

**The Gullible Person: Development and Validation of a Self-Report Measure of
Gullibility**

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Abstract

People may have an enduring personality trait, gullibility, which makes them more likely to become scam victims. This dissertation describes the empirical development and validation of a new scale for measuring gullibility. After reviewing the relevant literature in Chapter 1, Chapter 2 reports on the development of a new, two-factor (Persuadability and Insensitivity), 12-item, Gullibility Scale. Chapter 3 presents two studies that confirm the two-factor structure of the Gullibility Scale, while also demonstrating that it is positively related to measures of paranormal beliefs and social vulnerability, negatively related to a measure of social intelligence, and not related to trust. Chapter 4 examines the scale's test-retest reliability and criterion validity. The studies reported here showed that self-reported scam victims scored significantly higher on gullibility than did community members, psychology undergraduate students, and members of a critical thinking interest group (Skeptics). The remaining studies in this thesis examined the theoretical assertion that gullibility is a function of the ability and motivation to detect cues of untrustworthiness. Chapter 5 reports the results of two studies in which the Gullibility Scale was used to predict responses to a Prisoner's Dilemma task that manipulated untrustworthiness cues. Although there was no relationship between scores on the Gullibility Scale and decisions made in the Prisoner's Dilemma, the results provided confirmation that individual differences in trust and gullibility are unrelated. The final study in Chapter 6 presented participants with a series of scam emails. Gullibility was positively associated with rating scam emails as persuasive and also predicted intent to respond to them. However, there was no relationship between gullibility and cognitive ability (as measured by the Cognitive Reflection Test and Raven's Advanced Progressive Matrices) or the ability to detect pseudo-profound bullshit. The final chapter, Chapter 7, reviews the findings of this dissertation and provides suggestions for future research.

Statement of Candidature

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

30.09.19

Alessandra Teunisse

Date

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Note

Some of the studies reported in this thesis have been published in the following journal article:

Teunisse, A., Case, T. I., Fitness, J., & Sweller, N. (2019). I should have known better:

Development of a self-report measure of gullibility. *Personality and Social*

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Chapter 1

Introduction to the thesis

If you say “gullible” slowly, it sounds like “oranges”

Source Unknown

In 2007, Arthur Stimpson of Norfolk, England - a university graduate and member of the Royal Institute of Chartered Surveyors - received an email telling him that he had won £2.7 million in the Spanish National Lottery (Bracchi, 2011). However, before he could receive his prize money, he was informed that there would be some “administrative costs” in transferring the money to him. Over the course of two years he surrendered not only £50,000 of his own money but also convinced at least thirteen people in his village to lend him money to pay the “transfer fees.” His loans ranged from £10,000 to £400,000. In the end, the respectable and intelligent Arthur Stimpson lost all that he owned, accrued unmanageable debt to his former friends, and was jailed for fraud (Bracchi, 2011).

Unfortunately, cases similar to that of Arthur Stimpson are not uncommon. In 2018, scams cost consumers US\$2.71 billion (an increase of nearly one billion dollars from 2017), with more than 900 complaints received per day (Federal Bureau of Investigation Internet Crime Complaint Center, 2018). Furthermore, it is likely that this figure is an underestimate because many would be too embarrassed to report that they had fallen victim to a scam. Given the enormous financial and emotional costs of scams, there is a need to better understand the underlying factors that contribute to an individual’s susceptibility to falling victim to them.

Although most people have received a scam email at some point, not everyone has complied with these emails. This suggests that there are some individual differences that

influence the likelihood that people will be “taken in” by scams. Research has demonstrated, for example, that some people may be better at detecting deceptive cues than others, depending on personality traits such as openness and agreeableness (Enos et al., 2006). Similarly, some professional lie catchers (i.e., law enforcement groups and clinical psychologists) have been found to be highly accurate at detecting lies (Ekman, O’Sullivan, & Frank, 1999). Others have proposed the ability to detect deception may comprise particular skills, such as domain specific skills (i.e., emotion recognition, empathic accuracy, deciphering situational affect) or channel specific skills (i.e., voice quality, body language, linguistic comprehension; Schlegel, Boone, & Hall, 2017). However, a meta-analysis of deception detection research may cast doubt on this potential individual difference in detection deception skills (Bond & DePaulo, 2008). Bond and DePaulo found that people with no special training or aids were accurate in detecting lies 54% of the time. This suggests that the average person may not be able to detect deception easily but perhaps (considering the earlier evidence presented) certain types of training programs, professions, or even personality differences can enhance this skill.

Even though the research on individual differences in deception detection, especially in terms of personality, is limited, research has found individual differences in the tendency for people to fall for phishing emails (Vishwanath, Herath, Chen, Wang, & Rao, 2011; Williams, Beardmore, & Joinson, 2017) or scams (Fischer, Lea, & Evans, 2013; Modic, Anderson, & Palomäki, 2018; Whitty, 2018). For example, Whitty (2018) found that romance scam victims were likely to be well-educated, middle-aged women who were impulsive, trustworthy, kind, and who tended to have an addictive disposition. Overall, it appears that there are potentially several personality traits that relate to why some people are more vulnerable to scams than others. One of those personality traits, and the central focus of this thesis, is a general tendency to be gullible.

The aim of this introductory chapter is to review the relevant literature on gullibility and potentially related traits. Firstly, the potential impact of contemporaneous situational factors such as fatigue, cognitive load, and emotional states on gullibility will be identified. Then, the different theoretical perspectives on the nature of gullibility (i.e., as an emotional, behavioural, and/or cognitive construct) will be discussed before establishing the perspective that gullibility is a personality construct. Traits potentially related to gullibility, such as social intelligence, cognitive ability, cue detection abilities (e.g., deception and “bullshit” detection), and other individual differences such as the tendency to hold superstitious beliefs will be discussed, along with an examination of current measures of gullibility. The chapter will conclude with an overview of the studies that comprise this thesis.

