

Children's use of personal knowledge and adult testimony in fantasy/reality distinctions

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Abstract

This study aimed to investigate children's conceptual understanding of particular human attributes and their relation to children's judgements that a person was 'real' or 'not real'. The study explored the extent to which children relied on their own knowledge versus the testimony of others when making reality-status judgements about unfamiliar people with characteristics that were *possible*, *improbable* or *impossible* of human beings. Testimony came from a child or an adult in order to make comparisons of children's trust in two different informants with varying amounts of knowledge. The sample consisted of 61 children between the ages of 3 and 6 recruited from a primary school in Essex.

The study employed a within-subject experimental design, in which both the attributes of the stimuli and the testimony of informants were manipulated in order to observe the effect on children's reality-status judgements. In order to investigate the possibility of developmental trends, the sample was divided into two age groups made up of 3-4 and 5-6 year olds. A novel categorisation task and interview schedule were developed for this study, which measured children's initial reality-status judgements and compared these with their judgements after hearing testimony from an adult or a child.

Analysis of children's judgements showed that children across the sample distinguished between possible and impossible attributes, both in their initial judgements and in their use of testimony, but that only the older age group distinguished between improbable and impossible attributes. There were no significant differences in children's trust in the two different informants, but children did rely on testimony differentially according to both age and the type of attribute.

The findings suggest that young children are able to reflect upon the extent of their own knowledge, and the potential reliability of other people, in order to make decisions about an unfamiliar entity's reality status. This study extends the findings from previous research by addressing children's understanding of the kinds of attributes that render human beings real or unreal. Future research could build on this study by employing a longitudinal within-subject design, which would suggest possible causal influences, and would also offer insights into the developmental trajectory of children's conceptual understanding within this field.

Chapter 1: Introduction

1.1. Children's conceptual development

One of the most influential theories in our understanding of children's conceptual development is Piaget's theory of genetic epistemology (Wadsworth, 1995). Piaget's theory of cognitive development is based on the notion that children construct their own reality based on adaptation to, and engagement with, their environment. Piaget (1967) argued that, when children are born, they possess schemas representing cognitive structures that allow them to mentally organise stimuli as they engage with them. As children go through Piaget's four stages of cognitive development, they develop a capacity for mental representation of concepts, which results in the network of schemas becoming more complex and sophisticated. Piaget (1969) refers to the processes by which children come to refine their schemas as assimilation and accommodation. Assimilation can be understood as the process of fitting novel stimuli into existing schemas, whereas accommodation refers to the refinement of existing cognitive structures (either through the creation of new schemas or the modification of existing ones) in order to assimilate new information. When existing stimuli are not sufficient for the understanding of new situations or entities, an individual is said to be in a state of 'disequilibrium', which can be described as,

> a state of cognitive conflict resulting when expectations or predictions are not confirmed by experience…the discrepancy between the expected and what actually occurs is disequilibration and results in disequilibrium (Wadsworth, 1995, p. 19).

Therefore Piaget argues that children use their existing knowledge of the world to process novel information, and they are quick to resolve the conflict that arises when their expectations are not met.

Another major tenet of Piaget's theory is that children's development occurs on a continuum of four key stages: the sensori-motor period, the pre-operational stage, concrete operations, and formal operations. Although Piaget's stage theory has faced criticism for homogenising individual children's development (Gilmore & Bryant, 2006) and providing little explanation for development within stages (Brown & Desforges, 1977; Driver, 1978), Piaget's stages can be viewed as along a continuum, in which each stage represents a qualitatively different type

of thinking and reasoning from the previous ones, but in which there are also differences between children at the same stage. Arguably the key stage for understanding children's representation and development of concepts is that of pre-operational thought, as it is at this stage (between the approximate ages of 2 and 7) that children begin to use what is termed the 'semiotic function' (Piaget, 1969). This function represents the emergence of children's understanding that a signifier in the form of language, for example, can be used to represent something else. The ability to mentally represent entities and refer to them in language allows for a more complex system of schemas and concepts to be developed and understood by the child. The child in the pre-operational stage is also characterised as egocentric; she is unaware that other people may not perceive reality in the same way that she does.

According to Piaget's theory, children's schemas or concepts during this stage are based primarily on perceptual features and are developed through direct experience with the referents. However, there are several concepts (for example, emotions such as happiness or anger) that are readily assimilated by young children, despite their inability to engage directly with the referents (Wadsworth, 1995). Similarly, in order to develop concepts within the domains of science and religion (Harris & Koenig, 2006), history (Corriveau, Kim, Schwalen, & Harris, 2009) and social norms (Nurmsoo, Robinson, & Butterfill, 2010), children are predominantly reliant on information relayed by other people. However, separating domains of knowledge into those where concepts are directly acquired and those where the testimony of others is required does not reflect the complex nature of concept acquisition; indeed the process of conceptual development should be considered neither entirely innate nor entirely learned (Gelman, 2009, p. 3). Despite acknowledging the role played by adults in shaping children's learning (Piaget, 1972, 1973), Piaget's theory offers little explanation as to the cognitive processes that children use to determine when to privilege their own experience rather than the testimony of others. Counterintuitive information contradicting children's pre-existing concepts is frequently transmitted through the testimony of others but readily accepted despite this contradiction (Lane & Harris, 2014). Further investigation of the situations in which children privilege their own directly-acquired knowledge over the testimony of others, and vice versa, will provide knowledge about how children's concepts are refined over the course of development.

1.2. Rationale for the study

Empirical research in this area has applied Piaget's theories to the domain of ontology and the role played by the testimony of others in influencing children's understanding of reality. Children's use of testimony in determining the reality status of entities is well-documented (see e.g. Harris, 2012; Harris, Pasquini, Duke, Asscher, & Pons, 2006; Woolley & Ghossainy, 2013), as is children's ability to evaluate entities based on their characteristics (e.g. Harris, Brown, Marriott, Whittall, & Harmer, 1991; Sharon & Woolley, 2004; Wellman & Gelman, 1992). However, there are only a few studies that compare children's use of their own knowledge with the testimony of others, and the present study is therefore situated within this domain by focusing specifically on the interaction between these two processes. Furthermore, previous research has tended to operationalise children's conceptions of reality and fantasy through their judgements of familiar real versus fantasy characters (Sharon & Woolley, 2004) or novel animals (Lopez-Mobilia & Woolley, 2016), but no published studies were found on children's use of their own intuitions and the testimony of others when judging the attributes and characteristics of unfamiliar human beings. The aim of the present study is therefore to offer a contribution to knowledge in this area by focusing on a domain that has received little empirical investigation: children's understanding of the characteristics of human beings, and how these characteristics may differentially determine reality status. In order to explore the age trends observed in other studies (e.g. Morison & Gardner, 1978) regarding children's judgements of human attributes, this study compared two age groups of 3-4 year olds and 5-6 year olds, which also allowed for a comparison of children hypothesised to be within the same Piagetian stage.

1.3. Research questions

Four research questions were formulated in order to investigate the interaction between children's own intuitions and the testimony of others when making judgements about the reality status of unfamiliar people.

1. How do young children's reality-status judgements vary according to the attributes of an entity/person?
2. How does children's trust in testimony vary according to the status of the informant?
3. How do young children's reality-status judgements vary according to the nature of testimony?
4. What is the effect of age on research questions 1-3?

1.4. Structure of the dissertation

Chapter 2 presents a review of both theoretical and empirical literature related to the research questions. A broad evaluation of research on children's reality/fantasy distinction and on their use of testimony is provided, as well as a more specific analysis of studies investigating the interaction between children's prior knowledge and their use of testimony. The gap in the literature within which the present study is located is identified and the ways in which this study builds upon previous research are discussed.

Chapter 3 describes the research design used for this study based on the research questions, and discusses matters including recruitment, sampling, and piloting. The development of the novel instrument (a categorisation task and interview schedule) used for this study is presented in detail, and potential challenges to the reliability and validity of the instrument are addressed. Ethical considerations relevant to this study are also discussed.

Chapter 4 presents the results from the statistical analysis of the data. The planned analysis strategy is discussed in relation to assumptions for parametric tests and preliminary descriptive statistics, and the main and post hoc analyses for each research question are then presented.

Chapter 5 situates the present study within the empirical research context, and offers an interpretation of this study's findings in light of the previous literature on the topic. The limitations of the study are presented, and suggestions are made regarding ways to address these limitations and extend the findings from this study. A final overall conclusion is then presented.

Chapter 2: Literature Review

2.1. Introduction

This chapter will provide an overview of the existing literature on how children come to understand what is real and what is not. The first section will discuss the theoretical background and will relate the Piagetian framework to the domain of ontology. The second section will review existing studies that examine how children use both perceptual and conceptual features to make decisions about the reality status of an entity. The third section will introduce the notion of testimony, and will discuss the conclusions from the existing literature regarding children's evaluation of the source of novel information. The final section will aim to highlight how this study is situated within a gap in the current research literature.

2.2. Theoretical framework

Although Piaget's main focus was on epistemology and the development of knowledge, the Piagetian theoretical framework regarding conceptual development has clear applications for the domain of ontology and reality-status judgements. According to Piaget's hypothesis, older children would make more accurate and consistent reality-status judgements, both because of their proximity to the logical concrete operations stage, and because of their increased amount of experience with real referents in the world. The relation between children's trust in testimony and the domain of ontology is also exemplified by Piaget's theory in the conflict that arises when children are presented with information from others that runs counter to their expectations. Piaget (1978, p. 37) argues that the disequilibrium resulting from this conflict leads to 'reflective abstraction' about the robustness of schemas in children in a more advanced stage of their development, whereas children at the pre-operational stage are not hypothesised to engage in such cognitive reflection. Piaget suggests that children at this stage do not question the veracity of their own thoughts because they are unaware that the viewpoints of others differ from their own. Thus, when presented with information that runs counter to their expectations, children at the pre-operational stage are likely to reject it (Wadsworth, 1995, p. 66).

However, applying these notions to reality-status judgements leads to conflicting hypotheses. Because of their proximity to the concrete operations stage, one would hypothesise that older children would be more capable of logical reasoning and may therefore be more receptive to testimony when novel information runs counter to their conceptual expectations. It would be

expected that younger children who are still in an egocentric stage of development would be more likely to reject claims that contradict their own prior knowledge. However, this does not explain the findings from empirical research that suggest that younger children are highly susceptible to the 'pull' of testimony (Clément, Koenig, & Harris, 2004), or that children recognise that experts in a particular area possess more knowledge about a subject than they themselves do (Landrum & Mills, 2015).

Vygotsky's theory of conceptual development provides some explanation for the findings that young children can privilege testimony over their own directly-acquired knowledge. Although this theory is often placed in opposition to Piaget's, it does in fact share several key principles. Vygotsky's theory is often considered to prioritise the role of social interactions that Piaget neglected, but in fact both theories regard social interactions as key to children's development, albeit in different ways (Amin & Valsiner, 2013; Carpendale & Müller, 2013). While Piaget considers social interaction as one of many sources of disequilibrium, Vygotsky (1978) views the social and cultural environment as fundamental to children's development of concepts. His notion of the 'zone of proximal development' refers to the zone within which children of a certain developmental level are able to learn with the help of others who are more knowledgeable, and emphasises the role played by adults and peers in children's early development. What is implicit in Vygotsky's theory that is not addressed in Piaget's is the notion of mediation: children do not simply learn through direct experience with the world, because their construction of knowledge is mediated by the way the information is transmitted by more knowledgeable social agents such as parents, teachers, and peers.

However, although an evaluation of others' knowledge is implicit in Vygotsky's theory, it is not explicitly acknowledged, and so no explanation is offered regarding the criteria that children use to determine when to trust testimony. Evidently parents, teachers and peers play an important role in children's conceptual development, but children are not universally credulous (Harris, 2012), and from an early age are able to make evaluations of not just the *content* but the *source* of information. Neither Piaget nor Vygotsky offers an explanation as to why children who have not reached Piaget's concrete operations stage of development are able to make source evaluations when it comes to learning new information, and how children determine when their own conceptual knowledge is sufficient. Empirical research on this topic investigates these notions by aiming to provide an insight into the way in which children reconcile the conflict of using their own knowledge versus the testimony of others.

2.3. Reality-status judgements and children's use of conceptual evidence

One key tenet of Piaget's theory of cognitive development is that children in the pre-operational stage rely on perceptual features and their own direct experience to assimilate novel information. Empirical evidence supports this notion: research suggests that children are able to distinguish television fantasy from reality from a young age (Downs, 1990; Wright, Huston, Reitz, & Piemyat, 1994) and understand that fiction books are different from real life in terms of the reality status of both characters and events (Samuels & Taylor, 1994; Woolley & Cox, 2007). These kinds of distinctions rely heavily on the perceptual input of the stimulus being judged: young children may come to believe that the simple fact that something is being presented from within the frame of a television screen or book is enough to render it unreal. By the age of 6, however, children recognise that events portrayed on television can sometimes be real (Li, Boguszewski, & Lillard, 2015), suggesting that between the ages of 4 and 6, children become less reliant on perceptual characteristics to make their reality-status judgements, and instead begin to develop their understanding of conceptual features that determine whether or not an entity can be real.

Contrary to the historically prevalent hypothesis that children are fantasy-prone (Piaget, 1930; Subbotsky, 1994), results from empirical literature suggest that children make a clear distinction between reality and fantasy, and their fantastical thinking differs from adults only in terms of *content* (Woolley, 1997). By the age of 3 children understand the difference between ordinary events and events that happen by magic (Johnson & Harris, 1994), and become more likely with age to spontaneously pair entities based on similar reality status rather than other functional similarities (Morison & Gardner, 1978). Young children recognise that toys and pictures may resemble a particular referent but explicitly acknowledge that they are not that thing in reality (Woolley & Wellman, 1990). Children aged 3-6 also make a distinction between fantasy characters from different worlds (e.g. Batman and Spongebob) and those from the same world (e.g. Batman and Robin) in the way they relate to one another (Skolnick & Bloom, 2006), suggesting that, like adults, children's reality/fantasy distinction is not binary but represents a complex conceptual understanding. Similarly, preschool children have been found to reliably distinguish between real entities and mental entities (i.e. a real balloon and an imagined image of a balloon) (Harris et al., 1991), and do not attribute real properties to mental representations of real entities (Wellman & Estes, 1986). In fact, children's ability to imagine impossible events, such as walking through a brick wall, decreases with age, suggesting that children's orientation towards reality becomes so strong that their imagination is constrained by the causal

features of reality (Lane, Ronfard, Francioli, & Harris, 2016). Children are evidently adept at using their own direct experience with entities and events to help them make reality-status judgements.

More recent research has shifted the focus away from children's reality/fantasy distinction within the realm of magic and fantasy, and on to their understanding of the properties and contexts of entities that can be less directly perceived and experienced. Children report greater levels of belief in invisible scientific entities such as germs and oxygen than in impossible entities such as flying pigs, despite admitting that they do not know what the former look like (Harris et al., 2006). Children also explain the visibility of real entities (germs) and not-real entities (ghosts) differently, relying on scientific causal principles for the former and (lack of) reality status for the latter (Woolley & McInnis, 2015). Children's understanding of causality and its relation to reality status has also been examined in relation to judgements about machines: 4-6 year olds reliably judge unfamiliar possible machines as real significantly more often than machines that violate physical and biological causal principles (e.g. machines that could turn a child into a grown-up) (Cook & Sobel, 2011), suggesting that the mechanism behind children's judgements about what is real is their underlying conceptual understanding, rather than their own experience. Although studies in this area have focused on different kinds of entities, they have historically relied on categorisation tasks as their methodology. In an effort to provide evidence using a different method, Martarelli and Mast (2013) compared children's reaction times when judging real and fantasy stimuli. Children responded more quickly and accurately when categorising real compared to fantasy entities, and although younger children were more accurate on specific fantastical stimuli, such as Spiderman and Mickey Mouse, by the age of 5 children performed more accurately when judging generic fantastical stimuli like unicorns. These findings provide further support for the notion that young children's understanding of the properties of real and fantastical entities becomes more secure over the course of early development, and that this understanding is applied across a range of entities and in different methodological settings.

As well as making judgements about familiar entities, children can also reliably use evidence to determine the reality status of a novel entity. Having been told that novel animals called 'takins' eat twigs, children are more convinced of the reality status of these entities if they are shown relevant evidence (i.e. twigs) rather than irrelevant evidence (i.e. feathers) (Tullos & Woolley, 2009). Children's ability to evaluate this kind of evidence and use it as a basis for

their judgements improves significantly between the ages of 3 and 7: although generally children are accurate at sorting familiar characters according to their reality status, school-aged children are more systematic than preschoolers in their use of historical and fantastical contexts to determine whether a novel person is likely to be real (Corriveau et al., 2009). Similar findings have been observed when comparing scientific and fantastical contexts: by the age of 5, children are more willing to judge novel entities as real if they have been presented in a scientific context than in a fantastical context (Woolley & Van Reet, 2006). The use of context in making reality-status judgements extends beyond the preschool years: 10-year-old children are more convinced of the reality of imagined and novel entities if they have been presented in a realistic context that is elaborate rather than simple (Van Reet, Pinkham, & Lillard, 2015). This suggests that school-aged children continue to refine their conceptual understanding of the kinds of contextual properties that are inherent to reality and fantasy over the course of development.

The above research provides evidence of children's implicit ability to differentiate between fantasy and reality characters across a wide variety of domains, suggesting that from a young age children possess a domain-general understanding of the underlying causal constraints of possibility. However, the measures used in these studies did not explicitly address children's understanding of the specific attributes of different entities that may form these causal constraints. In order to further explore the exact nature of different properties considered necessary for reality, Sharon and Woolley (2004) used a novel design to investigate how different attributes might differentially affect children's reality status judgements. As well as carrying out a categorisation task, children aged 3-5 were asked about the physical, biological, social and mental capabilities of 2 real entities, 2 generic fantastical entities, and 2 specific fantastical entities. The researchers found that, although 5 year olds matched adults in their understanding of the kinds of attributes that real and pretend entities can possess, 4 year olds attributed more social and physical properties to real than fantastical entities, whereas 3 year olds showed no systematic differentiation (although they exhibited a trend towards attributing more social properties to real people). Despite their relatively sophisticated understanding of the properties that different entities could possess, all age groups were at chance at correctly categorising fantastical characters as such, and the percentage of correctly categorised real entities increased with age. Two interesting conclusions can be drawn from the results from this study. Firstly, this study demonstrates that the development of children's concepts of the kinds of attributes that real people possess appears to precede their ability to translate these

concepts into a criterion on which to base reality-status judgements. Secondly, the results from this study suggest that once children make this connection, social and physical attributes are the first criteria used to make reality-status judgements; young children seem to consider social rules and physical features as laws of reality before they are able to fully comprehend the mental and biological attributes that necessarily accompany them. The results from this study suggest that children's causal understanding may be less advanced than previous studies suggest, and support Piaget's predictions for children at this stage of development, as young children used socially-accepted behaviours that they have accommodated, along with directly observable perceptual features, to make their reality-status decisions.

However, the results of this study should be viewed in light of the specific entities that were chosen. Only 53% of 3-year-olds and 50% of 4-year-olds were familiar with one of the real entities (Michael Jordan), and so children's judgements of the properties he possessed were likely to be unsystematic and not based on an understanding of the inherent properties of reality and fantasy. Furthermore, the specific fantastical entities chosen for this study (Santa Claus and the Easter Bunny) are not representative of children's general reality/fantasy distinction owing to the endorsement of their existence by adults; research by Harris et al. (2006) on the role played by testimony in children's judgements of different fantastical beings will be explored later on in this chapter. It may also be that children's apparent ability to differentiate domain-specifically is in fact representative of the early stages of children's sensitivity to the difference between necessary and empirical truths (Shtulman, 2009), and this ability has been explored in more detail by Shtulman and Carey (2007).

