Investigating social vulnerability in children using computer mediated role-play

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Abstract

Here, we report a study using computer role-play to investigate Disinhibited Social Engagement in 54 typically developing children aged 6, 8 and 10 years. Children completed 22 (theme-matched) vignettes and computerised scenarios that captured the themes of the specific symptoms of Disinhibited Social Engagement Disorder (DSM V, APA 2013). Our newly created 22 Paper pencil vignettes and computer role-play scenarios were used in conjunction with the Strange Stories (O'Hare, Bremner, Nash, Happé & Pettigrew 2009) and Parent and Teachers completed versions of the Relationship Problems Questionnaire (RPQ: Minnis Reekie Young, D., O'Connor, Ronald, Gray, & Polmin, 2007). Our findings revealed the developmental (age) differences of social vulnerability/indiscriminate friendliness and potential advantages of computer-mediated role-play in comparison to "paper pencil" tasks. We argue that using a method of children role playing characters gives a better insight into children's true vulnerabilities. We discuss our findings in relation to using this methodology for clinicians and researchers to improving social skills in the most socially vulnerable children.

Investigating social disinhibition in children using computer-role play

1. Introduction

Child friendly software applications are now commonplace. As well as providing learning and entertainment, they have opened an exciting avenue for research to help children with social and cognitive difficulties via intervention and clinical assessment. Research in this field tends to integrate computer technology with real world-based activities, as a means to carry out research with children in a safe, controlled and ethical environment.

The most popular areas of research in this area tend to be interventions to improve social skills, cognitive skills, and learning (Beals, 2016: Vannini et al., 2011, Wass, & Porayska-Pomsta, 2013). By contrast, our research reported in this paper uses this technology for psychological and behavioural assessment in children. Clinicians who assess children who are diagnosed with developmental disorders and/or whom display problem behaviours, report that children often do not present their problem behaviours in the clinic. Indeed, these children can give socially appropriate answers when questioned, but do not conduct themselves in a "socially desirable" manner in the real world (Minnis, et al., 2010). Certainly, some children can be very socially aware, particularly if they have experienced a difficult upbringing; while others may not have the verbal sophistication required to describe their experiences in an interview, questionnaire or person-centered role-play task (Minnis, et al., 2010). Therefore, accurately assessing social behaviours in children can be difficult. So, there is a need for measurement tools that are more representative of real life environments that can be reliably and consistently administered by researchers and clinicians alike, in a manner that children can engage with. At the same time as this need for appropriate assessment, there is a burgeoning interest in serious gaming. Here, video game elements are used in nongaming systems to improve user experience and engagement, at face value these can be perceived to be games for entertainment, but in the

development of serious games the designers will have disguised an education or training purpose (Stokes, 2005; Vannini et al., 2011).

Although the measures used in this reported study can be used as a general measure of social vulnerability in middle childhood, they were initially created with a more extreme clinical population of vulnerable children in mind (in order to capture the nature of vulnerable behaviours more accurately), specifically, Disinhibited Social Engagement (DSE or indiscriminate friendliness IF) is a highly prevalent trauma and stressor related disorder. Described in the DSM-V, (APA, 2013) as a pattern of behaviour in which a child actively approached and interacts with unfamiliar adults, DSE is a tendency to be unduly affectionate and disinhibited towards others. This can result from or leave children vulnerable to child abduction and/or abuse, which are among the most common offenses committed against children (NSPCC, 2017). Currently, our knowledge on children's' disinhibited social behaviour is largely derived from observational and qualitative research (Bennett, Espie, Duncan, & Minnis, 2009; Bruce, Tarullo, & Gunnar, 2009; Lawler, Hostinar, Mliner, & Gunnar, 2014). This research generally focuses on DSE in infants and adolescents because measuring this level of social behaviour accurately in middle childhood has proved challenging for both clinicians and researchers (Minnis, Read, Connolly, Burston, Schumm, Putter-Lareman & Green 2010).

Until 2013, DSE was classified as a sub-type of reactivate attachment disorder (RAD). Therefore, questionnaire measures of DSE/IF tend to be a sub-scale in measures of RAD. For example, Millward et al, (2006), Minnis et al, (2002), & Minnis et al., (2007) assessed RDA & DSE behaviours using the relationships problems questionnaire, which are parent and teacher checklists for RDA that includes a sub-scale measure of DSE/IF. This measure is widely used to assess children's DSE/IF behaviors in research and clinical settings. However, this questionnaire does not give the clinician or the researcher the ability to witness the child's behaviors. So, there is much need for measures that focuses on the 'real world' DSE/IF behaviors in middle childhood. We employed the RPQ as an additional measure of DSE/IF in this research.