Situational Influences on Gullibility

I will be arguing in this thesis that gullibility is primarily a personality construct, rather than a transient state reflecting, for example, an uncharacteristic lapse in attention. However, it is important at the outset to acknowledge that everyone may behave in a gullible fashion occasionally in their lives, due to the influence of various situational factors. For example, situations in which a person is fatigued or under high cognitive load may impair their ability to detect cues of untrustworthiness or make them more easily persuaded. Similarly, mood and affect could also focus an individual’s attention on certain cues and distract them from others. Forgas (2019), for example, found that people who were primed with a positive (versus a negative) mood were more subject to a truth bias, more receptive to nonsense, and worse at detecting deception. These findings would suggest that transient moods and emotional states can also play a role in transient gullibility.

Fatigue

Fatigue has been found to facilitate greater primacy effects (Webster, Richter, & Kruglanski, 1996). Cognitively fatigued participants who were presented first with positive

information about a fictional character and then negative information were far more likely to form a positive impression (i.e., there was a greater primacy effect; Webster et al., 1996).

Therefore, people might be more likely to leap to conclusions and be less critical when they are tired. Similarly, a study of Jewish-Israeli judges found that their judicial rulings could be influenced by extraneous factors such as fatigue (Danziger, Levav, & Avnaim-Pesso, 2011).

When they were required to make repeated rulings, the judges were more likely to rule in favour of the status quo (i.e., deny parole). This further suggests that mental depletion or fatigue could affect a person's ability to detect cues of untrustworthiness or make them more persuadable. Fatigue, then, appears to facilitate a "cognitive miser" processing style (Taylor, 1981), characterised by a tendency to make decisions that save time and effort at the cost of accuracy. Therefore, fatigue could influence a person's transient gullibility.

Cognitive Load

Increasing cognitive load is another contemporaneous variable that might contribute to transient gullibility. Jeong and Hwang (2012) found that participants who were multitasking, compared to participants who were not multitasking, were significantly less able to form counterarguments to (or to be critical of) information presented to them. Furthermore, Sivaramakrishnan and Manchanda (2003) manipulated cognitive load by asking participants to focus closely on product features and found that participants under high cognitive load were less able to perceive a difference in value than were participants under low cognitive load. Therefore, increasing cognitive "busyness" or dividing an individual's attention could potentially increase their gullibility by reducing their normal levels of sensitivity to cues of untrustworthiness. Further, Gilbert et al. (1993) found that putting participants either under a high cognitive load or under time pressure increased their tendency to believe false information. Therefore, most of the evidence thus far indicates that situational

variables such as fatigue, divided attention, or cognitive busyness could decrease the ability to detect cues of untrustworthiness and make a person temporarily more persuadable.

Mood

Finally, moods or emotions could also increase the likelihood of gullibility. Greenspan et al. (Greenspan, Loughlin, & Black, 2001), for example, argued that scammers could manipulate a person's emotional state in order to exploit them. Forgas and East (2008b) found that people in positive moods are poorer at detecting deception than people in negative or neutral moods. Furthermore, Forgas and Ciarrochi (2001) found that people in a positive mood (who are higher on openness to feelings) valued their actual possessions as well as potential consumer possessions significantly more than people in a negative mood. Thus, it would appear to benefit a scammer to induce a positive mood in a potential victim so that they will value the potential possession more and be more likely to lower their guard to get it. On the other hand, some research has found that excluding people, and thereby inducing negative affect, makes them more compliant with persuasive attempts (Pfundmair, Aydin, & Frey, 2016), more obedient (Riva, Williams, Torstrick, & Montali, 2014), and increases the likelihood of them making risky financial decisions (Duclos, Wan, & Jiang, 2013). Negative affects such as loneliness may not only motivate people to use online dating sites (thereby exposing themselves to potential scammers) but could also diminish their ability to detect cues of untrustworthiness. Clearly there is room for more research to clarify the effects of different moods on gullibility, but the evidence suggests they may play a powerful role in certain circumstances.

In summation, certain situational variables such as fatigue, increased cognitive load, or certain moods and emotions may influence the likelihood of a person behaving in a gullible fashion. However, these situational variables cannot fully explain why some people

are typically more likely to fall for a scam than others. We now examine evidence for the existence of a personality variable that underlies these phenomena.

Understanding Gullibility

Gullibility has been poorly defined and inconsistently operationalised in the psychological literature. For example, some have defined gullibility as simply being unable to detect lies (Forgas & East, 2008b), whereas others have assumed that accepting general and positive feedback entirely describes gullibility (i.e., the Barnum Effect; for an example see Piper-Terry & Downey, 1998). Further, examples of gullible behaviour tend to extend to the broad classes of phenomena including falling for email scams (e.g., Prince of Nigeria scam; Herley, 2012), joining a cult, believing the world is flat, that vaccinations cause autism, or even that the 1969 moon landing was faked (Forgas & Baumeister, 2019).

A scam has been defined as a fraudulent or dishonest business practice intended to con a person out of money, valuables, or personal details (Fischer et al., 2013). The reasons people fall for scams are varied. Some scams, such as the Prince of Nigeria scam, contain many cues to their basic implausibility and untrustworthiness; therefore, it is likely that individual differences such as gullibility would influence whether or not a person would comply with them. However, some scams are more sophisticated. When scammers disguise themselves to appear as legitimate authorities requesting personal and sensitive information, it is called phishing (Wang, Herath, Chen, Vishwanath, & Rao, 2012). Spear phishing is a specific type of email that appears especially genuine and is often targeted at employees of a business (Wang et al., 2012). In these situations, when the scam email looks entirely legitimate and there are almost no cues to its untrustworthiness, then it is not clear that gullibility would be the primary reason for people's response to it. Rather, people could be fooled by these scams due to their apparent plausibility and use of effective persuasion techniques such as time pressure (Cialdini, 2001) or simply social compliance (e.g., Stajano

& Wilson, 2011). Thus, although gullibility could be one of the reasons people fall for scams, it is only part of this complex social phenomenon that the internet has facilitated.

