Developing A Novel Measure of Theory of Mind:

The Friendship Game

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A thesis submitted in partial fulfilment of the requirements of the University of East London for the degree of Professional Doctorate in Clinical Psychology

June 2020

ABSTRACT

Advanced tests of Theory of Mind (ToM) have offered support for the ToM model of ASD with adults with High Functioning Autism Spectrum Disorder (HF ASD). Other support for the ToM model of ASD has arisen from research incorporating video and audio elements to improve the real-life applicability of ToM tests for adults with HF ASD. Building upon this research, the current study develops a new measure of Theory of Mind (ToM) that adopts a game-like design that is both challenging and engaging for adults with HF ASD: The Friendship Game (TFG).

The thesis documents the initial development of TFG, followed by an exploratory quantitative and qualitative validation of TFG. Eight participants with HF ASD were recruited to the study. Their individual performances on TFG were compared to their performances on Cognitive and Social Cognitive Assessments and self-report measures, relative to UK norms. The participants' verbal responses in TFG were explored to assess perceived evidence of ToM application and accuracy. The participants also provided feedback on the testing experience to further assess TFG's validity and relevance to the adult HF ASD population.

The results provided initial support for TFG's validation as a new measure of ToM for adults with HF ASD. Exploration of the participants' verbal responses suggest that there was no evidence of floor or ceiling effects in TFG. Participant feedback also indicated that the TFG is both an engaging and challenging test of ToM. Whilst they reflected that social interaction is more complex in everyday life, TFG helped to identify and prompt a discussion around these difficulties. Ideas for how TFG could be developed into an intervention to support adults with HF ASD were also discussed.

The findings of the study were discussed in relation to previous research and ideas for future directions. The study's methodological and theoretical limitations were also explored. For example, the impact of the small participant size on the conclusions that can be draw from of the study. Also, the contextual challenges involved in the validation of a new measure of ToM.

ACKNOWLEDGMENTS

I would like to firstly thank the study participants for their highly valued contribution to this study. Without their generosity, this thesis would have not been possible. I would also like to thank everyone who supported me with the game development and recruitment process.

I would also like to thank my academic supervisor Dr Matthew Jones Chesters for his structured approach, humour and encouragement throughout.

I also am extremely grateful to my partner Chris, friends and family who have offered endless emotional support throughout the whole process.

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CHAPTER 1: INTRODUCTION

1.1 Autism Spectrum Disorder

The diagnosis: Autism Spectrum Disorder (ASD) is descriptive of a dyad of impairments: deficits in social Interaction and communication and; evidence of restrictive and repetitive interests and heighted sensory differences (American Psychiatric Association (APA), 2013). As it is the latest diagnostic definition within the DSM 5, ASD will be the terminology referred to throughout this thesis. There will also be reference to the more generic term of Autism, in order to acknowledge the historical and cultural evolution of the ASD diagnostic label.

1.1.1 Deficits and descriptions of ASD

In the 1940s two different conceptualisations of Autism were developed. In Austria, Asperger's account of 'autistic psychopathology' was based upon a group of children whom he observed to have an array of talents combined with deficiencies in social relationships, peculiarities in social communication, obsessional interests and rigid, repetitive behaviours (Asperger, 1944; Frith, 1991b). A year before Asperger's publication, Kanner; an influential child psychiatrist based within the United States, published a different account of Autism. Due to his status within the medical field, Kanner would choose to work almost exclusively with young children on the extreme end of the spectrum of cognitive and linguistic impairment (Silberman, 2015). Kanner's paper, being published in English as opposed to German, generated a lot more early research interest than Asperger's (Frith, 1991b). This subsequently led to his conceptualisation being more influential in how autism was originally shaped to be a condition emerging in early childhood with traits of significant intellectual, communicative and social impairment (Kanner, 1943).

Within the early 1980s, Wing challenged Kanner's conceptualisation of Autism, by proposing that it was a spectrum condition also affecting those with high intellect (Wing,1988;1979). Her description of an 'Autism Spectrum' was more in line with Asperger's original account of the condition, but differed from his view

that it was separate condition to Kanner's account of Autism (Frith, 1991a). Instead, she argued that both conditions lay on a continuum. Her work led to Asperger's syndrome being introduced into the DSM-IV as a subcategory of Autism. The new diagnostic category described individuals who had intellectual strengths but whose significant difficulties with: social interaction; communication and restrictive, repetitive interests resulted in great challenges in everyday functioning.

Wing's work was also a key influence in how Autism came to be understood as 'Autism Spectrum Disorder' (ASD) within the APA, DSM-5 (American Psychiatric Association, 2013). To be diagnosed with ASD, one must be assessed to meet diagnostic criteria across two axes:

- A: Evidence of deficits in social Interaction and communication
- B: Evidence of restricted, repetitive patterns of behaviours, activities and/or interests and hyper or hypoactivity to sensory input.
- Both should be present since childhood, persistence across multiple contexts and result in limits/impairments of everyday functioning.

1.1.2. Contemporary Diagnostic Features

Prior to the introduction of the DSM-5, there were disputes regarding whether an Autism diagnostic category would benefit from being 'spilt' into multiple subcategories or 'lumped' into one overarching category (Tsai & Ghaziuddin, 2014; Waterhouse, London, & Gillberg, 2016). Former diagnostic labels of Autism have 'split' Autism Spectrum Disorder (APA, 1991) into the sub-categories of: Autistic Disorder (AD); Asperger Syndrome (AS) and Pervasive Developmental Disorder- not otherwise specified (PDD-NOS). However, it was later argued that there were more similarities than differences between the categories, thus bringing their diagnostic validity into question (Lord et al., 2012; Waterhouse et al., 2016). As such, the DSM 5 'lumped' the DSM IV Autism subcategories into the single diagnostic label of ASD (American Psychiatric Association, 2013). The DSM 5 emphasis on 'spectrum' identifies ASD as being a heterogeneous condition consisting of variations across language and intellect.

Unfortunately, the change in the diagnostic criteria caused controversy amongst those within the ASD population. Individuals previously diagnosed with AS had taken pride in the identity of 'Aspie' and were therefore upset at the news of its removal (Attwood, 2006; Ryu & Han, 2016). Some individuals with AS were also concerned that this label would result in people associating them with having a lower level of intellectual functioning (Linton, Krcek, Sensui, & Spillers, 2013). On the other hand, individuals who had been previously diagnosed with AD were offended by the insinuation that they were lower functioning than those with AS, and that being categorised together was something to be ashamed of (Linton et al., 2013). Individuals with ASD are now grouped according to intellect; those with a diagnosed learning disability would be considered low functioning (LF ASD) and those without a learning disability would be considered high functioning (HF ASD). Due to the limited scope of the thesis, adults with HF ASD will be the focus of the current study.

1.1.3. Adults with High Functioning ASD

The challenges faced by adults with HF ASD have often been minimised, underrepresented and under-researched (Tantam, 1991, 2014). The research conducted with this population indicates that adults with Autism have fewer friendships and involvement in recreational activities than those without a diagnosis of Autism (Orsmond, Kraus, & Seltzer, 2004). In addition to this, research from the National Autistic Society found that 70% of autistic adults told them that they would like more support in order to feel less isolated (Rosenblatt, 2008). Another study found an association between Autistic adults having fewer friends and having high scores on low self-esteem, anxiety and depression on range of mood measures (Mazurek, 2014). This research therefore highlights the need for further research into methods of supporting the needs of the high functioning adult ASD population.

1.1.5. Epidemiology

In 2017, it was estimated that the prevalence of ASD in developed countries around the world is 1.5% (Lyall et al., 2017). In 2012, it was also estimated that

there are around 700,000 people on the Autistic Spectrum in the UK, which if including their families, affects around 2.8 million people (Brugha et al., 2012).

In 2012, the Centre for Disease Control reported a 78% increase in incident rates of Autism in 8 year olds from 2004-2008 (Taylor, Jick, & Maclaughlin, 2013). The increase in diagnostic rates over the years has been attributable to a number of factors. Firstly, changes in diagnostic criteria to ASD (American Psychiatric Association, 2013), has made it more likely for individuals to be diagnosed (King & Bearman, 2009). Secondly, an increase in awareness of Autism over the years has made schools and GP's more likely to recognise Autism and refer individuals for a diagnostic assessment (Heidgerken, Geffken, Modi, & Frakey, 2005). Thirdly, more adults are now being diagnosed with ASD (Lord, Elsabbagh, Baird, & Veenstra-Vanderweele, 2018).

1.1.6. Sex

Historically, more males have been diagnosed with Autism in comparison to females, with early estimates of the gender ratio being around four males to one female (Wing, 1981). This ratio has led to a number of theories of Autism being developed, such as Baron-Cohen's: Extreme Male Brain Theory of ASD (Baron-Cohen, 2010). More recently, this sex difference has been estimated to be closer to 3:1 (Loomes, Hull, & Mandy, 2017). These findings suggest that women have been under diagnosed, diagnosed late or misdiagnosed (Ferri, Abel, & Brodkin, 2018). Autism being less diagnosed in women has also led to fewer female research participants in ASD research (Loomes et al., 2017). This in turn has resulted in there being less understanding about how ASD presents itself in women. For example, research has since demonstrated that women with ASD are more likely than men to mask their symptoms in a process known as 'camouflaging' (Dean, Harwood, & Kasari, 2017), which is suggested as a reason for why features of ASD are more difficult to recognise in women in comparison to men (Kreiser & White, 2014).

1.1.7. Co-Morbidity

It has been reported that 54% of adults diagnosed with ASD were also diagnosed with a co-existing mental health disorder; 29% with a diagnosis of an anxiety

disorder and 26% with a diagnosis of depression (Croen et al., 2015). The high rates of anxiety in the ASD population have been linked directly to the ASD symptoms; such as distress about changes in routine and heightened sensitivity to sensory stimuli (Gillott & Standen, 2007). Research has also demonstrated that ASD features interact bi-directionally with mental health conditions (Fodstad, 2019). In addition to this, research has shown that heighted physiological arousal, combined with deficits in social interaction and communication, increases the likelihood of individuals with ASD experiencing anxiety when faced with interpersonal and/or environmental stressors (Bellini, 2006). Research has also shown that adults with ASD, who have a higher level of language skills and independence, were more likely to report symptoms of depression due to the increased perception of the disparity in their social skills compared to their 'neurotypical' peers (Hedley & Young, 2006; Sterling, Dawson, Estes, & Greenson, 2008).

1.1.8. Cross-Cultural Issues

Whilst there have been relatively few cross-cultural ASD studies to date, the limited research has demonstrated a number of cross-cultural differences in ASD diagnostic rates. For example, one major cross-cultural study found that the UK endorses a higher level of symptom severity in comparison to Israel on the same screening measure. One explanation for this was due to there being a different conceptualisation of developmental milestones in the two countries. Research has also demonstrated that the extent to which having a diagnosis of ASD is stigmatised in a country, influences the likelihood of it being diagnosed. For example, in South Korea it was found to be more stigmatising to receive a diagnosis of ASD than a diagnosis of attachment disorder, due to ASD being considered untreatable (Kang-Yi, Grinker, & Mandell, 2012). Research has also shown that access to diagnostic services within a country also influences cross-cultural differences in diagnostic rates (Honda, Shimizu, Imai, & Nitto, 2005).

Be this as it may, there are a number of limitations with cross-cultural Autism research. Firstly, the majority of cross-cultural research is based upon ASD diagnostic criteria and assessment tools that have been developed within a Western Context and subsequently translated. This arguably fails to account for

the nuances in behavioural manifestations of ASD across countries. For example, Lotter (1978) found that non-verbal children with Autism in Africa (Ghana, Nigeria, Kenya, Zimbabwe, Zambia and South Africa) were more likely to engage in 'unusual water carrying movements' and 'banging', whereas English children were more likely to demonstrate 'flapping and self-injurious behaviour'. Research has also demonstrated that there are different cultural interpretations of diagnosable Autism characteristics. For example, in countries such as the UK and USA, not making eye contact during social exchanges is considered rude and is likely to be why this is considered a key diagnostic feature of ASD (American Psychiatric Association, 2013). However, emphasis on this feature may also create a cultural prejudice against countries that avoid eye contact out of respect for their elders (Wheeler, 2011).

1.1.9. Limitations of the Medical Model approach to ASD

As discussed, to have a diagnosis of ASD one would need to demonstrate evidence of having a 'deficit' in social communication and interaction skills (American Psychiatric Association, 2013). Using this premise to assess whether someone has a diagnosis is rooted within the medical model approach (Kapp, Gillespie-Lynch, Sherman, & Hutman, 2013). The medical model has been criticised for applying a deterministic framework to considering whether someone has a neurodevelopmental disorder (Laurelut et al., 2016). Akin to diagnosing an illness, the diagnostic process locates the 'problem' within the individual (Shyman, 2016). This is problematic, because the ASD aetiology is a complex mix of culturally bound environmental and biological influences (Mandy & Lai, 2016), rather than something that can be identified via a blood test.

Be this as it may, it is important to note that a diagnosis of ASD can also offer an individual and/or their family crucial access to legal frameworks supporting their rights. For example: access to an educational statement for educational support; access to a social care assessment for support with social care needs and a method of identifying with other individuals who share the same diagnosis (The National Autistic Society, 2019).

1.1.10. Current ASD policy

The Autism Act (2009) was established in England after two years of campaigning from The National Autistic Society. It is the first piece of legislation that specifically supports individuals with Autism (The National Autistic Society, 2019). The Act resulted in the launch of the first Autism Strategy titled: 'Fulfilling and Rewarding Lives Strategy'. A review of this strategy with service users, parents, carers and professionals resulted in the development of 'Think Autism' in 2014 (Department of Health, 2014).

The key points from the strategy included:

- Increasing Autism Awareness
- Developing pathways to address the needs of adults with ASD, such as supporting the identification of an implementation of reasonable adjustments within places of employment.
- Improving the access to and reliability of the Autism diagnostic assessment process.

Since the strategies have been released, around 93% of the areas in England now have an adult diagnostic service and since last year, the strategy has been extended to children (The National Autistic Society, 2019).

Despite the many achievements, people are still waiting lengthy times to receive a diagnostic assessment of ASD and are being denied assessments of their social care needs (Public Health England, 2017). In order to address these factors, the National Autistic Society has been working with the All Party Parliamentary Group on Autism to review the successes and pitfalls of The Autism Act, as well as identifying areas for further development (The National Autistic Society, 2019).

1.1.11. Aetiology

In the early 1920s psychodynamic theories were the most popular explanations of the causes of Autism (Wolff, 2004). Psychogenic theories of ASD were accepted across the medical field due to the lack of medical research in to the causes of ASD at the time (Feinstein, 2011). Researchers who supported the

psychogenic explanation of ASD believed that Autism was caused by a lack of parental warmth resulting in extreme withdrawal of the child (Kanner, 1949). The 'Refrigerator Mother' explanation of Autism was coined by Kanner (1949) and popularised by Bettelheim, who was a well know psychiatrist at the time (Feinstein, 2011). Bettelheim's influence was responsible for the launch a range of Autism treatments, one of which included the separation of Autistic children from their parents to live in a residential facility (Pollak, 1997). In the 1960's, the psychogenic explanations of Autism became less popular and research shifted towards biological understandings of ASD (Wolff, 2004). For example, many researchers considered Autism to be an early form of childhood schizophrenia (Eisenberg & Kanner, 1956), however, this idea was abandoned by the late 70s (Kolvin, 1971). Other researchers explored the association of Autism with neurodevelopment disorders (Bartak, Rutter, & Cox, 1975) and with medical conditions, such as Rubella (Chess, 1977).

Currently, theories about the causes of ASD have span from purely genetic (Caglayan, 2010; Geschwind, 2011; Lichtenstein, Carlström, Råstam, Gillberg, & Anckarsäter, 2010; Muhle, Trentacoste, & Rapinaefer, 2016; Warrier, Baron-Cohen, 2017; Woodbury-Smith, & Scherer, 201, 2004; Sch 8; Yuen, Szatmari, & Vorstman, 2019) to purely environmental (Grabrucker, 2013; Hertz-Picciotto, Schmidt, & Krakowiak, 2018; Landrigan, 2010; Patel et al., 2018; Rodier & Hyman, 1998). More recently, there has been a growth in research looking at the interaction of genetic and environmental factors as a cause of ASD (Hegarty et al., 2019). In a review of this area by Mandy and Lai (2016), it was discussed that ASD has a strong genetic component. However, there is also evidence to suggest that prenatal, perinatal and postnatal factors influence the emergence of ASD and its developmental course.

Research looking into the causes of ASD has strived to find targeted interventions that will help to reduce the intensity of the presentation upon daily functioning (Veenstra-Vanderweele & Blakely, 2012). However, some authors have contested research looking into Autism aetiology, raising ethical concerns that this information might be used to pursue eugenic practices (Pellicano &

Stears, 2011). Others have also raised concerns that genetic and environmental aetiological research places too much emphasis on Autism being a disorder and therefore dismisses strengths held in the ASD population and value of neurodiversity (Baron-Cohen, 2009; Treffert, 2014).

1.2. Psychological Theories of ASD

1.2.1. History and Background

Within the 1920's, psychologists became interested in social cognition and individual differences (Deary, 2001). During this time, the psychometric approach was a leading method of understanding individual differences in general cognition (Mayer, 1990). Thorndike (1920), was one of the first researchers to outline that social cognition should be measured separately from general cognition. Whilst he believed that measures of social cognition could improve the ability to understand and manage humans, he reflected that social cognitive tests could only be assessed correctly in a natural setting where humans could socially interact with one another (Thorndike & Stein, 1937). The George Washington Social Test was the first tests to attempt to quantify social intelligence through facets of judgement, such as the recognition of mental states and memory of names/faces (Moss & Hunt, 1927). It was however found to be unsuccessful in its attempt to qualify social intelligence as its own entity due it being highly correlated with general intelligence.

Years later, Marlow and colleagues (1986) collated a large battery of personality measures in order to examine various aspects of social cognition. Their factor analysis revealed five dimensions of social intelligence: social skills; pro-social attitude; emotionality; empathy skills and social anxiety. These dimensions were found to be independent of measures of general intelligence. Gardener (1996) built on these findings by proposing that intelligence should be understood as modalities as opposed to a single defining unit. He suggested that interpersonal intelligence is a measure of one's sensitivity to other people's moods, temperament, feelings and motivations as well as their ability to cooperate. Likewise, intrapersonal intelligence should be considered as a measure of one's

own ability to identify their strengths and weaknesses, unique qualities and their ability to predict their own emotions and reactions.

Social cognitive research later moved into the realm of neuropsychology; researchers sought to better understand the underpinnings of social cognition through mapping them on to specific brain regions. For example, brain injury research provided insight into the role of: the posterior superior temporal sulcus region for interpreting action (Saxe, Carey, & Kanwisher, 2004). Neuropsychological research also highlighted the role of the temporal-parietal junction role in mental state representation (Saxe & Kanwisher, 2003); the amygdala in emotional recognition (Adolphs, 2001); the ventro-medial prefrontal cortices in emotion decision-making (Shamay-Tsoory, Tomer, Berger, & Aharon-Peretz, 2003) and the role of the somato-sensory cortexes in social drive and anticipatory fear (Sutton et al., 2005).

Interest in how social cognition develops in humans initially focused on the innate drive for infants to interact with their caregivers. Piaget (1964) theorised that infants gradually build an internal representation of the world as their brain modules slowly become active (Rochat, 2009). Research demonstrated that neurotypical infants coordinate eye gaze (Castiello, 2003); participate in joint attention (Tomasello & Farrar, 1986) and engage in mirrored movements (Gallese & Goldman, 1998) with their caregivers. Later research offered a more complex understanding of social interaction, through investigating how the infant caregiver relationship informs the development of social cognitive networks via motor, sensory and perceptual routes (Klin, Jones, Schultz, & Volkmar, 2003; McKinnon & Moscovitch, 2007; Meltzoff, 2007). This move away from a domain-specific to a domain-general understanding of social cognition offered a more nuanced appreciation of how one's personality, social environment and culture interact with brain networks to develop social interaction abilities. In support of this, Meltzoff's (2007) research demonstrated that infants respond to others using a 'like me framework'. She proposed that through using motor, sensory and emotional cues, infants create a mental representation of acts they see others perform and liken it to their own experiences. Accordingly, the studies

demonstrated that infants develop their understanding of the world through interacting relationally (Rochat, 2009; Vygotsky, 1967).

The following section will offer a summary of the four leading psychological theories of ASD; Executive Functioning, Weak Central Coherence, Extreme Male Brain Theory of Autism and Theory of Mind.

1.2.2.1. Executive Functioning and the Frontal Metaphor

EF is the term widely used to describe the range of cognitive skills required for regulating thoughts and actions (Alvarez & Emory, 2006; Barkley, 2012). Specifically, it is an umbrella term for functions such as response selection/inhibition, planning and working memory (Hill, 2004). The frontal lobe is said to primarily be responsible for these 'higher order' neurocognitive functions (Alvarez & Emory, 2006; Baddely, 1986; Barkley, 2012). However, there is also evidence to suggest that EF processes involve interconnectivity between different brain regions (Foster, Buck, & Bronskill, 1997). Therefore, whilst the frontal lobes remain a significant area of cognitive functioning in tasks that require EF abilities, a more nuanced understanding would appreciate how EF tasks require global interconnectivity across the brain.

Difficulties with EF have been associated across neurodevelopmental presentations from early childhood (Sun & Buys, 2012). A growing body of research has demonstrated that compared to matched controls, individuals with ASD show difficulties with tasks that involve: mental flexibility (Meltzer, 2014), inhibition (Bishop & Norbury, 2005), set-shifting (Ozonoff & Jensen, 1999) and self-monitoring (Robinson, Goddard, Dritschel, Wisley, & Howlin, 2009).

The Executive Dysfunction theory of ASD (Hill, 2004; Ozonoff, Pennington, & Rogers, 1991; Shallice, 1988) explains that the above-mentioned neurocognitive differences account for a range of difficulties in individuals with a diagnosis of ASD. For example: the need for consistence; perseverating on tasks; becoming pre-occupied with special interests and experiencing challenges with detecting subtle social cues to adapt social communication styles (Craig et al., 2016).

1.2.2.2. Weak Central Coherence

The Weak Central Coherence Theory (Happé & Frith, 2006) was developed in response to findings that ASD participants perform superiorly in comparison to normally developing participants on: embedded figure tasks (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) block design tasks (Morgan, Maybery, & Durkin, 2003) and rote memory tasks (Frith & Happé, 1994). The theory is said to account for the detail-focused attention style of individuals with ASD (Happé & Frith, 2006). It also accounts for difficulties experienced by this population in integrating social information that is required for social interaction and mentalizing (Frith, 1989). The theory of WCC also provides an explanation for the heightened sensory differences experienced by individuals with ASD. For example, many individuals with ASD report a heighted sensitivity to recognising distinct musical tones, or having a talent a painting in photographic detail (Morgan et al., 2003).

1.2.2.3. Extreme Male Brain Theory of Autism

Baron-Cohen (2010) suggests that the 'male brain' is statistically more likely to think systemically than the female brain. Therefore, ASD captures the extreme end of this spectrum. He argues that this is evidenced within ASD through the insistence on sameness, displaying restricted interests and behaviours, as well as thinking, communicating and interacting more logically as opposed to empathetically (Greenberg, Warrier, Allison, & Baron-Cohen, 2018). Nonetheless, this theory has been criticised for perpetuating the idea of a 'male norm' of behaviour, which has social consequences of perceptions of skills strengths across sexes (Ridley, 2019).

1.2.2.4. Theory of Mind

The Theory of Mind (ToM) Model has dominated the field of research investigating how humans interact with one another since the 1970's (Leudar & Costall, 2009a). Premack and Wooduff (1978) were the first to create a set of experiments which demonstrated that humans and primates share that capacity to acknowledge themselves as unique but distinct from others (Premack, 1976; Premack & Woodruff, 1978). It was subsequently proposed that humans apply theories of mental states to understand their own actions and make predictions

about the behaviour of others. As such, the phrase ‘Theory of Mind’ was developed (Wimmer & Perner, 1983).

Early research in this area discovered that children at three years old make reference to their own and others intentions when being asked ‘why’ questions (Hood, Bloom, & Brainerd, 1979). Three to five year olds have also been found to correctly identify the difference between intended and unintended acts (Shultz, 1980). Later, a more complex ToM task was developed called the false-belief task paradigm (Perner, Leekam, & Wimmer, 1987). This test requires an individual to hold in mind information that another person is not aware of. Performances on this test revealed that that four year olds, but not three year olds can understand their own minds to be distinct from that of another (Gopnik & Astington, 1988; Perner et al., 1987).

In Baron-Cohen, Leslie and Frith’s (1985) classic ToM study, it was discovered that typically developing (TD) children and intellectually impaired children with Down’s Syndrome can pass theory of mind tests, but children of the same age with Autism and average intelligence have difficulty. This study launched the ToM theory of Autism, which describes that individuals with ASD lack the capacity to theorise about the beliefs and desires of themselves and others (Baron-Cohen, 1997; Baron-Cohen et al., 1985). In support of this theory, behavioural studies have demonstrated that children with ASD are developmentally delayed in acquiring the ability to attribute mental states both to humans (Happé, 1994) and ambiguous visual stimuli (Kiln, 2000). The ToM theory of Autism has also been supported by numerous accounts of individuals reflecting upon their experience of living with a diagnosis of Autism (Grandin, 1995; Losh & Capps, 2006; Ryan & Raisanen, 2008). Within these reflections, many have also detailed their experience of struggling with the introspective aspects of social interaction (Frith & Happé, 1999).

1.2.2.5. Beyond ToM

The ToM Model of Autism has been criticised for its unquestioned dominance across the ASD research field (Reddy & Morris, 2009). For example, it is regularly explored in books (Attwood, 2006) and online resources (Baron-Cohen,

2008) as being one of the leading theories of Autism, without there being room for an exploration of its weaknesses and limitations as a theory.