As well as measuring DSE/IF, we argue that for a typical population of children, our computer role-play task is a valid measure of social vulnerability. We propose that computer role-play technologies, as opposed to traditional 'paper and pencil' measures, offer a valuable method for measuring social behaviours in clinical settings and controlled research environments that can provide a 'more real to life' or fidelity of assessment of children's social behaviour – because of the interactive participation that the children have to take. Here, we highlight the potential benefits of computer role-play technologies as psychological measurement tools for assessing children's social behaviour in a more ecologically valid way.

1.1 Measuring children's social understanding

Since Wimmer and Perner's (1983) seminal work, measuring children's social understanding has come from a theory of mind tradition (ToM: An understanding that another's mental state/ intentions may be different from your own): From using dolls (e.g. Baron-Cohen, Leslie & Frith, 1985), to advanced theory of mind measuring story vignettes (e.g. Happé, 1994; see Rajendran & Mitchell, 2007, for a historical review). Happé's 'Strange Stories' are simplified narratives of everyday scenarios followed by questions that assess the participants understanding of nonliteral language short stories (included measures of sarcasm, figures of Speech, white lies, etc.). Versions of these stories have been shown to even discriminate developmental stages (e.g. O'Hare et al., 2009) and between those who do and do not have ASD (Happé 1994) and disinhibited attachment disorder (Kay & Green, 2016). Even those who passed 2nd order ToM tasks gave incorrect responses to some of the strange stories (Happé 1994; Jolliffe & Baron-Cohen, 1999).

Despite the popularity of story vignettes, it is argued that most of the experimental paradigms designed to assess ToM abilities involve fairly well developed expressive and receptive language skills, which can cause issues, since many groups of children have poor verbal abilities (Colle et al., 2007). Thus, failure on such tasks may in fact reflect participants' inability to comprehend task instructions, nearly as much as deficits in mental-state understanding

(Astington, 2001; Frye et al., 1995). As such other novel approaches have been suggested, for example; Sivaratnam, Cornish, Gray, Howlin and Rinehart (2012) successfully validated a colorful comic strip ToM measurement tool that better relies on non-verbal abilities to facilitate children who suffer from language related impairments. The success of this type of task relies on clear visuals such as the characters changing emotions and changing scenes presented in each scenario to help the children follow the story with ease in a non-verbal way.

However, Rajendran and colleagues (Rajendran & Mitchell, 2000; Rajendran, Mitchell & Richards, 2015) argued that such tasks (Verbal or nonverbal) measure children's *reflective* rather than *working* understanding and that computer-role play offers a truer indication of children's understanding. Computer-role play offers the chance of putting 'oneself in another's shoes' and potentially having to simulate (Harris, 1992; Jones, Price & Selby, 1998), what a character might do in a hypothetical situation. This is in contrast with the story vignette paradigm in which a child might feel under pressure to give the correct or most appropriate answer (Seigal, 2004) or have to work the correct answer in a more abstract or 'theory theory' type way (e.g. Chapman, 1988).

Another advantage of using computer-role play technology is that it is immersive – that is it can give players a sense of "psychological presence" of being there (Tamborini & Skalaki, 2006) and identity (Gee, 2014). Presence is important because the greater the degree of presence, the more chance that participants will behave in a virtual environment, in a manner which is comparable to their behaviour in the "real world". Arguably, presence brings into play "natural" responses to a situation (e.g. Slater, 1999).

1.2 Technologies in research with children

Recent research from a range of disciplines including psychology, psychiatry, education and computer science (e.g. Fletcher -Watson et al 2014; Hall, Woods, & Hall, 2009; Minnis et al., 2010; Porayska-Pomsta, 2012; Rajendran, Mitchell, & Rickards, 2005) have highlighted the potential benefits of utilising technologies in the measurement and intervention of social

behaviour in various groups of children, particularly those with Autism Spectrum Disorder (ASD) who seem to display an affinity with these technologies (See Rajendran 2013; Wass, & Porayska-Pomsta, 2013 for reviews).

Despite research that focused on the negative impacts of playing video games (Anderson & Bushman, 2001), serious games can contribute to knowledge and skill acquisition (Boyle et al., 2016). Furthermore, both typically and atypically developing children play video games for pleasure. They will immerse themselves in these games and increasingly, interact with peers for hours through online gaming, despite perhaps having cognitive or social issues which cause them difficulties with other everyday "real world" tasks (Durkin, 2010).