As noted above, gullibility has been defined and operationalised inconsistently. In particular, gullibility has been conceptualised as an emotion (Cooper & Avery, 2019), a behaviour (Greenspan, 2009a), and as an aspect of cognition (Gilbert et al., 1993; Mayo, 2019b). Each of these perspectives will be discussed below, but ultimately it will be argued that gullibility is best understood as an aspect of personality.

Gullibility as an Emotion

Cooper and Avery (2019) argue that it may be easier to identify gullibility than to define it. They view gullibility as an emotion; “an uncomfortable feeling state that is prompted by the perception that one has been persuaded to believe something that is not true” (p.307). At best, it is a feeling that may make people uncomfortable and at worst it may threaten a person’s self-worth. Cooper and Avery acknowledge that this conceptualisation of gullibility is similar to cognitive dissonance (as they are both feelings people wish to reduce). Therefore, in order to avoid and reduce the feeling of gullibility people may “double down” on a belief, increase their certainty in it, and refuse to acknowledge that they have been duped (Cooper & Avery, 2019). Furthermore, they argue that not all persuasion attempts may result in the feeling of gullibility, even if a person discovers they have been misled.

Cooper and Avery’s (2019) approach to gullibility, then, is to define it as an emotional reaction to a specific incident and it is experienced once a person realises that they have been duped. However, there are many instances when individuals hold beliefs or perform behaviours that most others would describe as demonstrating gullibility (e.g., believing that vaccinations cause autism). According to Cooper and Avery, if these individuals do not have insight into their own gullibility, then by definition their beliefs and behaviours cannot be defined as gullibility. Clearly, this approach to gullibility is limiting as

it requires the person in question to eventually realise that they have been duped.

Furthermore, although Cooper and Avery admit their conceptualisation of gullibility is similar to cognitive dissonance, it is not clear how they are actually distinct phenomena.

Although understanding gullibility purely as an emotion has limitations, affect may play an important role in gullibility (as discussed earlier). A reliable finding to emerge from the research on affect and social judgments is that, compared to negative mood, individuals in a positive mood state tend to engage superficial or heuristic processing (Forgas, 2019). Importantly, positive mood (as opposed to negative mood) increases reliance on heuristic processing in veracity judgements (Koch & Forgas, 2012), increases the likelihood of seeing meaning in random or meaningless phrases (Forgas, 2019), decreases the ability to detect deception (Forgas & East, 2008b), and increases the likelihood of uncritically accepting interpersonal messages (Forgas & East, 2008a). In sum, although gullibility is broader than simply an emotional reaction to being duped, relatively transient affective states may render a person more or less gullible.

Gullibility as Behaviour

Taking a more systematic approach to understanding gullibility, Greenspan (2009a, 2009b) proposed a model of gullible action. According to Greenspan, being credulous is the tendency to *believe* something without critically examining the evidence for that claim (Greenspan, 2009a; Greenspan et al., 2001). Being gullible, on the other hand, can be defined as a tendency towards being duped (Greenspan, 2009a; Greenspan et al., 2001). The key difference is that gullibility requires a *behavioural* component. Greenspan (2009b) proposed a four-factor causative model for a gullible behaviour comprising situational factors (e.g., time pressure or social pressure), cognitive factors (e.g., cognitive ability), affect factors, and personality factors. He proposed that gullibility is an outcome which is affected by the interaction of the four elements of the model.

Overall, there is little empirical evidence for this model. Most of Greenspan's research uses case studies (mostly of people with developmental delays or cognitive impairments) to inform the models, rather than empirical studies (Greenspan, 2009a, 2009b; Greenspan et al., 2001). As a result, it is difficult to discern whether this model is generalisable. Furthermore, one key problem for Greenspan's conceptualisation of gullibility as a purely behavioural phenomenon is that "gullible" behaviours might represent compliance rather than an acceptance of a false premise. For instance, an unassertive person might be fully aware that a salesperson is making exaggerated claims regarding the effectiveness of a product. But, in order to end the high-pressure interaction, the person acquiesces and simply purchases the product. This is but one example of a seemingly gullible action unaccompanied by belief. It points to the necessity of focusing on belief in defining gullibility, which is the approach adopted in this thesis.

Gullibility as a Cognitive Process

Another approach to gullibility has been to examine it as a cognitive process (Gilbert et al., 1993). This approach explores whether a person may understand a concept, or entertain it, without necessarily believing it (Gilbert et al., 1993). On one hand, Descartes (1644/1984) argued that understanding a notion and believing a notion were two separate and sequential processes. Essentially, a person may comprehend a message and then either accept or reject it. On the other hand, Spinoza (1677/1982) argued that understanding and believing are the same mental operation. Then, after reflection, a person may "unbelieve" or actively negate anything which is found to be at odds with established facts. Therefore, acceptance may be a passive and automatic act whereas rejection may be an active process that can undo the initial passive acceptance (Gilbert et al., 1993).

The results of a series of experiments by Gilbert et al. (1993) supported the Spinozan account, rather than the Cartesian account. Specifically, participants were given information

(labelled as true and false) about a criminal defendant or another college student while under a cognitive load (in Study 1) or time pressure (in Study 2) and asked to make judgements about the target figure (e.g., sentencing judgements or liking judgements). Those participants under cognitive load or time pressure who were interrupted were more likely to believe the false information, even though it had been labelled as false compared to participants who were not interrupted. Gilbert et al. (1993) argued that rejection of false information is an active process that can be interrupted (e.g., by cognitive load or time pressure). In order to actively negate information a person must have logical ability, access to correct information or a set of true beliefs to compare any new beliefs to, and they must also have the ability and willingness to undertake this active negation of information (Gilbert et al., 1993). In this sense, belief is easier than doubt. Accordingly, Gilbert et al.'s (1993) work suggests that people have a default gullible mindset that must actively be overcome.