Baron-Cohen, Leslie, & Frith (1985) point out that there is a lot of variability of children passing theory of mind tests in studies. They also point out that 20% of children in the original study ToM study passed the false-belief task and another task where mental state attribution was tested via pictures. In the study's defence, Baron-Cohen (1989) explained that those who were successful on the first-order theory of mind test were then unable to pass a more complex second-order theory of mind test, suggesting that an underlying theory of mind deficit still existed in the ASD population. Nonetheless, Happé and Frith (1995) claim that ToM does not provide enough of an explanation for the previously described 'triad of impairments' known to the disorder.

Gallagher (2004) also proposed that the inter-subjectivity involved in social interaction is a lot more complex than simply attributing mental states. For example, whilst three year olds can not pass first-order theory of mind tests, they are still able to establish a social interaction as they enter the testing room through making eye-contact, smiling, gesturing etc. Coster and Lauder (2009b) also argue that many groups of individuals are unable to pass theory of mind tests, but are undeniably sociable in nature. For example: individuals with severe learning disabilities; those who lack capacity and even cats and dogs. As such, failing to pass a theory of mind test does not automatically define someone as having a diagnosis of Autism. Furthermore, the ToM theory of Autism is limited in its ability to provide an explanation for the wider range of verbal and non-verbal features that contribute to social interaction.

1.2.3. Beyond a Single Deficit Model of ASD

Although the single deficit models have given rise to a range of useful frameworks for further research, they fail to capture the heterogeneity (Mandy & Lai, 2016); co-morbidity (Simonoff et al., 2008); strengths (Baron-Cohen, 2009) and the savant skills (Treffert, 2014) observed within the ASD population (Happé, Ronald, & Plomin, 2006). An alternative perspective is to see the common underlying traits and conceptualizations of ASD as being part of a wider

framework that incorporates multiple cognitive domains into one model (Herbert, 2005). Other researchers have also tried to weave the various theories into one thread. For example, by suggesting that the commonalities across the cognitive models are unified by an underlying difficulty in cortical information integration, which are the result of under-connectively between different brain regions and over-connectivity within localized areas the brain regions (Rippon, Brock, Brown, & Boucher, 2007).

1.2.4. General Cognition and ASD

There is some evidence to suggest that individuals with ASD demonstrate different performances on tests of general cognition, in comparison to individuals without ASD. For example, some studies (Dawson, Soulières, Gernsbacher, & Mottron, 2007; Ghaziuddin & Mountain-Kimchi, 2004; Grondhuis & Mulick, 2013) have found that individuals with ASD demonstrate superior performances on non-verbal visual spatial tests, such as WAIS Block Design Tests (Wechsler, 2008) and Raven Matrices (Raven, Raven, & Court, 2000). Dawson, Soulières, Gernsbacher, & Mottron (2007) argue that performance of these tests are often discussed as being a non-verbal ability weakness, rather than a strength in visual-spatial abilities in the ASD population. It is also a common suggestion that individuals with ASD show poor fluid intelligence (Blair, 2006; Ozonoff et al., 1991). However, research has since demonstrated that individuals with ASD outperform individuals without ASD on Raven's Standard Progressive Matrices Test (Raven et al., 2000).

There has also been a lot of interest in to differences in performances for individuals with ASD in comparison to typically developing (TD) individuals on tests of Social Cognition. The field of Social Cognition has generated a wide span of approaches to researching how and why humans interact with one other, such as: understanding beliefs, Mentalizing; coordinating attention; coordinating action; facial expressions and eye gaze (Blakemore, J. Winston, & Frith, 2004). One key finding that has arisen from this research has been the discovery of the mirror neuron system; a neural network that becomes active when experiencing or doing something and when we observe others experience or do something (Rizzolatti & Craighero, 2004). Research in this area gave rise to the Broken

Mirror Neuron Theory of Autism, which proposes that the mirror neuron system is less active in individuals with ASD than TD individuals (Dapretto et al., 2006; Perkins, Stokes, McGillivray, & Bittar, 2010). Whilst the theory has its limitations (Fan, Decety, Yang, Liu, & Cheng, 2010; Southgate & Hamilton, 2008), the results suggest that the Mirror Neuron System is a key part of complexity of factors the give rise social communication and interaction difficulties in individuals with ASD (Hamilton, 2013).

Social cognitive research has also demonstrated that children with ASD show differences in eye-gaze, imitation and joint attention in comparison to TD individuals (Park, 1972; J. H. Williams, Whiten, Suddendorf, & Perrett, 2001). However, research has since suggested that children with Autism do not have an absence of these skills, but instead focus on different aspects of their environment. For example, when viewing a video of adults in a social scenario, children with ASD focus on the mouths of the actors, in comparison to the control group who were looking at the eyes (Klin, Jones, Schultz, Volkmar, & Cohen, 2002). Studies researching emotional recognition have also found that language comprehension that has been learnt through social interaction, was achieved over greater periods of time for children with ASD than TD children (Murphy, Barnes-Holmes, & Barnes-Holmes, 2005). In addition to this, some studies have shown that children with ASD struggle to recognise their own emotional states in comparison to normally developing children (Kuusikko et al., 2008; Meltzoff, 2007). Whilst these findings provide some explanation for the social differences observed in individuals with ASD, these findings are inconsistent with other studies showing that children with ASD can describe their emotions in relation to friendship satisfaction and can describe feelings of anxiety and distress that lead to social withdrawal (Bauminger & Kasari, 2000; Bauminger, Shulman, & Agam, 2003; White & Roberson-Nay, 2009). Therefore, it could be argued that individuals with a diagnosis of ASD do have access to their emotions, but they express them differently to those around them. Another explanation is that individuals with ASD overcome difficulties with emotional processing through drawing upon other cognitive or intellectual methods (Hermelin & O'Connor, 1985). The authors suggest that that logical-affective state can be slower and more error-prone than an auto-affective state adopted by TD individuals. Whilst

the same end goal can be achieved, the theory suggests that the different routes result in differences in performance on tests of social cognition(Williams & Happé, 2009).

As explored, there are wide number of approaches to measuring social cognition in ASD. However, the ToM model remains the most dominant theory of ASD. Over the years this has also led to ToM tests gaining the most empirical support of this theory (Baron-Cohen, 2000). Whilst first and second order false belief tests gave rise to the ToM theory, research indicates that they are not effective at discerning a difference in ToM abilities for those aged over fourteen (Jolliffe & Baron-Cohen, 1999; Lombardo et al., 2007; Ozonoff, Pennington, et al., 1991), despite evidence of difficulties in social communication and interaction (Tager-Flusberg, 1999). There are various explanations as to why this is, for example, some authors say that ToM tests do not adequately capture difficulties in everyday 'normative' social interaction because the testing procedures are too artificial and focus too specifically on certain aspects of social cognition, such as shared expectation (Curry & Jones-Chesters, 2012; Green, Gilchrist, Burton, & Cox, 2000). Other explanations suggest that the tests are limited by not controlling for differences in language ability between participants (Happé, 1994).

More advanced and naturalistic tests were subsequently developed and fall into two over-arching categories: non-literal language tests and emotional recognition tests. The non-literal language tests (for example: the Faux-pas test (FPT) (Baron-Cohen, O'riordan, Stone, Jones, & Plaisted, 1999) and the Strange Stories Questionnaire (SSQ) (Happé, 1994)) are advanced ToM tests that were developed to measure the detection of non-literal language. For example, the SSQ tested the detection of sarcasm, persuasion and white lies and the FPT tested for the recognition of someone mistakenly saying something they should not have. On the other hand, emotional recognition tests (for example: Reading the Mind in the Eyes Test (RMET: Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001)) measure the ability of an individual to detect an emotion by looking at an image of a person's face or picture. The following literature review will explore the use of advanced ToM tests and other ToM measures to consider

whether there is support for the ToM model of Autism in the HF Adult ASD population.

1.3. Literature Review

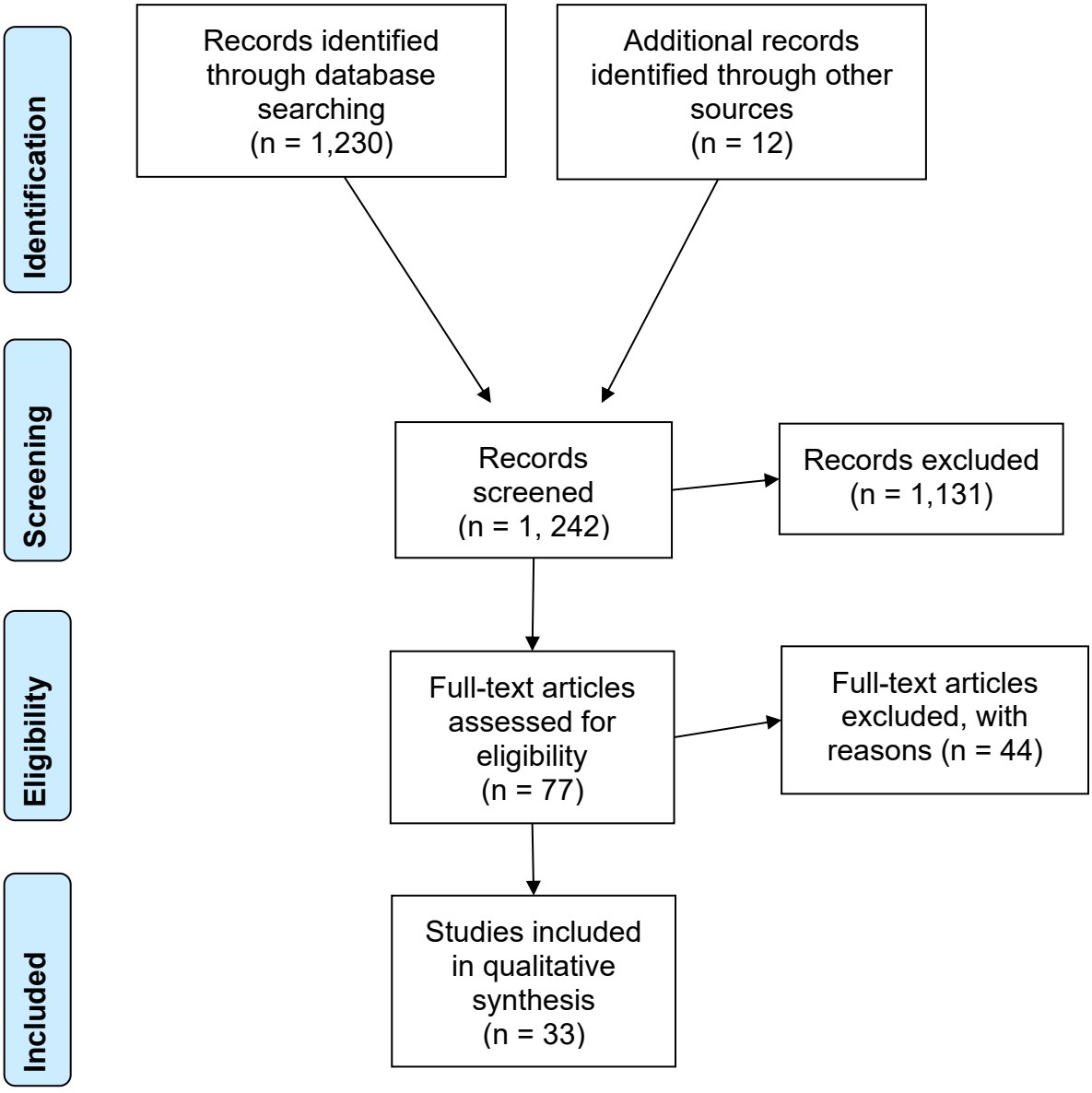
The literature review was not intended to be a full systematic review, however a systematic process was used to develop search terms and an exclusion criteria. A literature review of ToM tests with the Autism population prior to 2000 has already been conducted (For review, see Baron-Cohen, 2000). Accordingly, the current literature review spans from 2000-2020 so as not to replicate these findings. The following section will also focus specifically on research using tests of ToM with Adult HF ASD participants and matched controls to explore whether there is support for the ToM model in the adult HF ASD population.

1.3.1. Data Sources

The initial searches were carried out using the EBSCO electronic databases to identify relevant research published between 2000 and March 2020. Further searches were then carried out using narrative and snowballing techniques via Google scholar. A diagram illustrating the selection process can be seen in Figure 1. The following search terms were used to conduct the searches: “Asperger’s Syndrome”, “Autism”, “Autism Spectrum Disorder”, “Theory of mind”, “ToM”, “social understanding”, “social cognition”, “false belief”, “perspective taking”, “mindreading”, “mentalizing”, “Test”, “measure”, “assessment”, “adult” “18+”. Studies selected were written in English and were published in peer-reviewed journals.

Figure 1.

PRISMA (Moher, Liberati, Tetzlaff, Altman, & Group., 2009) Adapted Flow Diagram of Article Selection Process



1.3.1.1. Advanced ToM tests

A number of studies have found that HF Autistic adults perform more poorly than matched normally developing controls on the SSQ, FP and RMET (Pedreno, Pousa, Navarro, Pamias, & Obiols, 2017; Scheeren, De Rosnay, Koot, & Begeer, 2013; Zalla, Sav, Stopin, Ahade, & Leboyer, 2009). However, the results of these tests were limited by: small sample size; a wide age-span and a lack of female

participants. There is also evidence to suggest that some advanced tests of ToM are more effective at supporting the ToM model in the HF adult ASD population than others. For example, a number of studies have found that adult HF ASD participants have poorer performances than normally developing matched controls on the FPT and the SSQ test, but not on the RMET (Oakley, Brewer, Bird, & Catmur, 2016; Söderstrand & Almkvist, 2012; Spek, Scholte, & Van Berckelaer-Onnes, 2010).

1.3.1.2. Implicit ToM

More recently, it has been theorised that ToM has separate implicit (unconscious and spontaneous) and explicit (conscious and deliberate attention) components (Southgate, Senju, & Csibra, 2007). Tests of ToM have been developed in order to assess whether differences in implicit and explicit ToM can be observed in the adult ASD population in comparison to matched, TD controls. To assess implicit ToM, an eye-tracking devise is typically used to measure anticipatory looking on a false-belief task. Explicit ToM is then typically measured by assessing participant performance on classic ToM tests (Senju, Southgate, White, & Frith, 2009). A number of studies have adopted this paradigm and supported the finding that there is a specific deficit in implicit ToM, but not explicit ToM in adults with HF ASD (Doi, Kanai, Tsumura, Shinohara, & Kato, 2020; Schneider, Slaughter, Bayliss, & Dux, 2013; Schuwerk, Vuori, & Sodian, 2015; Senju et al., 2009; Sommer et al., 2018; Torralva et al., 2013). A further study also used a novel computerized version of an implicit ToM task (Deschrijver, Bardi, Wiersema, & Brass, 2016). Whilst no group differences were found, errors made on the task were positively correlated with self-reported autistic traits and observed autistic behaviors.

Schuwerk et al. (2015) later adapted the implicit ToM task paradigm (Senju et al., 2009) to include a learning element. The results of this study revealed that a difference was found between the adult HF Autism group (N=18) and the matched TD controls (N=19) on the original implicit ToM false belief task. However, no difference was found between the two groups when the learning component was added to the task. The results therefore suggested that HF adult

Autistic participants could modify their performance on the implicit ToM tasks, based upon experience.

One study used a naturalistic video task to observe the implicit and explicit ToM processes between HF adults ASD (N=28) participants and the TD control participants (N=23). In support of the ToM model of ASD, the results revealed that the HF adult ASD participants performed more poorly in the naturalistic ToM video tasks than the control group. However, in contrast to previous findings the results revealed that both implicit and explicit ToM processes were similarly impaired in the adult HF ASD group, despite there being a distinction between the two ToM processes in the control group. One study also found much subtler differences in Implicit ToM in ASD participants (N=17) in comparison to the TD controls (N=17), suggesting that TD adults also demonstrate difficulty with implicit ToM (Cole, Slocombe, & Barraclough, 2018).

1.3.1.3. Naturalistic

There are number of studies that have drawn upon the ToM model to develop ToM tests that are more naturalistic. For example, one study introduced an naturalistic open-ended narrative task to measure the number of mental state words used by adult HF ASD participants (N=20) in comparison to TD matched controls (N=20) (Beaumont & Newcombe, 2006). The findings revealed that the HF Autistic group used significantly fewer mental state words on the open-ended narrative task than the control group. It was also recorded that the ASD group gave fewer explanations for character's mental states. Other studies showed evidence in support of a ToM deficit in Adults with HF ASD when a vocalization component was added to the ToM tasks (Kleinman, Marciano, & Ault, 2001; Rutherford, Baron-Cohen, & Wheelwright, 2002).

A number of studies have used video clips to assess emotional recognition and mental state identification. The results of these studies reveal that adults with HF perform poorer in these tests that matched TD controls (Dziobek et al., 2006; Golan, Simon Baron-Cohen, Hill, & Golan, 2006; Heavey, Phillips, Baron-Cohen, & Rutter, 2000; Ponnet, Roeyers, Buysse, De Clercq, & Van der Heyden, 2004). One study used video clips of Happé's (1999) Strange Stories items to increase

the real-word applicability of the ToM test (Brewer, Young, & Barnett, 2017). The results indicated that there was a group difference found between the ASD (N=163) and the TD controls (N=80) on the social sub-test, but not on the physical subtest after controlling for verbal IQ. Interestingly, a lot of inter-group variation was also observed within the ASD group with some demonstrating little difficulty and others demonstrating significant impairment.

One naturalistic study found no support for a deficit in ToM in HF ASD participants (N=34) in comparison to matched normally developing controls (N=34). The study used the Communication Game (Epley, Morewedge, & Keysar, 2004) to measure the participants ability to consider another person's knowledge when interpreting what he/she said, in order to move objects across a board (Begeer, Malle, Nieuwland, & Keysar, 2010). Previous studies also demonstrated that the Communication Game was sensitive to variations in mood (Converse, Lin, Keysar, & Epley, 2008) and culture (Wu & Keysar, 2007).

1.3.2. Summary and Gaps in the Literature

In the studies that used the classic advanced ToM tests (SSQ, FPT and RMET), there were mixed findings and numerous study limitations. For example, the lack of female participants in the studies failed to take into account the different presentations of ASD across sexes (Kreiser & White, 2014). Another limitation is the wide span of ages used in some the studies. For example, one study included participants between the ages of twelve and forty-two (Pedreno et al., 2017). This in turn limited the internal validity of the study by failing to account for the developmental differences with and across the groups (Blakemore, Winston, & Frith, 2004). Other limitations included evidence of IQ correlating with performance on the RMET (Baker, Peterson, Pulos, & Kirkland, 2014). Whilst there was some evidence of cultural diversity across the studies (Söderstrand & Almkvist, 2012), as discussed earlier, drawing conclusions from cross-cultural studies needs to be approached with caution (Dyches, Wilder, Sudweeks, Obiakor, & Algozzine, 2004). Accordingly, whilst there was some support for the ToM model within the Adult ASD population, there was need for the research to be replicated with larger, more representative sample.

The naturalistic studies also showed support for the ToM model of ASD. The tests also offered reliable and ecologically valid methods of discerning within group differences in ToM accuracy, whilst also controlling for IQ and verbal ability. However, the adoption of the mood and culture sensitive; Communication Game paradigm (Begeer et al., 2010), found there to be no difference between the ASD participants and the matched controls. Accordingly, the voice, video, and open-ended narrative naturalistic tests may be limited by a lack of sensitivity to variations in mood in culture. A further limitation may be the applicability of these tests for use in a clinical setting. Most of the studies described lengthy testing procedures and the requirement of technology to play a video (Livingston, Carr, & Shah, 2019). Accordingly, future studies may benefit from adapting the naturalistic ToM studies to be quicker and more accessible for use in a clinical setting.

The implicit ToM tests offered insight into difficulties with spontaneous ToM in adults with HF ASD. One study also highlighted that including a learning component can improve the implicit ToM performance in the HF adult ASD group (Schuwerk et al., 2015). This provides some explanation for why individuals with ASD appear to pass first and second order ToM tasks beyond a certain age (Jolliffe & Baron-Cohen, 1999; Lombardo et al., 2007; Ozonoff, Pennington, et al., 1991). It also provides some explanation for the social cognitive processes behind social camouflaging (Dean et al., 2017). However, the findings of other studies suggested that improving the real-life applicability of the ToM test may increase the likelihood of explicit ToM errors being made (Rosenblau, Kliemann, Heekeren, & Dziobek, 2015). The research described may also be subject to limitations and surrounding debate regarding the existence and measurability of implicit ToM (Livingston et al., 2019). For example, the accuracy of using eye-tracking device as a indicator of implicit ToM (Heyes, 2014).

1.3.3. The Current Study

The current study aims to build upon the research discussed above by developing an ecologically valid and engaging measure of ToM that also explores the implicit components of ToM. To date, not many studies have used a game-like procedure to test the ToM model in adults with HF ASD (Livingston et al.,

2019). Games have been described as a form of play that involve elements of activity, self-motivation, make-believe processes and rewarded action (Rieber, 1996). When applied to a measure of social cognition, a game-like process can replicate elements of interpersonal coordination such as: turn taking, decision making, goal setting and rule breaking (Higgins, McCann, & Fondacaro, 1982; Mehta, Starmer, & Sugden, 1994a, 1994b). The ambition of the current study is to apply a game-like design to increase the engagement and level of social interaction when assessing social cognition (ToM) in the adult ASD population. It aims to support the adult HF ASD population through being a more enjoyable assessment experience. Furthermore, the interactive features of the standardized measure aims to connect more closely with everyday difficulties in social interaction and communication faced by this population. The study will also explore the implicit and explicit aspects of the ToM model by qualitatively exploring the reasoning behind the ToM decisions made within the game. It is hoped that this approach to the assessment of social cognition (ToM) will offer intervention level benefits through the immediate social feedback offered via the game-like approach. The following chapter will discuss the new measure's design, development, and review processes.

CHAPTER 2: METHOD 1

2.1 Philosophy of Science

Epistemology is the branch of philosophy concerned with the nature, origin and limits of human knowledge (Ferrier, 1854). There are multiple epistemological positions (Willig, 2013), each with their own assumptions regarding how knowledge is derived and the interaction between concepts such as subjectivity, truth and fact (Lloyd, 2014). It is important for researchers to be aware of and explicit about the philosophical position of the research, because these assumptions underpin and guide the methodological design and data analyses (Barker, Pistrang, & Elliott, 2015). Although a full account of the debates and development in epistemology is beyond the scope of the thesis, an exploration of the philosophical position taken by the researcher is provided below.

The scientific method is grounded within the realist epistemological position. It follows the notion that reality exists and is independent of our representations of it (Grayling, 1992). Positivism is often associated with this position and is based on the view that whatever exists can be verified through logical proof, experiments and observation (Martin, 1981). Popper (1963) was a prominent advocate of the scientific method, but criticised the positivist empirical approach of using simple observations to form the basis of knowledge (Caldwell, 2015). As such, he argued that scientific research should rely on deduction and falsification. Hypotheses should therefore be derived from theory and tested through experimental or observational research in order to falsify a theory's claims (Caldwell, 2015). Whilst the positivist approach to the scientific method remains influential, it has been criticised for its failure to address issues of power, which privileges certain types of knowledge over others (Pilgrim, 2013).

Social constructionism is another epistemological position (Burr, 1998). It follows the assumption that society is actively produced by human beings and therefore the portrayal of the world is socially produced rather than pre-existing (Thomas, 1966). It is argued that language makes it possible to develop thoughts and

concepts, which in turn generates a structure for how the world is experienced (Burr, 1998). Social constructionism is criticised for being open to extreme relativism through placing too much emphasis on language (McLaughlin & Boghossian, 2008). For example, it can undermine the role of innate biological tendencies (Pinker, 2016).

Disability research has typically been categorized into either realist or social constructionist positions (Bhaskar & Danermark, 2006). Research lying within a realist epistemological position has sought to discover the 'truth' behind the origin of a disability; for example, research investigating the genetic profile of those with ASD. On the other hand, research lying within a social constructionist position has helped to illustrate how social and cultural confines of language use has shaped and limited our perception of disability (Burr, 2003).

The current research sits in between the realist and social constructionist positions through taking a Critical Realist epistemological position (Willig, 2013). This stance assumes that a 'real' world and knowledge exists and can be objectively measured, but the source of measurement is limited by human bias and subjectivity (Lopez & Potter, 2005). Accordingly, whilst the current study makes inferences about ToM based upon observed verbal and behavioural responses; it also acknowledges that ToM is a construct that is developed by subjective interpretations, thus, cannot be directly observed.

2.2. Overview

As discussed in the introduction, the current study aims to develop an ecologically valid and engaging game-like measure of ToM that is suitable for the HF ASD population; The Friendship Game (TFG). The current study has been split into two stages: the first stage documents the development and initial testing of the TFG; the second stage investigates the performance of the participants on TFG. The aims and objectives of the current study are as follows:

2.2.1. Aims

1.
    a. Develop a new measure of social cognition for use with adults with ASD that is based upon the ToM construct.
    b. For the measure to demonstrate increased ecological validity in comparison to previous measures of social cognition.
2. To consider how the results relate to current measures of social cognition
3. To use the knowledge gained from the research to make recommendations for intervention.

2.2.2. Objectives

1. To investigate performance on the new test in adult participants with HF ASD.
2. To explore that any deficits on the new test were not due to weaknesses in other areas of cognitive function.
3. To interview participants to obtain feedback regarding:
    a. Their experience of playing TFG
    b. How TFG compared to other measures of social cognition
    c. How TFG compares to everyday experiences of challenges with social cognition
    d. Ideas for how TFG could be improved and/or adapted for intervention support with everyday challenges with ToM

2.3 Test Development

The aim of the current study was to develop a new measure of social cognition that is both engaging and takes account of social learning capacities within the Adult ASD population. The following section will describe the stages of TFG development. Due TFG being in the pilot stages of development and due to the time limits of completing a thesis, it was not anticipated that a large participant number would be achieved. Instead, TFG development will adopt an exploratory method to testing the validity and reliability of TFG. It is hoped that the pilot testing of TFG will inform future objectives and formal validation of the TFG. To do this, TFG will follow the following stages of instrument development.