The results from the previous study highlight the importance of distinguishing between children's general reality/fantasy distinction and their attitudes towards particular counterintuitive entities, and as a result these two phenomena should be considered separately and measured accordingly (Boyer, 1997). Shtulman and Carey (2007) carried out a pivotal study that investigated the role played by counterintuitive concepts in children's reality-fantasy distinction. Children aged 4-8 were asked to categorise possible-ordinary, possible-atypical (referred to as 'improbable') and impossible events based on their reality status. The researchers found that children were accurate in their judgements of possible and impossible events, but that children of all ages denied the possibility of improbable events (such as drinking onion juice) in real life. Although children's accuracy improved when improbable and impossible events were put in direct contrast, performance was still not at the level of adults,

suggesting that children were not reliably distinguishing between attributes that render an entity necessarily unreal, and those that are simply less likely to occur in day-to-day life. The results from this study suggest that the concepts representing 'real' and 'not real' continue to develop and be refined throughout childhood and into adulthood, as children begin to realise the limits of using their own experience as a robust criterion upon which to make reality-status judgements.

There is ample research providing support for Piaget's theory that children use their own understanding of the world and thus their understanding of the kinds of properties that entities can possess in order to make reality-status judgements. However, the notion that children before the approximate age of 8 are not receptive to, or cognizant of, the testimony provided by others is questioned by Harris et al. (2006). They carried out a series of experiments exploring children's reality-status judgements of real, scientific, fantastical and impossible entities. In an experiment involving real, scientific, and impossible beings, children aged 4-8 were more convinced of the existence of both real and scientific entities over impossible entities, despite knowing only what the real entities looked like. In another experiment comparing scientific entities with two kinds of fantastical beings (*endorsed* beings like Santa Claus whose existence is endorsed by adults, and *equivocal* beings like mermaids whose existence is not), 5-6-year-old children reported stronger belief in the existence of scientific entities than both kinds of fantastical beings, but importantly were also more confident in the existence of endorsed than equivocal entities. Although these initial studies had a small sample size and limited external validity, the results served as the foundation for future research into children's trust in testimony and provide compelling evidence contrary to Piaget's theory on two counts. Firstly, they demonstrate that children report similar levels of belief in real entities and in scientific entities with which they have no direct experience, and secondly that children differentiate in their judgements of the existence of fantastical beings that are endorsed by adults, and those that are not. The fact that children as young as 4 readily believe in the existence of entities that they themselves cannot directly observe, and at the age of 5 are able to distinguish between different kinds of fantastical beings based on their endorsement by adults suggests that the testimony of others has a clear part to play in pre-operational children's ontological conceptual development. The results of this study warrant an investigation into the different circumstances in which children seek testimony, and the factors that influence children's trust in different informants.

2.4. Testimony and source evaluations

Empirical evidence suggests that children (and adults) readily use their own first-hand experience and prior knowledge to decide whether or not an entity is real, but there is evidently a limit to the role that direct experience can play in children's understanding of the world (Harris, 2012). Traditionally research in this area has focused on how children develop their intuitions about the world around them rather than on how they make decisions about the reliability of secondhand information (Bergstrom, Moehlmann, & Boyer, 2006; Harris & Koenig, 2006). Although younger children sometimes overestimate the amount of knowledge that can be acquired first-hand, by the age of 5 children are able to reliably distinguish between knowledge that can be acquired directly and knowledge that requires input from other sources (Lockhart, Goddu, Smith, & Keil, 2016). Thus children's mistakes about the reality status of entities may be partially explained by children's egocentric overestimations of the extent of their knowledge about the world, but may also be owing to the absence of testimony providing an alternative viewpoint. It is impossible to disentangle children's concepts from their social context (Vygotsky, 1978), and therefore research into the influence of the testimony of others in this domain must also be examined.

There are several factors that are hypothesised to influence children's trust in testimony. Although young children prefer to obtain information from familiar over unfamiliar informants (Corriveau & Harris, 2009), children are adept at using the information at their disposal to evaluate the characteristics of others who are unfamiliar to them (Chen, Corriveau, & Harris, 2016). Lane, Wellman, and Gelman (2013) found that children aged 3-6 tended to endorse the testimony of informants who were described as 'honest' and 'smart', but that irrespective of traits, children trusted informants if they attributed knowledge to those informants. Although the participants in their study did not always attribute knowledge accurately, Lane et al.'s (2013) findings suggest that from the age of 3 children begin to understand that others may possess knowledge that they don't, and that possessing the necessary knowledge is a key reason to endorse an informant's testimony.

Studies investigating the effect of accuracy on children's trust in testimony have found that the prior accuracy of informants is even more important than familiarity with the informant (Corriveau & Harris, 2009; Guerrero, Cascado, Sausa, & Enesco, 2017) as well as the age of the informant (Jaswal & Neely, 2006). When presented with conflicting testimony, preschool children who are able to monitor accuracy prefer to learn novel object labels from the

previously accurate informant (Koenig, Clément, & Harris, 2004; Vanderbilt, Heyman, & Liu, 2014), and this extends to a preference for learning information beyond the original domain in which an informant was accurate (Koenig & Harris, 2005). The tendency to selectively trust informants based on accuracy improves with age: while children aged 3 prefer to trust informants who are consistently accurate, 4-year-olds are able to monitor relative, rather than absolute, accuracy when deciding between the testimony of two informants (Pasquini, Corriveau, Koenig, & Harris, 2007). Using a more ecologically valid measure focusing not on conflicting testimony but on one informant's accuracy over time, Ronfard and Lane (2017) found that not only did children monitor informants' relative accuracy, but they also regained trust in an informant who had been inaccurate if they went on to provide accurate information. Evidently even before entering Piaget's concrete operations stage of development, children are able to monitor the accuracy of different sources and can make decisions as to the reliability of the information provided.

There may be a Piagetian explanation for this seemingly paradoxical ability to monitor accuracy at the pre-operational stage: children may form schemas incorporating the accuracy of informants based on their own direct experience with them, and can therefore use this experience to determine whether or not to trust the testimony an informant provides. However, children are also often faced with situations in which they may not personally observe the accuracy of informants but have to infer their potential reliability using other cues. One such cue to reliability is expertise, and the ability to recognise that certain informants may be more or less knowledgeable in certain domains.

Children's ability to preferentially ask for and endorse testimony provided by experts has been documented in a number of studies. Children as young as 3 recognise that knowledge is clustered into different domains (Lutz & Keil, 2002), and that certain informants may possess greater knowledge of a particular domain than other informants (Vanderborght & Jaswal, 2009). Children prefer to learn novel word labels from an expert than a non-expert (Sobel & Corriveau, 2010) and are more likely to endorse testimony about a novel animal if it has been provided by an animal expert rather than a maternal figure (Boseovski & Thurman, 2014). A developmental shift in the ability to cluster knowledge has also been observed: older children consider that when it comes to judging why tennis balls bounce better on concrete than on grass, for example, an expert with knowledge within the same general discipline (i.e. a physics expert) will be a better source of information than an expert with similar goal- or topic-oriented

knowledge (i.e. a tennis expert) (Danovitch & Keil, 2004). Children may also sometimes overestimate the extent of others' knowledge within their area of expertise: when asked to attribute knowledge to an informant with general expertise (e.g. an animal expert) and an informant with more specific expertise from a lower taxonomic category (e.g. a poodle expert), children aged 6-10 and adults consider that a specialist will have more knowledge of both specific trivia *and* of discipline-centred general principles than a generalist (Landrum & Mills, 2015). Supporting Woolley and Ghossainy's (2013) argument that children are 'naïve skeptics', children as young as 3 have been shown to be sensitive to different areas of expertise, and recognise that being an expert in one area does not necessarily render an informant more reliable in other domains (Koenig & Jaswal, 2011). Moreover, Koenig and Jaswal (2011) found that children preferred to obtain information from a neutral informant over an informant who had been described as knowing very little about a different, unrelated subject, and argue that children may have an 'undifferentiated mistrust' of inaccurate sources of information rather an undifferentiated trust of accurate informants (p. 1645). This finding suggests that comparing the expertise of two informants separately, rather than in direct comparison with one another, may provide a more informative insight into the processes that children use when evaluating informants on an individual basis.

In order for children to actively use expert testimony, they must not only be able to recognise that some informants may be more or less knowledgeable in certain domains, but also determine when to seek testimony and from whom they should seek it. Aguiar, Stoess, and Taylor (2012) investigated this hypothesis empirically by carrying out a series of experiments, in which 4-6-year-old children were first asked to match three puppets representing a firefighter, doctor, and farmer to statements corresponding to each puppet's area of expertise; children of all ages were generally accurate at identifying which puppet would be the best person to ask for a given statement. Participants were then told that they would be working in a team with the puppets, so accordingly could either choose to provide an answer themselves, or ask one of the puppets to provide an answer. Participants tended to assign more questions to themselves than the puppets but frequently answered questions incorrectly, and when they did ask the puppets, were less accurate in their assignment than they had been in the preliminary study. By the age of 6, children were more accurate in their choice of expert, suggesting that as children develop, they possess an increased awareness of the limits of their own knowledge, and are therefore better able to decide when to seek help, and from whom.

However, although children recognise that others possess knowledge that they themselves do not, young children may not fully understand how to obtain information from others who possess the relevant knowledge in an experimental situation (Robinson, Butterfill, & Nurmsoo, 2011). This may explain the findings of studies such as Vanderbilt et al. (2014), who found that, when presented with two informants who disagreed with one another, children preferred to endorse accurate over inaccurate informants, but when children were presented with informants individually, trust in accurate and inaccurate testimony was not significantly different across conditions. In a follow-up study, children opted to trust familiar informants whose inaccuracy had previously been demonstrated, rather than asking to hear the testimony of an unfamiliar informant about whose accuracy they had no information. Although the researchers conclude that this may be the result of a tendency for young children to view people in a positive light, Robinson et al.'s (2011) findings suggest that this may in fact reflect a more general lack of understanding about how to elicit information based on other people's knowledge and experience. This has methodological implications for studies in this area: when testing the effect of testimony and expertise in a research context, it may then be more valid to utilise a tool that measures young children's receptivity to testimony when they receive it rather than their willingness to seek it out themselves.

2.5. Background to the current study

There is robust empirical research to suggest that in order to learn about the world and develop their conceptual knowledge, children use their own direct experience and understanding of properties, as well as the indirect knowledge communicated through the testimony of others. However, fewer studies have explored how these two processes interact with one another. One such study is that by Chan and Tardif (2013), who compared American and Chinese children's endorsement of testimony for ambiguous items and items that were highly salient to preschoolers' prior knowledge. Children aged 5-6 and 7-8 took part in a category judgement task which involved labelling objects and sorting them according to shared characteristics. The researcher left the room after the practice items and a confederate teacher helped the child to label the objects but provided labels that conflicted with children's prior knowledge. Children were then asked to teach the game to younger children, and trust in testimony was measured based on how many of the incorrect labels children endorsed. The researchers found that participants in both cultures endorsed more incorrect labels in the weak prior knowledge condition (i.e. for objects that were ambiguous) than those in the strong prior knowledge condition. They also controlled for children's scores on a measure of social compliance and

found that the effect of knowledge strength was still significant. This suggests that children are less likely to endorse testimony from others when it is in conflict with prior knowledge.

However, because Chan and Tardif (2013) used object naming as the measure for children's receptivity to testimony, it is unclear about the extent to which children engaged in any kind of cognitive reflection upon hearing the informant's testimony; it may well be that compatibility with a child's vocabulary was the mechanism underlying children's trust in testimony in this study. Children may view adults as 'expert language users' (Fusaro, Corriveau, & Harris, 2011) and therefore they may be more susceptible to testimony when, as in this case, it concerns violations of their knowledge of language rather than concepts. This is an important methodological consideration for research into children's receptivity to testimony, as many studies operationalise this concept by measuring children's endorsement of novel object labels. However, children are likely to be receptive to learning the names of novel objects from others because children learn language entirely through social interaction. Because there is only an arbitrary relationship between a word and its referent (Wadsworth, 1995), when children observe an informant make a mistake in their labelling, their response may be driven by the extent of their vocabulary, rather than their conceptual understanding of the identity of an object or entity. Using such an instrument does not allow for the measurement of the interaction between children's understanding of conceptual information about properties and attributes and the information provided by others. A small number of studies have investigated the interactions between prior knowledge and testimony using children's reality-status judgements, and the present study aims to extend this research.

Lane and Harris (2015) investigated the relationship between informant expertise and the extent to which novel entities possessed properties that were intuitive to children's expectations about reality. Children aged 3-8 were presented with claims about novel entities, which varied according to the expertise of the informant and the extent to which the entity's attributes were consistent with children's prior knowledge (termed 'intuitiveness' by the researchers). For example, in the intuitive condition 'yeters' were described as 'animals that are so strong that they can pull flowers from the ground', whereas in the counterintuitive condition they were described as 'animals that are so strong that they can pull trees from the ground'. Children's pre-existing intuitions about counterintuitive capacities was also assessed for four items on which children did not hear testimony. 3-4, 5-6 and 7-8 year olds were all accurate in their attribution of knowledge to the correct experts, and children of all age groups reported stronger

belief in entities that came from relevant experts rather than irrelevant experts. Levels of belief were also stronger for entities that possessed capacities that were compatible with children's prior intuitions compared to those that were counterintuitive. Although children aged 3-4 reported equal belief in both kinds of entity, children in the older age group were more sceptical of the counterintuitive entities, which upon initial inspection appears to contradict results from previous studies (see Shtulman & Carey, 2007) that children become more receptive to claims that are improbable over the course of development. However, a multiple regression analysis including children's pre-existing intuition scores rendered age only marginally significant. This suggests that older children's decreased belief in counterintuitive capacities is accounted for by increased certainty in their own intuitions, and consequently a lower level of trust in testimony that challenges their intuitions. The results from this study suggest that even preschool children are able to weigh up the intuitiveness of an informant's testimony with their own prior knowledge and expectations in order to make judgements about an entity's reality status. However, while this study demonstrated a clear difference between children's belief in intuitive and counterintuitive entities, it did not include a comparison with impossible entities. Research has shown that children aged 3-4 do not reliably distinguish between impossible and improbable entities when making reality-status judgements (Shtulman & Carey, 2007), but it is unclear whether or not children would distinguish between these entities in their use of testimony.

Lopez-Mobilia and Woolley (2016) operationalised this question by carrying out a study into the effect of expert and non-expert testimony on children's reality-status judgements of possible-typical, possible-atypical (improbable), and impossible entities. Participants aged 5-6 and 7-8 were asked to categorise novel animals according to their likely reality status. The novel animals bore similarities to familiar animals but differed according to a key characteristic: for example, an improbable entity was described as being 'like a lion, but it swims underwater', whereas an impossible entity was described as being 'like a lion, but it eats nails'. After being introduced to these entities, children were asked if they wanted to make a guess themselves or hear the testimony of a zookeeper and a chef (expert and non-expert respectively) before guessing. In both cases children then heard testimony and were asked if they wanted to change their minds if they had already made a guess. Children of both age groups were more likely to guess without hearing testimony on the impossible trials, suggesting not only that they distinguished between impossible and improbable entities, but also that they were most confident in their prior knowledge for these entities. Furthermore, children were

more likely to claim that an entity was real when the expert said so than when the non-expert did, and the effect size of this difference was greatest for improbable entities (Cramer's V = 0.42 compared to 0.36 for impossible entities and a nonsignificant difference of 0.19 on possible entities). However, when the researchers carried out a second study presenting testimony separately, the effect of expertise on children's trust in testimony was no longer significant. A number of conclusions can be drawn from these results. Firstly, it appeared that, contrary to Shtulman and Carey (2007), children differentiated between possible, improbable, and impossible entities, both in their initial reality-status judgements and in their receptivity to testimony, although it should be noted that even some of the children in the younger age group showed ceiling and floor effects in their initial judgements of the possible and impossible items, which limited their receptivity to testimony. Secondly, this study demonstrates that the processes of using prior knowledge and the testimony of others do interact, and children appear to be more susceptible to the pull of testimony for entities that are neither entirely compatible nor entirely incompatible with children's own concepts of reality.

The present study is based on research by Lane and Harris (2015) and Lopez-Mobilia and Woolley (2016) but extends it in a number of ways. Firstly, this study uses the research design of Lopez-Mobilia and Woolley (2016) to investigate children's trust in testimony for different kinds of entities but with a younger age group. This is based on previous research suggesting that 3-4 year olds reliably distinguish between reality and fantasy (Johnson & Harris, 1994) and recognise the expertise of informants (Lutz & Keil, 2002). Using a younger age group also addresses the floor and ceiling effects found by Lopez-Mobilia and Woolley, and allows for the early development of children's fantasy-reality distinction and trust in testimony to be ascertained. The present study also uses the single-informant design by presenting expert and non-expert testimony separately, rather than concurrently, as this is considered more ecologically valid (Ronfard & Lane, 2017) and allows for the individual impact of each informant on each attribute type to be measured. Children in the present study were also not required to actively seek testimony, but instead received it routinely on every trial to combat the effects found by Robinson et al. (2011). The present study also elicited certainty judgements from children; children are frequently unsure about their reality-status judgements (Sharon & Woolley, 2004), and using a dichotomous yes/no measure may be an insensitive assessment of children's underlying concepts of reality and thus may yield invalid results. For this reason this study ensured that children's certainty in their decisions was also measured using a scale based on Lane and Harris (2015). Finally, this study differs from much of the previous literature in

that it does not use novel animals as stimuli. Much of the research on children's trust in testimony is conducted using novel animals; participants are told, for example, that an unfamiliar animal called a 'surnit' runs when it is scared (Van Reet et al., 2015), and are then asked to make reality-status judgements based on this information. Research has traditionally used animals as the stimuli as children are familiar with and confident of the classification of items within this particular domain (Woolley & Ghossainy, 2013). Using stimuli from another category may provide deeper insights into how children use their own knowledge and the testimony of others in domains about which young children may be more or less confident of their knowledge. For this reason, the present study used photographs of novel people as the stimuli, and manipulated the attributes according to properties that are *possible*, *improbable*, and *impossible* of human beings. Research has shown that children do differentiate between people using different kinds of properties (Sharon & Woolley, 2004), and the present study is unique in looking at the ways that children's reality-status judgements and their trust in testimony vary when it comes to making judgements based not on an entity as a whole, but on a person's attributes and characteristics.

Chapter 3: Methodology

3.1. Introduction

This chapter will present this study's research design and will outline the methodological framework underpinning this study. Firstly the study's aims and research questions will be presented, followed by a justification for the research design. A description of the sampling and recruitment procedures and the development of the instrument used in this study will then be provided, as well as the testing procedure for both the pilot and the final study. Finally the issues of reliability, validity and ethics will be discussed.

3.2. Background and aim

The aim of this study was to carry out an analysis of how children use their own knowledge and the testimony of others to make reality status judgements about people with different attributes. Extensive previous research in this area has used novel animals as the stimuli, but there are very few studies that investigate both children's use of attributes and their receptivity to testimony using other stimuli. To the best of my knowledge, there are no published empirical studies analysing children's reality-status judgements of unfamiliar people based on their attributes. As such, this study used stimuli consisting of photographs of people whose attributes were manipulated in order to examine the effect on children's reality status judgements. This study therefore aimed to offer a new insight not only into how children use different sources of information in determining whether or not something is real, but also into the kinds of behaviours and attributes that young children consider to be necessary for a person to be real.