Mercier (2017) built on the work by Gilbert et al. (1993) and argued that people are less gullible than is commonly believed due to efficient mechanisms of epistemic vigilance. Epistemic vigilance essentially involves an act of monitoring incoming knowledge for cues indicating untrustworthiness or potential for deception (Sperber et al., 2010). Epistemic vigilance can fail in two ways: Through gullibility (e.g., accepting too much information) or conservatism (e.g., rejecting too much information). Although Mercier mainly focuses on the first point, the second point is discussed by Vohs, Baumeister, and Chin (2007). They name this failure sugrophobia: "the chronic and possibly exaggerated fear of being duped... sugrophobia, from the Latin *sugro*, which means to suck. Sugrophobia translates literally as fear of sucking, that is, of being a sucker" (Vohs et al., 2007, p. 128). Thus, gullibility is a failure of epistemic vigilance wherein a person accepts too much information.

Thus far, this cognitive perspective suggests that people have a default gullible mindset (or way of processing information) that requires active negation, or epistemic

vigilance, to counter or correct it. Mayo (2019a, 2019b) agrees with this perspective but further argues that apart from a gullible mindset, people could also have a sceptical mindset (which could be considered a sugrophobic outlook (see Vohs et al., 2007) as outlined earlier) that automatically rejects information rather than accepting it. She argues that two independent factors contribute to spontaneous disbelief (i.e., a sceptical mindset); possessing contradicting knowledge, and being distrustful (Mayo, 2019a). Regarding distrust, she found that both dispositional distrust, as well as priming distrust, led to people using a sceptical mindset. Essentially, people primed with untrustworthy faces or who were lower in dispositional trust were prone to negate significantly more (i.e., suggest an incongruent term rather than a congruent term for the priming word), as in this mindset comprehension equals rejection or consideration of the opposite perspective (Mayo, 2019a). The results of these studies led Mayo to consider that a sceptical mindset, rather than being purely limited to a cognitive system, may be a personality trait or disposition (Mayo, 2019b). Therefore, although epistemic vigilance and the process of actively negating information are important to gullibility, gullibility cannot be purely limited to cognitive processes. Gullibility appears to be a personality trait that is influenced by both affect and cognition.

Gullibility as a Personality Construct

Rather than viewing gullibility purely as a behavioural outcome, an emotion, or a cognitive process, the research in this thesis considers it to be a personality construct. Personality has been defined as “an individual’s characteristic pattern of thought, emotion, and behaviour, together with psychological mechanisms – hidden or not – behind those patterns” (Funder, 1997, pp. 1–2). This definition supposes that a personality trait should be relatively enduring and consistent. However, as mentioned earlier, gullibility can differ depending on context. This perspective is consistent with the interactionist approach to personality (e.g., Mischel & Shoda, 1995; Mischel, Shoda, & Mendoza-Denton, 2002);

essentially, behaviour is a function of the interaction between personality and the situational context (Funder, 2006).

Rotter (1980) defined gullibility as “believing another person where there was some clear-cut evidence that the person should not be believed” (p.4). Yamagishi, Kikuchi, and Kosugi (1999) elaborated on Rotter’s (1980) definition, arguing that the gullible person is insensitive to cues of untrustworthiness. For the purposes of this thesis, however, and considering the research discussed above (e.g., see Gilbert et al., 1993), this definition has been expanded such that gullibility is *an individual’s propensity to accept a false premise in the presence of untrustworthiness cues*. An individual may or may not act upon this acceptance, but it is the acceptance of the false premise when they should have known better that is central to the concept of gullibility. The present definition requires a person to accept a premise despite the presence of untrustworthiness cues (c.f., Gilbert et al., 1993; Mayo, 2019a), which may then lead to a particular gullible belief (e.g., that vaccinations cause Autism) or behaviour (e.g., not vaccinating your children). Approaching gullibility in this way requires consideration of two important features: (a) the nature of the cues indicating an untrustworthy situation and (b) the ability and/or willingness of an individual to detect those cues.

The cues to a potentially untrustworthy situation can vary from overt (e.g., receiving the email from the “Prince of Nigeria” promising great riches) to subtle (e.g., goods or services offered at “unbeatable” prices). With respect to the second feature, an inability to detect cues could result from such factors as low social intelligence, fatigue, divided attention, cognitive load, or even different types of emotional states. However, even if the ability to detect cues is unimpaired, motivation has the potential to moderate this ability. For example, a strong desire for love may blind a normally critical person to the warning signs that they are being taken in by a romance scam (e.g., see Whitty, 2018). While relative lack

of expertise may also put individuals into a vulnerable position and make them more gullible, Whitty (2018) found that knowledge of cybersecurity did not predict whether or not an individual had become the victim of a romance scam. Overall, our understanding of how ability and/or willingness to detect untrustworthiness cues predict gullibility is limited, and this will be the focus of the current investigation.

Trust and Gullibility

Trust is often considered a synonym of gullibility. A person is considered gullible because they were too trusting or placed too much trust in something or someone. Trust has been defined as a generalised expectancy that a person can be relied upon (Rotter, 1967) or that a person will not knowingly act detrimentally to our interests (Hardin, 2001). Mayo (2019a, 2019b) found that people who were more trusting had a “gullible” mindset (i.e., a mind wherein information is understood and immediately accepted) compared to those who were less trusting. Participants who were less trusting were more likely to negate information rather than accept it (see earlier section on gullibility as a cognitive process).

However, there is a growing body of work which suggests that highly trusting individuals are not necessarily gullible (Carter & Weber, 2010; Rotter, 1980; Sturgis, Read, & Allum, 2010; Yamagishi, 2001; Yamagishi et al., 1999). Although Rotter (1967) did not observe any relationship between gullibility and trust using a single sociometric item estimate of gullibility (i.e., participants were rated by others on how gullible they were perceived to be), there is some evidence to suggest that trust might be associated with a *reduced* propensity to be duped. Yamagishi et al. (1999) described a series of experiments where participants were divided into high and low trusting groups and presented with vignettes. Participants were given positive or negative information about a central character in the vignette. When there was no information supplied, the high trusters were much more likely than the low trusters to say that the character would act in a trustworthy manner.