At present the vast majority of the research on technology-based measurement and intervention tools are largely focused on facilitating children and young people with ASD, (e.g. Fletcher-Watson, Pain, Hammond Humphry, McConachie 2016; Parsons, 2016; Wass, & Porayska-Pomsta, 2013). Although there are many similar research endeavors aimed at supporting children with other developmental and psychological disorders e.g. Attention Deficit Hyperactivity Disorder (ADHD) and Specific Language Impairment (LI: Flecher-Watson & Durkin 2014).

Some examples of research with a focus on children and young people with ASD includes, Beaumont and Sfronoff (2008) 'Secret Agent Society' which aimed to improve emotional and behavioural skills in individuals with High-Functioning Autism. Beaumont and Sfronoff carried out a randomised control trial which included a range of individual computer-based training in social skills, with some group work and some parental input. The researchers found that post intervention resulted in improvements in social skills in the playground and classroom. However, because these skills were not directly observed, it has been argued that future research should aim to directly measure social skills in children and, so, focus on the *process* as well as the *outcome* (Golan, Sinai-Gavrilov & Baron-Cohen 2015; Whalen et al., 2010). Social stories software, such as Story Maker ™ (Kokiana & Kern, 2010), offer a way to directly measure

the process by shifting away from "paper pencil" outcome measures to computer role play. These digital measures also mean that hundreds of social stories can now be stored on a single device. Despite this methodological advantage, convenience and portability, there have been – to date – no direct comparisons between performance on social story computer games and traditional "paper pencil" formats.

The utility of storytelling apps and computer games seems especially beneficially for understanding children's social development. For example, Happé and Frith, (2014) highlighted there are a number of developmental disorders which are primarily characterised by social cognitive atypicality other than Autism Spectrum disorders e.g. Williams Syndrome, Downs Syndrome, ADHD and Specific Language Impairment (SLI). So, along with attachment-related disorders such as Disinhibited Social Engagement Disorder, this gives measures of social cognition wide scope for validation.

Extant research suggests that individuals treat computerised objects and space just as they do when interacting in "real-world" social situations and relationships (e.g. Reeves & Nass, 1996). So, this social interaction with computers facilitates a safer environment in which to assess children and young people's behaviours in social relationships and environments – but without losing real-world engagement. Using computer-mediated role-play, therefore, provides a more 'person-centred' approach to understanding children's social behaviour rather than from a third person perspective. Indeed, there is increasing appreciation of the potential of computer-assisted role-play environments as effective, appropriate, engaging, tools (Imholz, 2008). These platforms provide virtual learning environments (VLEs) populated by synthetic/digital characters engaged in role-play scenarios that can offer users safe and compelling access to real-world social and emotional experiences (Dautenhahn, Bond, Canamero, & Edmonds, 2002).

Recent interdisciplinary work has produced prototype tasks for measuring children's social understanding, e.g. using a virtual role-play program called 'FearNot!' (E.g. Hall, Woods & Hall; 2009). Here, ToM methods were used to gain insights into children's (N = 345) abilities to

correctly attribute beliefs, desires, goals and precepts to others, through a virtual role-play task about bullying in which the participants were 'synthetic characters' (i.e. computer generated), rather than actual children undergoing a real bullying experience. The children who took part role-played a third character that played a "friend" who gave the victim advice after they had viewed the bullying scenario. This advice was then used to measure the child participant's social understanding and Theory of Mind. Thus, it is clear to see that computer role-play is a fruitful tool for assessing children's social understanding.

As well as computer role-play being a useful tool for assessing children's social understanding, it can be utilised to measure other social behaviour in children, for example attachment issues. In infants, attachment issues are most commonly measured using the 'Strange Situations' procedure (SSP: See Ainsworth, 1979). However, the SSP is not appropriate for measuring attachment difficulties in older children, which has proved to be notoriously difficult (e.g. Minnis et al., 2010). One task that does reliably measure attachment issues in middle childhood, however, is the 'Manchester Child Attachment Story Task' (MCAST: Green, Stanley, Smith, Goldwyn, 2000). This is a representational procedure for assessing attachment patterns of young school aged children. The task is based around a doll's house and after hearing a story from the task administrator the child participant then takes on the role of a doll to complete the scenario (i.e. the child represents themselves through the doll).