3.3. Research questions

The research questions for this study are as follows:

(1) How do young children's reality-status judgements vary according to the attributes of an entity/person?
(2) How does children's trust in testimony vary according to the status of the informant?
(3) How do young children's reality-status judgements vary according to the nature of testimony?
(4) What is the effect of age on research questions 1-3?

3.4. Research design

As this study was looking to compare children of two different ages but could only take place at a single time point, the study employed a cross-sectional experimental design based on previous empirical studies. This design allowed for both within- and between-subject comparisons to be made, as reality-status judgements were not only compared across age groups but also across individual participants' judgements of different kinds of attributes and after hearing supporting and conflicting testimony. Although this design does not allow for causal inferences to be made about the effect of age, the within-subject experimental conditions mean that the effect of both attribute type and testimony on children's reality-status judgements can be ascertained, whilst also controlling for the influence of extraneous variables or between-participant effects. The within-subject design thus allows robust conclusions to be drawn about how children use the information at their disposal to make reality-status judgements.

3.5. Recruitment

Participants were recruited from two Year 1 classes and two Nursery classes within a school in Essex. These classes were chosen as previous research shows that children differ in their ability to make accurate reality-status judgements between the ages of 4 and 6 (Shtulman & Carey, 2007). A combination of purposive and convenience sampling was used to recruit schools owing to a limited time frame and because this gave the best chance for a relationship to be observed within the constraints of this study (Punch, 2009). Information letters providing details of the study were sent to headteachers of several state primary schools with attached nurseries in Essex (Appendix A), one of which accepted the invitation to take part. Once initial consent had been obtained from the headteacher, information letters were given to teachers of the Year 1 and Nursery classes in order to provide them with information about the nature of the study. Both Nursery classes consented to participate and two of the three Year 1 classes also consented and participated based on staff availability and timetabling. Power calculations were carried out in order to determine the minimum sample size needed to reach the desired power of 0.95 and a medium effect size of 0.5 (J. Cohen, 1988) which was determined based on previous research in this area (see e.g. Lopez-Mobilia & Woolley, 2016). The minimum sample size under these conditions was determined to be 54 (Faul, Erdfelder, Buchner, & Lang, 2009) and so opt-out consent forms were randomly distributed to parents of 35 children in each year group to allow for instances of parental non-consent. However, although the sample size is in theory large enough to detect effects, this is still considered a small sample size (Field, 2009), particularly with regards to detecting effects on the outcome variables if the effect size

is small. Because of this, and because of the non-probabilistic nature of convenience sampling, the results from this study may not be generalisable beyond the participating school; it should be noted, however, that this is also the case in the vast majority of published studies in this research area. Additionally, recruiting participants from within the same school provides a control for school effects and further strengthens the robustness of the within-subject experimental design with regard to internal validity.

3.6. Participants

Overall, consent was obtained for 64 children across the two year groups. 3 of the 64 children were tested but ultimately excluded from the analysis as they did not meet the inclusion criteria, resulting in a sample of 61 children. Demographic characteristics of the participants are detailed in Table 3.1.

	Nursery	Year 1
N	28	33
Number of girls/boys	16/12	15/18
Mean age (SD)	51	74
Standard deviation	3.18	3.28

Table 3.1. Demographic characteristics of the sample (ages given in months)

3.7. Instruments

The instrument used for data collection was developed for this study but was based on the instrument created by Lopez-Mobilia and Woolley (2016) and is similar to reality-status judgement tasks used in other empirical research. Because developing a new instrument requires considerable work (Punch & Oancea, 2014), it is important to evaluate the suitability of existing instruments and to ensure that they are accurately operationalising the concept under investigation (Punch, 2009). As one of the aims of the present study was to explore children's understanding of what constitutes a 'real' person, the stimuli from previous studies were adapted in order to reflect this concept. An interview schedule consisting of 12 test items was thus developed using photographs of people unknown to the participants. A further difference between the instrument developed for the present study and the instrument used by Lopez-Mobilia and Woolley (2016) is that testimony is presented separately, rather than at the same time. One methodological criticism that research in this area has faced is that the method of presenting children with conflicting testimony has low ecological validity, as in real-life

situations children usually only learn from one informant at a time (Ronfard & Lane, 2017). An additional challenge of presenting two contrasting informants simultaneously is that it is impossible to see whether participants agree with the informant providing affirmative testimony or disagree with the informant providing negative testimony. For this reason, testimony was presented individually, rather than concurrently, in the present study. Examples of how testimony was presented in this study can be seen in Images 3.2 and 3.3 on p.26.

The sources of testimony also differed from previous studies to reflect expertise in this area. Using novel animals as stimuli as in Lopez-Mobilia and Woolley (2016) provides the opportunity for the testimony of an animal expert such as a zookeeper to be contrasted with that of somebody with a different, unrelated area of expertise. However, given that the present study focuses on the attributes of ordinary-looking children, providing an expert in this area is more difficult. Because some of the test items were described as being 'children from another school', a teacher was chosen as the expert in this area. Furthermore, research has shown that children aged 3-5 are more convinced by the testimony of adults than of children (Lampinen & Smith, 1995), and they prefer to learn novel information from teachers rather than peers (Rakoczy, Hamann, Warneken, & Tomasello, 2010). Therefore to provide a contrast with the teacher, another child was chosen as the non-expert. Although previous research has demonstrated that children consider their own knowledge to be comparable to that of child informants (Taylor, Cartwright, & Bowden, 1991), children aged 3-5 do also recognise that there are some domains in which a child would be a more trustworthy informant than an adult (Jaswal & Neely, 2006; Vanderborght & Jaswal, 2009). A comparison of children's trust in these two providers of testimony would thus provide an interesting insight into whether children aged 4-6 consider the domain of human characteristics to be one in which a teacher would be a more knowledgeable informant.

A further adaptation to previous studies was made by creating a measure of certainty in children's judgements. Sharon and Woolley (2004) argue that children's reality-status judgements are frequently not dichotomous, as children are often unsure about their decisions. Forced-choice questions may lead to answers that do not represent children's uncertainty about an entity, and therefore it was considered important to capture this element when investigating children's reality-status judgements in this study.

3.8. Pilot

As this interview schedule was developed specifically for this study, it was necessary to carry out a pilot study in order to ensure that the items, and the instrument more generally, functioned as intended (Bryman, 2016). As a result, a pilot study was carried out with 8 children aged between 4 and 5 attending the same school as the participants in the sample (but from different classes). This enabled the researcher to gain experience of administering the interview schedule, but also meant that the newly developed instrument could be tested. Following the pilot study, changes were made to three of the test items to ensure that the attributes of each item were clear. It was also evident that children were still unsure of the criteria on which to base their reality-status judgements with only one practice item, so a second practice item was included to address this problem. A final modification as a result of the pilot was to change the criteria for exclusion. The initial exclusion criterion was that any child who did not assign the correct reality status to the practice items would not be included in the data analysis. However, it became clear following the pilot study that the wording of this focused too heavily on accuracy, which meant that many of the younger children in the sample, whose fantasy-reality distinction has been found to be less secure than that of older children (Morison & Gardner, 1978), would be excluded. As a result, the wording was changed to reflect not children's accuracy but their understanding of the correspondence between the different coloured boxes and reality status.

3.9. Procedures

3.9.1. Data collection

Participants were informed that they were going to play a game that involved sorting photographs of real and pretend children into boxes based on information about the people in the photographs. The stimuli consisted of 14 laminated photographs of children, made up of 2 practice items and 12 test items (see Appendix B). Participants were shown two boxes and were informed that the red box was for real children and the blue box for pretend children (Appendix C). A laptop computer was used to introduce the informants to the participants who were told that they were a teacher and a child from another school who could help them to decide. In order to measure children's certainty, two cartoon faces were used to represent feeling 'very sure' and 'a little bit sure'.

The 2 practice items were administered following the study protocol (Appendix D), which were intended to familiarise participants with the game and ensured that they understood what each

box represented. Although Lopez-Mobilia and Woolley (2016) ensured that the trial on which the expert claimed an impossible entity was real was administered last, it was considered in the present study that an entirely random order would result in more valid results (see Section 3.10.2 for a further discussion of internal validity in this study), and research has shown that children are able to monitor the accuracy of an informant and do still trust an informant who has previously been inaccurate (Ronfard & Lane, 2017). For this reason, the 12 test items were administered in a random order for each participant. For each item, participants were told the name and age of the child in the photograph and were given a description of the child's attribute. For example, participants were shown Figure 3.1 and were told that this child's name was Alice, she was 6 years old and she liked dancing.



Figure 3.1. Example of a 'real' item

Participants were asked to decide if they thought this child was real or pretend, and how sure they were of this decision. Testimony was then given either by the teacher or the child, who appeared on the computer screen with a speech bubble saying whether they thought the item was real or pretend, and a photograph of the box corresponding to this statement (see Figures 3.2 and 3.3 overleaf).



Figure 3.2. Teacher testimony for 'real' items

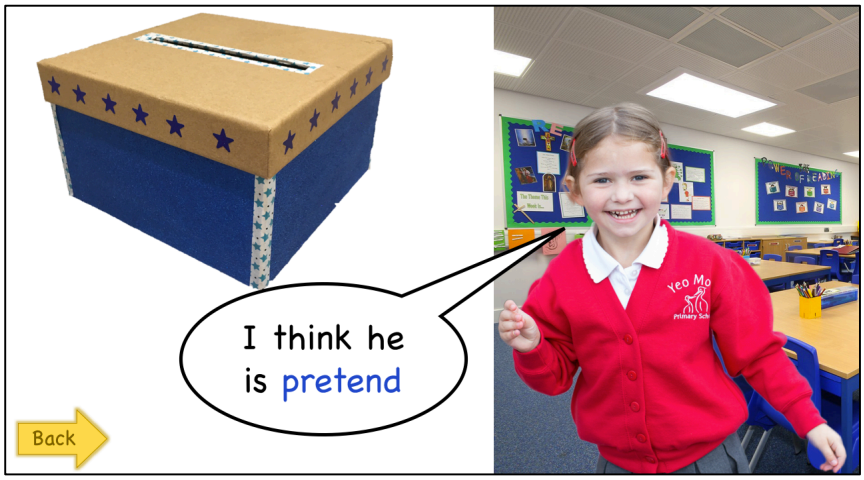


Figure 3.3. Child testimony for 'pretend' items

The experimenter read out the informant's claim and reminded the participant of his or her original judgement, and finally asked the participant to put the item in the real or pretend box. A second certainty judgement was then elicited.

The test items varied according to three types of attributes: possible, improbable, and impossible. The attributes of the possible items were developed to be consistent with children's beliefs about reality and the attributes that real people possess. Improbable attributes were those that were not physically or causally impossible but were conceptually improbable and considered to be inconsistent with children's theories of reality. Impossible items consisted of attributes that were both causal and conceptual violations of children's understanding of what

it means to be a real person (as defined by Shtulman & Carey, 2007). A list of all 12 test items and the 2 practice items can be found in Table 3.2.

	Possible	Improbable	Impossible
Practice	Likes to eat sandwiches	n/a	Breathes fire out of his nose
Test	Likes dancing	Wears shoes and socks to bed	Makes things disappear by clapping her hands
	Has a baby sister called Bella	Eats jelly with a straw	Runs faster than a car
	Reads books about animals	Goes swimming wearing a coat and scarf	Has wings and flies around the garden
	Plays with friends at nursery	Sleeps in a treehouse	Walks through brick walls

Table 3.2. The 2 practice and 12 stimulus items within the 3 categories of possible, improbable, and impossible.

3.9.2. Scoring

Measures were taken of children's reality-status judgements and children's certainty both before and after testimony. Answers were coded on a scale of 0 to 3 based on previous research (see Harris et al., 2006; Lane & Harris, 2015), with 0 representing 'not real, very sure', 1 representing 'not real, a little bit sure', 2 representing 'real, a little bit sure', and 3 representing 'real, very sure'.

3.10. Validity and reliability

One challenge with developing a new instrument is that lack of standardisation means that results run the risk of being invalid and/or unreliable. However, efforts should still be made to ensure that the development of the instrument results in one which is as reliable and valid as possible within the time available.

3.10.1. Reliability

Reliability assumes that instrumentation, data and findings should be controllable, predictable, consistent and replicable (L. Cohen, Morrison, & Manion, 2007). In order to improve the reliability of this study, efforts were made to ensure that all extraneous sources of variation

were controlled for and minimised. This included creating and following a standardised study protocol for each child, carrying out data collection in a quiet room away from distractions, and following a comprehensive scoring system administered in the same way on every trial. As previously discussed in Section 3.8, piloting was highly important, both to ensure familiarity with the study protocol on the part of the researcher, but also to minimise the effects of other factors such as lack of participant motivation. Because the instrument in this study consisted of 12 items, rather than 6 as in Lopez-Mobilia and Woolley (2016), piloting served as a way of ensuring that an interview schedule of this length was within young children's concentration span and therefore that participants remained interested for the duration of the task.

3.10.2. Validity

In order to demonstrate content validity a researcher must ensure that an instrument covers the main elements under investigation as comprehensively as possible (L. Cohen et al., 2007). In this study piloting was essential to establish content validity, as it ensured that all of the items were clear, easy to understand, and relevant to the issue under investigation. Construct validity was established by rooting the present study both in theoretical literature exploring children's conceptual development, and in empirical literature which, despite using different stimuli, operationalises children's understanding of the fantasy-reality distinction and their use of testimony in this way.

Although external validity in this study is low owing to the nature of non-probabilistic sampling, the within-subject experimental design results in high levels of internal validity; because the same participants made reality-status judgements at each testing occasion (i.e. before and after testimony), inferences about the change in their judgements can be attributed to the experimental manipulation of attributes and testimony. Internal validity was also addressed in the sampling procedure, as drawing all participants in both age groups from the same school controlled for school effects as a potential confound in the outcome variables. Presenting the items in a random order for each participant also addressed threats to internal validity such as fatigue or practice effects.

Ecological validity was also prioritised so that the study was valid within the context in which it took place. Efforts were made to ensure that the task was similar to the kinds of activities that are familiar to children in a preschool and school setting. As discussed in Section 3.7, a

methodological adaptation was also made to present the two types of testimony separately in the interest of ecological validity.

3.11. Ethics

Ethical considerations are a key part of carrying out research, and are currently more central to the discussion of research in the social sciences than they have ever been before (Bryman, 2016). The present study adhered to the British Educational Research Association (BERA) Ethical Guidelines (British Educational Research Association, 2011), and was approved by the University of Oxford Central University Research Ethics Committee (CUREC) (Appendix E). CUREC Approved Procedure 25 was especially appropriate for this study, particularly concerning issues of safeguarding and the use of opt-out consent.

3.11.1. Safeguarding and confidentiality

The researcher obtained an enhanced Disclosure and Barring Service (DBS) check in order to be able to work with children in a school setting, and it was also highly important to ensure adherence to school guidelines on Child Protection and Safeguarding at all times. An additional ethical consideration regarding safeguarding was made concerning the data collected from participants. Although the data from participants in this study was not of a sensitive nature, all data collected were anonymised by assigning identification numbers to each child. A key matching children's anonymised responses to their names and dates of birth were stored in a secure location and were permanently deleted once the data had been processed electronically. All electronic data were stored securely on a password protected computer.

3.11.2. Consent and assent

CUREC Approved Procedure 25 specifies that opt-out consent can only be used under two conditions (Central University Research Ethics Committee, 2017). Firstly, children and their parents/guardians must be provided with ample information about the study on which to make an informed decision about the participation of their child. The information sheet and opt-out consent form should give parents/guardians enough time to read the information and object to their child's participation, and should specify that if the form is not returned, their child could be asked to participate in the research. In this study parents/guardians were given three weeks to return the consent form, and were provided with information about the study and its ethical implications in the form of an information leaflet (Appendix F).

The second condition for opt-out consent is that the topic under investigation should be one that parents/guardians should not find contentious. An investigation of children's understanding of fantasy and reality was not considered to pose any such problems, and the methodology was similar to the kinds of activities that children are used to doing at school; consultation with the head teacher also confirmed that opt-out consent was the most suitable for this study. Parents and school staff were also informed that they would receive a report detailing the results of the study once data had been analysed and written up.

Though children are unable to give informed consent on their own behalf, it was nonetheless critical to ensure that all participants were willing to take part in order to minimise undue harm. As a result, verbal assent from each child was also obtained before beginning with the study procedure.

Chapter 4: Results

4.1. Introduction

In this chapter the analysis strategy for this study will be described with reference to results from preliminary analyses of descriptive statistics. The assumptions for parametric statistical testing will be discussed and related to the data. The main analyses will then be presented in relation to the study's four research questions, and a summary of the results will be provided.

4.2. Research questions

This study investigated four main research questions:

(1) How do young children's reality-status judgements vary according to the attributes of an entity/person?
(2) How does children's trust in testimony vary according to the status of the informant?
(3) How do young children's reality-status judgements vary according to the nature of testimony?
(4) What is the effect of age on research questions 1-3?

Data were collected from children from two age groups in order to explore changes over the course of children's early development.

4.3. Preliminary analyses

4.3.1. Descriptive statistics

Table 4.1 presents the means, medians, and standard deviations of children's reality-status judgements before and after hearing testimony. Based on previous research, mean scores from 0-0.75 represent strong disbelief, 0.76-1.5 represent modest disbelief, 1.51 to 2.25 represent modest belief, and 2.26-3 represent strong belief (Lane & Harris, 2015). The attributes of the entities are detailed in the left-hand column, with the nature of the testimony provided for each item described in parentheses.

	3-4 year olds (N=28)						5-6 year olds (N=33)					
	Initial judgement			Judgement after testimony			Initial judgement			Judgement after testimony		
Entity type/person	M	Mdn	SD	M	Mdn	SD	M	Mdn	SD	M	Mdn	SD
Possible (teacher 'real')	2.50	3	0.88	2.68	3	0.48	2.94	3	0.35	2.91	3	0.29
Possible (teacher 'not real')	2.07	2.5	1.12	1.07	0	1.30	2.82	3	0.58	2.09	3	1.26
Possible (child 'real')	2.07	3	1.18	2.57	3	0.88	2.61	3	0.93	2.76	3	0.75
Possible (child 'not real')	2.04	3	1.23	0.86	1	1.01	2.70	3	0.81	2.33	3	1.11
Improbable (teacher 'real')	1.82	2	1.16	2.00	2	1.05	1.09	1	1.18	1.61	2	1.30
Improbable (teacher 'not real')	1.25	1	1.11	0.57	0	0.88	0.79	0	1.11	0.46	0	0.90
Improbable (child 'real')	1.46	2	1.14	2.21	2	0.96	0.70	0	1.05	1.09	1	1.26
Improbable (child 'not real')	1.54	1	1.23	0.96	1	1.17	1.24	1	1.23	0.76	0	1.06
Impossible (teacher 'real')	1.50	1	1.23	2.18	3	1.12	0.79	0	1.24	1.21	0	1.39
Impossible (teacher 'not real')	2.21	3	1.10	1.14	1	1.27	1.03	1	1.19	0.76	0	1.06
Impossible (child 'real')	1.18	1	1.25	1.96	2	1.17	0.21	0	0.42	0.76	0	1.17
Impossible (child 'not real')	1.57	2	1.29	0.96	1	1.00	0.36	0	0.86	0.30	0	0.77

Table 4.1. Descriptive statistics for reality-status judgements before and after hearing testimony according to age

4.3.2. Analysis strategy

Although the unit of observation in this study was the individual children who participated, the unit of analysis was at the level of the different items representing different combinations of attributes and testimony. In order to analyse this kind of data, a combination of repeated-measures and mixed ANOVAs was planned. A repeated-measures ANOVA was planned to examine the effect of attributes on children's initial reality-status judgements, and a mixed ANOVA would then compare main effects and interaction effects of the independent variables after hearing testimony. This design would also assess the effect of age as a between-subjects factor.