Interestingly, when negative information about the central character was presented, the high trusters responded to it more quickly than the low trusters and changed their opinion of the central character's trustworthiness more quickly than the low trusters (Yamagishi et al., 1999). This suggests that the high trusters were *more*, rather than less, sensitive to negative information. These findings suggest that the relationship between trust and gullibility requires further exploration.

Ability to detect cues of untrustworthiness

The ability to detect cues of untrustworthiness is an important theoretical pillar of gullibility. This ability could be influenced by a person's social intelligence but has often been conflated with common sense or a person's Theory of Mind. Furthermore, there is a perception that the reason a person may be gullible is because they are less intelligent (or have lower cognitive ability). Some consider gullibility as an inability to detect deception or to detect "bullshit" (Pennycook, Cheyne, Barr, Koehler, & Fugelsang, 2015). Apart from social intelligence, common sense, and cognitive ability, other individual differences may be related to gullibility, such as social vulnerability, or holding superstitious beliefs. However, the present approach argues that although these and other variables may be related to gullibility, they are not a proxy for it.

Social Intelligence, Common Sense, and Cognitive Ability

Social intelligence refers to a person's ability to make accurate social inferences based upon interpretation of social information (Grieve & Mahar, 2013). Pinsker and McFarland (2010) argued that the two major aspects relevant to social intelligence are the ability to understand and predict the motives and intentions of other people, and the ability to reflect and understand one's own mental experiences. They claimed that Theory of Mind essentially encompasses these two abilities. Similarly, Baron-Cohen et al. (1999) likened Theory of Mind to social intelligence. Essentially, Theory of Mind refers to the knowledge and

understanding of other people's mental states (Charlton, 2001), which appears to be a central component of social intelligence. However, Kosmitzki and John (1993) argued that social intelligence consists of both cognitive and behavioural components, which are not necessarily considered in models of Theory of Mind. Regardless, if social intelligence or Theory of Mind is considered to be the ability to make accurate social inferences and to behave appropriately, then this concept is very similar to Sternberg's (1998, 2002, 2004) notion of a "wise action": the application of tacit knowledge towards the attainment of common good. It could be argued that those individuals who do not employ tacit knowledge (or fail in their epistemic vigilance) could be described as gullible.

The construct of common sense has been defined in several ways. For example, it has been defined as an intuitive judgement: a "sound judgement of a practical nature that is intuitive rather than dependent on special knowledge" (Greenspan, Switzky, & Woods, 2011, pp.242-243), and as a cognitive ability to adaptively deal with social problems relating to understanding, predicting, and manipulating the behaviours of other people (Charlton, 2009). The first definition of common sense is similar to Sternberg's (2002, 2004) notion of tacit knowledge and the second definition is reminiscent of social intelligence. Fletcher (1984) argued that common sense could be categorised in three ways: "(a) as a set of shared fundamental assumptions, (b) as a set of maxims or shared beliefs, and (c) as a shared way of thinking" (p.203). All these definitions suggest that common sense is a skill used to intuitively understand and predict other people's behaviours or decisions. This skill seems to be very similar to social intelligence and perhaps could be part of that construct. Overall, common sense could be related to a person's epistemic vigilance or their ability to detect cues of untrustworthiness. Therefore, those who lack this ability may be more gullible.

Interestingly, Charlton (2009) suggested that common sense is not necessarily correlated with intelligence. His "Clever Sillies" hypothesis suggests that people who have

high IQs have an increasing tendency to incorrectly over-use abstract analysis in the social domain, instead of using the evolved common-sense techniques, leaving them predisposed to silly ideas or acting incorrectly in certain social problems. Therefore, the relationship between cognitive ability and gullibility is not clear and requires exploration.

Either way, the suggestion that a person is lacking in common sense, has low social intelligence, has poor Theory of Mind, or has not effectively gained or utilised tacit knowledge points to similar deficiencies even if they present differently (i.e., as an inappropriate behaviour or as a failure of a cognitive process). Therefore, all these similar concepts could influence a person's gullibility such that they may be more easily persuaded or less able to detect cues of untrustworthiness.

Detecting Deception and Pseudo-Profound Bullshit

The body of research on deception detection has mainly focused on an individual's ability to detect certain leaked cues that indicate someone is lying. Involuntary behaviours such as facial expressions can provide subtle cues that can be utilised to determine a potential liar's honesty (e.g., Ekman, 1992; M. G. Frank & Svetieva, 2013; Hartwig & Bond, 2014; Vrij, Leal, Mann, Vernham, & Brankaert, 2015). Deception detection is an element of gullibility; however, it is argued here that gullibility is a superordinate category wherein other fields of research, such as deception detection, can be subsumed. Essentially, *deception* involves an action or occurrence that can mislead someone whereas *lying*, a subcategory of deception, is when someone *deliberately* misleads another person without prior notification (M. G. Frank & Svetieva, 2013). An example of deception could be a tiger's distinctive striped coat. The tiger did not consciously select to wear those stripes; it deceives its prey by blending into its environment but it does not lie (M. G. Frank & Svetieva, 2013). However, most of the research in deception detection is interested in detecting lies, rather than deception.

Overall, the research on lie detection aims to discover ways to increase a person's ability to detect deception. There is conflicting evidence on the effectiveness of training, with some arguing that the behavioural cues are too weak to be perceived effectively (Hartwig & Bond, 2011) and others insisting that there is a positive and significant effect (Driskell, 2012; M. G. Frank & Feeley, 2003). Although gullibility has been defined in terms of insensitivity to cues of untrustworthiness, it is not synonymous with deception detection. This field focuses on cues of mistrust, such as facial, verbal, and non-verbal cues. Analysis of these cues and training of people to recognise them is central. However, susceptibility to being scammed is broader than this. Many situations when a person could be manipulated do not include face-to-face interactions. For example, the Prince of Nigeria email scam is usually confined to email correspondence and subtle cues to deception (such as microexpressions, tone of voice, or gesture) are often absent. Furthermore, the cues to detecting lying are not very clear to most people, with detection rates at around chance level (Bond & DePaulo, 2006). However, detection rates for scams such as the Nigerian Prince scam are very high (Herley, 2012). While believing lies may be an instance of gullibility, it is argued here that gullibility extends to include a wider range of phenomena than face-to-face interactions.