Stages of instrument development (Prince, Stewart, Ford, & Hotopf, 2003)

1. Definition of construct
2. Review of construct definition
3. Item drafting
4. Item review
5. Alpha testing
6. Beta testing
7. Post-development testing

2.4 Item Drafting

2.4.1 Concept Development

When casting around for ideas for a new and engaging measure of social cognition, a board game called ‘Fog of Love’ (FoL) (Hush Hush Projects, 2018) was discovered. The aim of FoL is to create a hypothetical romantic relationship between two characters. Each player builds a character by selecting their personality and identity (name, interests and career); they then answer a series of questions both individually and collectively to assess their characters compatibility for one another. The players gain points for answering questions that are in line with their characters’ individual and shared personality traits. At the end of the game, the players decide whether their characters are romantically compatible for one another.

It was identified that FoL drew upon the ToM paradigm in order for the characters to build romantic compatibility to one another. As such, the players needed to theorise about their own characters’ mind and the other characters’ in order to select answers that were in line with both their individual and collective personalities traits. Accordingly, FoL was identified as a novel and engaging format by which the new measure of Social Cognition could be based upon. Similarly, it was decided that ToM would be the primary construct that would be measured within the new measure social cognition, TFG. In order to convert FoL into a standardised and engaging measure of ToM, appropriate for use with an

adult HF ASD population, a series of adaptations were made. The following section describes the steps taken to convert FoL into TFG.

2.4.2. Building a Friendship

Firstly, it was considered more appropriate and ethical for a new measure of social cognition to be based upon building friendships, rather than a romantic relationship. Accordingly, this was the first change that was made. The stages of building a friendship then needed to be standardised. To do this, a series of social scenarios and four responses were created to produce the initial ToM content. The social scenarios were organised into the 'Chapters' of making a new friendship. It was proposed that the application of ToM to develop a new friendship could be conceptualised in the following way:

- Chapter 1: Getting to know each other's personality and sharing information about oneself to help the other person understand your own personality.
- Chapter 2: Making inferences about the other person's actions according to the beliefs and desires that align with their personality. Also, making decisions based upon one's own personality that will help the other person understand your beliefs and desires and make inferences about your likely actions.
- Chapter 3: Using knowledge about one's own and another person's beliefs and desires to help compromise on a course of action when agreeing about a decision, that will make both parties' happy.

2.4.3. Characters

Another element that needed to be adapted was the standardisation of the characters. This aspect of the game went through several reviews because of the emphasis on the game to incorporate an element of real-life applicability. As described above, in the "Fog of Love" game, the two players design their own character, however, it was decided that this would made it difficult for the conditions to establish internal and external reliability. Instead, the researcher would play the character of 'Ashley' in order to standardise the conditions and make it clear that the participant was not building a real-life relationship with the

researcher. The name ‘Ashley’ was chosen as a gender-neutral name to reduce the confounding influence of the researcher playing a character of the opposite/same gender to the participant.

2.4.4. Personality

To build a character, the participant was asked to select three personality traits that reflect their own personality. Similar to FoL, the personality traits were adapted from research on the HEXACO model of personality structure (Ashton & Lee, 2007). The HEXACO model was originally designed as a method of measuring human behaviour, thought and emotion (Matthews, Deary, & Whiteman, 2003). Their research proposed that there are six personality dimensions: Honesty-Humility (H), Emotionality (E), Extroversion (X), Agreeableness (A), Conscientiousness (C) and Openness to Experience. Each of these factors consists of a high and low dimension of the trait. It was considered that the participant might perceive being ‘low’ on the trait dimension negatively, accordingly, the ‘high and ‘low’ dimensions of the HEXACO model traits were adapted to so that the participant could have twelve trait options to choose from. Each trait included three synonyms to help explain the meaning of the trait. Listed below is the final adaption of the HEXACO model for TFG:

- Honesty-Humility
    - (High) Sincere: Someone sincere may be honest, modest and/or fair.
    - (Low) Sceptical: Someone sceptical may be cautious, inquisitive and/or cynical

- Emotionality
    - (High) Sensitive: Someone sensitive may be compassionate, understanding and/or sympathetic.
    - (Low) Strict: Someone strict may be hard, ruthless and/or unforgiving.

- Extroversion

    - (High) Extroverted: Someone extroverted may be outgoing, sociable and/or assertive.
    - (Low) Introverted: Someone introverted may be private, quiet and/or reserved

- Agreeableness
    - (High) Gentle: Someone gentle may be calm, cooperative and/or forgiving
    - (Low) Autonomous: Someone autonomous may be resilient, independent and/or self-assured

- Conscientiousness
    - (High) Disciplined: Someone disciplined may be organised, diligent and/or hard-working
    - (Low) Relaxed: Someone carefree may be light-hearted, scatty and/or easy-going

- Openess to Experience
    - (High) Curious: Someone curious may be innovative, creative and/or unconventional
    - (Low) Pragmatic: Someone pragmatic may be careful, measured and/or restrained

In order to standardise the selection of personality traits, the participant was asked to select one trait from four ‘Set A’ options, one trait from four ‘Set B’ options and one trait from four ‘Set C’ options. Each set included two of the HEXACO trait dimensions, therefore four personality traits in total. An example of how this was displayed for the participant can be found in Appendix 3.

The following approach was taken to standardise the conditions by which ‘Ashley’s’ personality traits were selected.

- For trait A, ‘Ashley’ had the same personality trait as the participant, to ensure they had commonalities.

- For trait B, ‘Ashley’ selected the alternative HEXACO trait, but at the same high/low end of the dimension as the participant. This was a way of introducing trait differences between the participant and Ashley.
- For trait C, Ashley selected the same HEXACO trait, but at the opposite end of the dimension. This was designed to make it more difficult for the participant to reach a compromise with ‘Ashley’.

2.4.5. Social Engagement

In each chapter, the researcher read a series of social scenarios to the participant. The participant and ‘Ashley’ then selected an answer (A,B,C or D) that were in line with their own and Ashley’s personality traits. After allowing time to read through the answers, both the participant and ‘Ashley’ revealed their selected answer at the same time using a counter with ‘A’, ‘B’, ‘C’ or ‘D’ written on it (Appendix 4). The counters were designed to mimic the social interaction created between two players in FoL and thus increase the ecological validity of TFG. The counters also provided a tangible motivation for selecting the correct answer, which helped to scaffold the social learning element within TFG.

In FoL, the characters also gained tokens for selecting answers that were in line with their own and their collective personality traits. The use of tokens was initially considered as an engaging method of motivating the participants to build a friendship within TFG. However, it also presented an ethical dilemma of the participants feeling disheartened if they were unable to gain points. Whilst the participants still scored points using a similar method, the use of tokens was removed.

2.5. Alpha Testing

The alpha testing of the TFG used a co-production approach (Gibbons et al., 1994), whereby key stakeholders: ASD experts by experience and by profession collaborated to inform the development and evaluation of TFG.

2.5.1 Presentation

An initial draft of TFG was presented via PowerPoint to a group of Clinical Psychologists, Trainee Clinical Psychologists and Assistant Psychologists who work in an NHS Autism Diagnostic Service. A copy of the presentation can be located in Appendix 9. A demonstration of TFG was conducted with a Trainee Clinical Psychologist, there was then an opportunity for the team to provide feedback.

Overall, TFG was well received from the professionals who attended the workshop. The feedback suggested the TFG was considered socially engaging and non-stigmatising through the use of the game-like features. The attendees also agreed that the responses required the participant to apply ToM skills in order to think about their own beliefs and desires as well as 'Ashley's' in order to decide upon an answer response. As such, an initial assessment of content validity and face validity of TFG was achieved.

2.5.2. Pilot Studies

During this stage, the items were also assessed for face validity and test-re-test reliability. This process assessed TFG for ceiling, floor effects and internal consistency. Due to TFG being completed within the time constraints of a thesis, only 10 people were used in the alpha testing stage, rather than the 50-100 that is typically recommended (Prince et al., 2003). Included in the alpha testing process were professionals in the field of: Clinical Psychology, Nursing, Social Work, individuals with knowledge of ASD that the researcher knew professionally and personally and an adult with a diagnosis of HF ASD. Unreliable items, such as those considered too easy (ceiling effects) or questions consistently answered incorrectly (floor effects) were removed. Collectively, their feedback helped to shape the answer responses to the social scenarios in Chapters One, Two and Three. For example, an answer in line with the 'Curious' answer response in Chapter Two was consistently mistaken for the 'Sensitive' answer response. The wording was subsequently adapted to account for this floor effect.

Feedback from this round suggested that it was too time-consuming and confusing for the participant to read the social scenarios and answer response options out loud. Accordingly, to increase the internal consistency of the

measure, it was decided that the researcher would read all the scenarios to the participant; the participant would then silently read the answer responses before selecting their answer via the counter.

2.6. Final Draft: Game Play and Scoring

All of the social scenarios and answers responses described within this section have been significantly adapted from FoL and/or newly developed for TFG. This includes the method taken to increase the difficultly of the questions as the chapters progress. The standardisation of the scoring system was also newly developed for TFG by the researcher. The final draft of the manual and record form that was used in the validation study can be found in Appendices 1 and 2 respectively.

2.6.1. Chapter One: Learning

The aim of Chapter One was to create some training scenarios where the participants could share knowledge about their own personality and learn about 'Ashley's' personality. The participant was presented with three scenarios (Appendix 5), the first and third scenario asked the participant what 'Ashley' would do based upon their Set A and Set C personality traits respectively. The second scenario asked the participant what they would do in a scenario based upon their set B personality trait. Each scenario has four trait prompts (seen within the sample below in bold) to help the participant familiarise themself with how to select an answer.

2.6.1.1. Sample:

Present Card 1 and SAY: *"Here is the first situation. This is about what Ashley would do, based on their personality. You say to Ashley: 'Ashley, it must be your birthday soon, how are you planning to celebrate it?'*

Now, look at these options [point to response options and allow examinee a few moments to read]. *So, based on Ashley's Set A personality traits* [point to personality cards set out in front of examiner], *which **one** of these answers A, B, C, or D do you think Ashley would give?"*

a) **Sceptical** - I doubt anyone will want to do anything, it is just a birthday
b) **Disciplined** I need to save money to go on a holiday, so I will have nice a dinner at home.
c) **Sincere** – I will host a small gathering and tell people in advanced so they can make arrangements if they would like.
d) **Relaxed –** I do not mind, I'll sort it out nearer the time

2.6.2. Chapter Two

The aim of Chapter Two was to assess the participant's ability to choose answer responses in line with their own personality traits and to identify responses that were in line with 'Ashley's' personality traits. In Chapter Two, the participant did not have the personality trait prompts to support their answers (Appendix 6). In the example below, the trait prompts in brackets were not visible to the participant). Similar to Chapter One, each of the six questions alternated between theorising about 'Ashley's' intentions and the participant's, based upon their selected personality trait. The order was as follows:

- Question 4, what the participant would do based upon their set A personality trait.
- Question 5, what 'Ashley' would do based upon their set B personality trait.
- Question 6, what the participant would do based upon their set C personality trait.
- Question 7, what 'Ashley' would do based upon their set A personality trait.
- Question 8, what the participant would do based upon their set B personality trait.
- Question 9, what 'Ashley would do based upon their set C personality trait.

2.6.2.1. Sample:

Present Card 4 and SAY: *"Here is the first situation. This one is about what **you** would do. Ashley says to you: 'I need to go to a bank meeting to organise my finances, how prepared do you think should I be?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based on your Set A personality trait* [point to personality cards]*, which of these answers should you give?"*

a) **(Disciplined) -** Lets plan a time to meet and organise what forms to bring
b) **(Relaxed)** – Take it easy! Just show up, I'm sure it'll be fine
c) **(Sceptical)** - I wouldn't trust banks if I were you!
d) **(Sincere)** - To be honest, I think you should contact the bank or look at their website to see what they recommend!

SAY: *"Why did you think answer X was in line with your set A personality trait?"*

2.6.3. Chapter Three

The aim of Chapter Three was to see whether the participants could consider both their own and Ashley's personality traits in order to make a compromise on an answer response to a social scenario. Chapter Three involved six scenarios where the participants were required to consider both their own personality trait and 'Ashley's' in order to make a decision that would suit them both. Due to the change in format, the first three questions included trait prompts to act as training rounds (Appendix 7). The questions included combinations of two traits to reflect the need to consider both their own mind and another's. It was designed and scored using the following format:

- Question 10 & 13, Set A and Set B traits were matched by having the same dimension. The best compromise was achieved from choosing the option that contained the shared Set A trait.
- Question 11 & 14, Set A and Set C traits were matched by having the same dimension. In order to provide more complexity, two correct options would reach a compromise on a decision with Ashley. One answer included the shared Set A trait, another answer included a combination of participant's and 'Ashley's' Set C traits. To standardise the procedure, 'Ashley' always chose the Set C response. However, the participant received a point for either option.

- Question 12 & 15, Set B and Set C traits were matched by having the opposite dimension. This meant that the participants had to reach a compromise on something, despite the personality traits being the opposite end of the spectrum to one another. The participants again had two correct options that would offer them a compromise on a decision with Ashley. One answer included a combination of participant's and 'Ashley's' Set B traits, another answer included a combination of participant's and 'Ashley's' set C traits. To standardise the procedure, 'Ashley' always chose the Set C response. However, the participant received a point for either option.

2.6.3.1. Sample:

Present Card 10 and SAY*: "Ashley says to you: 'It looks like someone has dropped a wallet on the floor, what should we do about it?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's A and B personality traits, which of these answers would both make you happy?*

When you have made your decision, please place counter A, B, C or D on the table face down"

A Sincere and Disciplined: We need do the honest thing and hand it in immediately to the police, let me organise a route that we can take.
B Sceptical and Relaxed: If they were clumsy enough to drop it, I doubt they will go to the effort of contacting the police. If they come back to look, they will find it.
C Sensitive and Pragmatic: Oh no, how horrible! They must be so worried! Let's leave a note here to say that we have taken it to the nearest police station.
D Strict and Curious: How careless! What sort of person just drops a wallet? Let's check to see if there are any contact details inside.

SAY: *"Why did you think answer X would make you and Ashley happy?"*

2.7. Beta Testing

At this stage, the surviving items would normally be tested for validity via a separate sample that would be large enough to perform a factor analysis (Prince et al., 2003). Due to TFG being completed within the time restraints of a thesis, it was not anticipated that the current study would reach a large enough sample to complete formal beta testing. However, a pilot version of this stage, using an exploratory methodology was attempted instead. This will be described in detail in the following chapter. Typically, a formal assessment of convergent validity would be achieved via TFG statistically demonstrating a positive relationship to a measure that assesses the same ToM construct. The comparison test should be an existing 'Gold Standard' of ToM that also touches up the social cognition construct (Campbell & Fiske, 1959; Prince et al., 2003). However, due to the current study being built on the premise that there is no 'gold standard' measure of ToM, this would have not been possible. The other limitation in assessing validity is due to sample size being rendered too small to perform statistical analyses. In the absence of a 'gold standard' measure and due to the small sample size, each participant's performance was treated as a separate 'case' study. to establish the following areas:

1)
    a) To assess whether the ASD sample were close to or different from the UK norms on the Cognitive Tests
    b) To assess whether the ASD sample were impaired on the tests and to observe whether this impacted their performance of TFG.
    c) To consider whether the scores on the mood measures affected the participant's performance on the Cognitive tests.
2) To compare the participant's performance on TFG with existing measures of ToM such as 'Social Stories' (Happé, 1994) and the 'Reading the Mind in the Eyes Test (Baron-Cohen et al., 2001).
3) To assess the construct validity of TFG through qualitatively reviewing the extent to which the chapters of TFG meaningfully measure all aspects of the ToM construct (Cronbach & Meehl, 1955).
4) To assess face validity through qualitatively reviewing the extent to which the new measure appears to measure the ToM construct (Prince et al., 2003)

CHAPTER 3. METHOD 2

3.1. Study Design

The current study used an exploratory research design to investigate performance on the new instrument, TFG, and to investigate relationships between the participants test performances. A Content Analysis Approach was used to further assess the face validity of TFG and to derive a scoring system. In addition to this, a Thematic Analysis approach was also used to analyse participant feedback in response to playing TFG. The results will inform future the objectives and the design of studies investigating TFG as a new measure of social cognition.

3.2. Ethical Issues

3.2.1. Ethical Approval

The study was approved by the University of East London Ethics Committee (Appendix 10).

3.2.2. Mental Capacity and Consent

Participants were identified via a diagnosis of HF ASD; there was therefore no anticipation that the participants would lack the capacity to give informed consent to participate. These labels indicate that they would have full capacity to consent. Participants were be allowed at least 48 hours from the point of receiving the information sheet (Appendix 11) to fully consider and reflect upon the potential risks and benefits of the research, ask questions and make a decision about whether or not to participate, before they were contacted by the researcher. Participants were encouraged to contact the researcher with any queries they might have before or after agreeing to participate in the study. Participants who did not adequately understand written information or verbal explanation given in English were to be excluded from the study. Whilst the researcher recognised the ethical implications of excluding these potential participants, the tests in question

were designed for those with good English fluency and comprehension. Furthermore, the study lacked the resources to employ interpreters for individual participants. On the day of testing the participants were given the opportunity to read through the information sheet again. If they were happy to participate, they were asked to sign a consent sheet (Appendix 12).

3.2.3. Confidentiality and Data Protection

Participants were allocated a number (e.g. 01,02 etc.) so that their data would be unidentifiable and stored separately from their identifiable information. Demographic Questions, social cognitive measures, Cognitive tests and feedback forms were stored in a padlocked folder (only accessible to the researcher and supervisors) for transporting from the testing venue back to the University of East London. Once at the researcher's home, they were stored in a padlocked filing cabinet that was only accessible to the researcher. The confidential information was kept as a hard copy to prevent accidently electronic transfer. The anomyonous data was scored and entered onto an Excel and SPSS database on the researcher's secure personal laptop and were password protected. The data was also uploaded onto the secure UEL Outlook OneDrive that can only be accessed by the researcher and the academic supervisor. Hard copies of the data will be destroyed once they are no longer required which is expected to be within two years from the end of the study. This is in keeping with the university research data archiving policy, which allows up five years data storage.

3.2.4. Participant Burden and Emotional Wellbeing

Participants deemed ineligible to participate may have felt upset and/or experienced a sense of injustice. The study maintained broad inclusion criteria, for example a large age range. However, participants deemed ineligible for the research when advertising the study would have been provided with a full explanation of the reasons for their ineligibility and with the opportunity to ask questions regarding this decision. In the end, this step was not required.

It was considered that the cognitive test questions and social cognition questions may have been perceived as intrusive or upsetting to the participants. However, a

considerate amount of research suggests that tests of social skills and cognitive function are not received as distressing to a vast majority of participants doing tests of this nature (Bennett-Levy, Klein-Boonschate, Batchelor, McCarter, & Walton, 1994). Nonetheless, a level of anxiety is common when completing tests of this nature due to a desire to do well (Bennett-Levy et al., 1994). Due to the tests being completed on a voluntary basis and not for diagnostic purposes, the anxiety was anticipated to be less. However, a poorer performance than anticipated may impact upon their self-esteem. Participants were informed that tests might be potentially distressing before consenting to take part in the research. They were also debriefed after participating and given the opportunity to receive a sensitively worded summary of how performed.

Participants were advised on the participation information sheet that they could contact the researcher if they wish to receive this information. They were informed that the tests do not constitute as being the results of a clinical cognitive test, because they were not conducted as part of a full set of measures alongside a cognitive assessment interview. Accordingly, the participants understood that the results had no diagnostic value and were only a summary of their performance as part of their research participation.

Due to the lengthy nature of the testing process, there was an increased likelihood of fatigue. Accordingly, participants were reminded that they could take a break at any point.

3.2. Recruitment

Six online social networks were e-mailed to request permission to advertise the study via a poster (Appendix 13) on their platform, the study was re-advertised on these platforms up to three times. Four participants were recruited via the ‘Meet Up’ platform and three participants were recruited via ‘Facebook’ groups. Twelve Autism Charities, and two generic mental health charities were contacted to ask for the study to by advertised. Each charity was contacted up to three times to follow up about the request. Three charities agreed to advertise the study further, however, no participants responded to these advertisements. Five further

participants were recruited via word of mouth, however three of these meet ups were cancelled due to the government enforced quarantine measures implemented in response to the 2020 COVID-19 pandemic.

3.2.1. Participants

Eight participants with a diagnosis of ASD were recruited via advertisements to local charity organisations, social media platforms such as 'Facebook' and Internet forums and word of mouth.

3.2.1.1. Inclusion and Exclusion Criteria

Whilst it was desired for the study to be inclusive as possible, some restrictions needed to be made. The upper age limit was restricted to 65 because evidence suggests that ages beyond this point may confound the results of the neurocognitive test outcomes (Lezak, Howieson, Loring, Hannay, & Fischer, 2004). The age limit of 65 could be argued to be an arbitrary number, however it is in keeping with the UK age of retirement and the typical lower age boundary for referral criteria for NHS older adult services. The other inclusion/exclusion criteria covered factors such as: substance misuse; serious mental health conditions and low educational attainment because of the significant impact these factors have on cognitive test outcomes (Lezak et al., 2004). As discussed earlier, good English fluency and comprehension were also considered in inclusion factors because of this being a requirement for the testing due to this being required for the majority of the test and questionnaires. Similarly, individuals with low functioning ASD or Learning Difficulties were also excluded, as it was considered that the tests would have been too challenging to complete. Ethnicity and mild mental health problems, such as anxiety and depression were not exclusion factors.

3.2.1.2. Inclusion criteria:

- Having a diagnosis of ASD/Asperger's syndrome
- Being aged 18-65
- Good fluency and comprehension of English
- No diagnosis of a learning disability

3.2.1.3. Exclusion Criteria:

- Current psychotic and/or serious mental illnesses
- Current illicit substance use/misuse in the last 6 months
- Learning Disability and/or (IQ <70)

3.3. Procedure

3.3.1. Consent

Those interested in participating were given the option of meeting at their home, the UEL campus or in a quiet and private space near to where they live. The participants also had the choice of time day and time they would like to meet. On the day of testing, the participants' capacity to consent was assessed and their written content was obtained. The participants were given an opportunity to ask any questions. Any travel expenses they incurred were also reimbursed at this point.

3.3.2. Set Up

The set up of the study was arranged so that that participant was sat opposite to the researcher on a table. For the neurocognitive tests and social cognitive measures (excluding TFG), the researcher asked the participants the questions and showed the stimuli to the participant, if required. Once the participant gave an answer, they wrote the answers in the record form. For the questionnaires, the participant was given the sheets to write their answers on. For TFG, a picture of the apparatus and set up can be seen in (Appendix 8).

3.3.3. Cognitive Function

As part of the validation process of TFG, in was important to determine that the participants' scores on TFG were a result of their social cognitive abilities, as opposed to their general cognitive function are: executive functions (visual and verbal), verbal function, visuo-spatial functions; short term stores and working memory. As discussed within the introduction, psychological theories of ASD suggest that executive function can impact upon the social cognitive functioning of individuals with ASD (Ozonoff et al., 1991). Accordingly, the participants'

performances on the cognitive measures were analyzed to observe their affect the participant's performance. Standardized verbal instructions were used to administrate the cognitive assessment. The instructions were written in the examiner's handbook and were taken from the original manuals.

3.3.4. Social Cognition

As part of the validation process, two existing measures of social cognition were used to observe how the participants' performances on these measures qualitatively compared to the new measure of social cognition, TFG. Due to there being no time limit to participate in TFG, this was administered last.

3.3.5. Self-report Measures

To assess for the impact of mood on participant's performance, the participant was given two mood measures to complete. In order to compare the participants results to performances of individuals in the wider ASD population, the participant's self-reported levels of cognitive and empathy and severity of ASD symptoms were assessed.

3.3.6. Qualitative

To record the social learning process, the participants were asked to provide a brief explanation for why they thought the answer that they selected was most in line with their own/'Ashley's' Set X personality trait. This helped to identify whether the participants were choosing a response based upon their own personality trait, 'Ashley's', or for another reason.

At the end of the game, the participants were asked four questions in order to review their experience of playing TFG. The interview schedule was as follows:

· How did you find thinking about both yours and Ashley's personality?
· How did your experience doing TFG compare to SS?
· How does TFG compare to your experience of making friends in real life?
· Do you have any further reflections on your experience of playing TFG?

3.3.7. De-briefing

The assessment lasted on average 1.5-2 hours to complete. After the testing was completed, participants were debriefed and had the opportunity to receive a summary of their performance using sensitively worded qualitative descriptions. The summary highlighted the participants' relative strengths and weaknesses.

3.5. Apparatus

The following tests, assessments and questionnaires were used to collect the data:

3.5.1. Demographic Information

3.5.1.1. Age: The participants' age was collected in years and months in order to make an accurate comparison with normative data and to obtain an age adjusted scaled score.

3.5.1.2. Education: The participants' number of years in education was collected because of the effect they this has on cognitive assessment outcome (Lezak et al., 2004).

3.5.1.3. Sex: The participant's sex was recorded because of evidence indicating that there are different ASD profiles in men compared to women.

3.5.1.4. Ethnicity: Participants were asked to record their ethnicity.

3.5.2. Cognitive Assessment Test Battery

The cognitive assessment test battery was included to ensure that any problems observed on TFG were not secondary to primary cognitive weakness.

3.5.2.1. Optimal Ability Screen

The Test of Pre-morbid functioning (TOPF) UK version (Wechsler, 2011), was used to assess reading ability. This also provided a brief assessment of the literacy/reading skills required for the rest of the assessments in the study. The task asked participants to read out 70 single words. The results were then converted into a prediction of the participant's full scale IQ.

3.5.2.2. Short-Term Stores & Working Memory

The digit span subtest of the WAIS -IV (Wechsler, 1997) was used to assess short-term memory and working memory. There were three parts to these tasks. In the first part, the participants were instructed to repeat a string of numbers in the same order (forward span), in the second part the participants were instructed to repeat the string of words in reverse order (backwards span). In the third part, the participants were instructed to repeat the string of numbers starting with the lowest number first then proceeding upwards (sequencing). Each trial starts with a string of two numbers increasing by one up to a maximum of 8 or 9 numbers. Each trial consists of two strings with equal numbers. The test is discontinued if participants fail to answer correctly on both strings within the same trial. On each part, a score of 16 can be achieved; meaning a total score of 48 is possible when combined.