4.3.3. Assumptions for parametric tests

Parametric tests such as ANOVA have two fundamental assumptions: normal distribution and homogeneity of variance (as well as sphericity when analysing within-subject effects) (Field, 2009). Therefore in order to be able to reliably use parametric tests to analyse these data, it is important to first ensure that the data meet the assumptions of these tests.

Although normality can be tested using the Kolmogorov-Smirnov test, it has been criticised for having low power in comparison to other tests, and therefore may not be sensitive enough to reveal significant deviations from normality (Razali, 2011). Normality was therefore tested using both the Kolmogorov-Smirnov test and through an examination of skewness and kurtosis statistics. Z-scores were calculated by dividing each skewness and kurtosis value by its standard error, and any scores above 1.96 were considered a significant deviation in a sample of this size (Field, 2009). Results from the Kolmogorov-Smirnov tests (Appendix G) indicated that both 3-4 and 5-6-year-olds' reality-status judgements of every item significantly deviated from normality, both before and after hearing testimony. Inspection of the z-scores for skewness and kurtosis (Appendix H) indicated that, while not every score was above 1.96, several of the skewness values deviated largely from normality as well as a number of the kurtosis values. Transformations of the data were not possible, as further inspection of histograms (Appendix I) demonstrated that the extent and direction of the skewness and kurtosis values were not consistent across variables.

It has been argued that ANOVA and other parametric tests are still robust statistical tests when it comes to analysis of data that deviates significantly from normality (Norman, 2010). Even if this is the case, it is still necessary to ensure that the other assumptions of parametric tests are met. Although Mauchly's test indicated that the assumption of sphericity was violated (Appendix J), the Greenhouse-Geisser correction can be used as a more conservative estimate (Field, 2009). However, Levene's test of homogeneity of variance demonstrated that variances in reality-status judgements differed significantly between the two age groups on all four possible items before hearing testimony, and on three possible items after hearing testimony. Similarly, variances on two of the impossible items were significantly different across age groups before testimony, and one of the impossible items, as well as two improbable items, also significantly differed after testimony (Appendix K). Although ANOVA is robust to deviations from one of its key assumptions (Lachenbruch & Clements, 1991), use of ANOVA when all assumptions are violated risks yielding invalid results. Therefore an alternative to the use of ANOVA in this study was sought.

4.4. Main analyses

Because of the violations of the assumptions of parametric tests, empirical research with a similar design and research questions to the present study was consulted. Although this study was based on Lopez-Mobilia and Woolley (2016), the adaptations made to the scoring to

include participants' certainty meant that the outcome variables were measured on a continuous scale measuring extent of belief, rather than a dichotomous scale with 0 and 1 representing 'real' and 'not real', respectively. As a result, the binary logistic regression used by Lopez-Mobilia and Woolley was not suitable for the present study. Previous empirical studies in which participants' certainty is incorporated in the outcome variables were also consulted (Lane & Harris, 2015; Woolley & Van Reet, 2006). These studies conducted mixed ANOVAs with age as the between-subjects factor, and testimony and attributes as the within-subjects factors. However, these studies did not provide evidence of the distribution of the dependent variables, nor of homogeneity of variance, and therefore this strategy was not adopted in the present study because of the clear violations to the assumptions of parametric tests. Although they are deemed less powerful than parametric tests (Sheskin, 2004), non-parametric tests were used to answer the research questions in this study in order to avoid making a Type I error.

Friedman's ANOVA, the non-parametric alternative to a repeated measures ANOVA, was employed when comparing dependent samples on more than one condition, with Wilcoxon signed-rank tests employed as post hoc tests to establish how each condition compared to the others. Mann-Whitney U tests were used for comparisons between independent samples in cases where the effect of age was investigated. On occasions where multiple comparisons were made, the significance value was adjusted using the Bonferroni method. Effect size *r* was calculated for all results using the formula described in Field (2009), $r = \frac{Z}{\sqrt{N}}$, where z represents the standardised z-score and N the number of total observations. For this study the criteria for small, medium, and large effect sizes are represented by 0.1, 0.3, and 0.5 respectively (Field, 2009).

4.4.1. *How do young children's reality-status judgements vary according to the attributes of an entity/person?*

In order to answer this question, children's initial reality-status judgements before hearing testimony were compared across the three attribute types. A composite score for each attribute was created from the sum of the four individual items. Initial investigation using Friedman's ANOVA revealed a significant effect of attribute type on children's reality-status judgements, $\chi^2(2)=57.34$, $p<.001$. Post hoc Wilcoxon tests were used to follow up this finding, with a Bonferroni correction applied for multiple comparisons; results are therefore reported at a .0167 level of significance. These tests showed that participants reported significantly stronger

belief in possible attributes, (Mdn=11) than in improbable attributes (Mdn=5) with a medium to large effect size, z=-6.155, p<.001, *r*=-0.45. Similarly, belief in possible attributes was significantly stronger than impossible attributes (Mdn=4), again with a medium to large effect size, z=-5.673, p<.001, *r*=-0.43. However, there was no significant difference found between judgements of improbable and impossible attributes, z=-1.494, n.s., *r*=-0.11.

4.4.2. *How does children's trust in testimony vary according to the status of the informant?*

In order to analyse the effect of testimony separately from its interaction with attribute type, an outcome variable was created measuring the degree of change between participants' initial judgements and their judgements once they had heard testimony. This variable did not include the direction of change but rather examined the impact of the expertise of the informant on children's trust in testimony. This was measured on a scale of 0-3 for each of the six items for which each informant provided testimony, with 0 representing no change and 3 representing the maximum change in cases where participants went from strong belief to strong disbelief, for example. A composite score was then created on a scale from 0-18 with descriptive statistics for this variable detailed in Table 4.2.

	Overall change for child	Overall change for teacher
N	61	61
Mean	4.05	4
Median	4	4
SD	3.30	3.07
Minimum	0	0
Maximum	12	12

Table 4.2. Descriptive statistics measuring extent of change after hearing testimony from a child and from a teacher

A Wilcoxon signed-rank test revealed that participants' judgements before and after testimony were not significantly different depending on which informant provided testimony, z=-0.278, n.s., *r*=0.03. Results from within each age group showed the same pattern: the extent of change was not significantly different between the two informants for 3-4 year olds, z=-1.257, n.s., *r*=-0.17, nor for 5-6 year olds, z=-0.758, n.s, *r*=-0.09.

4.4.3. *How do reality-status judgements vary according to the nature of testimony?*

Because informant expertise was not found to have a significant effect on children's reality-status judgements, teacher and child testimony were collapsed to form whole variables based on whether the informant said an item was 'real' or 'not real'. A series of Wilcoxon signed-rank tests were carried out in order to compare participants' initial reality-status judgements on the different items with their judgements after hearing testimony.

For possible attributes, children's reality-status judgements were rated significantly higher after hearing testimony that items were real (Mdn=6) than their initial judgements (Mdn=6) with a small effect size, $z=-2.068$, $p<.05$, $r=-0.19$, although it should be noted that data from 62% of participants showed tied ranks, meaning that their judgements did not change. Possible items were also significantly affected by testimony saying that they were not real, with reality-status judgements being significantly lower after testimony (Mdn=3) than they had been before (Mdn=6), with a medium-sized effect, $z=-4.087$, $p<.001$, $r=-0.37$.

A similar pattern was observed for improbable attributes, where children reported significantly stronger belief after hearing testimony saying that items were real (Mdn=3) compared to their previous judgements (Mdn=3), with a medium effect size, $z=-3.832$, $p<.001$, $r=-0.35$. Improbable attributes were also significantly affected by testimony saying that these items were not real, but in the opposite direction: reality-status judgements were significantly lower after testimony (Mdn=1) than they had been initially (Mdn=3), with a medium effect size, $z=-4.309$, $p<.001$, $r=-0.39$.

Items with impossible attributes were also affected by testimony saying that they were real, in that judgements were significantly higher after hearing testimony (Mdn=3) than they had been initially (Mdn=1), $z=-3.862$, $p<.001$, $r=-0.35$. There was also a medium-sized significant difference in the judgement of impossible items when testimony said they were not real: reality-status judgements were significantly lower (Mdn=1) than they had been initially (Mdn=3), $z=-3.86$, $p<.001$, $r=-0.35$, although in this case 54% of the sample did not change after hearing testimony.

Results indicate that both 'real' and 'not real' testimony did have an effect on reality-status judgements across the three kinds of attributes. In order to determine whether there was an interaction between testimony and attributes, Friedman's ANOVA was conducted comparing

the total scores on each pair of items across the three kinds of attributes that had received 'real' testimony. For example, a comparison was made between the two items with possible attributes that had received 'real' testimony, and the two items with improbable attributes that had received 'real' testimony. Friedman's ANOVA revealed a significant effect of attribute type on receptivity to 'real' testimony, $\chi^2(2)=48.681$, $p<.001$. Post hoc Wilcoxon tests (adjusted for multiple comparisons using Bonferroni corrections) demonstrated that reality-status judgements for possible attributes (Mdn=6) were significantly higher than for improbable attributes (Mdn=3) after hearing 'real' testimony, with a medium effect size, z=-5.387, p<.001, *r*=-0.4. Similarly, reality-status judgements after hearing 'real' testimony for possible attributes (Mdn=6) were significantly higher than for impossible attributes (Mdn=3), with a similarly sized effect, z=-5.421, p<.001, *r*=-0.4. However, there was no significant difference between judgements of improbable attributes (Mdn=3) and impossible attributes (Mdn=3) when participants heard testimony that they were real, z=-1.825, n.s., r=-0.14.

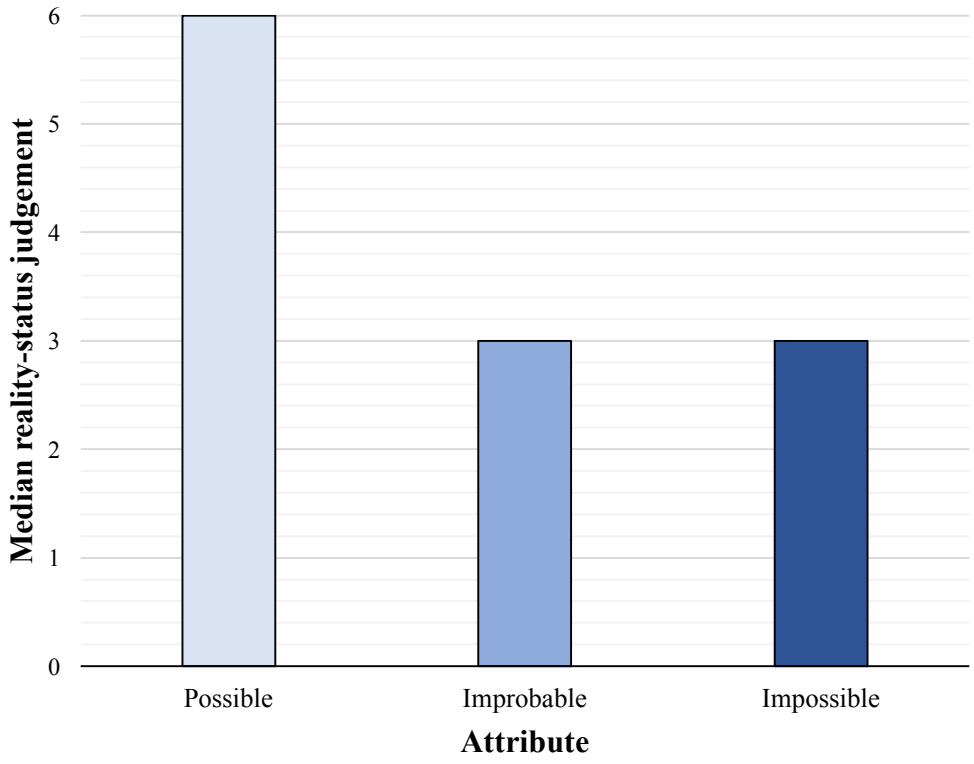


Figure 4.1. Median reality-status judgements for all three attribute types after 'real' testimony

A similar analysis was carried out to investigate the effect of 'not real' testimony. Friedman's ANOVA revealed a significant effect of attribute type on receptivity to this type of testimony,

$\chi^2(2)=26.724$, p<.001. Post hoc analyses revealed that when informants stated that items were not real, those with possible attributes were rated significantly higher (Mdn=3) than those with improbable attributes (Mdn=1), with a medium-sized effect, z=-4.743, p<.001, *r*=-0.33. Belief in possible attributes was also significantly stronger (Mdn=3) than belief in impossible attributes (Mdn=1) after 'not real' testimony, with a slightly smaller effect size, z=-3.962, p<.001, *r*=-0.29. However, no significant differences were found between ratings of improbable and impossible items when testimony said that they were not real, z=-0.918, n.s., *r*=-0.07.

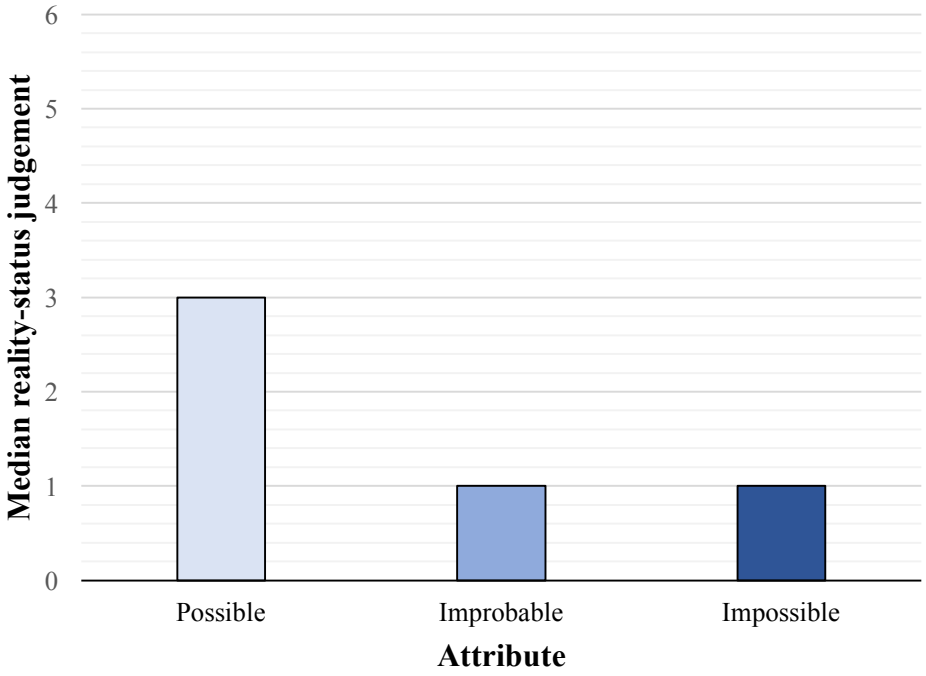


Figure 4.2. Median reality-status judgements for all three attribute types after 'not real' testimony

4.4.4. *What is the effect of age on research questions 1-3?*

Research question 1 – How do young children's reality-status judgements vary according to the attributes of an entity/person?

The differential effect of attributes on reality-status judgements across the two ages was assessed using post hoc Wilcoxon signed-rank tests with Bonferroni correction applied for multiple comparisons. For 3-4 year olds, belief in possible attributes (Mdn=10) was significantly stronger than belief in improbable attributes (Mdn=6) with a medium effect size, z=-3.234, p<.01, *r*=-0.35. However, there was no significant difference in strength of belief between possible attributes (Mdn=10) and impossible attributes (Mdn=6), z=-2.177, n.s., *r*=

-0.24), nor between improbable (Mdn=6) and impossible (Mdn=6) attributes, z=-0.593, n.s., *r*=-0.07. For 5-6 year olds, there was a large difference between children's belief in possible attributes (Mdn=12) and improbable attributes (Mdn=3), z=-5.026, p<.001, *r*=-0.51. Similarly, 5-6 year olds reported stronger levels of belief in possible attributes (Mdn=12) than impossible attributes (Mdn=2) with a large effect size, z=-4.991, p<.001, *r*=-0.5. A significant difference was also found between children's judgements of improbable attributes (Mdn=3) and impossible attributes (Mdn=2), with a smaller effect size, z=-2.514, p=.011, *r*=-0.25.

The extent of the differences between age groups in belief in each attribute type was then assessed using post hoc Mann-Whitney U tests. There was a significant difference between the two age groups in the extent of their belief in possible attributes, with 5-6 year olds reporting significantly stronger belief (Mdn=12) than 3-4 year olds (Mdn=10), U=247, z=-3.304, p=.001, *r*=-0.42. However, the strength of belief in improbable attributes was significantly lower for 5-6 year olds (Mdn=3) than for 3-4 year olds (Mdn=6), U=219.5, z=-3.544, p<.001, *r*=-0.45. Similarly, 5-6 year olds' level of belief in impossible attributes (Mdn=2) was significantly lower than that of 3-4 year olds (Mdn=6), with a large effect size, U=126, z=-4.912, p<.001, *r*=-0.63.

Research question 2 – How does children's trust in testimony vary according to the status of the informant?

Post hoc Mann-Whitney U tests were conducted in order to assess whether or not the two age groups differed in the extent of their trust of different informants. Results of the comparison of the two age groups revealed that the extent of change in judgements for 3-4 year olds (Mdn=6) was significantly greater than for 5-6 year olds (Mdn=2) after hearing the child's testimony, with a large effect size, U=192.5, z=-3.926, p<.001, *r*=-0.5. A similar pattern was observed for teacher testimony, with 3-4 year olds demonstrating a significantly greater change (Mdn=5) than 5-6 year olds (Mdn=3), but with a medium effect size, U=262, z=-2.913, p<.01, *r*=-0.37.

Research question 3 – How do reality-status judgements vary according to the nature of testimony?

Post hoc comparisons across the two age groups were conducted using Mann-Whitney U tests in order to see whether the interaction between testimony and attributes differed across the two groups. On possible items where testimony said that they were real, the two age groups did not differ significantly from one another, U=369, z=-1.675, n.s., *r*=-0.21. However, there was a

significant difference for possible items when testimony said that they were not real, in that 3-4 year olds' judgements (Mdn=1) were significantly lower than those of 5-6 year olds (Mdn=6), with a large effect size, U=185.5, z=-4.102, p<.001, *r*=-0.53. For improbable items with 'real' testimony, 3-4 year olds rated items significantly higher (Mdn=4) than 5-6 year olds (Mdn=3), with a medium effect size, U=255.5, z=-3.03, p<.01, *r*=-0.39. However, no significant differences were found between the age groups on items with improbable attributes when testimony said that they were not real, U=388, z=-1.117, n.s., *r*=-0.14. There was a significant medium- to large-sized difference between age groups on impossible items when testimony said that they were real, in that 3-4 year olds reported significantly stronger belief (Mdn=4.5) than 5-6 year olds (Mdn=1), U=221, z=-3.552, p<.001, *r*=-0.46. The same pattern was also observed for impossible items when testimony said that they were not real, but with a smaller effect size: 5-6 year olds' reality-status judgements on these items (Mdn=1) were significantly lower than those of 3-4 year olds (Mdn=1.5), U=289, z=-2.592, p<.01, *r*=0.33.

4.5. Summary of results

Attributes. Overall there were significant differences in reality-status judgements according to attributes, with children reporting significantly stronger levels of belief in entities with possible attributes than in those with either improbable or impossible attributes. No overall differences were found in children's judgements of improbable and impossible attributes.