The ability to detect bullshit could also be related to the ability to detect deception. Bullshit has been defined as communication that is designed to impress the receiver but does not necessarily have any concern for the truth (Pennycook et al., 2015; Petrocelli, 2018). The commonality between a liar and a bullshitter is that they both appear to be genuine, therefore it is difficult for the receiver of the communication to determine if the sender is lying, bullshitting, or telling the truth (Petrocelli, 2018). Pennycook et al. (2015) argued that some people may be more likely to accept statements as true or meaningful than others. In line with Gilbert et al.'s (1993) work, people are biased to accept and believe all communication and must actively negate information after the fact. Therefore, people may be generally prone to

accept bullshit. Pennycook et al. (2015) created a Bullshit Receptivity Scale and found that people who rated meaningless phrases as profound were likely to hold more paranormal and religious beliefs, and to have lower cognitive ability (as determined by a measure of verbal intelligence, a measure of numeracy, and Raven's Advanced Progressive Matrices), and more faith in intuition. These findings suggest that people who perceive meaningless statements as profound may have reduced epistemic vigilance (or less ability to detect cues of untrustworthiness). Therefore, they may also be more gullible.

Superstitious Beliefs

The acceptance of implausible beliefs such as superstitions and the paranormal has frequently been considered to demonstrate gullibility. Belief in paranormal phenomena comprises belief in phenomena that are unexplained by mainstream science and frequently incorporate magical processes (Swami, Pietschnig, Stieger, & Voracek, 2011). Research has identified both cognitive (e.g., Gilovich, 1991) and motivational (e.g., Case, Fitness, Cairns, & Stevenson, 2004) factors that might lead individuals to engage in superstitious or magical thinking. Belief in the accuracy of horoscopes (i.e., astrology) is an example of this. The descriptions in a horoscope are typically very general statements that most people would endorse and could apply to almost anyone, and yet people tend to view them as specific, personal, and accurate of themselves (Snyder, 1974). Interestingly, beliefs in telepathy, ghosts, or extra-sensory perception could also be described as non-scientific yet are relatively common, especially in younger people and women (Preece & Baxter, 2000). The fact that some of these beliefs are relatively widespread (i.e., most people hold one or more of these) suggests that acceptance of superstitions or non-scientific beliefs per se might not indicate gullibility, as otherwise nearly everyone would be described as gullible.

Measuring Gullibility

There have been several attempts to measure gullibility. Early attempts used a Barnum Effect paradigm, the results of which suggested that people who endorse highly generalisable feedback as unique and specific are more gullible. Currently, there is one published scale (to the author's knowledge) that measures gullibility in the cognitively impaired: The Social Vulnerability Scale.

The Barnum Effect

Initially, when researchers attempted to measure individual differences in gullibility, the paradigm of choice involved the “fallacy of personal validation” (Forer, 1949) which later came to be known as the Barnum Effect. The Barnum Effect refers to a tendency for people to accept bogus personality feedback; it is named after the famous 19th century American entrepreneur P. T. Barnum who allegedly once said, “there's a sucker born every minute” (Layne, 1979). The standard Barnum procedure begins with participants completing a personality test such as Cattell 16 PF (Furnham, 1989), Rorschach cards (Snyder & Clair, 1977; Snyder & Shenkel, 1976), or the Eysenck Personality Inventory (Christman, Henning, Geers, Propper, & Niebauer, 2008; Furnham, 1989). Then, the participants are provided with a “unique” personality profile based on their questionnaire responses (all participants are given an identical profile) and they are asked to rate the profile for accuracy (for a full review of the Barnum Effect see Dickson & Kelly, 1985; Furnham & Schofield, 1987). In sum, these researchers have argued that the more accurately the participants rate the profile to be, the more gullible they are.

However, none of the studies in this area (e.g., Carrier, 1963; Furnham, 1989; Piper-Terry & Downey, 1998; Snyder & Clair, 1977) provided a clear definition of gullibility; instead, they operationalised it as the acceptance of a fake personality profile. This limits the generalisability of the concept. In addition, another important limitation to consider is the

lack of construct validity of the Barnum procedure. As Layne (1979) argued, the Barnum Effect is most likely measuring rationality, rather than gullibility, as the profiles presented to participants are so generic that most rational people would endorse them. The personality profiles that participants received, such as the ones created by Forer (1949), tended to use favourable and trivial descriptions such as “Security is one of your major goals in life.” Most rational people should rate this type of statement as true, otherwise they would be endorsing the converse of the statement, wherein they desire a life of insecurity. Essentially, participants are presented with a personality profile that is so generic that a large proportion of the population will endorse it. However, labelling this endorsement as gullibility may be inaccurate. Furthermore, this tendency for people to accept general and vague information as personally meaningful is not confined to personality feedback; it is also a staple of cold reading—a technique used by psychics to persuade and manipulate their “marks” (Rowland, 2002). Therefore, construct validity may have been compromised in this body of research. Overall, the acceptance of the Barnum profiles seems to reflect a justified response to the over-inclusive statements that are characteristic of the profiles (Layne, 1979) and not a measure of gullibility.

The Social Vulnerability Scale

Certain individuals, such as the elderly, those with cognitive impairments, or developmental delays, may be more vulnerable to exploitation (Seward, Bayliss, & Ohan, 2018). Cognitive impairments associated with congenital abnormalities (e.g., neuronal migration disorder), dementias, or strokes can compromise memory (e.g., impaired ability to recall important information of previous mistreatment), executive functioning (e.g., limited ability to solve problems and plan), and social reasoning (e.g., impaired ability to predict behaviours of others based on inferences about thoughts, beliefs, and their intentions) thus leaving those afflicted more vulnerable to exploitation (Pinsker, Stone, Pachana, &

Greenspan, 2006). People who are socially vulnerable might also be described as gullible. Although the outward appearance may be similar, the underlying causes could be different. One person may be gullible due to their personality trait discouraging them to search for cues of untrustworthiness or being more easily persuaded, whereas another person may appear gullible due to cognitive impairments affecting their ability to make informed decisions.