Minnis et al. (2010) developed a computerised version of the MCAST (the CMCAST), that can be used on any standard computer. Story stems are represented on the computer by the movement of two-dimensional 'dolls' narrated by a generic voice. Children then take control of the task and complete each story by speaking into the computer; the audio-visual data produced by the child can be downloaded for later rating. The findings revealed that the CMCAST had similar reliability and validity as the MCAST and yielded further benefits. For example, it is easier to administer for large sample epidemiological studies, reduced reliance on trained researchers in task procedures, less exhaustive involvement of the researcher, has the potential to

yield truer more ecologically valid responses, and is slightly cheaper to administer than the MCAST.

1.3 The Present Study

Here, we investigated a) age-related developmental differences in DSE in middle childhood and b) potential advantages of computer-mediated role-play tasks as measures of DSE over a "paper pencil" tasks. We also investigated the relationship between DSE, Theory of Mind (ToM), and parent and teacher ratings of the child's quality of relationship (RPQ). Children were, therefore, asked to comprehend vignettes and role-play various characters in a variety of scenarios to investigate their DSE.

2. Method

2.1 Participants & Design

Insert table 1 about here

A total of 54 children were recruited to this study: 3 groups of typically developing children aged 6, 8, & 10 (see Table 1). However, one participant from the 10-year-old group was removed due to her score on the computer mediated-role play task being much higher than the mean score for this age group. We used a 3 × 2 factorial design: with a between subject's factor of age and a within subject's factor of presentation ('paper and pencil vignette' vs. 'computer role-play' version of the DSE task).

2.2 Materials & Procedure

The computer-mediated role-play scenarios and story vignettes were independently validated by the 3rd author, who is an expert in the field of child reactive attachment disorder and Disinhibited Social Engagement Disorder using a 5-point rating system (Strongly agree to Strongly Disagree) on each of the disinhibited social engagement disorder symptoms (DSM-V 2013). It was agreed that every story tapped into one or more of the specific symptoms of DSE.

Both paper pencil and computer versions of the DSE tasks are matched on themes and scoring to make them comparable. These tasks were counterbalanced across participants. The order of scenarios and vignettes were pseudo-randomised across participants.

The 14 item Teacher Relationship Problems Questionnaire (TRPQ) and 10- item Parent Relationships Problems Questionnaire (PRPQ: e.g. Minnis et al., 2007; Millward et al., 2006) and the already well-established Strange Stories ToM vignettes (O'Hare 2009) were employed. The 10-item PRPQ was sent to parents to be completed along with the consent form, these were then returned to the child's school. The child participants took part in 3 × tasks: 1 = Paper pencil ToM vignettes (Strange Stories: O'Hare 2009), 2 = Paper pencil DSE vignettes, (appendix A: Please contact first author for complete materials) 3 = Computer role-play measure of DSE in a children's computer story boarding called Kar2ouche (see appendix B: Please contact first author for complete materials). The class teachers completed the 14 –item Teacher RPQ on each child who took part in the study. The RPQ's are a measure of children's social behaviour's that relate to the themes of Disinhibited Social Engagement Disorder and have been validated on both atypical and typical populations of children (e.g. Minnis et al., 2007).

The children worked along with the researcher individually in a quiet room at their school. Testing time was approximately 1 hour per child and short breaks were granted at the child's leisure.

2.3 Scoring Procedures

2.3.1 Strange Stories: 12 strange stories accompanied by pictures were read out. Two questions per story were asked, the first requiring a 'yes or no' comprehension answer and the second requiring an open-ended justification answer. The procedure and scoring are in accordance with O'Hare et al., 2009.

2.3.2 Paper Pencil Vignettes: 11 different vignettes were used (appendix A). Comprehension questions were rated as correct (1) or incorrect (0). Responses to the justification questions require more subjective judgements on the part of the scorer. One point was awarded for each

response that indicated that the child was engaged in behaviours which could lead them to be socially vulnerable, these behaviours were judged on the criteria from the DSM-V for each of the themes being investigated. A score of zero was give when the child's response indicated correct justification of the question. Thus, the scoring of each vignette was between 0-2. Two raters coded the responses; the first rater was the primary researcher during the testing phase and coded all the data. The second rater was naive to the aims of the study and blind to participants' group membership; they coded 20% of the data. Any inconsistencies or confusion over answers/scores were resolved through discussion between the raters after the initial blind rating took place; inter-rater reliability (r = .82)