Testimony. The effect of expertise on children's trust in testimony was not significant overall, nor did it differentially affect each age group. Analysis of the interaction between attributes and testimony revealed that children's reality-status judgements of entities with possible, improbable, and impossible attributes were all significantly affected by both 'real' testimony and 'not real' testimony. The effect of 'real' testimony on children's reality-status judgements was significantly greater for entities with possible attributes than for those with improbable or impossible attributes, but judgements of the entities with improbable and impossible attributes did not significantly differ after children heard 'real' testimony. A similar result was found for 'not real' testimony, with children reporting higher levels of belief in possible attributes than improbable or impossible ones, and no differentiation was made between these two types of entity in terms of receptivity to 'not real' testimony.

Age. 5-6 year olds distinguished between all three kinds of attribute in their initial reality-status judgements, whereas 3-4 year olds only distinguished between possible and improbable

attributes and failed to differentiate between possible and impossible attributes, as well as improbable and impossible attributes, in their initial reality-status judgements. The effects of attributes on children's judgements were stronger for 5-6 year olds than for 3-4 year olds: 5-6 year olds were more certain than 3-4 year olds of the reality of possible entities and of the unreal nature of entities with both improbable and impossible attributes. A comparison of children's initial judgements with their judgements after testimony revealed that children aged 3-4 were more susceptible to testimony than 5-6 year olds, and this effect was found for both 'real' and 'not real' testimony. For entities with possible attributes, both age groups were affected by 'real' testimony to a similar extent, but 3-4 year olds were significantly more convinced by 'not real' testimony for these entities than 5-6 year olds. Children in the two age groups did not differ in their receptivity to 'not real' testimony for improbable attributes, but children aged 3-4 were significantly more affected by 'real' testimony than 5-6 year olds for these entities. The effect of 'real' testimony for entities with impossible attributes was significantly greater for 3-4 year olds than 5-6 year olds, whereas 5-6 year olds were significantly more convinced than the younger age group by 'not real' testimony for these entities.

Chapter 5: Discussion

5.1. Introduction

This chapter situates the present study within the context of the literature, and outlines the new contributions made by this study. The main findings are discussed in relation to the research questions and the broader theoretical and empirical literature. The study's limitations are then presented, followed by suggestions for future research and a final synthesis of the research evidence.

5.2. Unique focus on the ability to conceive of human attributes

Theories of conceptual development such as Piaget's and Vygotsky's provided a starting point for empirical research into how children come to understand the concept of reality. As a result, there is a large literature on children's understanding of reality and fantasy, but there are few studies that focus specifically on the particular attributes of entities. This study contributes to the literature by providing an insight into how children view the possibility of particular human attributes, and has provided new knowledge about how children use this possibility as a criterion to help them to make judgements about the kinds of attributes that make a person real or not. Previous research on the fantasy-reality distinction has focused on how children judge human-like entities as a whole; by focusing on the improbability of specific attributes, this study has provided further clarification of the criteria that children use when making reality-status judgements about human beings.

In terms of children's trust in testimony, this study is situated within a literature comparing the testimony of different informants and looking at the kinds of situations that prompt children to seek testimony. By violating children's conceptions of the possibility of the kinds of attributes that people can possess, this study has offered an insight into children's differential trust in testimony in situations where information is compatible or incompatible with their expectations. Trust in testimony was also extended more specifically to children's trust in a teacher compared to another child when it came to making judgements about real human attributes. This study has brought together the broader literature on children's use of testimony when making reality-status judgements and the less extensive literature on children's understanding of expertise, and offers new conclusions regarding the domains in which children consider adults to be experts.

5.3. Discussion of main findings

The first research question concerned children's understanding of different kinds of attributes and their relation to reality-status. Results from the whole sample showed that before they heard testimony, children consistently reported stronger levels of belief in entities with possible attributes than those with either improbable or impossible attributes. However, breaking this down by age revealed significant differences between 3-4 year olds and 5-6 year olds: whereas 3-4 year olds only distinguished between possible and improbable attributes in their reality-status judgements, 5-6 year olds made clearer distinctions between all three kinds of attribute, in that participants reported stronger belief in possible attributes than improbable attributes, which in turn were assigned a higher reality status than impossible attributes. The smaller effect size between improbable and impossible (r=-0.25) compared to between possible and improbable (r=-0.51) and possible and impossible (r=-0.5) suggests that although children are beginning to differentiate, they may be less certain of the distinction between events that are impossible, and those that are simply unlikely to occur. This extends the research by Lopez-Mobilia and Woolley (2016), in that it demonstrates that the ability to differentiate between improbable and impossible attributes develops between the ages of 4 and 6. This also contradicts results by Shtulman and Carey (2007), who found that this ability appears much later in development. One reason for this may be the use of different stimuli: whereas in Shtulman and Carey's study children did not differentiate between improbable and impossible events, in this study children were asked about human attributes. It may be that from an early age, children possess a more nuanced understanding of the possibility and impossibility of *attributes* that render people real or not when compared with the possibility of *events* that can occur in real life. These findings also suggest that the older children in this study were close to reaching Piaget's concrete operations stage, as, contrary to their younger counterparts, they appeared to understand that social rules that they have accommodated are typical but not necessary features of reality.

Analysing the breakdowns of reality-status judgements by age indicates that 5-6 year olds were more confident of their judgements across the three attribute types, and a comparison of effect sizes shows the largest difference between the two age groups was on impossible attributes (r=-0.63). This may be a result of younger children's more fluid fantasy-reality distinction as found by Lane and Harris (2015), but also provides support for Woolley and Ghossainy's (2013) notion that children are 'naïve skeptics'. By the age of 6, children who are more certain

in their understanding of fantasy and reality may be consequently more sceptical of entities with attributes that definitively violate their conceptions of reality.

In terms of the second research question, no significant differences were found in children's trust in each informant: children both overall and by age group were equally convinced by the teacher and the child's testimony. This provides support for studies such as Vanderbilt et al. (2014) and Lopez-Mobilia and Woolley (2016, Study 2), which found that children disregarded expertise and accuracy and trusted any informant when testimony was presented separately. However, this finding also supports observations made by Vanderborght and Jaswal (2009) that young children recognise that there are particular domains in which a child would be a better informant than an adult; it may be that in this case participants did not consider a teacher to be any more knowledgeable about the possibility of human attributes than a child. An alternative explanation for this finding is that, because all the people in the photographs were children, the participants considered child informants to be reliable sources of testimony for judgements about other children. Using photographs of adults may have resulted in a more clear-cut difference in children's trust in testimony. Furthermore, contrary to Piaget's hypothesis, the younger children in this study were significantly more susceptible than the older children to both types of testimony. Evidently 3-4 year olds are able to recognise that their own conceptions may not always be accurate, and as a result they are willing to accept the testimony of more knowledgeable others. The larger difference between age groups in trust in the child's testimony (r=-0.5) compared to the teacher's (r=-0.37) can be viewed alongside older children's increased certainty in their own judgements: it may be the case that some of the older children considered their own knowledge to be comparable to that of the child (as found by Taylor et al., 1991), and as a result were beginning to be less willing to accept her testimony.

The measures of children's trust in testimony for the third research question revealed a similar pattern to the overall sample's initial reality-status judgements. Although children were more affected by 'not real' than 'real' testimony for possible attributes (r=-0.37 and r=-0.19 respectively), children did not differ in their receptivity to either kind of testimony for improbable and impossible attributes: effect sizes across both attribute types for each kind of testimony were very similar (ranging from r=-0.35 to r=-0.39). Contrary to Lopez-Mobilia and Woolley's (2016) finding that children were most affected by testimony for improbable entities, this suggests that children in this sample were not differentiating between improbable and impossible attributes in their trust in testimony. However, it does not refute Lopez-Mobilia

and Woolley's conclusion that children are motivated to seek testimony for the items about which they are least certain, as initial reality-status judgements in the present study suggest that the overall sample was equally confident that both improbable and impossible attributes would render a person not real.

In light of the finding that age differences existed in children's understanding of the possibility of different attributes, viewing the differences in trust in testimony by age was necessary. Significant age differences were found in children's trust in testimony across the different attributes. When informants said that entities with possible attributes were real, there were no age differences between children's judgements. This indicates that the ceiling effects found by Lopez-Mobilia and Woolley (2016) were also present in this study, as children from both age groups were already relatively confident of their initial judgements for these attributes even before hearing testimony that confirmed their suspicions. The large difference (r=-0.53) between the two age groups for 'not real' testimony for entities with possible attributes suggests that older children were able to conclude that their own prior knowledge and experience with possible attributes was more reliable than the testimony of others in this case, whereas younger children accepted the testimony despite their apparent initial certainty in their own judgements. This was also the case for improbable and impossible attributes, in that younger children were more convinced by 'real' testimony for entities with improbable and impossible attributes than older children. These findings provide further support for the notion that the older children in this study were closer to Piaget's concrete operations stage: they appeared to be better able to critically reflect upon both their own initial judgements and the testimony of the informants to make a decision as to the more trustworthy option (which in this case was deemed to be their own prior knowledge).

Although overall no significant differences were initially found between children's trust in 'not real' testimony for improbable and impossible attributes, an interesting finding emerged regarding age comparisons in this area: no significant age differences were found for children's receptivity to 'not real' testimony for entities with improbable attributes. Given that young children were equally susceptible to testimony regardless of attribute type, it is not surprising that they reported strong disbelief upon hearing 'not real' testimony. As 'naïve skeptics' (Woolley & Ghossainy, 2013), it may be that older children had a tendency to view improbable attributes as not real but were less certain of this than they were for impossible attributes: as a result, 'not real' testimony for improbable attributes may have increased their certainty and

resulted in a judgement that was not significantly different from the younger group. This effect was not observed for impossible attributes: older children's judgements after 'not real' testimony were significantly lower than younger children's, which can be explained by the large difference between the two ages in their initial reality-status judgements (r=-0.63) as a result of floor effects in older children's initial judgements. This result provides further support for the notion that older children are confident of the impossibility of these attributes and appear to be more certain in their fantasy-reality distinction than their younger counterparts.

Results for all three research questions suggest that children of both age groups make distinctions between different kinds of attributes, both in their initial reality-status judgements and in their trust in testimony. A developmental trend in both children's decisions about the reality status of attributes and in their trust in testimony was observed: between the ages of 4 and 6 children appear to become much more certain in their judgements and as a result begin to privilege their own prior knowledge over the testimony of others when it comes to judging the likelihood of attributes in determining a person's reality status. This has interesting implications for Piaget's theory, as it suggests that children may begin the pre-operational stage as relatively credulous and uncertain of the extent of their own knowledge regarding characteristics of real people. As they gain more direct experience with reality and progress towards concrete operations, children appear to become more egocentric in that they are far less receptive to informants offering testimony that runs counter to their expectations. In order to progress into the concrete operations stage, there must come a point at which children recognise the limits of their knowledge and are able to engage in cognitive reflection to weigh up the likelihood of informants' claims in an abstract and systematic manner. Although it appeared that some of the children in the older group were beginning to engage in such reflection, a full investigation of this hypothesis by comparing 6 year olds with older children firmly in the concrete operations stage was not within the scope of the present study.

5.4. Limitations

5.4.1. Validity and reliability

Because of the violations to the assumptions of parametric tests, non-parametric tests were used in this study to ensure robust conclusions could be drawn. Although significant differences were detected for both the within- and between-subject contrasts using non-parametric tests, a direct statistical comparison of the *interaction* between the within-subject factors (attributes and testimony), and the between-subjects factor (age) was not possible

because there is no non-parametric alternative to mixed ANOVA. Although comparisons of effect size *r* do provide some insight into the size of the age differences across the different types of attribute and testimony, no direct statistical comparison could be made. One of the limitations of this study may therefore be compromised statistical conclusion validity, and as a result the conclusions based on comparisons of effect sizes should be interpreted with caution.

Moreover, because of the non-probabilistic sampling strategy used in this study, as well as the relatively small sample size (Field, 2009), it is not possible to generalise results beyond the sample selected for this study, and as a result external validity is low. Similarly, when divided into age groups, the sample used in this study is only just within the minimum limit to be able to detect effects using Wilcoxon signed-rank tests (Faul et al., 2009). Replicating this study with a larger and more diverse sample would allow for greater generalisation and would help to rule out the possibility of the null hypothesis being incorrectly rejected or of invalid statistical conclusions being drawn in this study. This would also allow for the instrument used in this study to be tested for convergent validity with other measures of children's reality-status judgements and trust in testimony (such as that used by Lopez-Mobilia & Woolley, 2016), to facilitate comparisons between dependent variables across different stimuli.

Although efforts were made to ensure that high standards of reliability were upheld in this study, developing a new instrument can pose problems for internal reliability. Although piloting addressed this limitation somewhat, three items were adapted after the pilot study and further piloting with these items was not possible within the time frame of this study. The extent to which these items reliably represented their respective attributes is therefore unclear. In order to improve the internal reliability of this scale, further development based on reliability coefficients such as Cronbach's alpha would ensure that all items on the possible, improbable, and impossible subscales were measuring the same construct.

5.4.2. Executive function

Lopez-Mobilia and Woolley (2016) argue that processing novel information, assessing its compatibility with existing knowledge, and deciding whether or not to trust the testimony of others is a complex metacognitive task. In the present study, children were not given a choice as to whether or not they received testimony, and as a result were often given information by informants that conflicted with their own initial judgements. Children therefore had to exercise considerable inhibitory control in order to decide whether or not to change their minds, as well

as a certain degree of self-regulation in order to participate in the activity and concentrate on making judgements on all 12 items. It may be that the developmental trends of increasing certainty in children's own judgements and decreasing trust in testimony that were observed in this study were partially mediated by older children's improved executive function skills (as found by Jaswal et al., 2014). Specific suggestions about how this limitation could be addressed are discussed in Section 5.5.

5.5. Directions for future research

In order to make comparisons between children in different Piagetian stages of development, further research could extend this study by making an additional comparison with children aged 7-8 (as per Lopez-Mobilia & Woolley, 2016) which would allow for conclusions to be drawn regarding the way that conceptual development of real human attributes continues to be refined and developed over time. Controlling for specific aspects of executive function would also result in a more precise measure of children's conceptual development and its effect on their judgements. Since this study required children to inhibit their initial response in order to critically reflect on the testimony they heard, including measures of inhibitory control such as the battery of tasks used by Carlson and Moses (2001) may help to identify the extent of the relationship between inhibitory control and children's receptivity to testimony when making reality-status judgements. Similarly, a longitudinal study tracing the development of this ability in the same individuals over time would allow for more robust conclusions to be drawn regarding the way that this ability develops, and would also provide insights into individual differences in children's estimations of their own knowledge and their trust in testimony.

Another option for further research would be to vary the nature of testimony by making comparisons between different informants. Building on research by Corriveau and Harris (2009), a comparison between a familiar teacher and peer, rather than two unfamiliar informants, could extend the findings of this study and may yield different results. Similarly, as no difference between the status of informants was found in the present study, the methodology could be adapted to include a comparison between different familiar adults, such as teachers and parents, or different familiar children, such as siblings and peers; this would further clarify the ways that children differentially estimate the extent of others' knowledge in relation to their own.

The scope of this study could also be extended by varying the nature of the stimuli according to the categories delineated by Sharon and Woolley (2004). A comparison between the probability of different attributes within the social, physical, mental, and biological domains would provide a richer explanation for the ways that children's schemas for different kinds of behaviours and characteristics develop, and whether or not these schemas develop simultaneously or at different rates. Similarly, asking children to provide justifications for their decisions as in Harris et al. (2006) would also help to understand the ways in which judgements of different attributes may differ. Some children in this study did spontaneously offer such justifications: for example, upon hearing the teacher give 'real' testimony for an impossible attribute, one child decided not to trust the teacher, remarking that, "maybe she thought it was a magic trick". Conducting more qualitative analysis of children's justifications for different items would offer a rich and detailed insight into the cognitive processes that children use to make decisions about reality status and whether or not to trust the testimony of others.

5.6. Conclusion

The aim of this study was to investigate whether or not children distinguished between unfamiliar people by the possibility of the attributes they possessed. The results indicated that by the age of 6, children possess a nuanced understanding of particular attributes that render people real or not real, and rely on testimony differentially according to these attributes. Within the restricted timeframe of a Master's project, this study has demonstrated that as children's concepts develop, they become more capable of making complex evaluations of both the inherent content and the source of novel information in order to assimilate this information. Future research could provide further clarification as to the different kinds of situations that may prompt children to use this ability, and could also provide an insight into the ways in which the underlying cognitive processes develop over time.

References

Aguiar, N. R., Stoess, C. J., & Taylor, M. (2012). The development of children's ability to fill the gaps in their knowledge by consulting experts. *Child Development, 83*(4), 1368-1381. doi:10.1111/j.1467-8624.2012.01782.x

Amin, T. G., & Valsiner, J. (2013). Coordinating operative and figurative knowledge: Piaget, Vygotsky, and beyond. In J. I. M. Carpendale & U. Müller (Eds.), *Social interaction and the development of knowledge* (pp. 87-110). New York, NY: Psychology Press.

Bergstrom, B., Moehlmann, B., & Boyer, P. (2006). Extending the testimony problem: evaluating the truth, scope, and source of cultural information. *Child Development, 77*(3), 531-538.

Boseovski, J. J., & Thurman, S. L. (2014). Evaluating and approaching a strange animal: children's trust in informant testimony. *Child Development, 85*(2), 824-834. doi:10.1111/cdev.12156

Boyer, P. (1997). Further distinctions between magic, reality, religion, and fiction. *Child Development, 68*(6), 1012-1014.

British Educational Research Association. (2011). Ethical guidelines for educational research. Retrieved from https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2011

Brown, G., & Desforges, C. (1977). Piagetian psychology and education: time for revision. *British Journal of Educational Psychology, 47*, 7-17.

Bryman, A. (2016). *Social research methods* (5th ed.). Oxford, UK: Oxford University Press.

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development, 72*(4), 1032-1053.

Carpendale, J. I. M., & Müller, U. (2013). Social interaction and the development of rationality and morality: an introduction. In J. I. M. Carpendale & U. Müller (Eds.), *Social interaction and the development of knowledge* (pp. 1-18). New York, NY: Psychology Press.

Central University Research Ethics Committee. (2017). *Approved Procedure 25: studies using non-invasive methods with children*. University of Oxford.

Chan, C. Y. C., & Tardif, T. (2013). Knowing better: the role of prior knowledge and culture in trust in testimony. *Developmental Psychology, 49*(3), 591-601. doi:10.1037/a0031336

Chen, E. E., Corriveau, K. H., & Harris, P. L. (2016). Person perception in young children across two cultures. *Journal of Cognition and Development, 17*(3), 447-467. doi:10.1080/15248372.2015.1068778

Clément, F., Koenig, M., & Harris, P. L. (2004). The ontogenesis of trust. *Mind & Language, 19*(4), 360-179.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Laurence Erlbaum Associates.

Cohen, L., Morrison, K., & Manion, L. (2007). *Research methods in education* (6th ed.). London, UK: Taylor & Francis Routledge.

Cook, C., & Sobel, D. M. (2011). Children's beliefs about the fantasy/reality status of hypothesized machines. *Developmental Science, 14*(1), 1-8. doi:10.1111/j.1467-7687.2009.00949.x

Corriveau, K. H., & Harris, P. L. (2009). Choosing your informant: weighing familiarity and recent accuracy. *Developmental Science, 12*(3), 426-437. doi:10.1111/j.1467-7687.2008.00792.x

Corriveau, K. H., Kim, A. L., Schwalen, C. E., & Harris, P. L. (2009). Abraham Lincoln and Harry Potter: children's differentiation between historical and fantasy characters. *Cognition, 113*(2), 213-225. doi:10.1016/j.cognition.2009.08.007

Danovitch, J. H., & Keil, F. C. (2004). Should you ask a fisherman or a biologist?: developmental shifts in ways of clustering knowledge. *Child Development, 75*(3), 918-931.