At the time the current research began, the Social Vulnerability Scale (Pinsker, McFarland, & Stone, 2011) was the most relevant scale in the literature for measuring gullibility. This scale was based on Greenspan and colleagues' work (Greenspan, 2009b; Greenspan et al., 2001) and was specifically designed to identify older adults (particularly people with dementia or other cognitive impairments) who may be especially vulnerable to financial abuse (Pinsker, 2011; Pinsker et al., 2006). This tool may be useful for identifying vulnerable older adults. However, the reasons for their vulnerability may be due to their cognitive impairments, rather than to their personality (or gullibility). Therefore, this tool may not be entirely appropriate for measuring gullibility. Given the gap in the literature for a reliable and valid measure of gullibility that could be used on a non-impaired and non-clinical sample, an important aim of this thesis was to develop a reliable and valid measure of gullibility that could be used with both non-clinical and clinical individuals.

Overview of the Thesis

The primary aim of this thesis was to further develop, refine, and investigate the validity of a self-report measure of gullibility based on my Masters research (Teunisse, 2015). Secondary aims were to explore gullibility-related phenomena, and to develop a behavioural paradigm for experimentally measuring gullibility. This Introductory chapter has outlined potential situational influences on gullibility such as fatigue, cognitive load, and mood. It has also described differing theoretical perspectives on gullibility, including gullibility as an emotion, a behaviour, and a cognitive process. In this thesis, gullibility is

understood as a personality construct: A gullible person is both easily persuaded and has difficulty in detecting cues of untrustworthiness. After defining gullibility, the current chapter described research on detecting cues of untrustworthiness, such as social intelligence, cognitive ability, deception and pseudo-profound bullshit detection, and holding superstitious beliefs. The final section of this chapter described existing measures of gullibility, such as the Barnum Effect and the Social Vulnerability Scale.

Chapter 2 presents the results of a re-analysis of the factor structure of a preliminary scale measuring gullibility (Teunisse, 2015). This initial scale comprised 24 items and three factors (Persuadability, Insensitivity to Cues of Untrustworthiness, and Unassertiveness). Although the initial scale appeared reliable and some initial evidence of validity was obtained, the Unassertiveness factor did not relate to all the variables in the same manner as the other two factors. Therefore, my aim in the study reported in this chapter was to undertake a reanalysis of the initial scale and to determine its most parsimonious factor structure. Chapter 3 presents two studies that not only replicated the new two-factor structure of the Gullibility Scale but that also provided further evidence for the convergent validity of the scale in relation to social intelligence, the Social Vulnerability Scale, and paranormal beliefs. The studies presented in Chapter 4 explored the criterion validity of the Gullibility Scale, using a sample of scam victims and members of a critical thinking interest group (i.e., Skeptics) and investigated the test-retest reliability of the Gullibility Scale. Chapter 5 reports the results of two studies that, using a Prisoner's Dilemma game taken from behavioural economics research, attempted to develop a behavioural paradigm for experimentally measuring gullibility. The study in Chapter 6 investigated the relationship between gullibility, cognitive ability, and pseudo-profound bullshit receptivity as well as providing behavioural validation of the Gullibility Scale using a scam email paradigm. The final chapter in this

thesis, Chapter 7, provides a brief review of all the studies' findings and provides suggestions for future research in this area.

Chapter 2

Measuring Individual Differences in Gullibility

Although research has identified some individual characteristics of people who could be considered gullible, for example not accurately detecting deception (Forgas & East, 2008b) or holding pseudo-scientific beliefs (Preece & Baxter, 2000), there have been very few attempts to accurately measure gullibility as a phenomenon in its own right. Some have defined gullibility in terms of neurocognitive deficits, labelling it “social vulnerability” and created a measure for it (Pinsker et al., 2011), whereas others have used the Barnum procedure to measure gullibility (e.g., Piper-Terry & Downey, 1998). The Barnum Effect refers to a propensity for people to accept vague and general statements as accurate feedback of their unique personality (see Dickson & Kelly, 1985 for a review). However, as Layne (1979) argued, the Barnum Effect is most likely measuring rationality, rather than gullibility, as the profiles presented to participants are so generic that most rational people would endorse them. To address this gap in the literature a new self-report measure of gullibility was created in the author’s Masters research (Teunisse, 2015). This chapter describes a study that explored a new factor structure of that preliminary scale (Teunisse, 2015).

Study 1: A Reanalysis of the Factor Structure Using Confirmatory Factor Analysis

Theoretical Background

Social vulnerability. The most relevant scale for measuring gullibility, as defined here, is the Social Vulnerability Scale (Pinsker et al., 2011). Building upon Greenspan and colleagues’ work (Greenspan, 2009b; Greenspan et al., 2001), this 15-item scale was developed to identify vulnerable older adults (i.e., those with dementia or other cognitive impairments) to financial abuse (Pinsker et al., 2011, 2006). The Social Vulnerability Scale comprises two factors: “Gullibility” and “Credulity”. The first factor (“Gullibility”) has eight

behavioural indicators of financial exploitation such as “signed up for dubious investments” and the second factor (“Credulity”) has seven items measuring a predisposition to unquestioningly believe verbal or written information, even after having been repeatedly misled or exploited by the same source. Although the Social Vulnerability Scale provides a useful tool for identifying credulous older adults at risk of financial exploitation, it has limitations as a general measure of gullibility across contexts (e.g., romance scams) and populations. This will be discussed in more detail in the next chapter.

Initial development of the Gullibility Scale. Considering this gap in the literature for a reliable and valid self-report measure of gullibility for a typical, non-clinical population, a preliminary measure was developed (Teunisse, 2015). The purpose of the study reported in this chapter is to further investigate the factor structure of this scale in order to explore its reliability and validity in the subsequent studies reported in this thesis.