3.5.2.3. Executive Functioning - Visual

The Matrices Reasoning subtest of the WAIS- IV (Wechsler, 1997) was used as a measure of the participants' visual reasoning ability. The participants were required to look at a visual pattern that was missing a piece of the pattern. They were instructed to select a piece from five options to complete the pattern. The total number of correct responses created a 'Visual Reasoning' total score'.

3.5.2.4. Executive Function - Verbal

The Delis-Kaplan Executive Function System (DKEFS: Delis, Kaplan, & Kramer, 2001) was used as a measure of the participant's asemantic and phonetic fluency as well as switching ability.

There were three parts to the tasks. In the Letter (Phonemic) fluency subset participants were given one minute to name as many words beginning with the letters 'F', 'A'' and 'S'. The rules meant that the participants needed to go as quickly as they could, but not use the names of people, places, or the same words with different endings. All three scores were combined to produce a raw total 'Letter fluency' score.

In the category (Semantic) fluency subset participants were asked to repeat the process but with categories. They were given a category and asked to produce as many words belonging to that category in one minute. There were two trials, and the categories included (Animals) and (Boy's Names). Both scores from the trials were combined to produce a raw total 'Category Fluency' score.

In the Category switching subset participants were given two categories (Fruit) and (Furniture) and asked to switch between the two as they listed them as quickly as they could. The total number of correct items of fruit and furniture produced a 'Switch Total' raw score. The number of correct switches between the categories produced a 'Switch Accuracy' total raw score.

3.5.3. Social Cognitive Test Battery

3.5.3.1. Facial Emotional Recognition

Reading the Mind in the Eye Test (RMET) (Baron-Cohen et al., 2001) was used to provide an indication of the ASD diagnosis severity. Participant performance on RMET was used as a form a qualitative validation of TFG.

3.5.3.2. Non-literal Language

Social Stories (SS) (Happé, 1994) consisted of eight short stories and a question that asked about the intentionality of the character in the story. Performance on SS was also used as a form a qualitative validation of TFG.

3.5.4. Questionnaires

The Questionnaire of Cognitive and Affective Empathy (QCAE) (Reniers, Corcoran, Drake, Shryane & Vollm, 2011) was used as an indication of ASD severity. Performance on this measure was also used as a form a qualitative validation of TFG.

The Autism Spectrum Quotient Test (AQ) (Woodbury-Smith, 2005) was used as a self-report measure of ASD severity. Performance on this measure was also used as a form a qualitative validation of TFG.

3.5.5. Mood Measures

Low mood and anxiety can both influence the participant's test performance of cognitive and cognitive measures (Lezak et al., 2004). Accordingly, the GAD-7 was used to assess the participants' levels of anxiety (Spitzer, Kroenke, Williams, & Löwe, 2006) and the PHQ-9 (Kroenke, Spitzer, & Williams, 2001) were used to assess the participants' levels of depression. The results from these questionnaires were used to observe any impact of mood and anxiety on the participant's performance on the cognitive assessments and social cognitive tests.

3.6. Analysis

3.6.1. Quantitative

The quantitative data was formed of questionnaires, cognitive and social cognition batteries. The data (raw scores, scaled scores or composite scores) were encrypted and entered into an SPSS (version 26.0) spreadsheet. The data was assembled into a series of tables and graphs in order to make inferences about their performance on TFG.

The data from each answer on TFG was entered onto an encrypted Excel spreadsheet. To assess construct validity of TFG, the answer responses selected by participants were compared to the correct answers to identify any anomalies in the answer responses' ability to address the ToM construct.

3.6.2. Qualitative

3.6.2.1. Transcription

The participants' verbal answer responses and feedback to the TFG were recorded verbatim through writing their responses as they spoke. They were then transcribed onto an encrypted Excel document. Transcripts were written to the participant's code anomalously to protect their identity.

3.6.2.2. Content Analysis

A Content Analysis (Erlingsson & Brysiewicz, 2017) was used to generate a preliminary understanding of the participants verbal answer responses to the social scenarios in relation to their own and/or Ashley's personality traits. A content analysis was chosen as an approach because it is not aligned with a particular philosophical tradition, which meant that there was flexibility in the approach by which the data could be analysed (Erlingsson & Brysiewicz, 2017).

The results from this analysis were used to further assess the construct validity of TFG. This was achieved through considering whether their answers indicated that participants correctly applied a ToM approach to answer the questions. The answers that did not demonstrate a correct application of ToM were also analysed to consider whether this was due to the participant not engaging with the measure, or whether it was due to errors made in their application of ToM. The results from the content analysis will also be used to derive a preliminarily scoring system for TFG.

The following steps were taken to analyse the data:

1. Theme
2. Category
3. Code
4. Condensed Meaning Unit
5. Meaning Unit

An abductive approach (Graneheim, Lindgren, & Lundman, 2017) was taken to analyse the data. Initially, the meaning units and codes were abstracted from the answer responses. The categories induced from this data were then used to derive a preliminary scoring system for TFG. For the highest level of abstraction, a deductive approach was taken to organise the categories into two overarching themes: "Evidence of correct application of ToM" and "No evidence or incorrect application of ToM". The data was then used to assess the construct validity of the application of ToM as a measurable construct. The academic supervisor informally verified the induced categories and deduced themes.

3.6.2.3. Thematic Analysis

Similar to the content analysis, the thematic analysis was chosen as a method because it does not align with a particular philosophical position (Braun & Clarke, 2006). As such, it is coherent with the critical realist philosophical position because it assumes that the ToM construct is a real entity that can be measured whilst also addressing the relativity of the ToM construct.

The results from this analysis were used to further assess the face validity of the friendship. This includes whether TFG is considered a challenging and engaging measure of ToM. The responses will also assess the ecological validity of TFG, in regards to its representativeness of every day difficulties in social interaction experienced by individuals with a diagnosis of HF ASD. Furthermore, the participant feedback will be used to consider the longer-term ambition of TFG being used to inform interventions in social interaction with the HF ASD population.

The analysis was conducted in line with Braun and Clarke's (2006) six stage model:

1. Familiarizing yourself with your data
2. Generating initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

The themes were abstracted by the researcher using a data-driven induction approach (Parker, 2004), where similarities and differences within the data were observed, then described in terms of categories and themes. The academic supervisor informally verified the themes.

CHAPTER 4: RESULTS 1

4.1 Demographic Information

Displayed within Table 1. is the group level demographic information for the participants within the study. The information is displayed on a group level in order to maintain the anonymity of the participant identities. In total, five men and three women participated in the study. All participants were white and all but one participant were of British origin. The youngest participant was aged 29 and the oldest 64. Six participants undertook further education beyond age 18 years. The demographic information for each participant was used to calculate the scaled scores for the participants' performances on the cognitive and social cognitive measures.

Table 1.

Combined participant demographic information

Sex	**Number**
Male	5
Female	3
Ethnicity	
White, British	7
White, Swedish	1
Age	
29	1
30	1
31	3
32	1
51	1
64	1
Years in Education	
13	2
16	3
17	2
20	1

4.2 Individual Descriptive Summaries of Results and Performance

The following section gives each the participants' individual raw and scaled scores for the self-report measures, cognitive, social cognitive tests and TFG (Tables 2-9.). Each table will be followed by an independent summary of the participants' results and performances. Firstly, the participants results on the GAD-7 and PHQ-9 will be discussed to assess the likelihood of mood impacting upon their performance. Secondly, the participants' relative strengths and weaknesses of the Cognitive Tests (WAIS-IV subscales and DKEFS-Verbal Fluency) will be discussed. Any underlying deficits that may impact upon the participant's performance on the social cognitive tests will also be noted. Following this, participants results on the QCAE and AQ will be discussed to see how their results compare to the wider ASD population. Similarly their performances on the established tests of social cognition (WACS-AF and SSQ), will then be discussed to see how their results compare to the wider ASD population. Finally, the participant's performance on the new measure of social cognition, TFG, will be discussed.

Where possible, scaled scores were derived from raw scores (Mean = 10, SD = 3) to validate performance relative to peers matched as far as possible for age and or sex. Verbal interpretation of these scores is provided for the reader. Where scores are 'Below Normal' or 'Impaired', that would indicate a cognitive deficit or weakness of sufficient severity to impact upon TFG performance and warrants being taken into account when interpreting performance.

4.2.1. Participant 01

Table 2.

P01 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	40	5	Below-normal
	Affective	35	11	Average
AQ	Social Skill	18	4	Below-normal
	Attention Switching	19	8	Average
	Attention to detail	23	12	High-average
	Communication	20	7	Low-average
	Imagination	22	9	Average
TOPF	(Correct)	54	10	Average
WAIS	Digit Span	19	5	Below-normal
	Similarities	24	9	Average
	Matrix Reasoning	12	6	Low-average
DKEFS	Letter Fluency	28	7	Low-average
	Category Fluency	38	9	Average
	Switch Output	11	6	Low-average
	Switch Accuracy	11	9	Average
WACS-AF	(Correct)	-	-	-
SSQ	Mental State (Correct)	14	11	Average
TFG	Total	13	--	--
	Own	5	--	--
	Ashley	8	--	--
GAD-7	(anxiety)	7	--	Moderate
PHQ-9	(depression)	6	--	Moderate

4.2.1.1 Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderate' levels of anxiety and depression. Accordingly, there was some possibility of mood impacting upon the participant's performance. However, no concerns with mood were observed on the day of testing.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in concept formation and the task setting and switching tasks. They had relative strengths in the verbal abstraction task in comparison to the visual abstraction tasks, indicating that they may be better at processing verbal in comparison to visual information. However, their relative weaknesses were in the attention and working memory. Their performance indicated that the participant may experience difficulties with sustaining attention, initiating a task and monitoring their performance. However, there were no further concerns that any underlying cognitive difficulties would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participants' performance on the QCAE indicated a poorer score of Cognitive Empathy, which was 'Below Normal' for the same sex peers , in comparison to their Affective Empathy which was 'Average'. The participant's AQ subscale scores indicate that they have significant difficulty with social skill, but overall their autistic tendencies are relatively mild in comparison to the wider ASD population. Unfortunately, the WACS-AF was not completed due to an administration error on the day of testing. The participant performed in the 'Average' range on the Mental State subtest of the SSQ in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 13 out of a total 21 points on TFG. They gave a higher number of correct responses when considering Ashley's personality traits than when they were considering their own, scoring 8 and 5 points respectively. This suggests that the participant had some difficulty in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.2. Participant 02

Table 3.

P02 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	39	1	Impaired
	Affective	30	5	Below Normal
AQ	Social Skill	27	4	Below Normal
	Attention Switching	24	8	Average
	Attention to detail	22	10	Average
	Communication	22	0	Impaired
	Imagination	26	7	Low Average
TOPF	(Correct)	62	12	High Average
WAIS	Digit Span	27	9	Average
	Similarities	27	11	Average
	Matrix Reasoning	20	11	Average
DKEFS	Letter Fluency	30	7	Low Average
	Category Fluency	50	14	Superior
	Switch Output	16	14	Superior
	Switch Accuracy	16	4	Below Normal
WACS-AF	(Correct)	17	8	Average
SSQ	Mental State (Correct)	13	10	Average
TFG	Total	20	--	--
	Own	11	--	--
	Ashley	9	--	--
GAD-7	(anxiety)	15	--	Moderately Severe
PHQ-9	(depression)	6	--	Moderate

4.2.2.1 Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderately Severe' levels of anxiety and 'Moderate' levels of depression. Accordingly, there was some possibility of mood impacting upon the participant's performance. However, no concerns with mood were observed on the day of testing.

The participant's performance in the neuropsychological test battery indicated that there were no concerns regarding the participants' reading abilities. There were no differences in their verbal and visual abstraction performances, indicating that there were no relative advantages in visual or verbal processing of information. Their relative strengths were in sustained task setting and switching. Their relative weaknesses were in attention and working memory. Overall, there were no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated a poorer Cognitive Empathy score, which was in the 'Impaired' range for the same sex, in comparison to their Affective Empathy score, which was in the 'Below Normal' range for the same age and sex peers. The participant's AQ subscale scores indicate that they have significant difficulty social and communication skills, but overall their autistic tendencies are relatively mild in comparison to the wider ASD population. The participant scored within the 'Average' range on WACS-AF, in comparison to same aged peers. The participant performed in the 'Average' Range on the mental state subtest of the SSQ, in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 20 out of a total 21 points on TFG. They gave a higher number of correct responses when considering their own personality traits than when they were considering Ashley's, scoring 11 and 9 points respectively. This suggests that the participant had almost no difficulty in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.3. Participant 03

Table 04.

P03 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	54	7	Low Average
	Affective	42	14	Superior
AQ	Social Skill	26	3	Impaired
	Attention Switching	27	8	Average
	Attention to detail	28	10	Average
	Communication	25	10	Average
	Imagination	19	5	Below Normal
TOPF	(Correct)	44	9	Average
WAIS	Digit Span	19	5	Below Normal
	Similarities	11	11	Average
	Matrix Reasoning	13	7	Low Average
DKEFS	Letter Fluency	30	7	Low Average
	Category Fluency	50	14	Superior
	Switch Output	24	16	Superior
	Switch Accuracy	16	4	Below Normal
WACS-AF	(Correct)	15	5	Below Normal
SSQ	Mental State (Correct)	13	10	Average
TFG	Total	20	--	--
	Own	10	--	--
	Ashley	10	--	--
GAD-7	(anxiety)	2	--	Mild
PHQ-9	(depression)	4	--	Mild

4.2.3.1. Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Mild' levels of anxiety and 'Mild' levels of depression. Therefore, there was a low likelihood of mood impacting upon the participant's performance. No concerns with mood were observed on the day of testing.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in the task setting and switching tasks. They had relative strengths in the verbal abstraction task in comparison to the visual abstraction tasks, indicating that they may be better at processing verbal compared to visual information. However, their relative weaknesses were in the sustained attention and working memory tasks. There was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated a poorer score of Cognitive Empathy, which was in the 'Low Average' range for the same sex peers, in comparison to their Affective Empathy, which was in the 'Superior' range for the same sex peers. Similar to previous research, the participant's results on the QCAE indicated a poorer Cognitive Empathy score, which was in the 'Below Normal' range for the same sex peers, in comparison to their Affective Empathy score, which was in the 'Low Average' range for the same sex peers. The participant's AQ subscale scores indicate that they have significant difficulties with social skill and imagination, but overall their autistic tendencies are relatively mild in comparison to the wider ASD population. The participant scored within the 'Below Normal' range on WACS-AF in comparison to same ages peers. This offers some suggestion of deficits in social cognitive ability. However, the participant performed in the 'Average' range on the mental state subtest of the SSQ, in comparison to same ages peers, indicating no deficits in social cognitive performance.

The participant scored 20 out of a total 21 points on TFG. There was no difference in correct responses when considering Ashley's personality traits in comparison to their own, scoring 10 points for both. This suggests that the participant had almost no difficulty in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.4. Participant 04

Table 05.

P04 performance on the self-report measures, Cognitive test battery and Social Cognition test battery.

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	34	4	Below Normal
	Affective	12	1	Impaired
AQ	Social Skill	21	6	Low Average
	Attention Switching	21	5	Below Normal
	Attention to detail	26	12	High Average
	Communication	26	12	High Average
	Imagination	24	8	Average
TOPF	(Correct)	17	8	Average
WAIS	Digit Span	5	6	Low Average
	Similarities	8	8	Average
	Matrix Reasoning	10	13	High Average
DKEFS	Letter Fluency	51	17	Very Superior
	Category Fluency	39	12	High Average
	Switch Output	14	13	High Average
	Switch Accuracy	14	12	High Average
WACS-AF	(Correct)	17	8	Average
SSQ	Mental State (Correct)	13	10	Average
TFG	Total	18	--	--
	Own	8	--	--
	Ashley	10	--	--
GAD-7	(anxiety)	9	--	Moderate
PHQ-9	(depression)	14	--	Moderately Severe

4.2.4.1. Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderate' levels of anxiety and 'Moderately Severe' levels of depression. During testing the participant appeared slightly anxious. To help manage this, the participant took some short breaks in-between the tests. Accordingly, the participant's mood may have impacted upon their performance.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in visual abstraction. Their relative weaknesses were in attention and working memory. Their results indicated that the participant may find it easier to process visual information in comparison to verbal information. Overall, there was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

In contrast to previous research within the ASD population, the participant's results on the QCAE indicated poorer Affective Empathy, which scored within the 'Impaired' range for the same sex, than Cognitive Empathy, which scored within the 'Below Normal' range for the same sex. The participant's AQ subscale scores indicate that their autistic tendencies are relatively mild in comparison to the wider ASD population. The participant scored within the 'Average' range on WACS-AF, indicating that the participant had no difficulties with their performance on this test. The participant also performed in the 'Average' range on the mental state component of the SSQ, which is in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 18 out of a total 21 points on TFG. They gave a higher number of correct responses when considering their Ashley's personality traits than when they were considering their own, scoring 8 and 10 points respectively. This suggests that the participant had almost no difficulty in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.5. Participant 05

Table 06.

P05 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	36	4	Below Normal
	Affective	25	7	Low Average
AQ	Social Skill	19	4	Below Normal
	Attention Switching	25	11	Average
	Attention to detail	24	9	Average
	Communication	23	5	Below Normal
	Imagination	21	6	Low Average
TOPF	(Correct)	24	13	High Average
WAIS	Digit Span	27	17	Very Superior
	Similarities	22	17	Very Superior
	Matrix Reasoning	34	9	Average
DKEFS	Letter Fluency	30	8	Average
	Category Fluency	36	9	Average
	Switch Output	12	8	Average
	Switch Accuracy	12	10	Average
WACS-AF	(Correct)	17	9	Average
SSQ	Mental State (Correct)	16	14	Superior
TFG	Total	19	--	--
	Own	9	--	--
	Ashley	10	--	--
GAD-7	(anxiety)	13	--	Moderate
PHQ-9	(depression)	15	--	Mild

4.2.5.2. Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderate' levels of anxiety and 'Mild' levels of depression. Accordingly, there was some potential of mood impacting upon the participant's performance. However, no concerns with mood were observed on the day of testing.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in verbal abstraction. Their relative weaknesses were in the visual abstraction and the attention setting and switching tasks. Their results indicated that the participant may find it easier to process verbal information in comparison to visual information. Overall, there was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated poorer Cognitive Empathy than Affective Empathy, however both scored within the 'Average' range for the same sex. The participant's AQ subscale scores indicate that they have significant difficulties with social skill, but overall their autistic tendencies are relatively mild in comparison to the wider ASD population. The participant scored within the 'Average' range on WACS-AF, indicating that the participant had very minor difficulties with their performance on this test. The participant scored 16 out of a total 16 points on the SSQ, which indicates that they performed 'Superior' in comparison to same age peers.

The participant scored 19 out of a total 21 points on TFG. They gave a higher number of correct responses when considering Ashley's personality traits than when they were considering their own, scoring 10 and 9 points respectively. This suggests that the participant had almost no difficulty in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.6. Participant 06

Table 07.

P06 performance on the self-report measures, Cognitive test battery and Social Cognition test battery.

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	36	4	Below Normal
	Affective	25	7	Low Average
AQ	Social Skill	24	4	Below Normal
	Attention Switching	23	11	Average
	Attention to detail	20	9	Average
	Communication	24	5	Below Normal
	Imagination	29	6	Low Average
TOPF	(Correct)	24	13	High Average
WAIS	Digit Span	27	17	Very Superior
	Similarities	22	17	Very Superior
	Matrix Reasoning	34	9	Average
DKEFS	Letter Fluency	30	8	Average
	Category Fluency	36	9	Average
	Switch Output	12	8	Average
	Switch Accuracy	12	10	Average
WACS-AF	(Correct)	19	9	Average
SSQ	Mental State (Correct)	16	14	Superior
TFG	Total	10	--	--
	Own	3	--	--
	Ashley	7	--	--
GAD-7	(anxiety)	13	--	High Average
PHQ-9	(depression)	15	--	Superior

4.2.6.1. Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderately Severe' levels of anxiety and 'Moderately Severe' levels of depression. Accordingly, there was possibility of mood impacting upon the participant's performance. However, no concerns with mood were observed on the day of testing.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in the sustained attention and working memory tasks and in the verbal fluency tasks. Their relative weaknesses were in task setting and switching tasks. Their results indicated that the participant may find it easier to process verbal information in comparison to visual information. Overall, there was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated a poorer Cognitive Empathy score, which was in the 'Below Normal' range for the same sex, in comparison to their Affective Empathy score, which was in the 'Low Average' range for the same sex. The participant's AQ subscale scores indicate that they have significant difficulties with social skill and communication. Overall their scores are in line with the average results for the wider ASD population. The participant scored within the 'Superior' range on WACS-AF, in comparison to same age peers. They also scored in the 'Superior' range on the mental state subtest of the SSQ, in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 10 out of a total 21 points on TFG. They gave a higher number of correct responses when considering their own personality traits than when they were considering Ashley's, scoring 7 and 3 points respectively. This suggests that the participant had some difficult in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.7.Participant 07

Table 08.

P07 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	50	8	Average
	Affective	30	9	Average
AQ	Social Skill	23	6	Low Average
	Attention Switching	20	9	Average
	Attention to detail	21	8	Average
	Communication	23	2	Impaired
	Imagination	30	1	Impaired
TOPF	(Correct)	12	13	High Average
WAIS	Digit Span	13	10	Average
	Similarities	14	16	Superior
	Matrix Reasoning	19	10	Average
DKEFS	Letter Fluency	14	13	High Average
	Category Fluency	13	10	Average
	Switch Output	14	6	Low Average
	Switch Accuracy	19	9	Average
WACS-AF	(Correct)	23	15	Superior
SSQ	Mental State (Correct)	15	12	High Average
TFG	Total	13	--	--
	Own	7	--	--
	Ashley	6	--	--
GAD-7	(anxiety)	21	--	Severe
PHQ-9	(depression)	6	--	Moderate

4.2.7.1. Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Severe' levels of anxiety and 'Moderate' levels of depression. Accordingly, there likelihood of mood impacting upon the participant's performance. However, no concerns with mood were observed on the day of testing.

There were no concerns regarding the participant's reading abilities. Their relative strengths were in verbal abstraction. Their relative weaknesses were in the task setting and switching tasks. Their results indicated that the participant may find it easier to process verbal information in comparison to visual information. Overall, there was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated a poorer score of Cognitive Empathy than Affective Empathy, however both scored within the 'Average' range for the same sex. The participant scored in the 'Borderline' severity range on the AQ. . The participant's AQ subscale scores indicate that they have significant difficulties with social skill and communication, but overall their autistic tendencies are relatively mild in comparison to the wider ASD population. The participant performed within the 'Superior' range on WACS-AF in comparison to same age peers. The participant also performed in the 'high average' range 15 on the mental state component of the SSQ in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 16 out of a total 21 points on TFG. They gave a higher number of correct responses when considering their own personality traits than when they were considering Ashley's, scoring 7 and 6 points respectively. This suggests that the participant had some difficult in their performance of this test. The potential reasons for this will be explored within the discussion.

4.2.8. Participant 08

Table 9.

P08 performance on the self-report measures, Cognitive test battery and Social Cognition test battery

Test	Component	Raw Score	Scaled Score	Interpretation
QCAE	Cognitive	43	2	Impaired
	Affective	32	5	Below Normal
AQ	Social Skill	24	6	Low Average
	Attention Switching	23	9	Average
	Attention to detail	25	8	Average
	Communication	21	2	Impaired
	Imagination	26	1	Impaired
TOPF	(Correct)	6	12	High Average
WAIS	Digit Span	7	11	Low Average
	Similarities	8	17	Average
	Matrix Reasoning	10	11	Average
DKEFS	Letter Fluency	50	13	High Average
	Category Fluency	37	9	Average
	Switch Output	12	8	Average
	Switch Accuracy	12	10	Average
WACS-AF	(Correct)	20	11	Average
SSQ	Mental State (Correct)	16	14	Superior
TFG	Total	15	--	--
	Own	6	--	--
	Ashley	9	--	--
GAD-7	(anxiety)	7	--	Moderate
PHQ-9	(depression)	5	--	Mild

4.2.8.1 Summary

The participant's scores on the GAD-7 and PHQ-9 indicate 'Moderate' levels of anxiety and 'Mild' levels of depression. Accordingly, there was some potential of mood affecting the participant's performance. However, no concerns with mood were observed on the day of testing.