Downs, A. C. (1990). Children's judgments of televised events: the real versus pretend distinction. *Perceptual and Motor Skills, 70*, 779-782.

Driver, R. (1978). When is a stage not a stage? A critique of Piaget's theory of cognitive development and its application to science education. *Educational Research, 21*(1), 54-61. doi:10.1080/0013188780210108

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160. doi:10.3758/BRM.41.4.1149

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London, UK: SAGE Publications.

Fusaro, M., Corriveau, K. H., & Harris, P. L. (2011). The good, the strong, and the accurate: preschoolers' evaluations of informant attributes. *Journal of Experimental Child Psychology, 110*(4), 561-574. doi:10.1016/j.jecp.2011.06.008

Gelman, S. A. (2009). Learning from others: children's construction of concepts. *Annual Review of Psychology, 60*, 115-140. doi:10.1146/annurev.psych.59.103006.093659

Gilmore, C. K., & Bryant, P. (2006). Individual differences in children's understanding of inversion and arithmetical skill. *British Journal of Educational Psychology, 76*(2), 309-331. doi:10.1348/000709905X39125

Guerrero, S., Cascado, C., Sausa, M., & Enesco, I. (2017). My teacher is wrong: preschoolers' opposition to non-conventional statements. *Early Childhood Research Quarterly, 39*, 1-13. doi:10.1016/j.ecresq.2016.11.001

Harris, P. L. (2012). *Trusting what you're told: how children learn from others*. Cambridge, MA: Harvard University Press.

Harris, P. L., Brown, E., Marriott, C., Whittall, S., & Harmer, S. (1991). Monsters, ghosts and witches: Testing the limits of the fantasy-reality distinction in young children. *British Journal of Developmental Psychology, 9*, 105-123.

Harris, P. L., & Koenig, M. A. (2006). Trust in testimony: how children learn about science and religion. *Child Development, 77*(3), 505-524.

Harris, P. L., Pasquini, E. S., Duke, S., Asscher, J. J., & Pons, F. (2006). Germs and angels: the role of testimony in young children's ontology. *Developmental Science, 9*(1), 76-96. doi:10.1111/j.1467-7687.2005.00465.x

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best. *Psychological Science, 17*(9), 757-758.

Jaswal, V. K., Pérez-Edgar, K., Kondrad, R. L., Palmquist, C. M., Cole, C. A., & Cole, C. E. (2014). Can't stop believing: inhibitory control and resistance to misleading testimony. *Developmental Science, 17*(6), 965-976. doi:10.1111/desc.12187

Johnson, C. N., & Harris, P. L. (1994). Magic: special but not excluded. *British Journal of Developmental Psychology, 12*, 35-51.

Koenig, M. A., Clément, F., & Harris, P. L. (2004). Trust in testimony: children's use of true and false statements. *Psychological Science, 15*(10), 694-698.

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development, 76*(6), 1261-1277.

Koenig, M. A., & Jaswal, V. K. (2011). Characterizing children's expectations about expertise and incompetence: halo or pitchfork effects? *Child Development, 82*(5), 1634-1647. doi:10.1111/j.1467-8624.2011.01618.x

Lachenbruch, P. A., & Clements, P. J. (1991). ANOVA, Kruskal-Wallis, normal scores and unequal variance. *Communications in Statistics - Theory and Methods, 20*(1), 107-126. doi:10.1080/03610929108830486

Lampinen, J. M., & Smith, V. L. (1995). The incredible (and sometimes incredulous) child witness: child eyewitnesses' sensitivity to source credibility cues. *Journal of Applied Psychology, 80*(5), 621-627.

Landrum, A. R., & Mills, C. M. (2015). Developing expectations regarding the boundaries of expertise. *Cognition, 134*, 215-231. doi:10.1016/j.cognition.2014.10.013

Lane, J. D., & Harris, P. L. (2014). Confronting, representing, and believing counterintuitive concepts: navigating the natural and the supernatural. *Perspectives on Psychological Science, 9*(2), 144-160. doi:10.1177/1745691613518078

Lane, J. D., & Harris, P. L. (2015). The roles of intuition and informants' expertise in children's epistemic trust. *Child Development, 86*(3), 919-926. doi:10.1111/cdev.12324

Lane, J. D., Ronfard, S., Francioli, S. P., & Harris, P. L. (2016). Children's imagination and belief: prone to flights of fancy or grounded in reality? *Cognition, 152*, 127-140. doi:10.1016/j.cognition.2016.03.022

Lane, J. D., Wellman, H. M., & Gelman, S. A. (2013). Informants' traits weigh heavily in young children's trust in testimony and in their epistemic inferences. *Child Development, 84*(4), 1253-1268. doi:10.1111/cdev.12029

Li, H., Boguszewski, K., & Lillard, A. S. (2015). Can that really happen? Children's knowledge about the reality status of fantastical events in television. *Journal of Experimental Child Psychology, 139*, 99-114. doi:10.1016/j.jecp.2015.05.007

Lockhart, K. L., Goddu, M. K., Smith, E. D., & Keil, F. C. (2016). What could you really learn on your own?: understanding the epistemic limitations of knowledge acquisition. *Child Development, 87*(2), 477-493. doi:10.1111/cdev.12469

Lopez-Mobilia, G., & Woolley, J. D. (2016). Interactions between knowledge and testimony in children's reality-status judgments. *Journal of Cognition and Development, 17*(3), 486-504. doi:10.1080/15248372.2015.1061529

Lutz, D. J., & Keil, F. C. (2002). Early understanding of the division of cognitive labor. *Child Development, 73*(4), 1073-1084.

Martarelli, C. S., & Mast, F. W. (2013). Is it real or is it fiction? Children's bias toward reality. *Journal of Cognition and Development, 14*(1), 141-153. doi:10.1080/15248372.2011.638685

Morison, P., & Gardner, H. (1978). Dragons and dinosaurs: the child's capacity to differentiate fantasy from reality. *Child Development, 49*(3), 642-648.

Norman, G. (2010). Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Science Education, 15*(5), 625-632. doi:10.1007/s10459-010-9222-y

Nurmsoo, E., Robinson, E. J., & Butterfill, S. A. (2010). Children's selective learning from others. *Review of Philosophy and Psychology, 1*(4), 551-561. doi:10.1007/s13164-010-0043-y

Pasquini, E. S., Corriveau, K. H., Koenig, M., & Harris, P. L. (2007). Preschoolers monitor the relative accuracy of informants. *Developmental Psychology, 43*(5), 1216-1226. doi:10.1037/0012-1649.43.5.1216

Piaget, J. (1930). *The child's conception of physical causality*. London, UK: Routledge & Kegan Paul Ltd.

Piaget, J. (1967). *The psychology of intelligence* (5th ed.). London, UK: Routledge & Kegan Paul Ltd.

Piaget, J. (1969). *The psychology of the child*. New York, NY: Basic Books.

Piaget, J. (1972). *Psychology and epistemology: towards a theory of knowledge*. London, UK: Allen Lane, The Penguin Press.

Piaget, J. (1973). *To understand is to invent*. New York, USA: Viking Press.

Piaget, J. (1978). *The development of thought: equilibration of cognitive structures*. Oxford, UK: Basil Blackwell.

Punch, K. F. (2009). *Research methods in education*. London, UK: SAGE Publications.

Punch, K. F., & Oancea, A. (2014). *Introduction to research methods in education*. London, UK: SAGE Publications.

Rakoczy, H., Hamann, K., Warneken, F., & Tomasello, M. (2010). Bigger knows better: Young children selectively learn rule games from adults rather than from peers. *British Journal of Developmental Psychology, 28*(4), 785-798. doi:10.1348/026151009x479178

Razali, N. M. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. *Journal of Statistical Modeling and Analytics, 2*(1), 21-33.

Robinson, E. J., Butterfill, S. A., & Nurmsoo, E. (2011). Gaining knowledge via other minds: children's flexible trust in others as sources of information. *British Journal of Developmental Psychology, 29*, 961-980. doi:10.1111/j.2044-835X.2011.02036.x

Ronfard, S., & Lane, J. D. (2017). Preschoolers continually adjust their epistemic trust based on an informant's ongoing accuracy. *Child Development,* Advance online publication. doi:10.1111/cdev.12720

Samuels, A., & Taylor, M. (1994). Children's ability to distinguish fantasy events from real-life events. *British Journal of Developmental Psychology, 12*, 417-427.

Sharon, T., & Woolley, J. D. (2004). Do monsters dream? Young children's understanding of the fantasy/reality distinction. *British Journal of Developmental Psychology, 22*, 293-310.

Sheskin, D. J. (2004). *Handbook of parametric and nonparametric statistical procedures* (3rd ed.). Boca Raton, FL: Chapman & Hall/CRC.

Shtulman, A. (2009). The development of possibility judgment within and across domains. *Cognitive Development, 24*(3), 293-309. doi:10.1016/j.cogdev.2008.12.006

Shtulman, A., & Carey, S. (2007). Improbable or impossible? How children reason about the possibility of extraordinary events. *Child Development, 78*(3), 1015-1032.

Skolnick, D., & Bloom, P. (2006). What does Batman think about SpongeBob? Children's understanding of the fantasy/fantasy distinction. *Cognition, 101*(1), B9-B18. doi:10.1016/j.cognition.2005.10.001

Sobel, D. M., & Corriveau, K. H. (2010). Children monitor individuals' expertise for word learning. *Child Development, 81*(2), 669-679.

Subbotsky, E. (1994). Early rationality and magical thinking in preschoolers: space and time. *British Journal of Developmental Psychology, 12*, 97-108.

Taylor, M., Cartwright, B. S., & Bowden, T. (1991). Perspective taking and theory of mind: do children predict interpretive diversity as a function of differences in observers' knowledge? *Child Development, 62*(6), 1334-1351.

Tullos, A., & Woolley, J. D. (2009). The development of children's ability to use evidence to infer reality status. *Child Development, 80*(1), 101-134.

Van Reet, J., Pinkham, A. M., & Lillard, A. S. (2015). The effect of realistic contexts on ontological judgments of novel entities. *Cognitive Development, 34*, 88-98. doi:10.1016/j.cogdev.2014.12.010

Vanderbilt, K. E., Heyman, G. D., & Liu, D. (2014). In the absence of conflicting testimony young children trust inaccurate informants. *Developmental Science, 17*(3), 443-451. doi:10.1111/desc.12134

Vanderborght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development, 18*, 61-71. doi:10.1002/icd.591

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wadsworth, B. J. (1995). *Piaget's theory of cognitive and affective development* (5th ed.). New York, NY: Longman Inc.

Wellman, H. M., & Estes, D. (1986). Early understanding of mental entities: a reexamination of childhood realism. *Child Development, 57*(4), 910-923.

Wellman, H. M., & Gelman, S. A. (1992). Cognitive development: foundational theories of core domains. *Annual Review of Psychology, 43*, 337-375.

Woolley, J. D. (1997). Thinking about fantasy: are children fundamentally different thinkers and believers from adults? *Child Development, 68*(6), 991-1011.

Woolley, J. D., & Cox, V. (2007). Development of beliefs about storybook reality. *Developmental Science, 10*(5), 681-693. doi:10.1111/j.1467-7687.2007.00612.x

Woolley, J. D., & Ghossainy, M. E. (2013). Revisiting the fantasy-reality distinction: children as naive skeptics. *Child Development, 84*(5), 1496-1510. doi:10.1111/cdev.12081

Woolley, J. D., & McInnis, M. A. (2015). The development of children's concepts of invisibility. *Cognitive Development, 34*, 63-75. doi:10.1016/j.cogdev.2014.12.009

Woolley, J. D., & Van Reet, J. (2006). Effects of context on judgments concerning the reality status of novel entities. *Child Development, 77*(6), 1778-1793.

Woolley, J. D., & Wellman, H. M. (1990). Young children's understanding of realities, nonrealities, and appearances. *Child Development, 61*(4), 946-961.

Wright, J. C., Huston, A. C., Reitz, A. L., & Piemyat, S. (1994). Young children's perceptions of television reality: determinants and developmental differences. *Developmental Psychology, 30*(2), 229-239.

Appendix A: Headteacher information letter

Head teacher name
School name and address
Date

Dear Head teacher name,

Children's use of personal knowledge and adult testimony in judgements of reality

I will be carrying out research for my Master's dissertation in early summer into how children use their own knowledge and the testimony of adults to distinguish between reality and fantasy. I hope that you and your school will be interested in participating.

From a young age children are presented with fictional characters in many forms, and I am trying to learn exactly how and when children begin to understand that the fictional characters in films, stories, and their own imaginations are different from the real people and events they encounter in the world. Research has shown that children often use adult testimony to help them decide whether something is real or pretend, and I am interested in studying different situations which might prompt children to use adult testimony over their own prior knowledge.

In practical terms, I would like to work with children aged 3-4 and 5-6 in Nursery and Year 1 for one to two weeks in May/early June 2017, during which time I would like to spend around 20 minutes with each child. The task would involve me showing children 12 photographs of real children (downloaded from a stock photo website) and giving them some information about the people in the photographs. The questions would follow the format: "This is Ben. He is five years old. He likes to eat ice cream", and "This is Alice. She is five years old. She can jump over high buildings". Based on this information, children would then be asked to make an initial guess as to whether the people were real or pretend, and how sure they were of this decision. They would then hear the opinion of an expert and a non-expert and would be asked if they wanted to change their mind, or stick with their original decision. The task should be similar to the sorts of things children are used to doing at school, and I hope it will be an enjoyable experience for them.

I would consult with the class teachers to fit best with their timetable and would aim to cause minimal disruption to normal classroom activities. I would ensure also to seek consent from parents/guardians, as well as asking individual children if they were happy to participate before proceeding with the task. All participants would also be made aware that they would be free to withdraw from the study at any time.

I have the required DBS clearance to work with children in schools, and previously worked in a primary school. All information collected for this project will only be used by the people involved in this study (i.e. me and my supervisor). The only personal information I will need to obtain from the school will be children's dates of birth, but I will ensure that children are anonymised using only a number to identify them and their responses. No information about individual children's responses will be made available. The research has been approved by Oxford University's Ethics Committee.

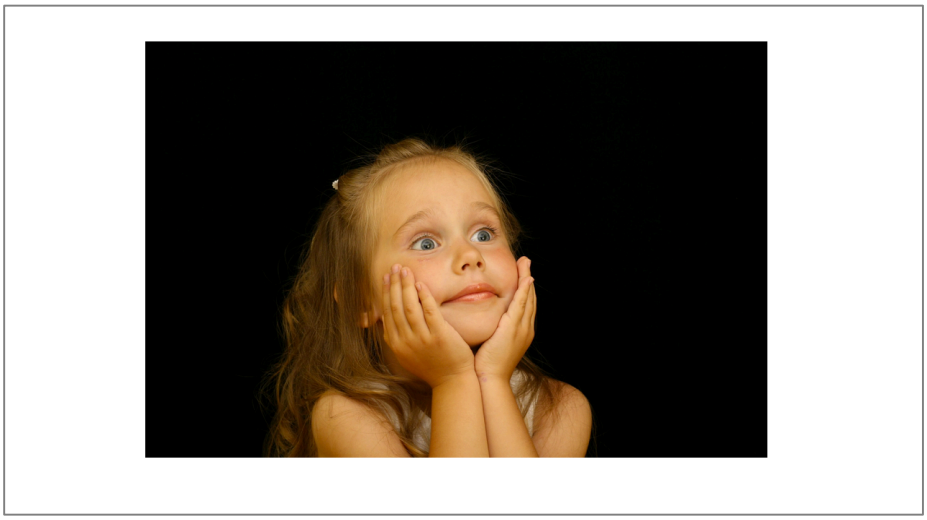
Once the study has been completed I will ensure that a report of the overall findings is provided to your school and to any parents who may be interested in reading this.

Thank you for taking the time to read this, and for your consideration of this project. I will contact you within a few days to ask whether you would like your school to participate in this project. Alternatively, you may prefer to reply to my email to indicate your interest in participating. If you have any questions about the study, please feel free to contact me by emailing (----------), or my supervisor ---------- at (----------).

I hope that this project may be of interest to you and I look forward to hearing from you.

Yours sincerely,

Appendix B: Screenshots of the 2 practice items and 12 test stimuli







Appendix C: Photographs of the ‘real’ and ‘pretend’ boxes





Appendix D: Study protocol

Introduction: Today I am going to need your help with playing a game together. I had a pile of photos of real children from another school, and a pile of photos of pretend "super-children" that aren't real. When I was coming to your school today, the two piles got all mixed up! I need your help to sort the photos back into these two boxes, a red one for Real Children (show box) and a blue one for Pretend Super Children (show box). I'm going to tell you something about all the children in the pictures, and you can decide if you think they sound like they might be real or pretend.

Luckily you won't have to decide on your own - we have two people who can help you by telling you what they think: a teacher called Mrs Fraser, and a child in her class called Rosie. When we look at the pictures, one of them is going to tell us what they think about whether the children are real or pretend. Sometimes they might say the same as you, and sometimes they might say something different from you. It's up to you to decide if you want to listen to them or not. Sometimes when you tell me what you think, you might be more sure for some of your answers than for other ones. When you tell me what you think, you can use these two smiley faces to tell me if you are very sure, or only a bit sure (show faces).

Check questions:

1. Which box is for real people/pretend people? 2. Who is this person (Mrs Fraser)? 3. Who is this person (Rosie)?

Warm-up trials: "Let's do some practice ones. Let's look at this picture together. This is a picture of Zoe. Zoe is 5 years old. She likes to eat sandwiches. Before we see what Mrs Fraser or Rosie says, can you tell me if you think Zoe is real or pretend?
(If they say they don't know) Can you make a guess about what he/she *might* be?
Can you use these faces to show me how sure you are? Remember, this one means you're very sure (show face 1), and this one means you're only a bit sure (show face 2).

Okay, let's see who's going to help us with this one – it's Mrs Fraser. Let's see what she says.
So you said Zoe was real/pretend, and the teacher says she is real. So what do you think? Does Zoe's picture go in the red box for real children or the blue box for pretend children? Can you use the faces to show me how sure you are?

Now let's do one more practice one. This is a picture of Tom. Tom is 4 years old. He breathes fire out of his nose. Do you think Tom is real or pretend? Can you use the faces to show me how sure you are?

Let's see who's going to help us this time – it's Rosie. Let's see what she says.
So you said Tom was real/pretend, and Rosie says he is pretend. So what do you think? Does Tom's picture go in the red box for real children or the blue box for pretend children?
Can you use the faces to show me how sure you are?

Now that we've done the practice ones, are you ready to start? Let's pull a card out and see whose picture we're going to look at first.

Appendix E: CUREC approval

Application Approval

Title:
Children's use of personal knowledge and adult testimony in understanding the fantasy/reality distinction

Researchers:
(---------- and ----------)

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

Please note that CUREC approval does not guarantee access to participants, and it is your responsibility to check whether countries or contexts in which you plan to conduct your research might impose additional requirements.

If your research involves participants whose ability to give free and informed consent is in question (this includes those under 18 and vulnerable adults), then it is advisable to read the following NSPCC professional reporting requirements for cases of suspected abuse
http://www.nspcc.org.uk/globalassets/documents/information-service/factsheet-child-abuse-reporting-requirements-professionals.pdf

Should there be any subsequent changes to the project which raise ethical issues not covered in the original application you should submit details to research.office@education.ox.ac.uk for consideration.

