c = 2 and TEC_3d = 2) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c = 2 and TEC_3d = 3) TEC_3_SubTcd=1.
EXECUTE.

IF  (TEC_3c = 2 and TEC_3d = 4) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c = 3 and TEC_3d = 1) TEC_3_SubTcd=1.
EXECUTE.

IF  (TEC_3c = 3 and TEC_3d = 2) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c = 3 and TEC_3d = 3 ) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c = 3 and TEC_3d = 4) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=4 and TEC_3d = 1) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=4 and TEC_3d = 2) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=4 and TEC_3d = 3) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_3c=4 and TEC_3d = 4) TEC_3_SubTcd=0.
EXECUTE.

IF  (TEC_4con=0 and TEC_4 =1) TEC_4_SubT=1.
EXECUTE.

IF  (TEC_4con=0 and TEC_4 =2) TEC_4_SubT=1.
EXECUTE.
```

```
IF  (TEC_4con=0 and TEC_4 =3) TEC_4_SubT=0.
EXECUTE.

IF  (TEC_4con=0 and TEC_4 =4) TEC_4_SubT=0.
EXECUTE.

IF  (TEC_4con=1 and TEC_4 =1) TEC_4_SubT=0.
EXECUTE.

IF  (TEC_4con=1 and TEC_4 =2) TEC_4_SubT=0.
EXECUTE.

IF  (TEC_4con=1 and TEC_4 =3) TEC_4_SubT=0.
EXECUTE.

IF  (TEC_4con=1 and TEC_4 =4) TEC_4_SubT=0.
EXECUTE.

RECODE TEC_5 (1=0) (2=1) (3=0) (4=0) (SYSMIS=SYSMIS) INTO TEC_5_SubT.
VARIABLE LABELS TEC_5_SubT 'TEC_5_SubT'.
EXECUTE.

RECODE TEC_6 (4=0) (1=0) (2=0) (3=1) (SYSMIS=SYSMIS) INTO TEC_6_SubT.
VARIABLE LABELS  TEC_6_SubT 'TEC_6_SubT'.
EXECUTE.

RECODE TEC_7 (4=0) (1=0) (2=0) (3=1) (SYSMIS=SYSMIS) INTO TEC_7_SubT.
VARIABLE LABELS  TEC_7_SubT 'TEC_7_SubT'.
EXECUTE.

RECODE TEC_8 (4=0) (1=0) (2=0) (3=1) INTO TEC_8_SubT.
VARIABLE LABELS  TEC_8_SubT 'TEC_8_SubT'.
EXECUTE.

RECODE TEC_9b (4=0) (3=0) (1=0) (2=1) INTO TEC_9_SubT.
VARIABLE LABELS  TEC_9_SubT 'TEC_9_SubT'.
EXECUTE.

COMPUTE TEC_T=TEC_1_SubT + TEC_2_SubT + TEC_3_SubT + TEC_4_SubT +
TEC_5_SubT + TEC_6_SubT + TEC_7_SubT + TEC_8_SubT + TEC_9_SubT.
EXECUTE.


DATASET ACTIVATE DataSet2.
USE ALL.
FILTER BY Filter_3_new.
EXECUTE.

SORT CASES  BY HStatus.
```

```
SPLIT FILE SEPARATE BY HStatus.

FREQUENCIES VARIABLES=Age VA SES TEC_T DANVA_T DANVA_FAC
DANVA_POS
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

SPLIT FILE OFF.

UNIANOVA DANVA_T BY HStatus WITH Age VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age VA SES HStatus.

UNIANOVA TEC_T BY HStatus WITH Age VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age VA SES HStatus.

USE ALL.
FILTER BY Filter_8to14.
EXECUTE.

UNIANOVA TEC_T BY HStatus WITH VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=VA SES HStatus.

UNIANOVA DANVA_T BY HStatus WITH VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=VA SES HStatus.

SORT CASES  BY HStatus.
SPLIT FILE SEPARATE BY HStatus.

FREQUENCIES VARIABLES=TEC_1_SubT TEC_2_SubT TEC_3_SubT TEC_4_SubT
TEC_5_SubT TEC_6_SubT TEC_7_SubT
    TEC_8_SubT TEC_9_SubT
  /ORDER=ANALYSIS.

SPLIT FILE OFF.
```

```
CROSSTABS
  /TABLES=TEC_1_SubT TEC_2_SubT TEC_3_SubT TEC_4_SubT TEC_5_SubT
TEC_6_SubT TEC_7_SubT TEC_8_SubT
    TEC_9_SubT BY HStatus
  /FORMAT=AVALUE TABLES
  /STATISTICS=CHISQ
  /CELLS=COUNT
  /COUNT ROUND CELL.