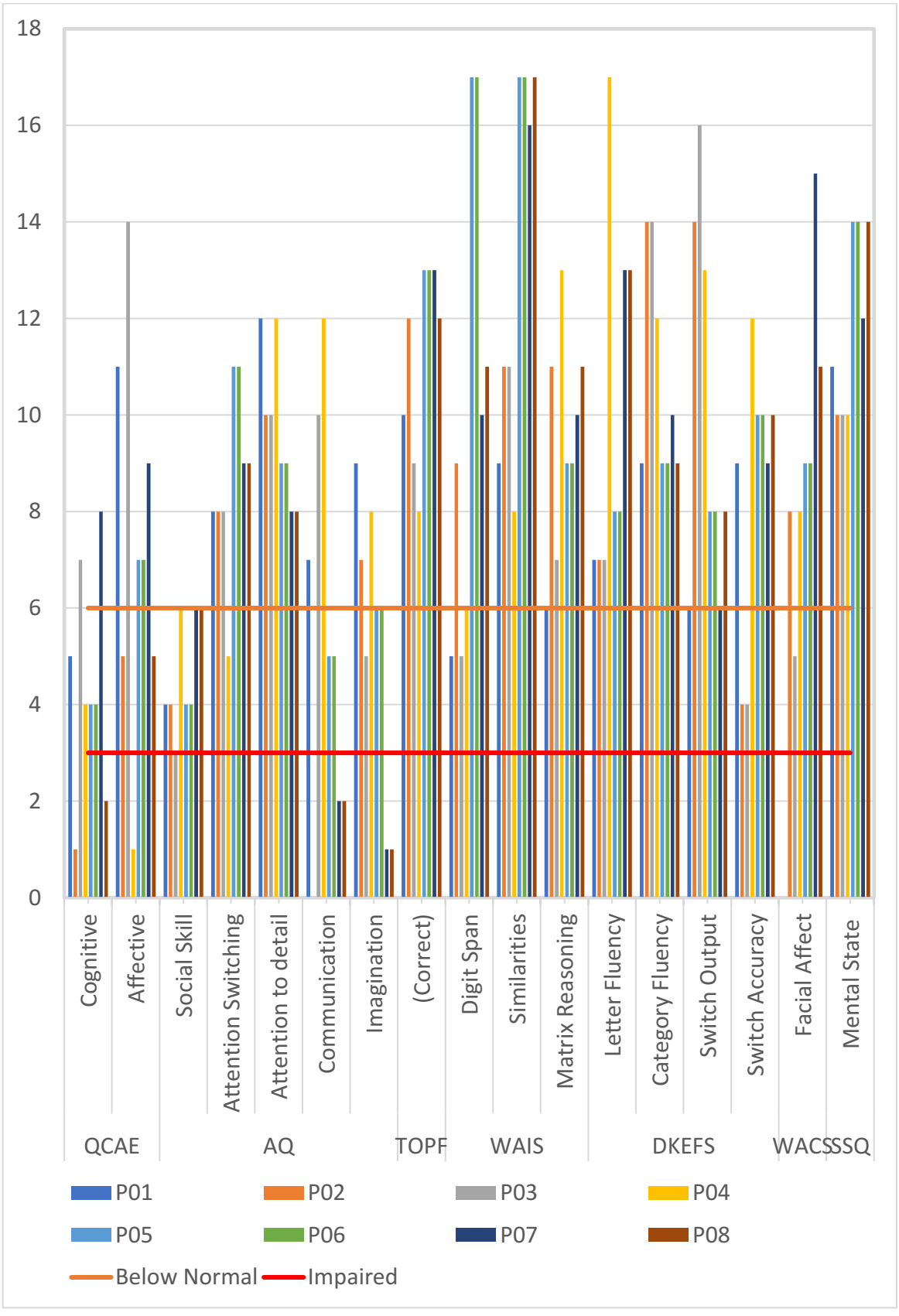
There were no concerns regarding the participant's reading abilities. Their relative strengths were in the verbal fluency. Their relative weaknesses were in task setting and switching. Their results indicated that the participant may find it easier to process verbal information in comparison to visual information. Overall, there was no indication of deficits in ability that would impact upon their performance on the tests of social cognition.

Similar to previous research within the ASD population, the participant's results on the QCAE indicated a poorer score of Cognitive Empathy which was 'Impaired' for the same sex, in comparison to their Affective Empathy was 'Below Normal' for the same sex. The participant's AQ subscale scores indicate that they have significant difficulties with communication and imagination. Overall their scores are in line with the average results for the wider ASD population. The participant scored within the 'Average' range on WACS-AF in comparison to same aged peers. The participant also scored in the 'Superior' range on the mental state subtest of the SSQ, in comparison to same age peers. Both performances indicate that the participant demonstrated no deficit in social cognitive performance based on these tests.

The participant scored 10 out of a total 21 points on TFG. They gave a higher number of correct responses when considering Ashley's personality traits than when they were considering their own, scoring 9 and 6 points respectively. This suggests that the participant had some difficult in their performance of this test. The potential reasons for this will be explored within the discussion.

Figure 2.

A bar chart of the collective participant scaled scores across tests



Displayed in Figure 2 is a bar chart of all the participant scaled scores across the tests. The scores that fall below the red horizontal line show the participant scores that were ‘Impaired’ and scores below the orange horizontal line show the participant scores that were ‘Below Normal’. The figure shows that the majority of the participants’ Cognitive Assessment performances fall above these ranges, suggesting that difficulties in TFG was unlikely to be through underlying cognitive weaknesses. Some participants’ scores indicated some underlying cognitive difficulties with sustained attention and switching attention between tasks. Whilst this may have impacted upon their individual performance on TFG, their scores did not appear to be consistently lower than the other participants scores on this measure (see individual summaries for TFG scores).

The results for the QCAE indicate that the all but one participant demonstrated poorer Cognitive Empathy than Affective Empathy, which is in keeping with previous findings with the ASD population. On the AQ, the lowest self-reported scores are for Social Skill, Communication and Imagination and the higher self-reported scores for Attention Switching and Attention to Detail, which is keeping with the ASD diagnostic criteria (APA, 2015).

The participant performances on the previous measures of social cognition, WACS-AF and SSQ indicate that the majority of the participants scored within Normal Ranges for this measure, apart from one participant who scored ‘Below Normal’ for their performance on WACS-AF.

CHAPTER 5: RESULTS 2

5.1 Content Analysis

In order to assess the face validity of TFG and to derive a scoring system, the participant's responses were analysed using a content analysis method (Erlingsson & Brysiewicz, 2017). As discussed within the methodology, ToM is the underlying construct that the TFG is adhering. Accordingly, it was important to assess the face validity of TFG by documenting the nature, variety and frequency of answer responses given in the three Chapters of TFG. As such, the answer responses for each chapter have been categorised by the researcher to be grouped into two themes: Theme One: "Correct Application of ToM" and Theme Two: "Incorrect or no evidence of application of ToM".

Each chapter of TFG was structured with a different format and objective, accordingly, the themes and categories derived from the content analysis were grouped according to Chapter. Table 9. displays a 'map' of the themes and categories that were derived by the researcher. In the following section, the categories have been discussed and illustrated via quotes of participants' verbal responses. A quantitative summary of the number of responses per category and theme, for each chapter.

Table 10.

Themes and categories derived from coded data

Theme	Category
Chapter One	
Correct application of ToM	Correct answer, correct intention
	Incorrect answer, correct intention
Incorrect or no evidence of application of ToM	Correct answer, ambiguous intention
	Correct answer, no evidence of ToM/ too easy
	Incorrect answer, incorrect intention
Chapter Two	
Correct application of ToM	Correct answer, correct intension
	Incorrect answer, correct intention
Incorrect or no evidence of application of ToM	Correct answer, ambiguous intention
	Correct answer, no evidence of ToM/ too easy
	Incorrect answer, incorrect intention
Chapter Three	
Correct application of ToM	Correct answer, correctly considers both perspectives
	Correct answer, only considers own perspective
	Incorrect answer, correctly considers one perspective
	Incorrect answer, correctly considers both perspective
Incorrect or no evidence of application of Theory of Mind	Correct answer, no evidence of ToM/ too easy
	Incorrect answer, incorrect intention

In the following section, participants' quotes have been organised using a format that helps illustrate the personality set, perspective and trait to which the answers referred. The following format has been used to code the answer responses:

Sample: **P03, A, 'Ashley', Relaxed - "Sounded like 'Ashley' would be easy going, take things one at a time"**

Coding:

- **P03**: Participant number
- **A**: Personality Trait Set (A,B C, Prompt A&B, Prompt A&C, Prompt B&C, A&B, A&C or B&C)
- **'Ashley'**: Answer in reference to participant or 'Ashley'
- **Relaxed**: Correct personality trait

5.2. Game Chapter One

Objective: Can the participant use the personality trait prompts to learn how to select an answer response for themselves and 'Ashley', that is in line with their their own personality trait or 'Ashley's'?

5.2.1 Theme One: Correct application of ToM

5.2.1.1. Category One: Correct answer, correct intention

This category has been perceived by the author to illustrate the answer responses that were correct and also demonstrate evidence of the participants theorising about their own mind and/or 'Ashley's, in relation to the selected personality trait.

P03, A, 'Ashley', Relaxed: "Sounded like 'Ashley' would be easy going, take things one at a time"

P04, C, 'Ashley', Autonomous: " Because she is independent and self-assured"

P07, C, 'Ashley', Autonomous: "She probably wouldn't want to be in a position where she would want to be with many people"

5.2.1.2. Category Two: Incorrect answer, correct intention

This category has been perceived by the author to illustrate the answer responses that were incorrect, but demonstrate evidence of the participants correctly theorising about their own mind and/or 'Ashley's, in relation to the selected personality trait.

P01, A, 'Ashley', Relaxed: "Sounded like 'Ashley' would be easy going, take things one at a time."

P01, B, Participant, Sensitive: "Because I am quite understanding and would try to figure out why someone would want a Tattoo"

P04, A, 'Ashley', Disciplined: "I think they are probably organised and would plan"

5.2.2. Theme Two: Incorrect or no evidence of application of ToM

5.2.2.1. Category One: Correct Answer, ambiguous intension

This category has been perceived by the author to illustrate the answer responses that were correct, but the rationale for selecting the answer was vague or unrelated to the selected personality trait.

P01, C, 'Ashley', Gentle: "Because 'Ashley' is easy-going, so would do whatever tickles their fancy"

P04, B, Participant, Strict: "I don't like tattoos"

5.2.2.2. Category Two: Correct answer, no evidence of ToM too easy

This category has been perceived by the author to illustrate the answer responses that were correct, but the participant was selecting their answers based upon matching words as opposed to theorising about their own or Ashley's intentions in relation to the selected personality trait.

P02, C, 'Ashley', Autonomous: "Because it's what it says"

P05, B, Participant, Sensitive: "I'm sensitive"

P08, A, 'Ashley', Sincere: "Isn't it based upon the trait selected"

5.2.2.3. Category Three: Incorrect Answer, incorrect intention

This category has been perceived by the author to illustrate the answer responses that were incorrect and that the participants' theorising about their own or Ashley's intentions were not related to the selected personality trait.

P06, C, ‘Ashley’, Gentle: “Because ‘Ashley’ is easy-going, so would do whatever tickles their fancy”

5.3 Game Chapter Two

Objective: Can the participant theorise about their own mind and that of Ashley’s in order to select an answer response that is in line with their own personality trait? Can they also select an answer response that is in line with Ashley’s personality trait?

5.3.1 Theme One: Correct application of ToM

5.3.1.1 Category One: Correct answer, correct intension

This category has been perceived by the author to illustrate the answer responses that were correct and also demonstrate evidence of the participants theorising about their own mind and/or ‘Ashley’s, based upon the selected personality trait.

P03, A, Participant, Relaxed: “Because it’s a carefree option - not making plans and taking it easy”

P04, B, ‘Ashley’, Pragmatic: “Rather than upset the person you would give other solutions”

P06, B, ‘Ashley’, Strict: “ She doesn't want to deviate from her schedule, she isn't concerned about the person falling over”

5.3.1.2.Category Two: Wrong answer, correct intention

This category has been perceived by the author to illustrate the answer responses that were incorrect, but demonstrate evidence of the participants correctly theorising about their own mind and/or ‘Ashley’s, in relation to the selected personality trait.

P03, B, ‘Ashley’, Sensitive: “Because she would want to help”

P05, C, Participant, Introverted: “I would choose this so I am not committing, so I can withdraw”

P07, C, ‘Ashley’, Autonomous: “ I think she is autonomous and wouldn't like to go with so many people there, I think she would also prefer to have alone time with a friend rather than going to the cinema to watch it”

5.3.2. Theme Two: Incorrect or no evidence of application of ToM

5.3.2.1 Category One: Correct Answer, ambiguous intention

This category has been perceived by the author to illustrate the answer responses that were correct, but the rationale for selecting the answer was vague or unrelated to the selected personality trait.

P02, B, ‘Ashley’, Curious: “This one sounded the most sensitive”

P04, A, ‘Ashley’, Disciplined: “I have sussed ‘Ashley’ out now”

P07, B, Participant, Pragmatic: “I think it will be too extreme to not be friends with them with the only issue being not wanting to drink”

5.3.2.2. Category Two: Correct answer, no evidence of ToM/ too easy

This category has been perceived by the author to illustrate the answer responses that were correct, but the participant was selecting their answers based upon matching words as opposed to theorising about their own or Ashley’s intentions in relation to the selected personality trait.

P02, A, Participant, Relaxed: “Because it’s what it says”

P02, B, ‘Ashley’, Sensitive: “This one sounded the most sensitive”

P08, C, ‘Ashley’, Extroverted: “That's the most extroverted social option”

5.3.2.3. Category Three: Wrong answer, wrong intention

This category has been perceived by the author to illustrate the answer responses that were incorrect and that the participants’ theorising about their own or Ashley’s intentions were not related to the selected personality trait.

P01, A, Participant, Relaxed: “They should contact their bank to make sure they have everything”

P04, A, Participant, Disciplined: “Because I don't know enough about banks, they are the experts”

P07: C, Participant, Extroverted: “It is better to go in a quiet time during the week, based upon ‘Ashley’ being an Autonomous person”

5.4. Game Chapter Three

Objective: Can the participant theorise about their own mind and that of 'Ashley's' simultaneously in order to select an answer response that is in line with both their personality traits?

5.4.1. Theme One: Correct application of ToM

5.4.1.1. Category One: Correct answer, correctly considers both perspectives

This category has been perceived by the author to illustrate the answer responses that were correct and also demonstrate evidence of the participants theorising about both their own mind and 'Ashley's, based upon the selected personality traits.

P01, Prompt B&C, Introverted & Gentle: "I am easy-going, reserved but quite understanding. 'Ashley' is calm and forgiving."

P03, Prompt A&B, Relaxed & Sceptical: "Because we have both got easy going, empathetic and understanding. I don't think they would be judgemental and talk immediately to the police"

P08, A&C, Sensitive & Curious: " Because it is still a relatively extroverted and autonomous way of acting upon it. In choosing to investigate as well as choosing to nor be mean about it"

5.4.1.2. Category Two: Correct Answer, correctly considers one perspective

This category has been perceived by the author to illustrate the answer responses that were correct and also demonstrates evidence of the participants theorising about only their own mind or 'Ashley's', based upon the selected personality traits.

P01, A&C, Relaxed & Sincere: "They haven't said the reason for not needing money, I would be reserved but still willing to help"

P02, B&C, Sensitive & Curious: " A seems like compassionate and curious, B is too practical. C is practical and extroverted that's also an option. A is what I would do in real life, so I will choose that option.

P04, A&B, Disciplined & Sceptical: “If you commit to one line of action you get stuck. You would pick and option with fluidity in order to leave the door open to other possibilities. Maybe we could pick a weekly payback option”

5.4.1.3. Category Three: Incorrect answer, correctly considers both perspectives

This category has been perceived by the author to illustrate the answer responses that were incorrect, but demonstrates evidence of the participants correctly theorising about both their own mind or ‘Ashley’s’, based upon the selected personality traits.

P06, A&B, Sceptical & Relaxed: “We are both sceptical and curious, so obviously we don't trust that out money will be paid back so it seems sensible for us to find information before we do something”

P07, A&C, Disciplined & Sceptical: “We don't know the extent of the falling out. For example, is the flat mate a heavy drug user. I think it's important to be stressed about drama, but it is important to work it out by talking. I think it is in both our interests to assess the situation, then work out the best way to deal with it.”

P08: A&C, Sincere & Relaxed: “I was trying to find a compromise between considering it still and at least being relatively sincere and honest, rather than just questioning how it is going to work”

5.4.1.4. Category Four : Incorrect answer, correctly considers one perspective

This category has been perceived by the author to illustrate the answer responses that were incorrect, but demonstrates evidence of the participants correctly theorising about only their own mind or ‘Ashley’s, based upon the selected personality traits.

P08, A&B, Sincere & Disciplined: “Because it is in keeping with ‘Ashley’s’ personality trait. None are in keeping exactly and I thought the pragmatic choice was in keeping with the autonomous one, so it seemed a measurable option to pick”

P06, A&B, Sceptical & Relaxed: “Because I think it is sensible to look first to see if there is a way of definitely getting in touch with the person. I wouldn't pick B

because I am too sceptical and wouldn't trust that the person is going to come back."

5.4.2. Theme Two: Incorrect or no evidence of application of ToM

5.4.2.1. Category One: Correct answer, no evidence of ToM/ too easy

This category has been perceived by the author to illustrate the answer responses that were correct, but the participant was selecting their answers based upon matching words as opposed to theorising about their own or Ashley's intentions in relation to the selected personality traits.

P02, Prompt A&C, Extroverted and Autonomous: "We are literally both extroverted and autonomous"

P03, Prompt B&C, Sensitive & Curious: "Because you are both carefree and sensitive, curious and non-judgemental"

P08, Prompt A&C, Extroverted & Autonomous: "The first one because it matches his extroverted and my autonomous personality traits"

5.4.2.2. Category Two: Incorrect answer, incorrect intention

This category has been perceived by the author to illustrate the answer responses that were incorrect and that the participants' theorising about their own or Ashley's intentions were not related to the selected personality traits.

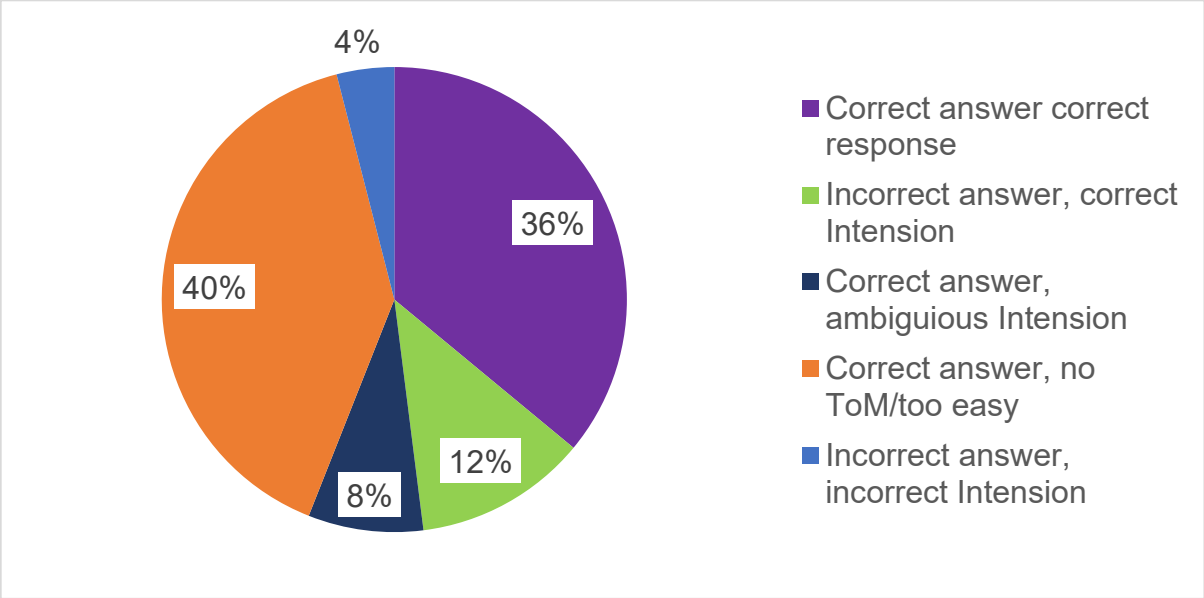
P01, Prompt A& B, Relaxed & Sceptical: "Because it is the most responsible thing to do. Honesty is the best policy"

P02, A&B, Relaxed & Sceptical: "D is mostly curious, C is mostly compassionate. I am thinking about how to bridge the gap if there are two people"

5.5. Quantitative Summary

Figure 3.

Pie Chart of the percentage of answers responses per category in Game Chapter One

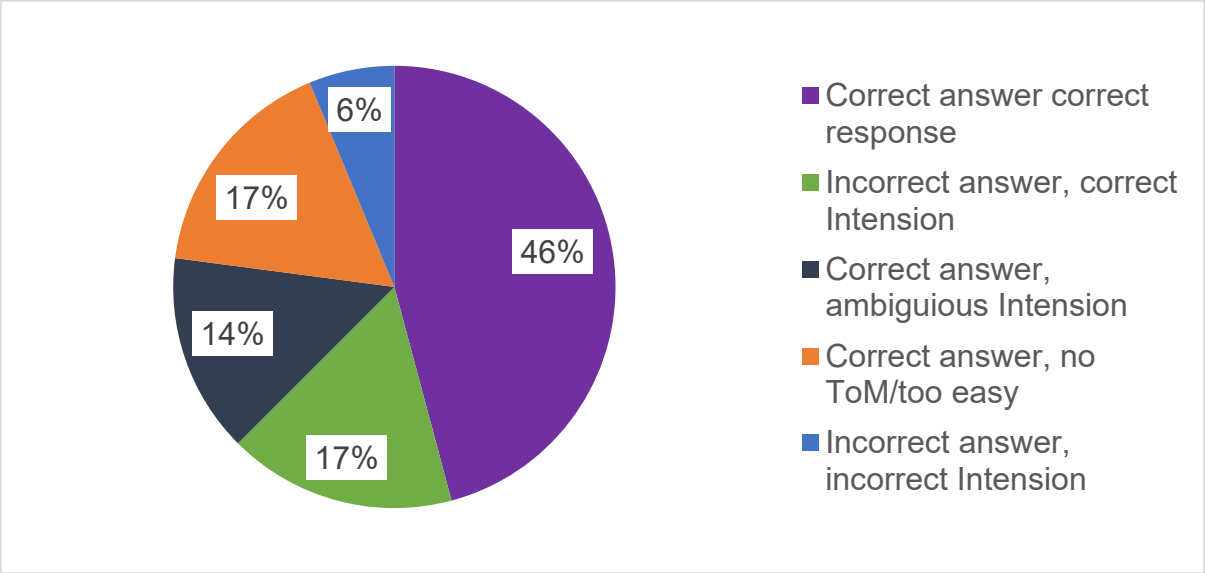


5.5.1. Game Chapter One

Displayed in Figure 3 is a pie chart of the percentage of answer responses per category in Chapter One. Within Theme One, "Correct application of ToM": 36% of the answer responses were perceived to be in the "Correct Answer, correct Intention" category and 12% were in the "Incorrect Answer, Correct Intension" category. Within Theme Two, "Incorrect or no application of ToM": 40% of the answer were perceived to be in "Correct answer, no ToM/too easy" category, 8% were in "Incorrect Answer, ambiguous intension" category and 4% of the answers were in "Incorrect Answer, incorrect Intension" category. The results suggest that there was a variety in methods taken by participants to answer the questions in this Chapter. The support this provides for the inclusion of a training Chapter will be explored in the discussion.

Figure 4.

Pie chart of percentage of answers responses per category in Game Chapter Two

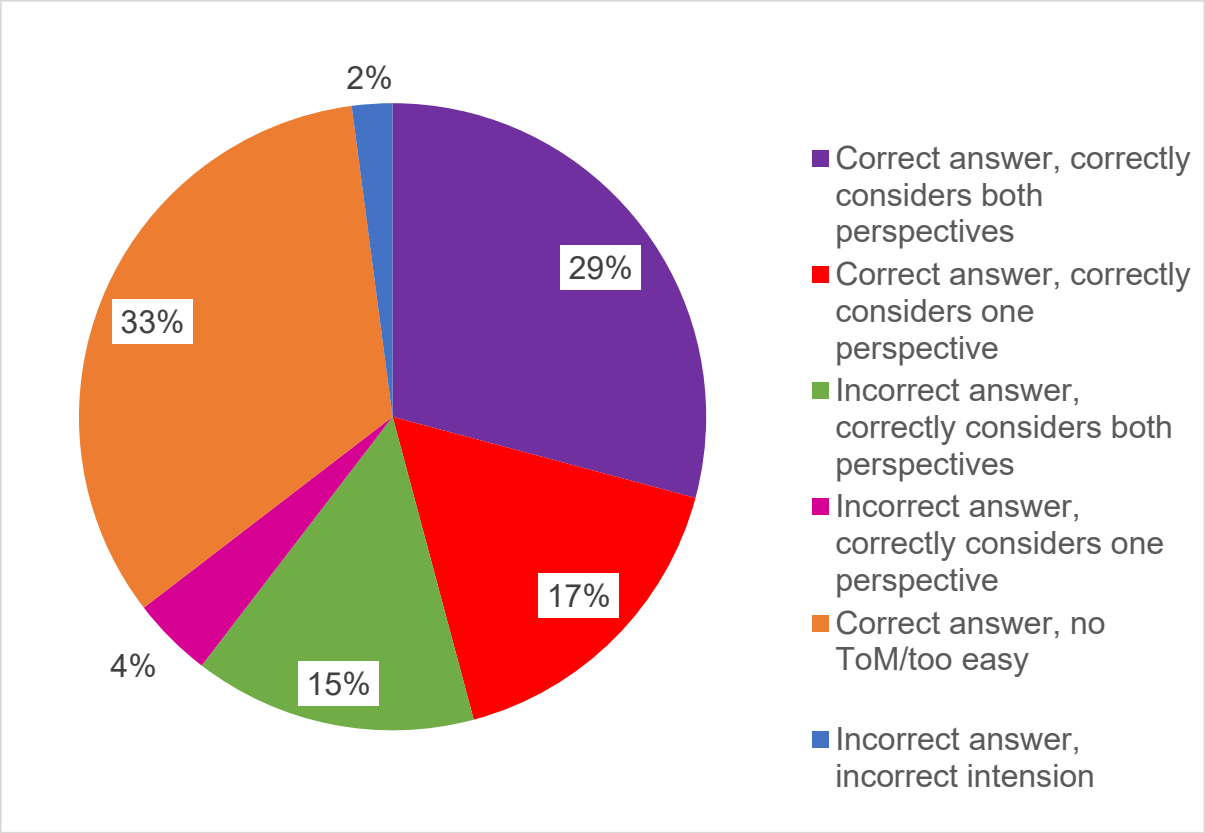


5.5.2. Game Chapter Two

Displayed in Figure 3 is a pie chart of the percentage of answer responses in each category in Chapter Two. Within Theme One, "Correct application of ToM": 46% of the answer responses were perceived to be in the "Correct Answer, correct Intention" category and 17% were in the "Incorrect Answer, Correct Intension" category. Within Theme Two, "Incorrect or no application of ToM": 17% of the answer responses were perceived to be in the "Correct answer, no ToM/too easy" category; 14% were in "Incorrect Answer, ambiguous intension" category and 6% of the answers were in "Incorrect Answer, incorrect Intension" category. The results suggest that there was a lot of variation in the methods given by the participants to how they responded to the questions. The reasoning for this will be explored in the discussion.

Figure 5.