Good luck with your research study.

Yours sincerely,
Heath Rose

Heath Rose
Associate Professor of Applied Linguistics
Department of Education
University of Oxford
15 Norham Gardens
Oxford, OX2 6PY
United Kingdom
TEL: +44-1865-274033
Co-Editor of Doing Research in Applied Linguistics; Co-Author of Introducing Global Englishes

Appendix F: Parent information leaflet and consent form

Children's use of knowledge and testimony in judgements of reality

Research study to investigate how children use their own personal knowledge and the knowledge of experts to distinguish between what is real and pretend

Who is carrying out this research?

My name is ----------, and I'm studying for a Master's in Child Development and Education at the University of Oxford. I have previously worked ----------

----------. I have the required DBS clearance to work safely with children in schools.

If you have any further questions about this research, please don't hesitate to contact me or my supervisor.

Contact Details

If you have any further questions about this research, please don't hesitate to contact me by emailing (----------), or my supervisor ---------- at (----------). We will do our best to answer any queries you may have.

If you remain unhappy or wish to make a formal complaint, please use the email address provided below to contact the chair of the Departmental Research Ethics who will aim to resolve the manner as promptly as possible.

Chair of Department Research Ethics Committee
Email: research.office@education.ox.ac.uk

Invitation to take part in a study

For further information please contact ---------- by email (----------)

Please fill in the slip on the back of this paper and return it to your child's teacher if you **DO NOT** want your child to take part.

Children's use of knowledge and testimony in judgements of reality

Dear **Parents/Guardians**,

I am writing to ask for your permission for your child to take part in a research study about the ways that children use information they already know and information provided by adults when making decisions about whether or not something is real.

The study will consist of showing children 12 different pictures and asking them if they think the person in the picture is real. Your child will be asked if he or she would like to participate and both you and your child have the right to withdraw from the study at any time.

I have included some information in this leaflet about why I am carrying out this study, what your child's role will be, and how the data I collect will be used. I hope that you will be happy for your child to take part in this research, but please read through the information in this pamphlet before you make your decision.

If you **DO NOT** want your child to take part in this study, please tear off the attached permission slip on this leaflet and return it to your child's teacher before **dd/mm/yyyy**. If we do not receive this slip from you, your child may be invited to take part in this study.

Please feel free to contact me if you have any further questions.

----------, MSc Student
Department of Education, University of Oxford

What are the aims of this study?

Fictional characters form an important part of children's lives, whether on television, in storybooks, or even in children's own imaginations. As children develop, they gain an understanding that fictional characters are somehow different from the 'real' people they encounter in the world. This research aims to look at the the kinds of information that children use to help them make this distinction, including their own knowledge and information provided by adults.

What will my child have to do?

The study will take place in the classroom during the school day. The task should take no longer than 15-20 minutes for each child. Before beginning, children will be asked if they are happy to take part in the study and will be told that they can stop whenever they wish.

The study involves working with children individually. Your child will be shown 12 pictures of different people, and given some information about the person in the picture (e.g. "This is Ben. He is 4 years old. He likes to eat sausages" and "This is Alice. She is 5 years old. She can jump over tall buildings"). Based on this information, children will then be asked to guess whether the people are real or pretend. They will then hear the opinion of a fictional teacher and a fictional child, and will be asked if they want to change their mind, or stick with their original decision.

How will the data be used?

The information gathered from this study will be used for the researcher's Master's dissertation to be submitted in August 2017. All information collected for this project will only be used by the researcher. No information about individual children's responses will be made available, and children will be anonymised using only a number to identify them.

This project has been approved by the Oxford University Ethics Committee.

To be returned to your child's teacher by **dd/mm/yyyy** if you **DO NOT** want your child to be part of this study.

I **DO NOT** give permission for my child to take part in the study entitled *Children's use of knowledge and testimony in judgements of reality.*

Child's name (block capitals).....

Parent/Guardian's name (block capitals).....

Parent/Guardian signature..... Date.....

Appendix G: Kolmogorov-Smirnov tests of normality

	Kolmogorov-Smirnov					
	3-4 years old			5-6 years old		
	Statistic	df	Sig.	Statistic	df	Sig.
Initial judgement possible teacher real	0.393	28	<.001	0.539	33	<.001
Initial judgement possible teacher not real	0.297	28	<.001	0.501	33	<.001
Initial judgement possible child not real	0.355	28	<.001	0.494	33	<.001
Initial judgement possible child real	0.355	28	<.001	0.482	33	<.001
Second judgement possible teacher real	0.429	28	<.001	0.531	33	<.001
Second judgement possible teacher not real	0.330	28	<.001	0.371	33	<.001
Second judgement possible child not real	0.267	28	<.001	0.423	33	<.001
Second judgement possible child real	0.437	28	<.001	0.505	33	<.001
Initial judgement improbable teacher real	0.239	28	<.001	0.246	33	<.001
Initial judgement improbable teacher not real	0.268	28	<.001	0.337	33	<.001
Initial judgement improbable child not real	0.240	28	<.001	0.239	33	<.001
Initial judgement improbable child real	0.217	28	0.002	0.354	33	<.001
Second judgement improbable teacher real	0.257	28	<.001	0.253	33	<.001
Second judgement improbable teacher not real	0.349	28	<.001	0.420	33	<.001
Second judgement improbable child not real	0.274	28	<.001	0.338	33	<.001
Second judgement improbable child real	0.269	28	<.001	0.292	33	<.001
Initial judgement impossible teacher real	0.210	28	0.003	0.403	33	<.001
Initial judgement impossible teacher not real	0.369	28	<.001	0.262	33	<.001
Initial judgement impossible child not real	0.223	28	0.001	0.482	33	<.001
Initial judgement impossible child real	0.256	28	<.001	0.483	33	<.001
Second judgement impossible teacher real	0.339	28	<.001	0.324	33	<.001
Second judgement impossible teacher not real	0.281	28	<.001	0.308	33	<.001
Second judgement impossible child not real	0.236	28	<.001	0.471	33	<.001
Second judgement impossible child real	0.262	28	<.001	0.377	33	<.001

a Lilliefors Significance Correction

Appendix H: Z-scores for skewness and kurtosis

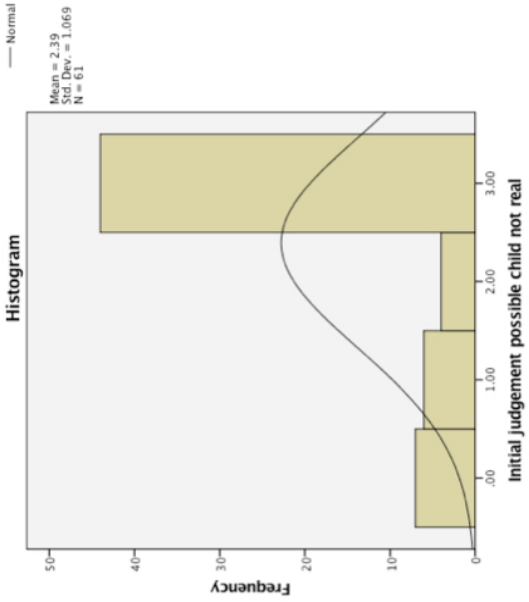
Judgements before testimony

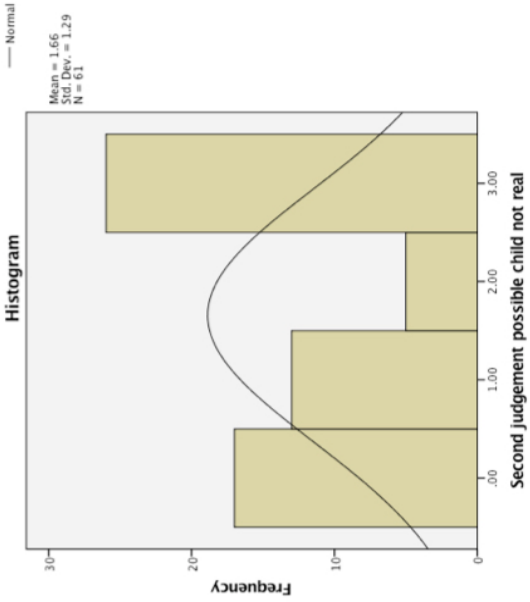
Variable	Age group	Skewness			Kurtosis		
		Statistic	Standard error	z-score	Statistic	Standard error	z-score
Initial judgement possible teacher real	3-4 yrs	-1.919	0.441	-4.351	3.117	0.858	3.633
	5-6 yrs	-5.745	0.409	-14.046	33	0.798	41.353
Initial judgement possible teacher not real	3-4 yrs	-0.831	0.441	-1.884	-0.736	0.858	-0.858
	5-6 yrs	-3.986	0.409	-9.746	17.606	0.798	22.063
Initial judgement possible child real	3-4 yrs	-0.724	0.441	-1.642	-1.165	0.858	-1.358
	5-6 yrs	-2.292	0.409	-5.604	3.946	0.798	4.945
Initial judgement possible child not real	3-4 yrs	-0.713	0.441	-1.617	-1.245	0.858	-1.451
	5-6 yrs	-2.76	0.409	-6.748	6.777	0.798	8.492
Initial judgement improbable teacher real	3-4 yrs	-0.4	0.441	-0.907	-1.321	0.858	-1.540
	5-6 yrs	0.66	0.409	1.614	-1.087	0.798	-1.362
Initial judgement improbable teacher not real	3-4 yrs	0.514	0.441	1.166	-1.022	0.858	-1.191
	5-6 yrs	1.175	0.409	2.873	-0.055	0.798	-0.069
Initial judgement improbable child real	3-4 yrs	-0.068	0.441	-0.154	-1.402	0.858	-1.634
	5-6 yrs	1.36	0.409	3.325	0.582	0.798	0.729
Initial judgement improbable child not real	3-4 yrs	0.104	0.441	0.236	-1.641	0.858	-1.913
	5-6 yrs	0.372	0.409	0.910	-1.482	0.798	-1.857
Initial judgement impossible teacher real	3-4 yrs	0.064	0.441	0.145	-1.624	0.858	-1.893
	5-6 yrs	1.155	0.409	2.824	-0.496	0.798	-0.622
Initial judgement impossible teacher not real	3-4 yrs	-0.996	0.441	-2.259	-0.545	0.858	-0.635
	5-6 yrs	0.777	0.409	1.900	-0.935	0.798	-1.172
Initial judgement impossible child real	3-4 yrs	0.497	0.441	1.127	-1.432	0.858	-1.669
	5-6 yrs	1.476	0.409	3.609	0.187	0.798	0.234
Initial judgement impossible child not real	3-4 yrs	-0.114	0.441	-0.259	-1.737	0.858	-2.024
	5-6 yrs	2.339	0.409	5.719	4.42	0.798	5.539

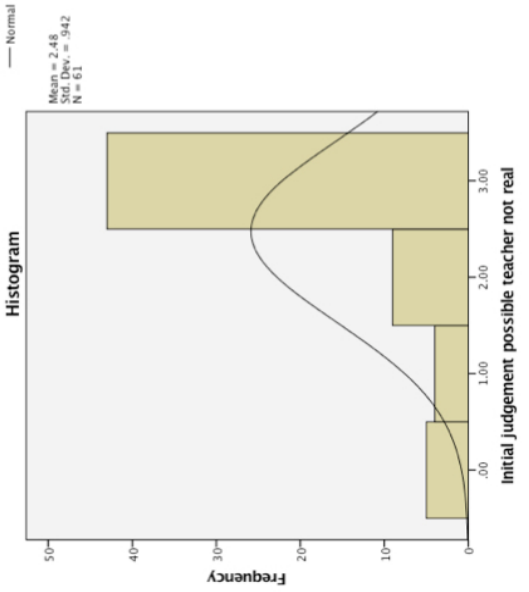
Judgements after testimony

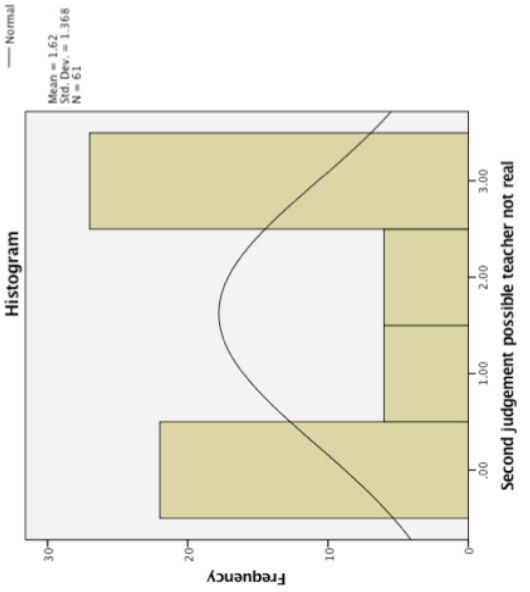
Variable	Age group	Skewness			Kurtosis		
		Statistic	Standard error	z-score	Statistic	Standard error	z-score
Second judgement possible teacher real	3-4 yrs	-0.809	0.441	-1.834	-1.456	0.858	-1.697
	5-6 yrs	-2.983	0.409	-7.293	7.343	0.798	9.202
Second judgement possible teacher not real	3-4 yrs	0.616	0.441	1.397	-1.459	0.858	-1.700
	5-6 yrs	-0.881	0.409	-2.154	-1.027	0.798	-1.287
Second judgement possible child real	3-4 yrs	-2.172	0.441	-4.925	3.976	0.858	4.634
	5-6 yrs	-3.326	0.409	-8.132	10.474	0.798	13.125
Second judgement possible child not real	3-4 yrs	1.006	0.441	2.281	0.016	0.858	0.019
	5-6 yrs	-1.307	0.409	-3.196	0.085	0.798	0.107
Second judgement improbable teacher real	3-4 yrs	-0.613	0.441	-1.390	-0.891	0.858	-1.038
	5-6 yrs	-0.111	0.409	-0.271	-1.754	0.798	-2.198
Second judgement improbable teacher not real	3-4 yrs	1.705	0.441	3.866	2.514	0.858	2.930
	5-6 yrs	2.167	0.409	5.298	3.878	0.798	4.860
Second judgement improbable child real	3-4 yrs	-1.283	0.441	-2.909	1.013	0.858	1.181
	5-6 yrs	0.619	0.409	1.513	-1.338	0.798	-1.677
Second judgement improbable child not real	3-4 yrs	0.97	0.441	2.200	-0.543	0.858	-0.633
	5-6 yrs	1.187	0.409	2.902	0.098	0.798	0.123
Second judgement impossible teacher real	3-4 yrs	-1.052	0.441	-2.385	-0.373	0.858	-0.435
	5-6 yrs	0.419	0.409	1.024	-1.774	0.798	-2.223
Second judgement impossible teacher not real	3-4 yrs	0.534	0.441	1.211	-1.45	0.858	-1.690
	5-6 yrs	1.354	0.409	3.311	0.627	0.798	0.786
Second judgement impossible child real	3-4 yrs	-0.823	0.441	-1.866	-0.797	0.858	-0.929
	5-6 yrs	1.246	0.409	3.046	-0.101	0.798	-0.127
Second judgement impossible child not real	3-4 yrs	0.795	0.441	1.803	-0.32	0.858	-0.373
	5-6 yrs	2.903	0.409	7.098	8.174	0.798	10.243