2.3.3 Computer-Mediated Role-Play Scenarios: 11 different computer-Mediated role-play scenarios were used (appendix B). Like the Story vignettes, comprehension questions where the child responded with a yes or no were rated as correct (1) or incorrect (0). Responses to the justification questions require more subjective judgements on the part of the scorer. One point was awarded for each response that indicated that the child was engaged in behaviours which could lead them to be vulnerable; these behaviours were judged on the criteria from the DSM-V for each of the themes being investigated. A score of zero was give when the child's response indicated correct justification/awareness of the safest actions to be taken. So, the scoring of each vignette was between 0-2. Two raters coded the responses; the first rater was the primary researcher during the testing phase and coded all the data. The second rater was naive to the aims of the study and blind to participants' group membership; they coded 20% of the data. Any inconsistencies or confusion over answers/scores were resolved through discussion between the raters after the initial blind rating took place; inter-rater reliability: (r = .99).

3. Statistical Analysis

One repeated measures 3 × 2 factorial ANOVA: with a between subject's factor of age and a within subject's factor of presentation ('paper and pencil vignette' vs. 'computer role-play' version of the DSE task). Additionally, the 14 TRPQ and 10- item PRPQ: were correlated using

Pearson's correlations with the Strange Stories (O'Hare 2009). All analysis was carried out using IBM SPSS statistics 22.

4. Results

There was a significant main effect of task presentation (computer mediated role-play, paper pencil) [F (1, 47) = 34.66 p < 0.001 Cohen's f = 0.86] *Post hoc* tests revealed that 6-year-olds displayed more DSE than 8-year-old s (p < 0.001) and 10 year-olds (p < 0.001). There was no significant difference between 10 & 8-year olds, p = .287. There was a significant interaction between task presentation (Computer Mediated Role-Play, Paper Pencil) and the age group of participants [F (2, 47) = 3.27 p = .047 Cohen's f = 0.37]. *Simple effects analysis* revealed that 6 years-olds (p < 0.001) and 8-year-olds(p=.002) displayed significantly more DSE in the computer mediated role-play task, than in the paper pencil vignettes, whereas 10-year-olds DSE did not significantly differ between task presentation (p =.081). See Figure 1.

Insert Figure 1 about here

Theory of Mind was negatively correlated to both DSE tasks with a Pearson correlation coefficient of r = -.439 and a significance value of < 0.001 for the paper pencil task and Pearson correlation coefficient of r = -.379 and p = 0.003 for the computer mediated role-play task. No correlations were found for the RPQ'S and DSE in either task presentation (paper pencil, computer mediated role-play). This is probably because the RPQ is a clinical measure and typically developing children were recruited in this study.

5. Discussion

First, our results show DSE behaviours seems to be developmental, i.e. 10 and 8-year-old showing fewer disinhibited behaviours than 6-year olds. Second this age differentiation was greater in the computer mediated role-play version of the task. So, these findings support our hypothesis that children will exhibit more DSE behaviours in the computer role-play than the

paper pencil version of the task. Third, our prediction that there would be a negative relationship between DSE and ToM was also supported which is particularly important to validating the measure.

This study was also the first to successfully quantify DSE and social vulnerability in middle childhood and is, also, the first to investigate the development of DSE and social vulnerability in the typical population of children. Further, we show the value of computer-mediated role-play, which extends serious gaming's current sphere of research activity into the field of children's psycho-social measurement.

Our findings support previous research that suggests using role-play measures children's working understanding in comparison to vignettes that rely on a more reflective understanding (Rajendran & Mitchell, 2000; Rajendran, Mitchell & Richards, 2015). Arguably the younger children performed in a way that is closer to their real-life behaviours in the role-play task because this allowed the child to simulate or "walk in the shoes" of the character and make real decisions in a simulation type way (e.g. Harris, 1992). Rather than deciding on what the characters might do in a hypothetical situation that is created using social vignettes where a child might feel under pressure to give the correct or most appropriate answer (Seigal, 2004), or have to work the correct answer out in more abstract or 'theory theory' type way (e.g. Chapman, 1988). This method seems to be especially valuable for children in the middle childhood range of around age 5 – 9 years old, whereas there was no significant difference in the scores of paper-pencil and role-play task version for the older children. This may because by the end of middle childhood/primary school years, typically developing children have largely mastered basic awareness of social safety.