Pie Chart of percentage of answers per category in Game Chapter Three



5.5.3. Game Chapter Three

Displayed in Figure 4 is a pie chart of the percentage of answer responses per category in Chapter Two. Within Theme One, "Correct application of ToM": 29% of the answer responses were perceived to be in the "Correct answer, considers both perspectives" category; 17% of the answers were perceived to be in the "Correct answer, correctly considers one perspective" category; 15% of the answers were perceived to be in the "Incorrect answer, correctly considers both perspectives" category and 4% of the responses were in the "incorrect answer, correctly considers one perspective" category. Within Theme Two, "Incorrect or no application of ToM": 33% of the answers were perceived to be in the "Correct answer, no ToM/too easy category and 2% of the answers were in the "Incorrect Answer, incorrect intension category". The results suggests that there was a lot of variation in the methods given by the participants to how they responded to the questions. The reasoning for this will be explored in the discussion.

CHAPTER 6: RESULTS 3

6.1 Thematic Analysis

This section continues to assess the face validity of TFG by using a co-production methodology to explore the participants' experience of playing the TFG. To do this, a Thematic Analysis (Braun & Clark, 2006) of participants' responses to the four post-test questions was conducted and a thematic 'map' was produced. Although the answers to each question were considered independently, themes across the questions were identified. Accordingly, the themes have been discussed in terms of *themes* and *subthemes*.

6.2. Overarching Themes

Four overarching themes appeared within the coded data across the four post-test questions. Within each theme there were two-three subthemes. Each overarching theme will be discussed and illustrated through the use of participant quotes. Table 10. displays the 'map' of the themes and subthemes that were perceived by the researcher.

Table 11.

Themes perceived in the coded data across Questions One to Four.

Theme	Subtheme
Engagement	Enjoyable and engaging
	TFG was more challenging
ToM Intervention	TFG encourages social perspective taking
	TFG could be adapted for use as an intervention
Ecological Validity	Mathematic processing of TFG answers
	Complexity of social nuances
Complexities of ASD experience	Sensory Differences
	Social Camouflaging
	Social Learning

6.2.1 Theme One: Engagement

The participants spoke about TFG being an engaging measure of ToM that challenged them more than the previously established measures of ToM.

6.2.1.1. Subtheme One: Enjoyable and stimulating

P01 “There were scenarios you had to really think about the other person's needs”

P03: “I think I would do it more easily if it was a questionnaire, it was way more difficult to combine both because there is more than one answer”

P05: “I liked it, it slightly stretched me more than my day to day. It makes me think of the responses we both would give”

6.2.1.2. Subtheme Two: TFG was challenging

P01: “TFH has more thought process involved […] you had to really think about the other person's needs. In the other one [SSQ] it was more about fact finding”

P03: “I found TFG more playful and less pressured [than SSQ]”

P05: “TFG was more interactive [than SSQ] as you are matching the roles of the two friends […] I found it enjoyable”

P01: “There were scenarios where you really had to think about the other person’s needs”

P04:” I found the stories and questions a lot easier, the facts were all there”

P05: “The Friendship Game was more challenging that Social Stories”

6.2.3. Theme Two: ToM Intervention

Participants expressed that TFG challenged them to consider more than their own perspective when selecting an answer response to the social scenarios. Participants also discussed ideas around TFG being adapted and used as an intervention to support individuals with ASD with social interaction difficulties.

6.2.3.1. Subtheme One: TFG encourages perspective taking

P01: “You would normally think about yourself first, then the other's personality second. So thinking about it more, raises awareness”

P04: “Whilst it was easier having it written down, in the real world I would struggle, I would probably just suggest what I would do”

P05: “It definitely makes you think more of the friend and what your own responses will be, rather than thinking about the most obvious answer- what your own thought would be”

P07: “Most of the time you are in your own little world. So thinking about other people’s needs puts that in to perspective”

6.2.3.2. Subtheme Two: TFG could be adapted for use as an intervention

P07: “I liked that it encourages a conversation and that you get to talk”

P04: “What would be helpful is to create an app. Then you have that to help you when making decisions of what to do “

P05: “ I wish me and my friends were on cards so I could be like 'see, you got my personality card wrong”

P06: “It would be interesting to play the game as somebody else, instead of myself”

6.2.4. Theme Three: Ecological Validity

Participants discussed how answering the questions in TFG could be achieved through using a formulaic process, rather than a ToM approach. They also reflected on challenges with social interaction being more complex and nuanced in everyday life than what was depicted in TFG.

6.2.4.1 Subtheme One: Mathematic processing of TFG answers

P02: “I thought of it like a math’s equation, which made it a lot easier”

P08: “ I found it difficult to stick within the boxes of my chosen traits”

P02: “the friendship game was more like algebra”

P08 : “I found it weird picking an answer based upon what I picked rather than what was instinctively my answer”

P06: “The thing I find difficult is not matching a card, but finding out what their personality is in the first place”

6.2.4.2. Subtheme Two: Complexity of Social Nuances

P03: “In different situations people are more one way than another [when decision making]. Some are more difficult [to decide upon] than others”

P07: “It's the nuances when things get tricky. It's also the external state of the person. E.g. In the 'dropped the wallet' example If upset she would have less compassion that day. It's really difficult to measure that”

P06: “It would be more nuanced in real life. For example, there definitely wouldn't be one right answer. It would depend on more than a few personality traits”

6.2.5. Theme Four: Complexities of ASD experience

Participants discussed their experiences of living with ASD, noting the particular challenges they experience with everyday social interaction. They also discussed the strategies they use to manage social interactions in daily life, such as observing and learning how individuals act in social environments and using social camouflaging techniques.

6.2.5.1 Subtheme One: Sensory Differences

P01: “I find that I do feel other people's emotions, but too strongly, it overwhelms me and I don't know what to do”

P08: “I think normal people can be so emotionally reactive that they can easily get upset. So being able to detach emotionally can be really helpful”

P02: “It is it hard for me to be in noisy group environments because I struggle to listen to what people are saying”

P07: “I understand nuances, I just don't like getting caught up in them”

6.2.5.2. Sub Theme Two: Social Camouflaging

P03: “I find it easier to go along with things [in real life] I say yes. I don't expect people to compromise, I do want other people want or not engage at all”

P08: “Quite often I act in the way I think the person might like to be treated rather than being able to think how they might want me to be”

P08: “I find that the people with Autism are sometimes more astute at picking our social emotions because of having to learn it to the point of overcompensating”

6.2.5.3. Sub Theme Three: Social Learning

P02: “ In real life you need to work out, what do you want and what can you offer. The personality traits would be more on a spectrum and they would dominate depending on the situation”

P02: “Everyone comes with a rule book. To some people it is instinctive, for people with Autism, they have to consult the rule book more regularly”

P07: “Having AS/HF ASD is like being in a submarine and having no computers. Everything is 100% manual”

P08: “As I got older I learnt how to act around others. “I think that social learning is a major factor in developing social awareness”

CHAPTER 7: DISCUSSION

The current study has developed a new measure of social cognition that addresses ToM in adults with a diagnosis of HF ASD. Building upon previous ToM research, TFG applies a game-like design to increase the engagement and complexity for use with adult and high-functioning presentations. The main findings of the research will be discussed throughout this chapter, including their clinical implications and limitations. There will be reference to previous research as well as the next steps required for the validation of TFG and the future development. Firstly, there will be a discussion of the individual case reviews. This will be followed by a discussion of the results of the content analysis and the implications this has for the scoring of TFG. Following this, the thematic analysis of the post-test questions will be considered in relation to the aims and objectives of the study.

7.1. Individuals Case Reviews

The individual case reviews informed the preliminary beta testing of TFG through providing an exploratory assessment of the validity of the new measure. The results of the cognitive tests, social cognitive tests and self-report measures will be discussed below.

7.1.1. Cognitive Measures

It was not observed that the participants' performances on TFG were associated with or could be explained by their performances on the tests of general cognition. For example, the participant who scored the lowest on TFG also performed in the "Average" or better ranges on the Cognitive tests. Whilst there was some indication that the participants' scores on the mood measures were sufficiently severe as to influence their test performances, it was not observed to affect their performances on the day of testing. Overall, the individual case reviews of the cognitive test data suggest that performance on TFG was not influenced by underlying cognitive difficulties, thus providing initial support of the independence of the measure (Prince et al., 2003).

7.2.2. Social Cognitive Measures

All participants' performances on the SSQ (Jolliffe & Baron-Cohen, 1999) scored in the "Average" range or above. These findings suggest that no participants had difficulty completing this measure, which is not in line with previous research findings with the HF ASD population (Pedreno et al., 2017; Scheeren et al., 2013; Zalla et al., 2009). On the WACS-AF, all but one participant performed in the "Average" range and above, which is not in line with previous research findings with the HF ASD population (Holdnack, Goldstein, & Drozdick, 2011). Overall, the participants' individual performances on the existing tests of social cognition only demonstrated minimal levels of impairment.

All participants' scores on the Cognitive Empathy subscale of the QCAE were in the "Average" range or below and six of the participants scored in the "Below range or below. This suggests that most of the participants have some difficult with cognitive empathy skills. In line with previous research (Rueda, Fernández-Berrocal, & Baron-Cohen, 2015), most participants scored higher on the Affective Empathy subscale; three participants scored in the 'Impaired" to "Below Normal" ranges, whilst five participants scored in the "Low Average" range and above. All participants had a diagnosis of ASD, five out of six of the participants showed significant difficulties with social skills, with a score in the 'Below Normal' or 'Impaired' ranges (Woodbury-Smith et al, 2005; Hurst, et al, 2007).

When exploring the convergent validity of TFG (Prince et al., 2003), the results on the existing social cognitive tests suggest that there would be no difference in performance on TFG in comparison to matched typically developing controls. However, most of the participants' individual scores on the QCAE evidence "Below Normal" scores in Cognitive Empathy. Overall the majority participants' self-reported difficulties were relatively mild in comparison to the wider ASD population, however, the relative strengths and difficulties from the sub-tests are in keeping with the ASD diagnostic criteria (APA, 2015). Accordingly, this offers some evidence to suggest that errors made in TFG could still be explained by a deficit in social cognition. If this were the case, it would suggest that the design of

TFG is more challenging for adults with HF ASD presentations, in comparison to existing measures of social cognition.

7.2.3. Education and Mood

All but two of the participants completed between three and ten years of further education, which is above average for the general population (National Master, 2020). The results indicate that most of the participants are representative of the very high functioning end of the ASD spectrum in regards to intellectual abilities and independence. However, this did not appear to impact upon their Cognitive test performance. Similarly, this does not minimise the impact on participant's ASD symptoms upon their everyday lives (Mazurek, 2014; Trembath, Germano, Johanson, & Dissanayake, 2012). For example, six out of the eight participants scored moderate to moderately severe levels of anxiety and/or depression on the GAD-7 and PHQ-9. As noted earlier, mood has a bi-directional interaction with ASD symptoms, which in turn impacts upon their severity. As such, caution should be applied to the interpretation of the results.

7.3. Content Analysis

The participants' individual performances on the TFG varied, with participants making between one and eleven errors. Some participants made more errors when considering 'Ashley's' perspective, others more when considering their own perspective. This finding is in line with previous Autism research indicating that individuals with ASD have difficulty theorising about their own mind as well as that of others (David et al., 2010; Mitchell & O'Keefe, 2008). The content analysis informed the preliminary beta testing stage of TFG through reviewing the content and face validity of the participants' verbal answer responses. It also continued to assess the feasibility of the measure through reviewing the test items for floor and ceiling effects. The following section will discuss the key findings from each chapter of TFG.

7.3.1. Game Chapter One

The objective of Chapter One was to familiarise the participants with how to give an answer response that was in line with their own or 'Ashley's' personality trait.

The results from the content analysis revealed that the greatest proportion of answer responses were in the ‘no ToM/Too easy’ category or the ‘correct answer correct response’ category. These findings indicate that most participants understood how to give the correct response by the end of the chapter. Frequent responses falling into the categories: ‘Incorrect Answer, Correct Intention’, ‘Correct Answer, ambiguous intention’ and ‘Incorrect answer, incorrect intention’, also provide evidence for there being some difficulty experienced by the participants during this chapter, suggesting that this chapter was not limited by floor or ceiling effects.

7.3.2. Game Chapter Two

The objective of Chapter Two was to see whether the participant could theorise about their own mind and that of ‘Ashley’s’ in order to select an answer response that is in line with their own or ‘Ashley’s’ personality trait. The largest proportion of answers were in the ‘correct answer and correct response’ category. This supports the construct validity (Prince et al., 2003) of the measure through demonstrating evidence of TFG requiring ToM skills to reach a decision. However, this also provides further evidence against the ToM model of ASD, through confirming that adults with a diagnosis of HF ASD can theorise about their own mind and that of Ashley’s (in line with Happé’s early criticisms of the false-belief tests).

A large minority of the participants’ responses were items in the ‘incorrect answer, correct intention category’. This suggests that questions in Chapter Two may give rise to some false negatives. There are a number of potential explanations for why this may have happened. For example, there may have been a flaw in the wording of the answer responses leading to there not being a clear enough differentiation between the personality traits. Another explanation may be that some participants are able to apply ToM skills when explicitly asked to explain their thinking, but make more errors when providing more spontaneous, implicit answers using the game’s ‘A’, ‘B’,’C’ or ‘D’ counters. This explanation is in line with previous research suggesting that individuals with ASD make more implicit ToM errors than explicit ToM errors (Schneider et al., 2013;

Schuwerk et al., 2015; Senju et al., 2009; Sommer et al., 2018; Torralva et al., 2013).

Seventeen percent of the answer responses were in the category ‘Correct Answer, too easy, no ToM’. This suggests that the questions in Chapter Two may have also given rise to false positives (Prince et al., 2003). Some participants may have adopted a systematic method of matching the language in the answer responses to the personality traits, as opposed to theorising about their own mind or that of another. This approach to answering the question is supported by Hermalin and O’Conner’s (1985) research suggesting that individuals with Autism overcome difficulties in processing emotions through using a cognitive or ‘logico-affective’ approach, rather than being guided by their emotions or employing a auto-affective approach. This approach to answering may have inadvertently been reinforced by the use of the trait prompts in Chapter One; participants may have learnt to match language as opposed to theorise about their interpersonal responses to the situation.

There being frequent responses coded under the categories: ‘Correct Answer, ambiguous intention’ and ‘Incorrect answer, incorrect intention’, also provide evidence for there being some difficulty experienced by the participants with the application of ToM during this chapter.

7.3.3. Game Chapter Three

The objective of Chapter Three was to see whether the participants could consider both their own and ‘Ashley’s’ personality traits in order to reach a compromise on an answer response to a social scenario. In this chapter, the largest percentages of answers were in the ‘correct answer, no ToM/too easy’ category. Similar to Chapter Two, there are number of explanations for why this might have been; such as participants adopting a logico-affective method of responding as opposed to an auto-affective method (Hermelin & O’Connor, 1985). Fifteen percent of the answers also belonged to the ‘Incorrect answer, correct application of ToM’ category. Similar to Chapter Two there are a number of explanations for why this might have been. For example, participants may make more errors when answering questions using a spontaneous and implicit

response as opposed to a more carefully reasoned, explicit response (Schneider et al., 2013; Schuwerk et al., 2015; Senju et al., 2009; Sommer et al., 2018; Torralva et al., 2013).

Seventeen percent of the answers were in the category ‘correct answer, but only considering one perspective’. The quotes allocated to this category suggest that some participants felt more comfortable choosing an answer based upon what they would do in that situation, rather than also considering how ‘Ashley’ would act. This provides evidence that theorising about more than their own perspective simultaneously was too challenging for a number of participants, consistent with a ToM model of ASD, and in line with the ASD feature of demonstrating difficulties in social-emotional reciprocity and adjusting behaviour to suit different social situations (American Psychiatric Association, 2013). Other participants gave answers that only considered ‘Ashley’s’ perspective, without also reflecting on what would make them happy. This pattern of responding suggests some participants are not aware of, or ignored their own needs in order to fit in with what others would like to do. This is in line with research demonstrating that individuals with ASD socially camouflage to meet the demands and complexity of social interaction (Dean et al., 2017).

7.3 Thematic Analysis

The themes identified from the analysis will inform the beta testing of TFG by extending the exploration of the face and content validity. In particular, addressing the objective of developing an ecologically valid and engaging measure of ToM, that is challenging enough for an adult HF ASD population. The themed responses also provide a preliminary indicator of TFG’s predictive validity, through considering how the participants’ experience of playing the TFG compares to their real life experiences of establishing new friendships. As previously discussed, the development and testing of TFG has been informed by a co-production approach (Gibbons et al., 1994). Accordingly, the participants’ responses to TFG are valued as a key contribution to the future shaping and development of TFG.

7.3.1. Theme One: Engagement

The responses suggest that TFG was received by many of the participants as being an engaging measure of ToM that prompted them to consider their own and Ashley's perspectives when deciding upon an answer. It was also noted that many of the participants considered TFG to be more challenging than the other measures of social cognition used in the study. This suggests that TFG may have addressed some criticisms of ToM measures; that individuals with HF ASD could pass these tests and thus were not challenging or engaging enough (Curry & Jones-Chesters, 2012; Green et al., 2000).

7.3.2. Theme Two: ToM Intervention

The quotes within this theme suggest that TFG may be a useful tool to promote social skills for adults with HF ASD who experience trouble with interpersonal interaction and communication. For example, a number of participants expressed that the personality traits and the selection of answer responses helped to scaffold their thinking around including both their own and 'Ashley's' perspective when selecting an answer. This is in line with Senju et al.'s (2009) study, which found the participant's implicit ToM performance improved when a pre-test learning condition was added. It also shows support for TFG's use of a game-like design, due to its ability to offer psychoeducation about ToM and how it relates to everyday social scenarios (Higgins et al., 1982; Mehta et al., 1994a, 1994b). One participant stated that the design of TFG helped to prompt a discussion, which in turn helped them to identify the ToM aspects of the TFG that they found challenging. This suggests that using an intervention tool, with a similar design to TFG, may help to scaffold social skills training (Sanders & Welk, 2005; Vygotsky, 1967). If effective, this may have significant impact, including for example, reducing loneliness (Mazurek, 2014) and unemployment (Krieger, Kinebanian, Prodinger, & Heigl, 2012; The National Autistic Society, 2019) in the adult HD ASD population.

A number of participants also suggested ideas for how TFG could be adapted into a tool for support with social skills. For example, one participant suggested that TFG could be developed into an app for a PC or Mobile Phone. This in turn could support adults with HF ASD to recognise other people's personality traits,

with the goal of making social interaction more predictable. Another participant suggested that TFG could be adapted to support the communication in already established relationships. For example, instead of playing themselves, they could play someone they knew. As an intervention, this could help two people to identify why they theorise about decisions in separate ways, which in turn could help them to reach a compromise on a difficult decision in everyday life.

7.3.3. Theme Three: Ecological Validity

Many of the participants' vocalised that their experience of social interaction and building new friendships is a lot more complex in real life than in the scenarios depicted in TFG. Some participants felt that answering the questions in TFG could be approached in a similar way to completing an algebra problem. These reflections suggest that participants may have been answering the questions using a logico-affective approach (Hermelin & O'Connor, 1985), which might explain why many participants gave simple, formulaic answers, as opposed to reasoning emotionally about why a decision was made. A number of participants also reflected that it was difficult to make decisions based upon just one of their selected personality traits. They explained that every day decisions are based upon more than one personality trait and are complicated further by elements such as mood and social setting.

Whilst the game-like structure of TFG strived to improve the real-life applicability of TFG (through incorporating a dynamic interaction with the researcher) the ecological validity of TFG was restricted through the need to standardise the testing conditions across participants and settings (Prince et al., 2003). Nonetheless, it is important to consider how elements of the game could be adapted to include more social interaction variants. For example, future adaptions of TFG may include chapters with additional personality and mood variants in order to increase the degree of social nuance.

7.3.4. Theme Four: Complexities of ASD Experience

The answer responses within this theme reflected the participants' experience of living with HF ASD and explored some of their personal challenges with social interaction and communication. Some participants stated that their social

interaction difficulties are further complicated by sensory difficulties, such as feeling sensitive to noise or experiencing physical sensations to other people's emotions. These reflections suggest that a full understanding of ASD encompass a wider set of issues than ToM.

Participants reported that they needed to spend a lot of time observing and learning how to interact socially. One person expressed that social interaction was instinctive to typically developing people, but individuals with ASD need to spend years learning how to socially interact via trial and error. This coheres with the point made earlier that offering a pre-test learning condition on implicit ToM tests can improve ToM performance in adults with HF ASD (Senju et al., 2009). Participants described this experience as being similar to needing to regularly consult a manual. This reflection suggests that some participants in the study feel more socially confident where social interactions are more familiar and predictable (For example: long-term relationships or long-term employment).

A number of participants expressed that they often go along with what others say, or otherwise feel as if they are over-compensating, which is in line with social camouflaging research (Dean et al., 2017). This was also noted when some participants only considered 'Ashley's' perspective and overlooked their own position when making a collective decision in the Game Chapter Three.

7.4. Methodological Limitations

The methodology of the current study was limited by a number of factors that have been discussed throughout the thesis. Most prominently, the conclusions that could be drawn from the preliminary alpha and beta testing were limited by a small sample size and not including a matched typically developing control sample.

All participants were recruited via online social media platforms and word of mouth. Recruiting participants via these methods increases the likelihood of sampling bias (Prince et al., 2003) through only recruiting participants who were willing to participate. This may also provide an explanation for why all but one of

the participants scored in the ‘borderline’ severity range on the AQ measure (Woodbury-Smith, 2005), and why the majority of the participants had an above UK average number of years in education (National Master, 2020). In turn, this may have resulted in the participants gaining a higher score on the measures of social cognition and TFG in comparison to the wider HF ASD population. Furthermore, it may have also impacted upon the verbal responses given in TFG. The current study was also limited through not taking account of the age of diagnosis and/or prior interventions. Taking note of these items would have provided further information regarding the individual severity of the ASD presentation.

The qualitative methods used in this study offer new insights into how the ToM model of ASD relates to difficulties in social interaction and communication for the participants in this study. However, the qualitative methodology has been criticised for its lack of rigor in assessing its validity in comparison to quantitative methods (Yardley, 2000). In response to this, Yardley (2000) set out criteria by which qualitative researchers can assess the validity of their research.

The first criteria is *sensitivity to context*. Part of this process was being aware of how the theories underpinning the feedback process may influence the researchers’ interpretation of the participants reflections; for example, the ToM model of ASD. Another part of this process was the importance of the researchers’ reflexivity about the surrounding social context. For example, the researcher acknowledging their presence as a ‘neurotypical’ and how this might be experienced by an individual with a diagnosis of HF ASD. A further consideration and potential limitation of the study was the shift in power dynamic from the researcher adopting an ‘expert’ position when conducting the Cognitive and Social Cognitive tests, to adopting a ‘neutral’ position when exploring their feedback afterwards. The reseracher used a diary to support their sensitivity to context, an excerpt can be found in Appendix 14.

The second criteria is *Commitment and Rigour.* This describes the extent to which the research underwent a thorough and meticulous process of data analysis. One potential limitation of this process was the use of documenting the

participants' feedback by hand. This method was chosen in order to minimise the already quite lengthy testing process. Whilst the responses were short enough for this to be achieved, it may have given rise to transcribing errors which would have been avoided if their feedback was electronically recorded. In addition to this, the relatively small participant number limited amont of the data available for analysis and reflective interpretation. However, the analysis of the reserach underwent several processes of contemplation before the final themes were agreed upon. There was also a process of triangulation whereby the academic supervisior independently reviewed the quotes to agree upon the final selection of themes.

The third criteria is *Coherence and Transparency.* This is the extent to which the story told from the data adequately reflects the participants' experience of playing TFG and thus convinces the reader of its success and key areas for improvement. The criteria is also line with the underlying philosophical positioning (please see theoretical limitations for a discussion). The transparency of the study also referes to the the extent to which the reseracher adopted a reflexive approach to considering the influences and motivations for conducting the research, as well as the external pressures that influenced the study. An exerpt of the reserachers personal reflections can be found in Appendix 15.

The forth criteria is *Impact and Importance*. As discussed above, and within the next section on the 'future developments', the participant feedback was a highly valued and core part of the TFG's development. Their reflections also reached beyond the TFG's development to consider how a measure of ToM only reflects a limited aspect of the HF ASD experience. Their views also offered a core ethical critique of the value placed on developing a somewhat reductive measure of their experience rather than focusing on the development of tools and interventions to support individuals with HF ASD. These reflections also highlight the limits of conducting research within the confines of a doctoral thesis, in that time and resource restrictions limit the ambitions of the research.

7.5. Theoretical Limitations

As discussed earlier, this approach taken to develop and validate TFG is consistent with the underlying critical realist philosophical position (Lopez & Potter, 2005). This has firstly been achieved through acknowledging that ToM exists as a measurable construct, and developing and validating a new tool that seeks to measure it. It also acknowledges that ToM is a recent and contested construct and is, therefore, limited by bias and subjectivity. The qualitative analysis therefore helped to interrogate and contextualise the notion of ToM. The co-production approach (Gibbons et al., 1994) also helped to ensure the design of the new measure is shaped by and relevent to adults with HF ASD. Whilst adults with HF ASD's feedback helped to inform the design throughout, the extent to which TFG was 'co-produced' was limited by the researcher making the ultimate decisions (Filipe, Renedo, & Marston, 2017).

Although the ToM model of ASD has received mixed findings over the past decades, it dominates the ASD research field. Choosing to develop the TFG based upon the ToM construct creates a problem of circularity; that the more a construct is researched, the more evidence is produced in support of it, which in turn makes it more likely for the study findings to be replicated. Adding to this challenge is the problem of validation. As discussed earlier, establishing the convergent validity of a measure is achieved through comparing it with a 'gold standard' measure (Prince et al., 2003). Due to ToM tests such as SSQ, RMET and FPT being the most researched measures of social cognition in the adult HF ASD population, they are frequently used to assess the convergent validity of new measures. This subsequently makes it difficult for newly developed and less established tests of social cognition to exert an influence on the literature (Everett & Earp, 2015; Schmidt & Oh, 2016; Shrout & Rodgers, 2018), which then decreases the likelihood of the study reaching 'gold standard' status.