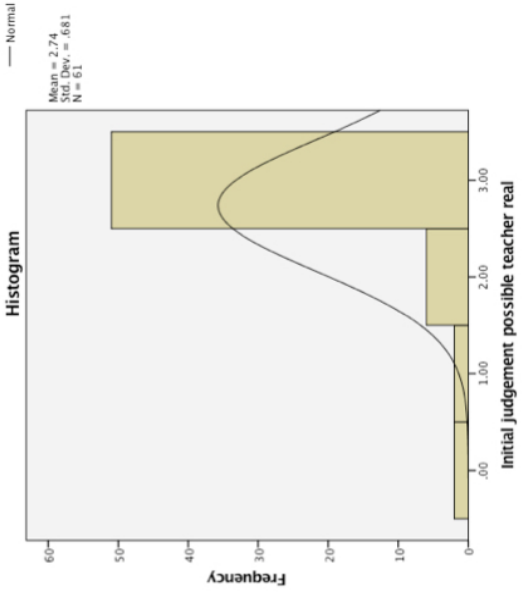
Appendix I: Histograms

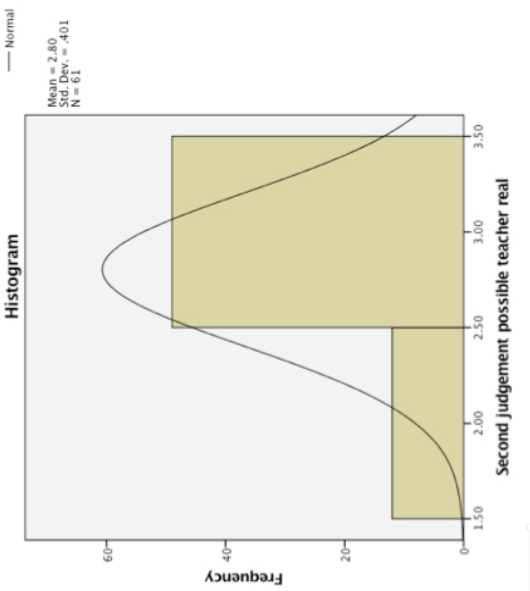


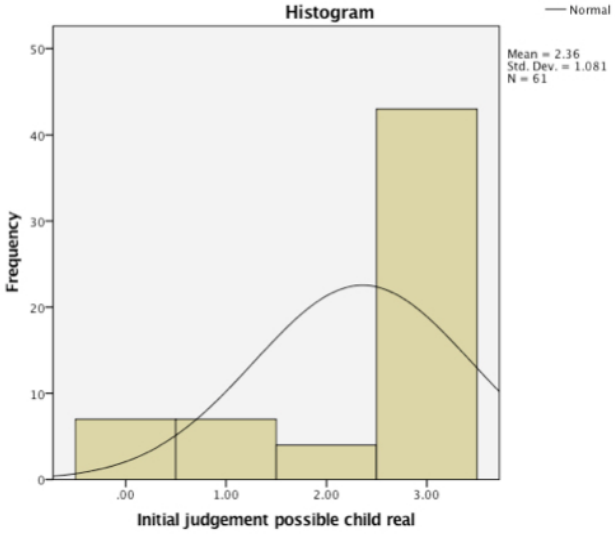


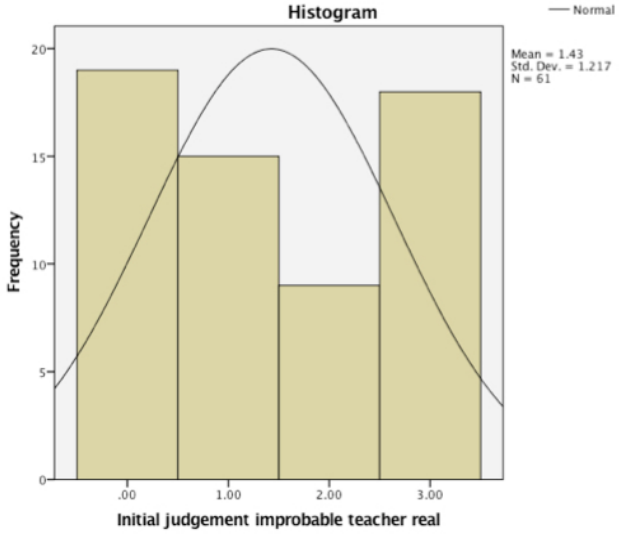


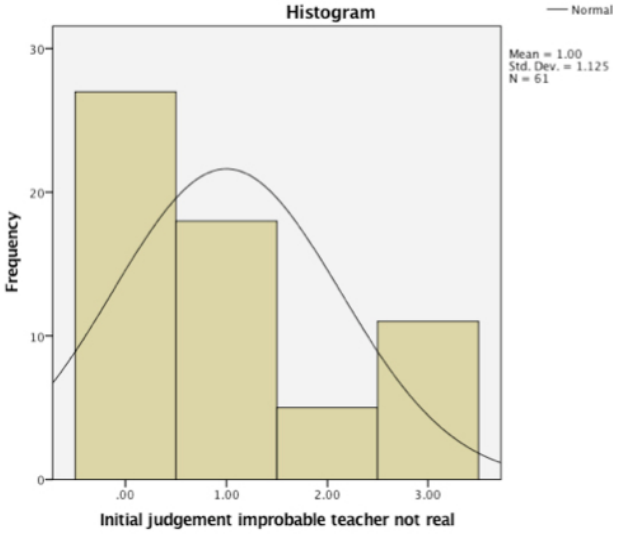


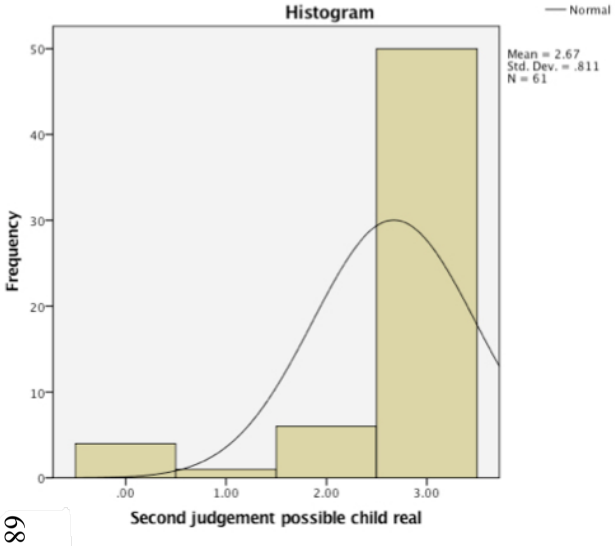


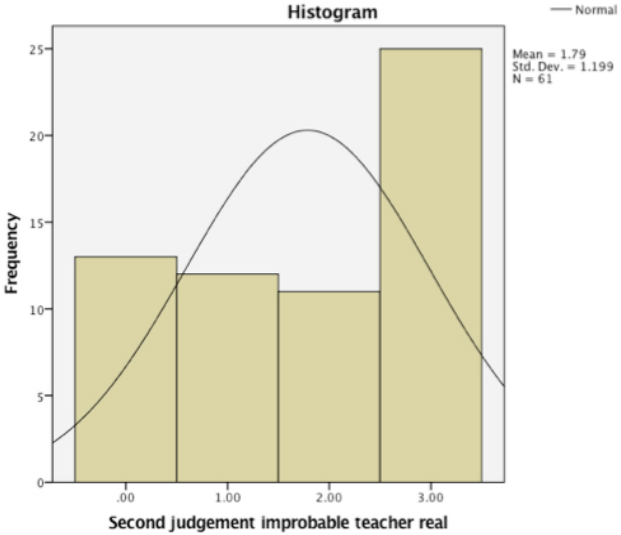


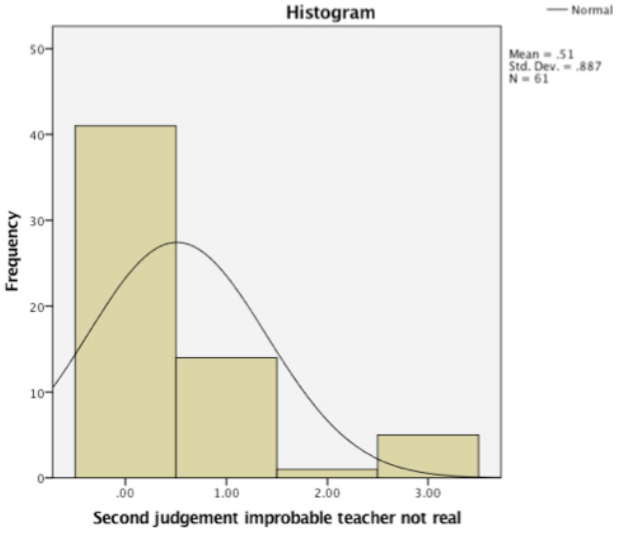

Histogram
Normal
Mean = 2.36
Std. Dev. = 1.081
N = 61
Frequency
Initial judgement possible child real

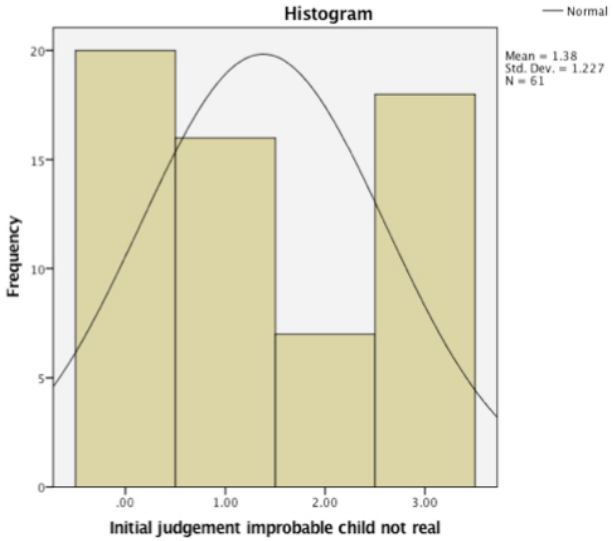

Histogram
Normal
Mean = 1.43
Std. Dev. = 1.217
N = 61
Frequency
Initial judgement improbable teacher real

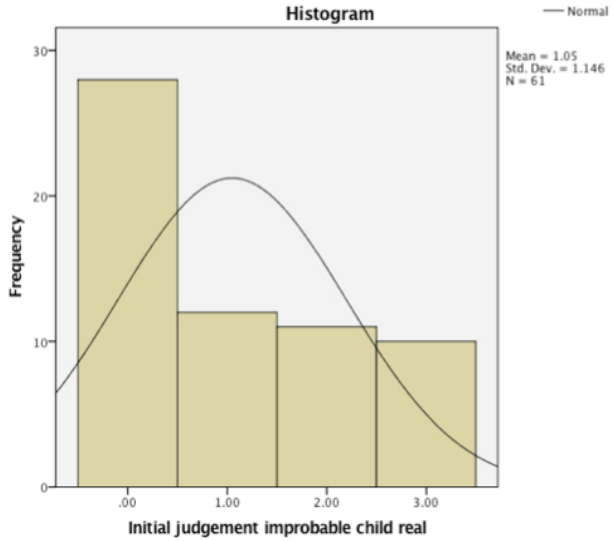

Histogram
Normal
Mean = 1.00
Std. Dev. = 1.125
N = 61
Frequency
Initial judgement improbable teacher not real

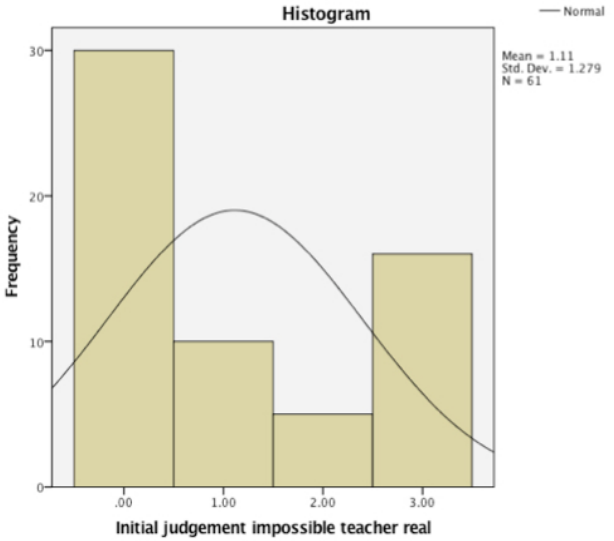

Histogram
Normal
Mean = 2.67
Std. Dev. = .811
N = 61
Frequency
Second judgement possible child real

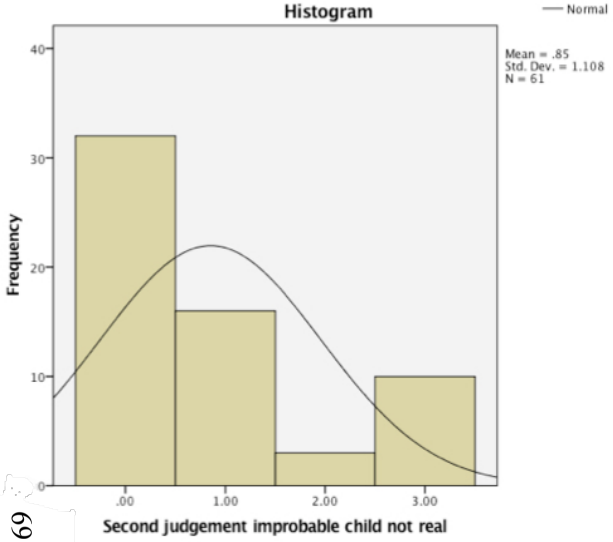

Histogram
Normal
Mean = 1.79
Std. Dev. = 1.199
N = 61
Frequency
Second judgement improbable teacher real


Histogram
Normal
Mean = .51
Std. Dev. = .887
N = 61
Frequency
Second judgement improbable teacher not real


Histogram
Normal
Mean = 1.38
Std. Dev. = 1.227
N = 61
Frequency
Initial judgement improbable child not real

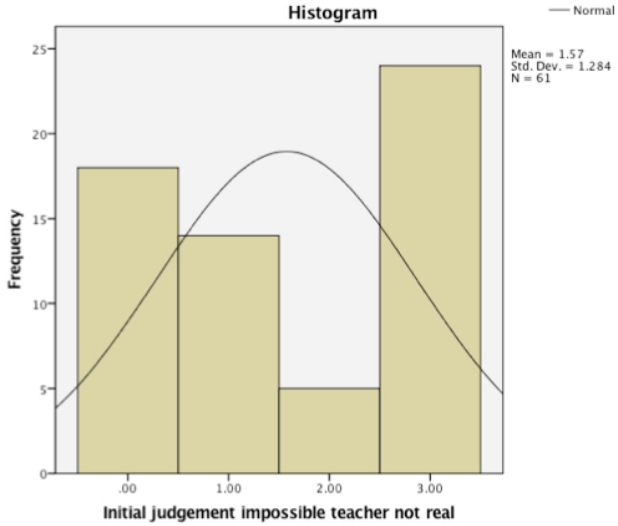

Histogram
Normal
Mean = 1.05
Std. Dev. = 1.146
N = 61
Frequency
Initial judgement improbable child real

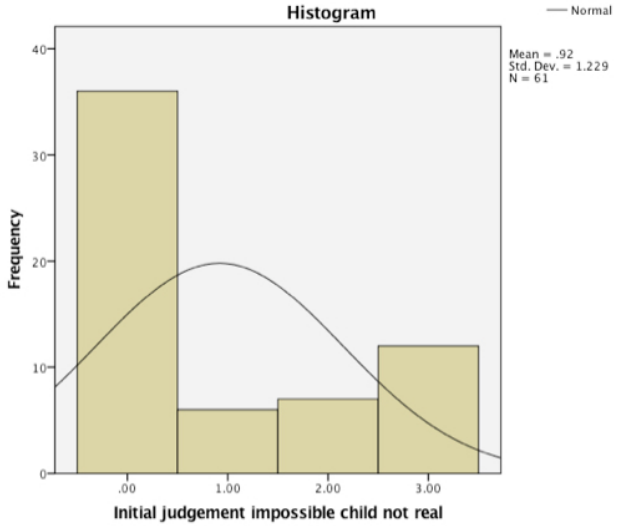

Histogram
Normal
Mean = 1.11
Std. Dev. = 1.279
N = 61
Frequency
Initial judgement impossible teacher real

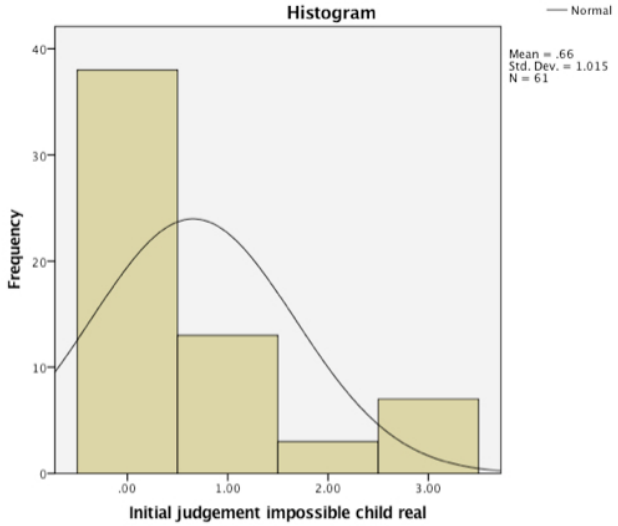

Histogram
Normal
Mean = .85
Std. Dev. = 1.108
N = 61
Frequency
Second judgement improbable child not real

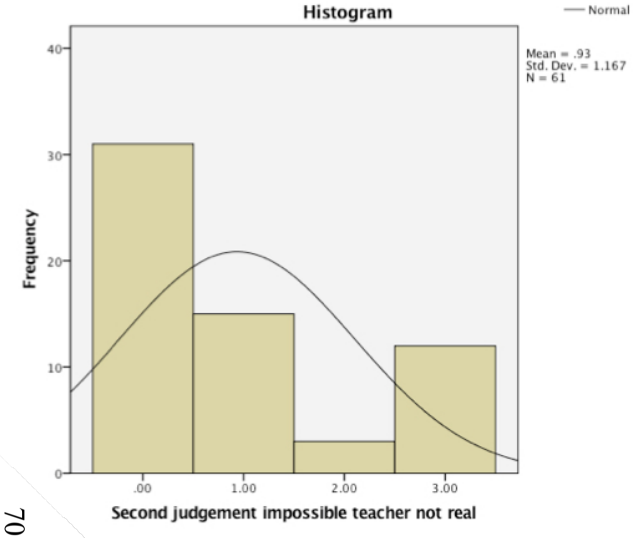

Histogram
Normal
Mean = 1.61
Std. Dev. = 1.255
N = 61
Frequency
Second judgement improbable child real

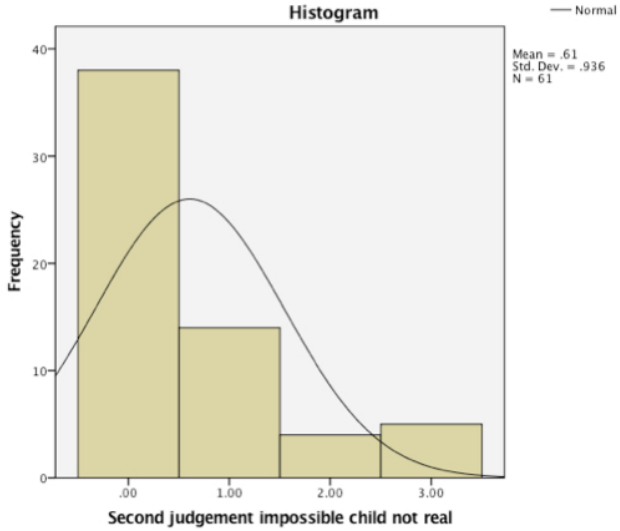

Histogram
Normal
Mean = 1.66
Std. Dev. = 1.353
N = 61
Frequency
Second judgement impossible teacher real

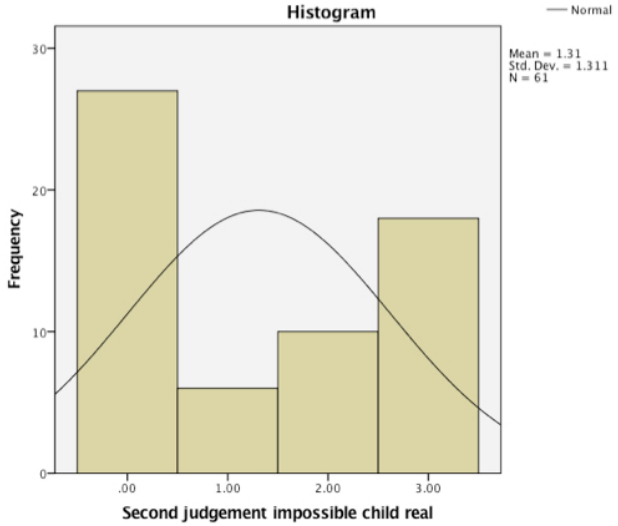

Histogram
Normal
Mean = 1.57
Std. Dev. = 1.284
N = 61
Frequency
Initial judgement impossible teacher not real


Histogram
Normal
Mean = .92
Std. Dev. = 1.229
N = 61
Frequency
Initial judgement impossible child not real


Histogram
Normal
Mean = .66
Std. Dev. = 1.015
N = 61
Frequency
Initial judgement impossible child real


Histogram
Normal
Mean = .93
Std. Dev. = 1.167
N = 61
Frequency
Second judgement impossible teacher not real


Histogram
Normal
Mean = .61
Std. Dev. = .936
N = 61
Frequency
Second judgement impossible child not real


Histogram
Normal
Mean = 1.31
Std. Dev. = 1.311
N = 61
Frequency
Second judgement impossible child real

Appendix J: Mauchly's test of sphericity

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1					Epsilon[b]		
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Attribute	0.786	13.993	2	0.001	0.823	0.858	0.5
Testimony	0.437	47.847	5	0.000	0.637	0.669	0.333
Attribute * Testimony	0.482	41.435	20	0.003	0.812	0.909	0.167

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + Age

Within Subjects Design: Attribute + Testimony + Attribute * Testimony

b. May be used to adjust the degrees of freedom for the averaged tests of significance.

Appendix K: Levene's test of homogeneity of variance

Judgements before testimony

	F Statistic	df1	df2	Sig.
Initial judgement possible teacher real	24.397	1	59	0.000
Initial judgement possible teacher not real	19.212	1	59	0.000
Initial judgement possible child not real	16.081	1	59	0.000
Initial judgement possible child real	7.57	1	59	0.008
Initial judgement improbable teacher real	0.031	1	59	0.860
Initial judgement improbable teacher not real	0.000	1	59	0.983
Initial judgement improbable child not real	0.053	1	59	0.819
Initial judgement improbable child real	1.219	1	59	0.274
Initial judgement impossible teacher real	0.145	1	59	0.705
Initial judgement impossible teacher not real	0.000	1	59	0.995
Initial judgement impossible child not real	16.382	1	59	0.000
Initial judgement impossible child real	46.564	1	59	0.000

Judgements after testimony

	F Statistic	df1	df2	Sig.
Second judgement possible teacher real	25.187	1	59	0.000
Second judgement possible teacher not real	0.181	1	59	0.672
Second judgement possible child not real	0.775	1	59	0.382
Second judgement possible child real	1.967	1	59	0.166
Second judgement improbable teacher real	6.22	1	59	0.015
Second judgement improbable teacher not real	0.05	1	59	0.824
Second judgement improbable child not real	0.019	1	59	0.892
Second judgement improbable child real	5.487	1	59	0.023
Second judgement impossible teacher real	6.685	1	59	0.012
Second judgement impossible teacher not real	3.272	1	59	0.076
Second judgement impossible child not real	2.816	1	59	0.099
Second judgement impossible child real	0.094	1	59	0.76

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Within Subjects Design: Attribute + Testimony + Attribute * Testimony