Thus, from a theoretical perspective, the findings support a simulation theory account of the development of ToM in middle childhood (Harris, 1992). This is important because it suggests that children's "real-world" behaviour is more likely to be measured accurately from a first person (e.g. role-play), rather than a third person (Paper pencil)

perspective. This finding also arguably supports the concept of presence (e.g. Slater 1997), in which responses in the computer role-play task version are more like the responses that participants might give in real life.

However, an alternate explanation may be that higher levels of disinhibited behaviour in a computer role-play task were due to the perceived safety of the environment. We argue though that this is unlikely because we recruited only typically developing children and found that most participants in the youngest age group (6-year-olds) achieved approximately only a quarter of the potential total disinhibited score available. This means that disinhibited and vulnerable behaviours are relatively low (as to be expected in this population), so there is plenty of "room" in the assessment to measure atypical behaviour. In order to fully validate this measure, therefore, it is important that future studies look at the differentiation of typical and atypical DSE and social vulnerability in middle childhood.

Indeed, such future research would add to the validation of this psychological measurement and has the potential to be of use in research related to attachment and disinhibited social engagement disorder, which up until now has been largely observational and qualitative in nature (e.g. Bennet et al., 2009). Children with attachment related disorders tend to display signs of social vulnerability, which in part along with cognitive and environmental factors is thought to be related to having a poor theory of mind (Pearce & Fisher, 2005; Kay & Green; 2016). Our findings demonstrated that poor theory of mind was related to higher levels of DSE or social vulnerability and (vice versa; good theory of mind is related to better social safety understanding no DSE).

In practical terms this means that some children can be very socially vulnerable when interacting with unfamiliar adults as they cannot understand that the intentions of others. Therefore, creating a safe virtual environment that maps on to real-life settings to asses these social vulnerabilities is essential for clinicians and researchers in this field. Meaning the findings

in the present research have implications for how technological advancement can be useful in both assessment and intervention in research, clinical practice and education.

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Appendices

Appendix A – Examples of theme matched pairs of DSE/IF Story Vignettes (Please contact first author for complete materials)

It is Susan's birthday soon. She is having a party and wants to invite all of her friends from school. When Susan's mum asks who she would like to invite, Susan says that she would like to invite her teacher, Mrs. Smith. Susan's mum tells her that Mrs. Smith is not really a friend and that she should invite some of the girls and boys from her class instead.

1. Is Mrs. Smith really Susan's friend?

2. Why did Susan's mum say that Mrs. Smith was not really a friend?

It's Halloween soon. Josh decides he wants to go trick or treating with his friends from Scouts. When Joshes dad asks who he would like to invite, Josh says that he would like to invite his Scout leader Mr Brown. Joshes Dad tells him that Mr Brown is not really a friend and that he should invite some of the girls and boys from Scouts instead.

1. Is Mr Smith really Josh's friend?

2. Why does Joshes dad tell Josh that Mr Brown is not really a Friend?

Ben is out shopping with his mum. Ben's mum leaves Ben in the toyshop alone, and tells him that she will come back and get him soon. She tells Ben not to talk to any strangers. While Ben is in the toy shop a man in a security guard uniform comes up to Ben and tells him that his mum had to go to another shop and that Ben should come with him to find her. Ben says "ok", and goes with the man to find him mum.

1. Should Ben have gone with the man?

2. Why should he/shouldn't he have gone with the man?

Kim is at the park having a picnic with her family. Kim asks her mum if she can go and play on the swings. Her mum says yes, but not to talk to anyone that she does not know. When Kim is at the swings a man comes over to her, he says to Kim that he has lost his daughter, who is only 4 years old. The man asks Kim if she could help him find her. Without checking with her mum, Kim goes off with the man to look for his daughter.

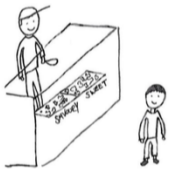
1. Should Kim have gone with the man to help find his daughter?

2. Why should/shouldn't Kim have gone with the man?

Jane is getting the bus home from School with her friends. When Jane gets on the bus, instead of sitting with her friends, she sits beside a lady whom she does not know. Jane asks the lady which is the best stop to get off at for the shopping centre. The lady tells her to get off in 3 stops time. When the bus stops Jane decides to get off with the lady. One of Jane's friends shouts on Jane to come back on the bus.

1. Should Jane have got off the bus with the lady?
2. Why does Jane's friend shout on Jane to come back?

Mark is at the cinema with his family. Mark decides that he wants some popcorn; he goes and queues up at the snacks counter while his family buy the tickets for the film. When Mark reached the counter he can't decide whether he wants sweet or savoury popcorn. He decides to ask the man behind him. The man standing behind him tells him that sweet is nicest. Mark buys the sweet popcorn and decides that he wants to see the film with the man.