7.6. Future Research Directions

In line with the Prince et al., (2003) guidelines, the next stage of instrument testing would require the recruitment of fifty to 100 participants. The data would then be used to assess the test-retest reliability, ceiling and floor effects and internal scale consistency of TFG. After any further changes to the TFG were

made, a different sample of participants would be recruited to inform the next stage of test development. The same comparison studies would be used in the main beta testing of TFG to assess the criterion and concurrent validity of TFG. Correlational analyses of the results would then generate information about TFG's validity coefficients, sensitivity, specificity, and positive and negative predictive value. During this process, the internal consistency of TFG would be re-examined and a factor analysis would be conducted to see whether the individual questions and chapters of TFG measure the same underlying ToM construct.

The ability of TFG to measure ToM ability would then be assessed through comparing the performances of the adult HF ASD group with a matched typically developing control group. A power analysis would be conducted to inform the number of participants required to perform a parametric statistical analyses (Field, 2013). A large and reliable difference found between the two groups would therefore offer support for the ToM instrument. The predictive validity of the measure would also be assessed. This might be achieved through observing whether TFG could predict self-reported ToM errors in everyday social interaction of the adult HF ASD participants. Finally, external investigators who are not part of TFG development team would independently assess the content validity of TFG before it could be considered a fully validated measure of ToM.

Once (and if) validated, it would be important to test the TFG using a varied participant sample, for example, with adult HF ASD participants from a non-western culture. The social scenarios depicted in TFG are likely limited by being developed from a western perspective and seeking to measure the ToM construct, which has been largely researched within a western context (Joseph, Reddy, & Searle-Chatterjee, 1990; Liu, Wellman, Tardif, & Sabbagh, 2008). Subsequently, the scenarios may need to be adapted for use in different cultures, to reflect the different cross-cultural nuances in ToM and social interaction (Liu et al., 2008). It would also be important to test the TFG on alternative clinical populations who have acquired brain injuries and thus present with impairments in social interaction and communication abilities (Henry, Phillips, Crawford, Ietswaart, & Summers, 2006; Lezak et al., 2004). Comparing ToM performances

to a different clinical population would help infer whether the test was predictive of a specific ASD related ToM deficit, or whether it measures ToM difficulties across different clinical presentations.

One of the objectives of the TFG development and testing was also to gain information regarding its use as a social intervention. It was important that ideas for this were generated via a co-production approach. As highlighted in the thematic analysis, a number of participants believed that TFG has the potential to support adults with HF ASD with social interaction skills. It will be useful for future developments of TFG to also explore its potential as an intervention. For example, through developing a mobile app to help practice social skills with different personalities in different social settings that offers constructive feedback. This approach may also provide more flexibility for age and cultural differences within the HS adult ASD population.

7.7. Conclusion

This study introduced a framework of how to conduct an exploratory validation study, which draws upon a co-production approach, to shape and inform the development of a new measure of ToM. The research findings give initial support for the content, construct and predictive validity of TFG. Participant feedback also indicates that the game-like design of TFG was engaging and more complex than previous measures of social cognition. TFG encouraged participants to reflect upon their personal difficulties with social interaction and communication, thus demonstrating the measure's potential as a social intervention. However, despite the early successes of the research, it was limited by a number of methodological and theoretical considerations. The ambition for the next steps of this research will be to disseminate the study findings through a publication and conference presentations. On a smaller level, the thesis will be shared with the participants of the study with the opportunity for them to feedback their reflections. It is hoped is that this bottom-up process of dissemination will also lead to further presentation opportunities.

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Appendix 1: Final Version of The Friendship Game

The Friendship Game

1. Overview and Personality Cards

Place the card decks and personality chart before examinee.
SAY: *"We will now be playing a game. It is about new friendships. The aim of the game is to earn as many friendship points as you can. For the purpose of this game, I will be playing as a character called 'Ashley' and you will be playing yourself* ['participant name']. *You will be trying to develop a friendship with Ashley. To earn friendship points, you will be answering questions about what you or Ashley would do in certain situations. The questions are written on the cards in front of you. The better choices you make, the faster you will make friends, and the more friendship points you will earn."*

"Your character [participant name] *will be based on your personality. By personality, we mean the way we approach the world, deal with other people, and feel about ourselves. I will make up a personality for Ashley. To start then, you must select three personality traits, from the choices I will give you, that you feel best describe you. After you have selected your traits, I will select the traits that best describe Ashley."*

1.1. Set A Present first set of cards**: Sincere A1; Sceptical A2; Disciplined A3; Relaxed A4**
SAY: *"Let's begin. Which **one** of these do you feel best describes you and your personality? If you have any questions about what the words mean, just ask me."*

Allow examinee time to review options and make their selection. When ready
SAY: *"That's great. I will place the card here* [place card in front of examinee] *so that you remember it."*

Consult Table below and identify corresponding trait for Ashley character. Pick up trait card and show to examinee. SAY: *"I would say that this card best describes Ashley."* Place card in front of examiner.

1.2. Set B Present next set of cards: **Sensitive B1; Strict B2; Curious B3; Pragmatic B4**
SAY: *"Which **one** of these do you feel best describes you and your personality? Ask me if you have any questions about the words."*

Allow examinee time to review options and make their selection. When ready
SAY: *"That's great. I will place the card here* [place card next to other card] *so that you remember it."*

Consult Table and identify corresponding trait for Ashley character. Pick up trait card and show to examinee.
SAY: *"I would say that this card best describes Ashley."* [Place card in front of examiner.]

1.3. Set C Present next set of cards**: Extroverted C1; Introverted C2; Gentle C3; Autonomous C4**
SAY: *"Now, which **one** of these do you feel best describes you and your personality? Ask me if you have any questions about the words."*

Allow examinee time to review options and make their selection. When ready
SAY: *"That's great. I will place the card here* [place card next to other cards] *so that you remember it."*

Consult Table and identify corresponding trait for Ashley character. Pick up trait card and show to examinee.
SAY: *"I would say that this card best describes Ashley."* [Place card in front of examiner.]

Table: Corresponding Personality Traits

Set A	**Set B**	**Set C**
If [participant] = A1, Ashley = A1	If [participant] = B1, Ashley = B3	If [participant] = C1, Ashley = C4
If [participant] = A2, Ashley = A2	If [participant] = B2, Ashley = B4	If [participant] = C2, Ashley = C3
If [participant] = A3, Ashley = A3	If [participant] = B3, Ashley = B1	If [participant] = C3, Ashley = C2
If [participant] = A4, Ashley = A4	If [participant] = B4, Ashley = B2	If [participant] = C4, Ashley = C1

2. Training & Chapter 1

SAY: *"So, you have now set out your personality and I have described Ashley's personality. You must make choices that will suit your personality and fit well with Ashley's personality. Let's start the game by practicing doing this. The friendship game will go through three Chapters. In this first Chapter 1, you and Ashley will get to know one another by asking and answering some questions. Try to make sure that your answers match the personality traits you selected, as this will help you and Ashley get to know one another. Let's begin."*

2.1. Present Card 1 and SAY: *"Here is the first situation. This is about what **Ashley** would do, based on their personality. You say to Ashley: 'Ashley, it must be your birthday soon, how are you planning to celebrate it?'*

Now, look at these options [point to response options and allow examinee a few moments to read].
So, based on Ashley's Set A personality traits [point to personality cards set out in front of examiner], *which **one** of these answers A, B, C, or D do you think Ashley would give?"*
A Sceptical: I doubt anyone will want to do anything; it is just another birthday.
B Disciplined: I need to save money to go on a holiday, so I will have nice a dinner at home.
C Sincere: I will host a small gathering and tell people in advance so they can come if they like.
D Relaxed: I do not mind; I'll sort it out nearer the time.

Once recorded, note whether correct. A correct response will correspond to the selected Set A trait.

- If correct SAY: *"Great; yes, as Ashley is* [name the personality trait] *this is their most likely response."*
- If incorrect (any other option chosen) SAY: *"That's not quite right. As Ashley is* [name the personality trait] *this* [point to response on card corresponding to that personality trait] *is their most likely response in this situation. Do you see?"* Repeat instructions above and provide further direction as necessary.

2.2. Present Card 2 and SAY: *"Here is the next situation. This is about what **you** would do, based on your personality. Ashley says to you 'I was thinking about getting a Tattoo with my friend's name on it. Do you think I should go for it?'*

Now look at these options [point to response options and allow examinee a few moments to read].
So, based on your Set B personality trait [point to personality cards set out in front of examinee], *which **one** of these answers A, B, C or D should you give?"*
A Sensitive: What a lovely idea, how thoughtful.
B Strict: I am not sure whether I would forgive you if you get a tattoo.
C Curious: How interesting! How big will it be?

D Pragmatic: Be careful that you don't regret it; maybe you should draw it on your arm first?

Once recorded, note whether correct. A correct response will correspond to the selected Set B trait.

- If correct SAY: *"Great; yes, as you say you are* [name trait] *this is the best thing for you to do."*
- If incorrect (any other option chosen) SAY: *"That's not quite right. As you say you are* [name trait] *this* [point to response on card corresponding to that personality trait] *is the answer that suit you best in this situation. Do you see?"* Repeat instructions above and provide further direction as necessary.

2.3. Present Card 3 and SAY: *"Here is the next situation. This one is about what **Ashley** would do. You say to Ashley: 'Ashley, what's your idea of a perfect Friday night?'*

Look at the options and tell me, based on Ashley's Set C personality trait [point to personality cards set out in front of examiner]*, which one of these answers do you think Ashley would give?"*

A Extroversion: I like getting in touch with lots of people and socialising into the night!

B Introversion: I prefer to have a quiet night in.

C Gentle: I see what other people would like to do and we agree a plan together.

D Autonomous: I prefer to do something on my own, in my own time.

Once recorded, note whether correct. A correct response will correspond to the selected Set A trait.

- If correct SAY: *"Great; yes, as Ashley is* [name the personality trait] *this is their most likely response."*
- If incorrect (any other option chosen) SAY: *"That's not quite right. As Ashley is* [name the personality trait] *this* [point to response on card corresponding to that personality trait] *is their most likely response in this situation. Do you see?"* Repeat instructions above and provide further direction as necessary.

3. Chapter 2

SAY: *"Good. So, we have learned a bit about how the game works; about Ashley's personality, and how to give answers that will reflect your own personality. Let's go on to Chapter 2. In Chapter 2, you and Ashley will be putting your friendship to the test. You will be presented with a number of situations, to respond to, based on your own personality. And in these situations, you will need to demonstrate your knowledge of Ashley's personality. Ready? Let's begin."*

3.1. Present Card 4 and SAY: *"Here is the first situation. This one is about what **you** would do. Ashley says to you:* '*I need to go to a bank meeting to organise my finances; how prepared do you think I should I be?'*

Ashley, now knowing a bit about your personality will now guess what you are going to do'

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based on your Set A personality trait* [point to personality cards]*, which of these answers should you give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Disciplined: Let's plan a time to meet and organise what forms to bring.
B Relaxed: Take it easy! Just show up, I'm sure it'll be fine.
C Sceptical: I wouldn't trust banks if I were you.
D Sincere: To be honest, I think you should contact the bank to see what they recommend.

I will play for Ashley, and will have a guess on what you will do based upon your Set A personality trait." Place an answer counter in position.

When ready SAY*: "Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."*

SAY: *"Why did you think answer X was in line with your set A personality trait?"*

3.2. Present Card 5 and SAY: *"This one is about what **Ashley** would do. You say to Ashley: 'If you saw a person fall over and hurt themselves when leaving here today, what would you do?'*

Based on Ashley's Set B personality trait [point to personality cards]*, which one of these answers A, B, C or D do you think that Ashley would give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Sensitive: I would be concerned that they are OK; and worry that I wouldn't be able to help them.
B Strict: I am on a strict schedule, so I would need head straight home.
C Curious: I would wonder what had happened and try to find something to create a bandage.
D Pragmatic: I would first check for danger, then follow safety procedures to see if they were ok.

I will play for Ashley. Which answer does Ashley give based upon their Set B personality trait?"
Place an answer counter in position.

When ready SAY*: "Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."*

"Why did you think answer X was in line with Ashley's set B personality trait?"

3.3. Present Card 6 and SAY: *"This one is about what **you** would do. Ashley says to you: 'I need to buy some new clothes, where do you recommend I go?'*

Ashley, now knowing a bit about your personality will now guess what you are going to do'

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based on your Set C personality trait* [point to personality cards]*, which of these answers should you give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Introverted: I recommend you shop online; you avoid the crowds and enjoy the quiet of home.
B Extroverted: Go to a big shopping mall where you can socialise and enjoy the hustle and bustle!
C Gentle: Where do you normally like to shop? That way I can think about what you would like.
D Autonomous: You should go to a department store alone, that way you can take as long as you like.

I will play for Ashley, and will have a guess on what you will do based upon your Set C personality trait." Place an answer counter in position.

When ready SAY*: "Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."*

SAY: "Why did you think answer X was in line with your set C personality trait?"

3.4. Present Card 7 and SAY: *"This one is about what **Ashley** would do. You say to Ashley: 'Ashley, I really want to get in shape, but I don't think I can afford the gym. Do you have any ideas of what else I could do?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based on Ashley's Set A personality trait* [point to personality cards]*, which of these answers A, B , C, or D would Ashley give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Sincere: To be fair, it is important to be healthy; can you do exercises at home instead?
B Sceptical: I don't believe in this media hype about needing to take care of your health.
C Disciplined: You should get up before work and jog three times a week for at least 40 minutes.
D Relaxed: Don't worry about getting in shape, you only live once!

I will play for Ashley. Which answer would Ashley give based upon their Set A personality trait?"
Place an answer counter in position.

When ready SAY*: "Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."*

SAY: "Why did you think answer X was in line with Ashley's set A personality trait?"

3.5. Present Card 8 and SAY: *"This one is about what **you** would do. Ashley says to you: '[participant name], I think I might need to cancel my plans with a friend I am seeing later, because I don't want to drink alcohol.*

Ashley, now knowing a bit about your personality will now guess what you are going to do'

Based on your Set B personality trait [point to personality cards]*, which one of these answers should you give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Sensitive: I can understand why you don't want to go, there is a lot of pressure to drink these days.
B Strict: If they are making you drink, when you do not want to, do not be friends with them.

C Curious: What's the worst that could happen? Go out and see if you could have some fun!
D Pragmatic: Why don't you suggest some non-drinking things you could do with your friend instead?

I will play for Ashley, and will have a guess on what you will do based upon your Set B personality trait." Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think answer X was in line with your set B personality trait?"

3.6. Present Card 9 and SAY: *"This one is about what **Ashley** would do. You say to Ashley: 'I have some free tickets to this horror film – would you like to see it with me?'*

Look at these options [point to response options and allow a few moments to read] *and tell me, based on Ashley's Set C personality trait* [point to personality cards]*, which of these answers would Ashley give?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Extroverted: Sure! And shall we see who else is free to join us?
B Introverted: I would prefer to wait until it is out on DVD, that way we can stop it if it gets too intense
C Gentle: That's really kind, thank you. But is it ok with you if I leave if I get too scared?
D Autonomous: Thank you, but I would rather pay to see this other film, and then meet you afterward?

I will play for Ashley. Which answer would Ashley give based upon their Set C personality trait?"
Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think answer X was in line with Ashley's set C personality trait?"

4. Chapter 3

SAY: *"Now, in Chapter 3, you will be presented with situations in which you and Ashley will need to make decisions together. You will play for yourself, and I will play for Ashley.*
Ready? Let's begin."

4.1. Present Card 10 and SAY*: "Ashley says to you: 'It looks like someone has dropped a wallet on the floor, what should we do about it?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's A and B personality traits, which of these answers would both make you happy?*

When you have made your decision, please place counter A, B, C or D on the table face down"

A Sincere and Disciplined: We need do the honest thing and hand it in immediately to the police, let me organise a route that we can take.
B Sceptical and Relaxed: If they were clumsy enough to drop it, I doubt they will go to the effort of contacting the police. If they come back to look, they will find it.
C Sensitive and Pragmatic: Oh no, how horrible! They must be so worried! Let's leave a note here to say that we have taken it to the nearest police station.
D Strict and Curious: How careless! What sort of person just drops a wallet? Let's check to see if there are any contact details inside.

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think answer X would make you and Ashley happy?"

4.2. Present Card 11 and SAY*: "You say to Ashley: 'A lot of people seem to be having fun over there and don't seem to mind random people joining in. Should we crash the party?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's A and B personality traits, which response would both make you happy?*

When you have made your decision, please place counter A, B, C or D on the table face down"

A Extroverted and Autonomous: Yeah, let's party! How about one of us goes over on our own first to see if it is worth joining?

B Sincere and Relaxed: We should probably ask if we can join, we can then take it easy for the rest of the night.
C Introverted and Gentle: Wouldn't it be more fun to spend time together? But, I'm happy to do my own thing if you would rather go?
D Sceptical and Disciplined: No way. We wouldn't be welcome! I'd rather we wait to go to a party that we'd been invited to attend.

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think answer X would make you and Ashley happy?"

4.3. Present Card 12 and SAY*: "Ashley says to you: 'There are lots of activities on around here this weekend. Shall we do something?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's B and C personality traits, which of these answers would both make you happy?*

When you have made your decision, please place counter A, B, C or D on the table face down"

A Sensitive and Curious: That's so kind of you to ask. I think I would like to do something I have never tried before.
B Strict and Pragmatic: Possibly: I could see what's available, we can then both look at some of the options before deciding.
C Extroverted and Autonomous: Great - I am planning to join a new sports club at the weekend, would you like to come along too?
D Introverted and Gentle: Maybe we could go somewhere together for a chat over some tea, then see what we feel like doing afterwards?

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think answer X would make you and Ashley happy?"

4.4. Present Card 13 and SAY*: "You say to Ashley: 'A mutual friend has asked to borrow a large sum of money from us. How should we respond?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's A and B personality traits, which of these answers could you both agree upon?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Sincere and Disciplined: I think we need to be honest about our concerns, but maybe we could set up a weekly payback arrangement.
B Sceptical and Relaxed: I'm not sure what this money is for, and I doubt they will pay us back; but let's help them out if they need it.
C Sensitive and Pragmatic: How horrible they are in trouble like this. Let's meet with them to help think of practical ways they can manage their money.
D Strict and Curious: This should not be our problem. I wonder why they need the money? We should find out how they will pay it back before deciding.

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think you and Ashley could both agree upon answer X?"

4.5. Present Card 14 and SAY*: "Ashley says to you: 'A mutual friend is having trouble with their flatmate and needs somewhere to stay for a few nights. How should we respond?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's A and C personality traits, which of these answers could you both agree upon?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Extroverted and Autonomous: The more the merrier! I will invite them to stay with me; and we can see if we can get them to fix the problem.
B Sincere and Relaxed: We should give them a chance to talk about what has happened, life's too short to get stressed about drama.
C Introverted and Autonomous: Personally, I don't like drama, and this would make things very crowded, let's stay out of it.
D Sceptical and Disciplined: Am not sure all this is necessary. How is it going to work? I think there should be ground rules about how long this is for.

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think you and Ashley could both agree upon answer X?"

4.6. Present Card 15 and SAY: *"You say to Ashley 'Look over there, there is a 3-year-old child playing in the road and there seem to be no adults nearby. What should we do?'*

Look at these options [point to response options and allow examinee a few moments to read] *and tell me, based upon yours and Ashley's B and C personality traits, which of these answers could you both agree upon?*

When you have made your decision, please place counter A, B, C or D on the table face down"

The options below will be presented to the participant on a card without the personality trait labels

A Sensitive and Curious: Oh no! I hope the child is OK. How has a child been left alone like that? Let's see if we can find out what's happening.
B Strict and Pragmatic: The parents should be more responsible! Let's go over and make sure the child gets out of the road.
C Extroverted and Autonomous: Oh yes, I'll go over and say hello; we'll see if we can find the parents and take their child back to them.
D Introverted and Gentle: Let's be careful that we don't upset anybody. Let's watch for cars while we look to see if anyone's around.

I will play for Ashley. Which answer would Ashley choose based upon their personality and what they know about you?" Place an answer counter in position.

Once yours and Ashley's counters are in the middle of the table faced down, you can turn them over to reveal your answers."

SAY: "Why did you think you and Ashley could both agree upon answer X?"

5. Game End

SAY: Now the game has ended, I would like to ask you some further questions:

1. How did you find thinking about both yours and Ashley's perspectives?

2. How did The Friendship Game compare to Strange Stories as a reflection of social interaction scenarios?

3. How did The Friendship Game compare to making friends is real life?

4. Do you have any suggestions of what might improve The Friendship Game as a measure of Social Cognition

Appendix 2: TFG Record Form

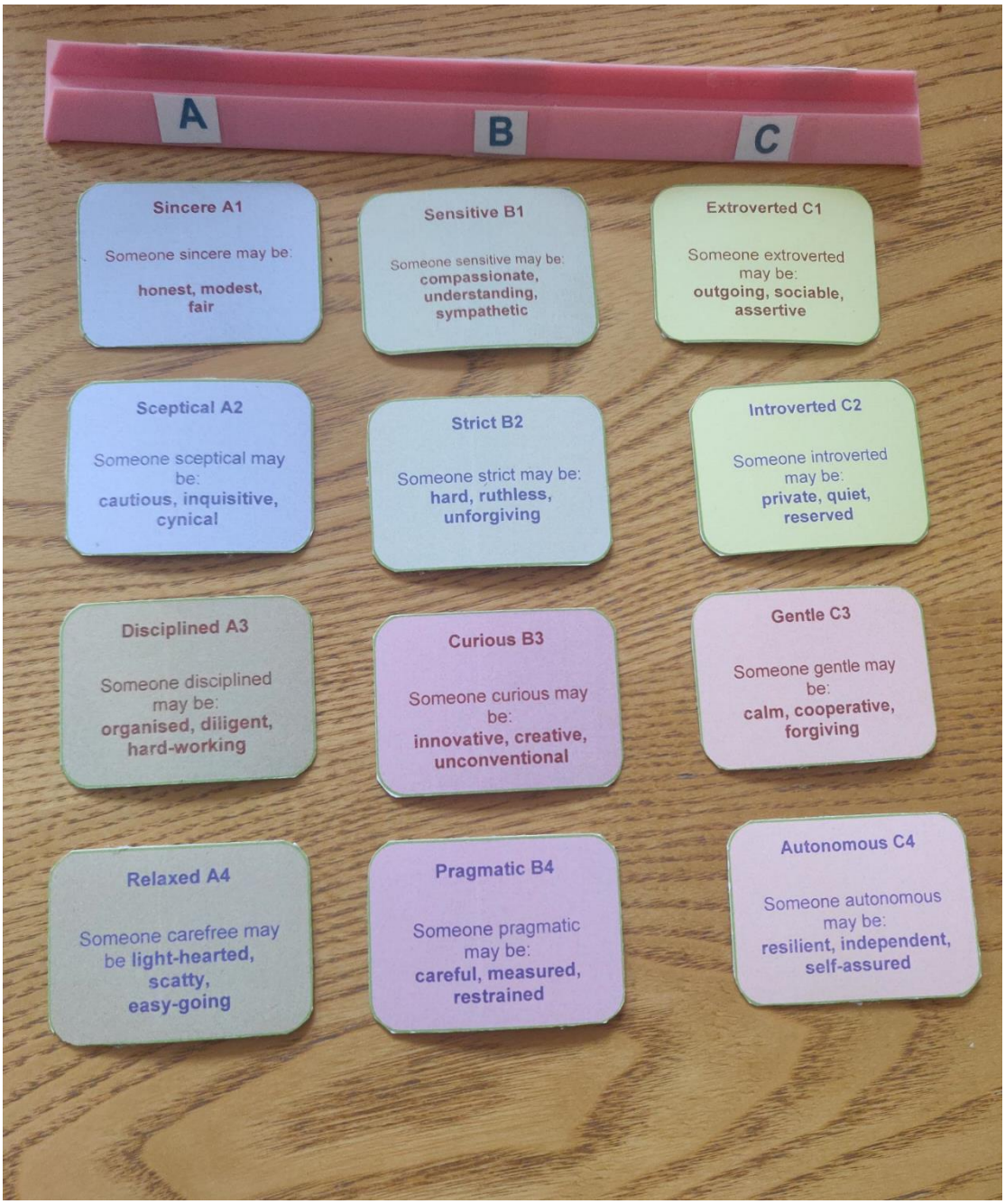
Personality Chosen

Sincere A1	Sensitive B1	Extroverted C1
Sceptical A2	Strict B2	Introverted C2
Disciplined A3	Curious B3	Gentle C3
Relaxed A4	Pragmatic B4	Autonomous C4

Item	Response	Scoring	
1. Ashley's Birthday	A B C D	Match Y or N	
Rationale:			
2. Ashley's tattoo	A B C D	Match Y or N	
Rationale:			
3. Perfect Friday night	A B C D	Match Y or N	
Rationale:			
4. Bank Meeting Preparation	A B C D	Match Y or N	
Rationale:			
5. Person Falls Over	A B C D	Match Y or N	
Rationale:			
6. Buying New Clothes	A B C D	Match Y or N	
Rationale:			
7. Gym Alternatives	A B C D	Match Y or N	
Rationale:			
8. Not Drinking Alcohol	A B C D	Match Y or N	
Rationale:			
9. Free Film Tickets	A B C D	Match Y or N	
Rationale:			
10. Dropped Wallet	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			
11. Crash a Party	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			