DATASET ACTIVATE DataSet1.
UNIANOVA TEC_T BY HStatus WITH Age VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age VA SES HStatus.

UNIANOVA DANVA_T BY HStatus WITH Age VA SES
  /METHOD=SSTYPE(3)
  /INTERCEPT=INCLUDE
  /PRINT=ETASQ
  /CRITERIA=ALPHA(.05)
  /DESIGN=Age VA SES HStatus.

USE ALL.
FILTER BY Filter_4a_new.
EXECUTE.

T-TEST GROUPS=HStatus(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=Age VA SES TEC_T DANVA_T
  /CRITERIA=CI(.95).

SORT CASES  BY HStatus.
SPLIT FILE SEPARATE BY HStatus.

FREQUENCIES VARIABLES=Age VA SES TEC_T DANVA_T
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

CORRELATIONS
  /VARIABLES=TEC_T DANVA_T VA Age SES
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

SPLIT FILE OFF.

CORRELATIONS
  /VARIABLES=TEC_T DANVA_T VA Age SES HStatus
```

```
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT DANVA_T
  /METHOD=ENTER Age SES
  /METHOD=ENTER EVT_4a_Cen HStatus
  /METHOD=ENTER EVT_4a_Cen_X_HS.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TEC_T
  /METHOD=ENTER Age SES
  /METHOD=ENTER EVT_4a_Cen HStatus
  /METHOD=ENTER EVT_4a_Cen_X_HS.

DATASET ACTIVATE DataSet1.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA BCOV
  /CRITERIA=PIN(.05) POUT(.10)
  /ORIGIN
  /DEPENDENT TEC_T
  /METHOD=ENTER HStatus EVT_4a_Cen EVT_4a_Cen_X_HS Constant.

USE ALL.
FILTER BY Filter_4b.
EXECUTE.

COMPUTE St4bEVT_CXCommPD1=EVT_4b_Cen * CommPD1.
EXECUTE.

COMPUTE St4bEVT_CXCommPD2=EVT_4b_Cen * CommPD2.
EXECUTE.

COMPUTE St4bEVT_CXCommCD1=EVT_4b_Cen * CommCD1.
EXECUTE.

COMPUTE St4bEVT_CXCommCD2=EVT_4b_Cen * CommCD2.
EXECUTE.
```

```
USE ALL.
FILTER BY Filter_4b.
EXECUTE.

FREQUENCIES VARIABLES=Age VA Comm_AgeSchool Comm_Degree Comm_Hx
Comm__SL_skill TEC_T DANVA_T
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

CORRELATIONS
  /VARIABLES=DANVA_T TEC_T Age VA Comm_AgeSchool Comm_Degree Comm_Hx
Comm__SL_skill
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TEC_T
  /METHOD=ENTER VA Comm_AgeSchool Comm_Degree Comm_Hx Comm_Parent
Comm__SL_skill.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT DANVA_T
  /METHOD=ENTER VA Comm_AgeSchool Comm_Degree Comm_Hx Comm_Parent
Comm__SL_skill.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT DANVA_T
  /METHOD=ENTER Age EVT_4b_Cen
  /METHOD=ENTER CommPD1 CommPD2
  /METHOD=ENTER St4bEVT_CXCommPD1 St4bEVT_CXCommPD2.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
```

```
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT TEC_T
  /METHOD=ENTER Age EVT_4b_Cen
  /METHOD=ENTER CommPD1 CommPD2
  /METHOD=ENTER St4bEVT_CXCommPD1 St4bEVT_CXCommPD2.


USE ALL.
FILTER BY Filter_5.
EXECUTE.

T-TEST GROUPS=Sex(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=PSMAT ProSoc TDiff
  /CRITERIA=CI(.95).

FREQUENCIES VARIABLES=Age VA TEC_T DANVA_T ToM5_T PSMAT ProSoc
TDiff
  /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN
  /ORDER=ANALYSIS.

CORRELATIONS
  /VARIABLES=PSMAT ProSoc TDiff ToM5_T DANVA_T TEC_T VA Age
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT PSMAT
  /METHOD=ENTER Age VA ToM5_T DANVA_T TEC_T.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT ProSoc
  /METHOD=ENTER Age VA ToM5_T DANVA_T TEC_T.

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA CHANGE
```

```
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT TDiff
/METHOD=ENTER Age VA ToM5_T DANVA_T TEC_T.
```