1. Should Mark go and see the film with the man?
2. Why does Mark want to go see the film with the man instead of his family?

Anna and her friend Ben are at the library to pick out some story books. When Anna gets to the counter with the book she wishes to borrow, she notices that lady librarian has a moustache and Anna has never seen a lady with a moustache before. Anna decides to ask the lady why she has a moustache, but the lady did not answer her question. On the way home Ben told Anna that she should not ask ladies questions like that.

1. Should Anna have asked the lady why she has a moustache?
2. Why does Ben tell Anna that she should not ask ladies questions like that?

Brian has just started primary 6; his new teacher is Mr McDonald. Brian thinks Mr McDonald is a cool teacher, because he was telling the class about his summer holiday to the USA. Brian puts his hand up and asks Mr McDonald if he got drunk on holiday. Mr McDonald tells Brian that he shouldn't ask questions like that.

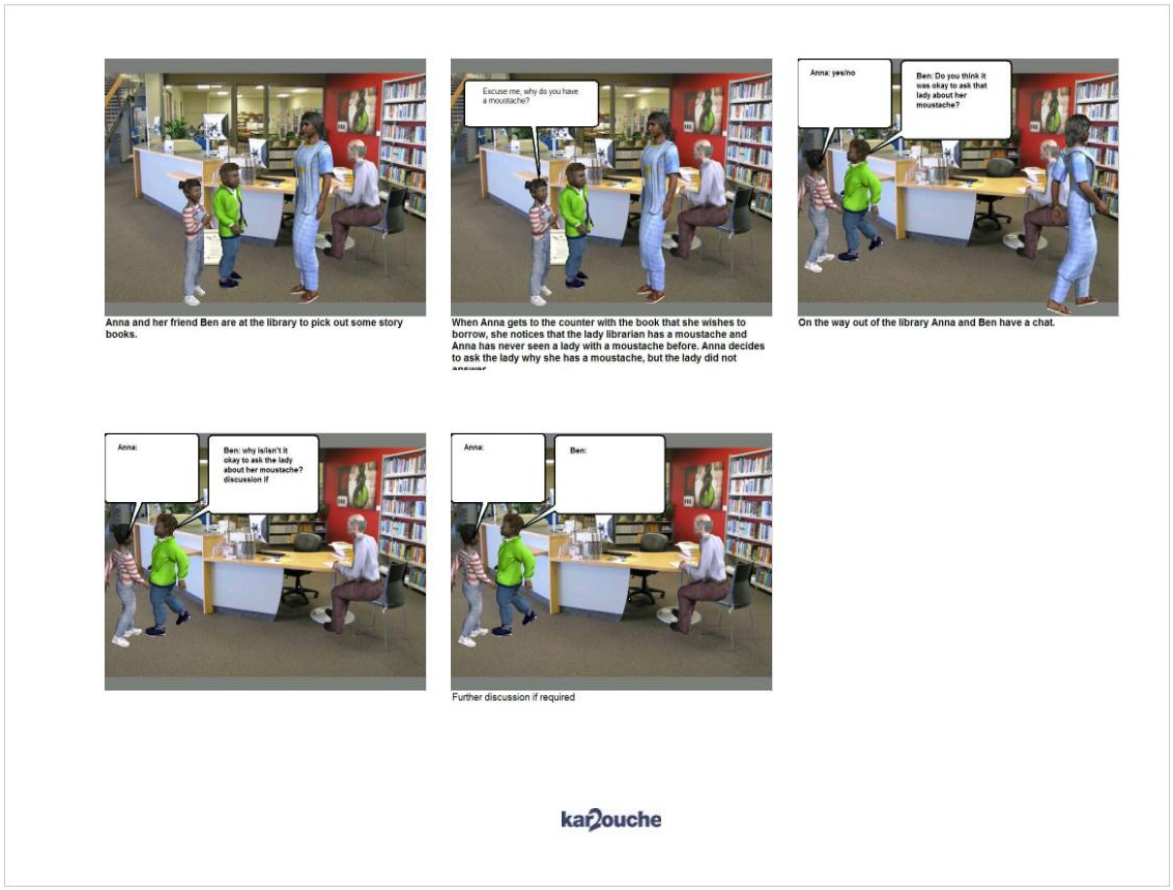
1. Should Brian have asked Mr McDonald if he got drunk on holiday?
2. Why does Mr McDonald say that Brian shouldn't ask questions like that?