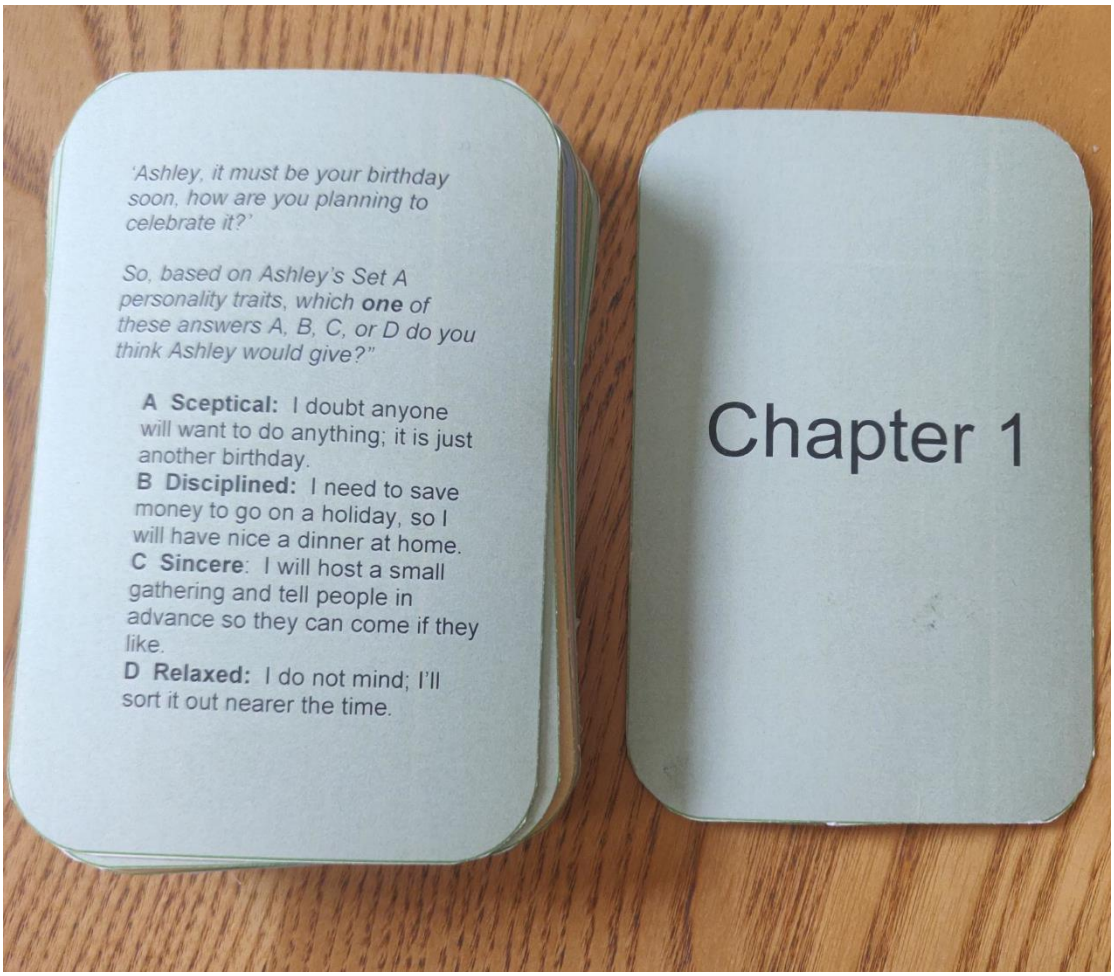
12. Weekend Activities	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			
13. Loan Money to a Friend	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			
14. Flatmate Trouble	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			
15. Child in the Street	A B C D	Match Self Y or N	Match Ashley Y or N
Rationale:			

Appendix 3: Personality Traits



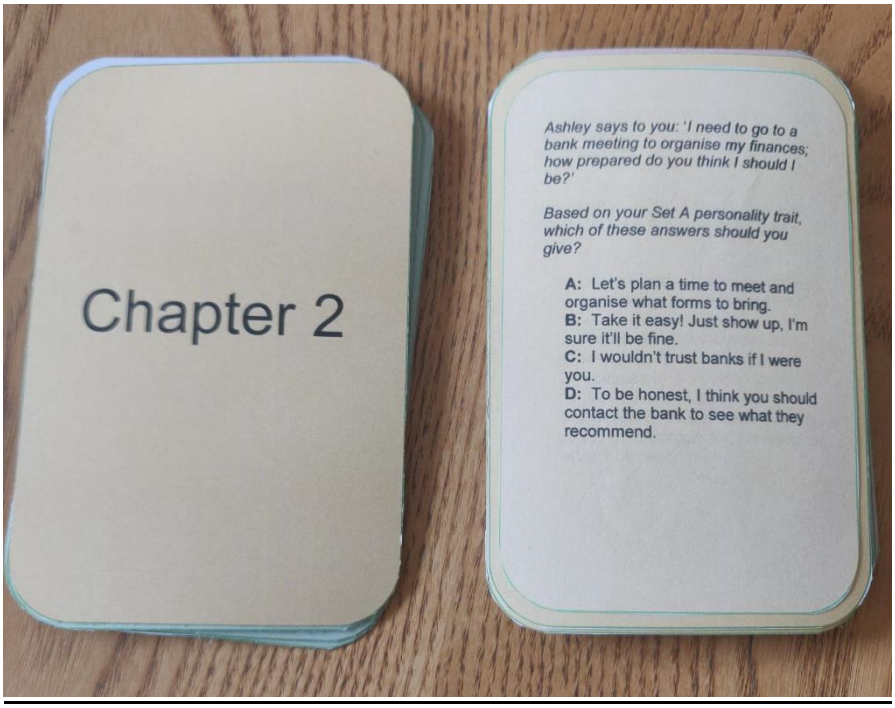
Appendix 4: Counters

Appendix 5: Game Chapter One

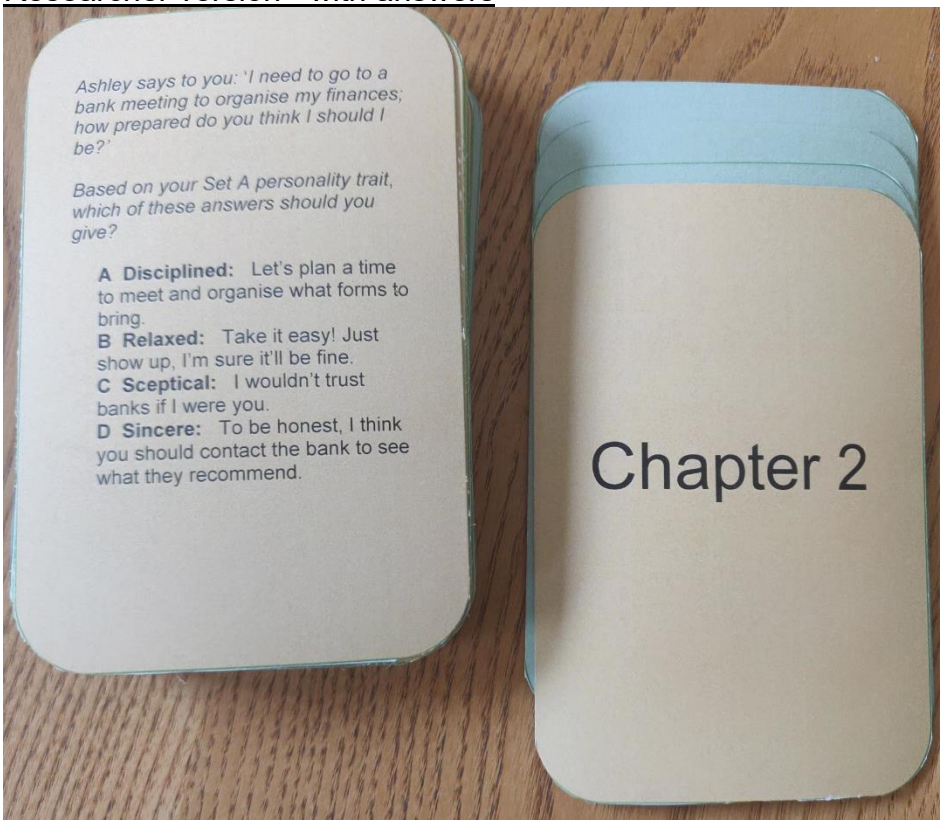


Appendix 6: Game Chapter Two

Participant version - without prompts



Researcher version - with answers

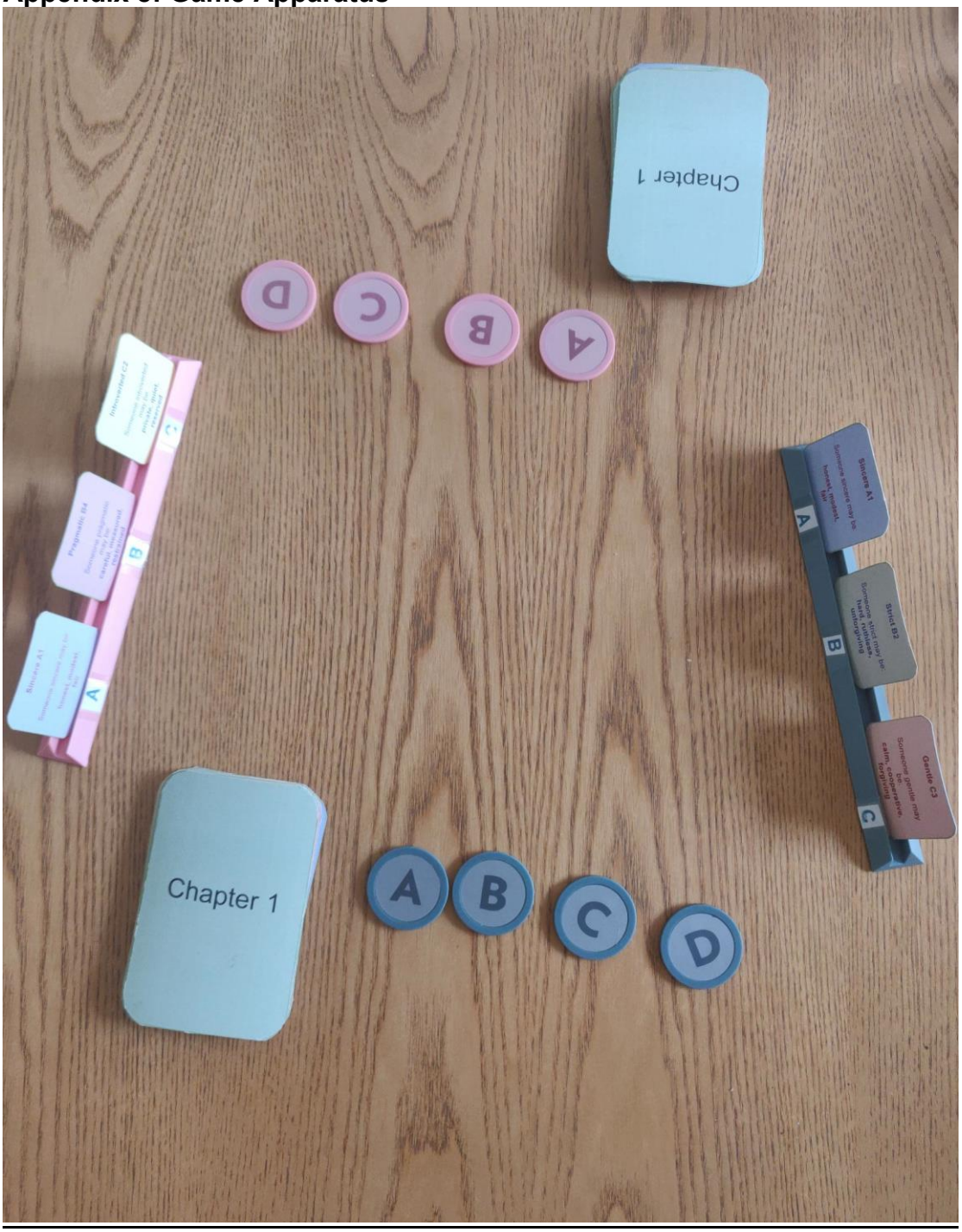


Appendix 7: Game Chapter Three

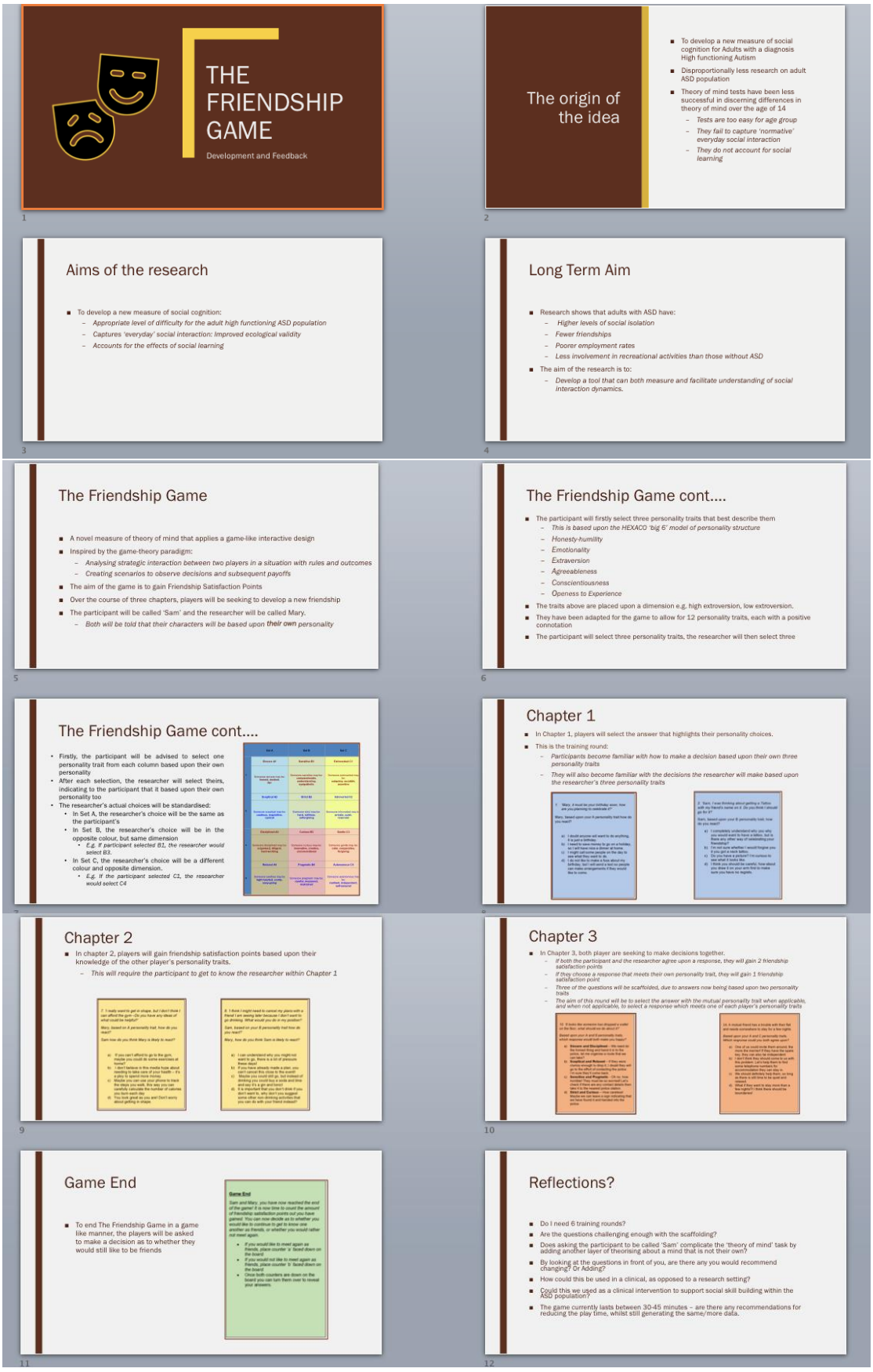
Training Round and Researcher version with answers

Participant version – without prompts

Appendix 8: Game Apparatus



Appendix 9: Presentation



Appendix 10: UEL Ethical Approval

School of Psychology Research Ethics Committee

NOTICE OF ETHICS REVIEW DECISION

For research involving human participants
BSc/MSc/MA/Professional Doctorates in Clinical, Counselling and Educational Psychology

REVIEWER: Ian Wells

SUPERVISOR: **Matthew Jones Chesters**

STUDENT: Maria Smithers

Course: Doctorate in Clinical Psychology

Title of proposed study: Developing a Novel Measure of Theory-of-Mind: The Friendship Game

DECISION OPTIONS:

1. **APPROVED:** Ethics approval for the above named research study has been granted from the date of approval (see end of this notice) to the date it is submitted for assessment/examination.

2. **APPROVED, BUT MINOR AMENDMENTS ARE REQUIRED BEFORE THE RESEARCH COMMENCES** (see Minor Amendments box below)**:** In this circumstance, re-submission of an ethics application is not required but the student must confirm with their supervisor that all minor amendments have been made before the research commences. Students are to do this by filling in the confirmation box below when all amendments have been attended to and emailing a copy of this decision notice to her/his supervisor for their records. The supervisor will then forward the student's confirmation to the School for its records.

3. **NOT APPROVED, MAJOR AMENDMENTS AND RE-SUBMISSION REQUIRED** (see Major Amendments box below)**:** In this circumstance, a revised ethics application must be submitted and approved before any research takes place. The revised application will be reviewed by the same reviewer. If in doubt, students should ask their supervisor for support in revising their ethics application.

DECISION ON THE ABOVE-NAMED PROPOSED RESEARCH STUDY
(Please indicate the decision according to one of the 3 options above)

APPROVED, BUT MINOR AMENDMENTS ARE REQUIRED BEFORE THE RESEARCH COMMENCES

Minor amendments required *(for reviewer)*:

No real need for an amendment, more a comment on the second prediction being a 'null-hypothesis'. I wonder if rather than this being a formal hypothesis it might be better as some form of pre-test of the validity of the intervention i.e. 'Any correlation between Satisfaction Scores within the Friendship Game and score of General Ability' would suggest issues with the validity of the intervention'

NO NEED FOR AN AMENDMENT TO THE FORM, JUST SOMETHING TO CONSIDER

Major amendments required *(for reviewer):*

Confirmation of making the above minor amendments *(for students)*:

I have noted and made all the required minor amendments, as stated above, before starting my research and collecting data.

Student's name *(Typed name to act as signature): Maria Smithers*
Student number: u1725738

Date: 27/03/2020

(Please submit a copy of this decision letter to your supervisor with this box completed, if minor amendments to your ethics application are required)

ASSESSMENT OF RISK TO RESEACHER *(for reviewer)*

Has an adequate risk assessment been offered in the application form?

YES / NO

Please request resubmission with an adequate risk assessment

If the proposed research could expose the researcher to any of kind of emotional, physical or health and safety hazard? Please rate the degree of risk:

☐ HIGH

Please do not approve a high risk application and refer to the Chair of Ethics. Travel to countries/provinces/areas deemed to be high risk should not be permitted and an application not approved on this basis. If unsure please refer to the Chair of Ethics.

	MEDIUM (Please approve but with appropriate recommendations)
X	LOW

Reviewer comments in relation to researcher risk (if any).

Reviewer *(Typed name to act as signature)*: Ian Wells

Date: 12/11/19

This reviewer has assessed the ethics application for the named research study on behalf of the School of Psychology Research Ethics Committee

RESEARCHER PLEASE NOTE:

For the researcher and participants involved in the above named study to be covered by UEL's Insurance, prior ethics approval from the School of Psychology (acting on behalf of the UEL Research Ethics Committee), and confirmation from students where minor amendments were required, must be obtained before any research takes place.

For a copy of UELs Personal Accident & Travel Insurance Policy, please see the Ethics Folder in the Psychology Noticeboard

Appendix 11: Information Sheet

School of Psychology

Information Sheet

Version 29.09.19

University of East London

Pioneering Futures Since 1898

The Principal Investigator

Name: Maria Smithers

Trainee Clinical Psychologist

School of Psychology

Email: u1725738@uel.ac.uk

Consent to Participate in a Research Study

The purpose of this page is to provide you with the information that you need to consider in deciding whether to participate in this research study.

DEVELOPING A NOVEL MEASURE OF THEORY-OF-MIND:

THE FRIENDSHIP GAME

Project Description

Theory of Mind (ToM) is how we understand the beliefs, ideas and intentions of others. Research has found that challenges with ToM are characteristic of the social communication and interaction difficulties experienced by those within the ASD population. However, methods of understanding ToM abilities are largely limited to younger populations.

The current research aims to develop a novel approach to understanding ToM in adults with ASD. To do this, we have applied a game-like interactive design, to make it more representative of the complexity of real life scenarios. The measure will be titled 'The Friendship Game'. This is due to its creation of scenarios where two friends strive to reach an agreement upon a posed question or decision in order to maximise their friendship satisfaction.

In order to assess whether this new measure works; the research will be comparing it against existing measures as well as controlling for general ability levels through the use of neuropsychological tests. It is therefore estimated that participation in the study will take approximately an hour and a half to complete.

We hope that The Friendship Game captures some of the difficulties experienced by Adults with ASD in everyday social interactions. If successful, it is hoped that the game can be used to develop a method of measuring ToM in adults that captures everyday challenges.

Confidentiality of the Data

Confidentiality will be ensured, all personal, questionnaire and test data will be anonymous and only identifiable by a unique participant code (your initials followed by month and year of birth i.e. AB, MM/YY). On closing the online study all data will be downloaded and stored on a password protected computer only accessible by the research team, for 10 years, in line with Research Councils UK (RCUK) guidance, after which data will be destroyed and all files deleted. Group data will be used for publication and/or dissemination, but no individual data will be identifiable.

Data Protection

The data collected from the questionnaires, tests and measures within this study will be entered on to a secure UEL server using encrypted software: SPSS. To back up the data securely, it will only be saved into the UEL One Drive folder.

Location

This will either take place at UEL Stratford campus, at your home or at another agreed location, for example, a spare room within a local charity or an interview room in an NHS service.

Disclaimer

You are not obliged to take part in this study, and are free to withdraw at any time during the study. If you chose to withdraw your questionnaire and test data after returning/submitting it simply email the research team providing them with your participant code (as indicated earlier) requesting to withdraw your data from the study. Should you choose to withdraw from the programme you may do so without disadvantage to yourself and without any obligation to give a reason.

If you have any questions or concerns about how the study has been conducted, please contact my supervisor

Name: Dr Matthew Jones Chester School of Psychology, University of East London, Water Lane, London E15 4LZ. 020 8223 4082

Email:
m.h.jones-chesters@uel.ac.uk

or

Chair of the School of Psychology Research Ethics Sub-committee: Dr. Mary Spiller, School of Psychology, University of East London, Water Lane, London E15 4LZ.
(Tel: 020 8223 4004. Email: m.j.spiller@uel.ac.uk)

Appendix 12: Information Sheet

School of Psychology

Consent Form
Version 29.09.19

University of East London
Pioneering Futures Since 1898

Consent Form for Participation in the Research Study

Researcher:
Supervised by:

Please initial box

1. I confirm that I have read and understood the information provided; I understand what the study is about, how it is being done, and why. ☐
2. I understand that my participation is voluntary and that I may withdraw at any time, without giving any reason, and without any consequences. ☐
3. I agree to short quotes from my answers being used in the write-up of this study, and that my anonymity will still be protected at all times. ☐
4. I give permission for the individuals named above, and examiners at the university to have access to the data generated by my participation. ☐
5. I voluntarily consent to take part in the above study and consent to the audiotaping of my answers. ☐

I agree to the terms.
Respondent's name (print):

……

Respondent's signature:

……

Date:

……

I agree to the terms:
Researcher's name (print):

……

Researcher's signature:

……

Date:

……..……

I have received the sum of £ ……. **Signature:**

……..

in payment of expenses. **Date:**

……..

Appendix 13: Recruitment Poster

Do you want to take part in research that is developing a board game about social relationships?

We are looking for ...

Individuals with a diagnosis of ASD/Asperger's Syndrome

Aged 18+

Participation will involve completing paper based tasks and a game for approximately 2 hours with the researcher.

The study can take place either at the UEL Stratford Campus, or a convenient local public space (e.g. a public library).

What is the study about?

Our study seeks to develop a novel method of understanding how we think about the minds of others. This research aims to contribute to the development of supportive tools for those who experience challenges with social interaction and find this is affecting their enjoyment of daily life.

About the Researcher

The researcher is currently completing a Doctorate in Clinical Psychology. They hope that this research, as part of their doctorate thesis, will contribute meaningfully to the wider body of Autism research.

If you would like to find out more information about the study or how to get involved, please e-mail the researcher via:

U1725738@uel.ac.uk

UEL

UEL Ethics Project ID: U1725738

Appendix 14: Excerpt from Research Reflection Diary

The participant was keen to support the study and engage in the measures. It appeared that 'doing well' was important to them. I felt encouraged to see that I was observing their 'best' performance, as this is an important factor in TFG's validation. However, I was concerned the participant's drive to 'do well' may also be a consequence of their fear of judgement or stigma related to not performing to a level they had hoped. In the position of researcher, I also noticed myself at times feeling excited if they performed to a high level on a particular subtest. This reminded me that despite striving to adopt a neutral position, I too am a product of my social context where I have been conditioned to place a lot of value on assessment. It was therefore important to hold in mind both the memory and observation of being measured, and the power held in position of the researcher conducting the tests. I was pleased to see that introducing TFG created a different testing atmosphere. Whilst there remained a desire to do well, the participant appeared more relaxed and willing to share their thoughts on the process. As the researcher, I also felt that was able to quickly gain a greater sense of the participant's experience, thought processes and social interaction skills.

Appendix 15: A personal reflection on the study aims and process

The experience of developing and testing TFG was an enjoyable and creative process. Adopting the game-like design offered the freedom to experiment with a format that was more complex than existing social cognitive measures. A personal goal of this endeavour was to create a social cognitive measure that was fun and engaging, rather than stigmatising and/or resulting in a foreboding sense of pass or failure. It is believed that the verbal answer-response element of TFG helped to achieve this through balancing the power dynamic between the researcher and the participant, whilst also measuring ToM. In addition to this, it is promising to see that the results offered early support for TFG being used as a social intervention for adults with HF ASD who seek support with communication and interaction skills.

The more challenging experiences from the research process were due to the difficulties in recruitment. Beyond the time limits of a thesis, many Autism charities responded to recruitment e-mails and phone calls expressing that their services were very busy. Many of these services also stated that they had received a lot of recruitment interest from Autism researchers seeking to advertise their studies. As such, they were cautious about over-burdening their service users with research advertisements, especially if they were not being paid. In addition to this, the span of time to recruit participants to the study was cut short owing to the UK government lockdown measures in response to the Covid-19 pandemic.