Appendix B – Examples of theme matched pairs of DSE/IF Role-Play Scenarios (Please contact first author for complete materials)

In the below scenarios the child and the researcher role-play by typing into the speech bubbles. The researchers character always initiates the conversation.

NB: In the above two scenarios the child plays the parent character and the researcher plays the child. In subsequent scenarios displayed here the child plays the child character and the researcher plays the adult or other child character (where specified).

NB: Here the researcher plays Sarah and the child plays Jane.



NB: Ben is played by the researcher Anna is played by the child. The first speech bubble for Anna has already been completed as part of the scenario.

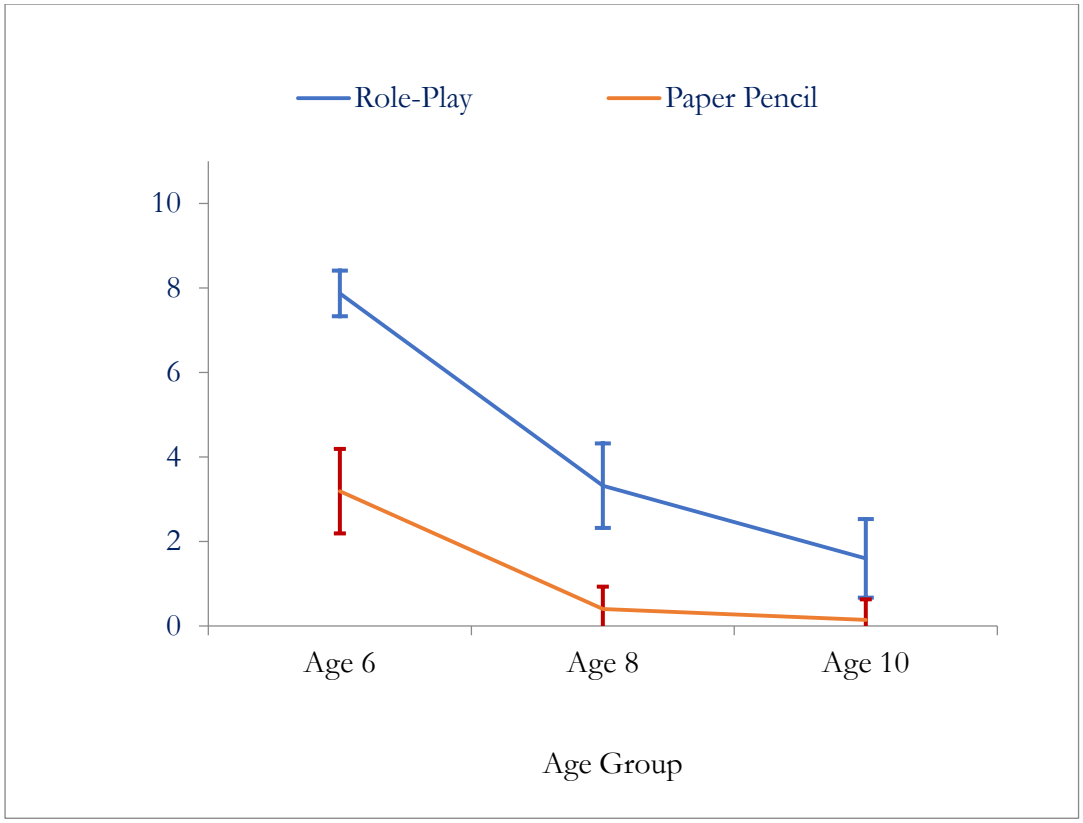
Table(s)

Table 1 Table 1: Participant Characteristics

Age Groups	N	Gender	14 -TRPQ Mean (SD)	10-PRPQ Mean (SD)
6	16	M8, F8	2.96 (2.10)	.94 (.37)
8	17	M8, F9	1.59 (1.80)	0.65 (.93)
10	20	M9, F11	0.90 (1.29)	0.20 (.52)

Figure(s)

Figure 1 Figure 1: Mean DSE by task presentation (Role-Play & Paper Pencil) and age group.



***Highlights (for review)**

Highlights:

- A comparison of a computer role-play story task with “Paper Pencil” style vignettes.
- Measures social vulnerability/ disinhibited social engagement in middle childhood.
- Computer role-paly is arguably more ecologically valid and more engaging.
- Associations between disinhibited/vulnerable social behaviour and Theory of Mind.