In the initial development of this scale, gullibility was defined as an acceptance of a false premise in the presence of untrustworthiness cues. This definition represented a departure from the Social Vulnerability Scale, which comprised only behavioural indicators of gullibility (cf. Greenspan, 2009a). Three subject matter experts generated an initial pool of 66 items (18 of which were reverse scored – see Appendix A for a list of the items) based on the definition of gullibility as a propensity to accept a false premise in the presence of untrustworthiness cues. The following categories were used to guide item generation: (a) perceptions of own gullibility (e.g., *“I guess I am more gullible than the average person”*); (b) others’ perceptions of the respondent’s gullibility, in order to address the issue of poor insight into their own gullibility (e.g., *“My family thinks I am easily led”*); (c) sensitivity to cues of unworthiness (e.g., *“I’m not that good at reading the signs that someone is trying to manipulate me”*); (d) not asserting oneself, in order to address the issue that people often end up a victim of a scam because they felt compelled to comply with the manipulator (e.g.,

“People often take advantage of my generosity”); (e) instances of being easily persuaded, in order to address the issue of respondents easily accepting a false premise (e.g., *“I have been persuaded to make donations to charities when I couldn’t really afford it”*); and (f) being too trusting (e.g., *“I trust what people say”*). The trust items were included to determine whether they would form a factor that was distinct from the remaining items on gullibility. This would provide a particularly firm test of the expectation that gullibility and trust are distinct constructs.

Some items from existing measures expected to be conceptually related to gullibility (e.g., social vulnerability, Pinsker et al., 2011; consumer skepticism toward advertising, Obermiller & Spangenberg, 1998; trust, Rotter, 1967; Machiavellianism, Christie & Geis, 1970; and social intelligence Grieve & Mahar, 2013; Silvera, Martinussen, & Dahl, 2001) were adapted for use in this preliminary scale. Together with items from existing measures that might be expected to be related to gullibility and the broad categories used for item generation, it was expected that the pool of items would provide adequate coverage of the construct of gullibility. Respondents were asked to rate how true they believed each statement was of them from 1 (*strongly disagree*) to 7 (*strongly agree*).

After the initial exploratory factor analysis was conducted the scale was reduced to 35 items and comprised four factors: Persuadability (e.g., *“I guess I am more gullible than the average person”*), Trustability (e.g., *“I trust what people say”*), Unassertiveness (e.g., *“People often take advantage of my generosity”*), and Insensitivity (e.g., *“I’m pretty poor at working out if someone is tricking me”*). Importantly, the Gullibility Scale did not correlate significantly with the Marlowe and Crowne Social Desirability Scale (Crowne & Marlowe, 1960), indicating that the responses on the Gullibility Scale were unaffected by social desirability.

In the initial confirmatory factor analysis in Study 2 of Teunisse (2015), the Trustability factor did not significantly improve the fit of the model (nor was it significantly correlated with the other factors) and so it was removed, reducing the scale to a reliable three-factor, 24-item scale. However, this scale was unbalanced, with 12 items loading onto the Persuadability factor and 6 items each onto the Insensitivity and Unassertiveness factors. Furthermore, although the initial exploratory factor analysis produced a four-factor model, nearly all of the items that clustered onto the Unassertiveness factor related to behaviours (e.g., *“I am often put in a situation where I have to pay for others.”*). Moreover, in the initial confirmatory factor analysis (after the Trustability factor was removed) in Teunisse (2015), the Unassertiveness factor had the lowest loading on Gullibility and did not relate to the other variables in the same way as the other two factors did. This suggested that the Unassertiveness factor was most likely not measuring gullibility. Furthermore, assertiveness has been defined as a person’s ability to assert or stand up for themselves without anxiety (Alberti & Emmons, 1970). It is considered a social skill with multiple dimensions whereas unassertiveness is considered a lack of this skill (Kammrath, McCarthy, Cortes, & Friesen, 2015). Conceptually, it does not appear to be related to detecting cues of untrustworthiness but rather to compliance behaviours. Therefore, the aim of the current study was to reanalyse the data and to test models without the Unassertiveness factor to determine if they had a better fit.

Other Relevant Constructs of Interest

Social Intelligence. Nearly a century ago Thorndike (1920) defined social intelligence as “...the ability to understand and manage men and women, boys and girls – to act wisely in human relations.” (p.228). Since then, a central problem that has been identified in the social intelligence literature is that the term “social intelligence” has been operationalised inconsistently (Brown & Anthony, 1990; Grieve & Mahar, 2013; Kosmitzki

& John, 1993; Silvera et al., 2001; Weis & Süß, 2007). However, there are two key elements in the Thorndike definition: social intelligence consists of both cognitive – “...ability to understand and manage...” – and behavioural – “...to act wisely...” – components (Kosmitzki & John, 1993). Although social intelligence was argued to comprise both these elements, some studies have operationalised social intelligence purely as a cognitive ability (Barnes & Sternberg, 1989; Petrides, Mason, & Sevdalis, 2011) whereas others define it in terms of behaviour (Ford & Tisak, 1983).

Like Thorndike, Kosmitzki and John (1993) argue that social intelligence is a multifaceted construct, encompassing both behavioural components (e.g., social adaptability, people skills) and cognitive components (e.g., knowing social rules, perspective taking, understanding people). The ability to understand social information (e.g., body language) and to use that information in certain contexts (e.g., high pressure selling situations) would be particularly relevant to the ability to detect cues of untrustworthiness. Therefore, it was predicted here that gullibility would be negatively correlated with social intelligence.

Agreeableness. Agreeableness is a personality trait which emphasises conformity, an avoidance of violating social norms or upsetting people, and compliance with social expectations (Bègue et al., 2015). Theoretically, there could be a positive relationship between agreeableness and gullibility as gullibility emphasises the acceptance of a premise despite the presence of cues indicating that the premise should not be believed (see Greenspan, 2009a). However, the tendency to agree with others and to comply with requests does not require acceptance of a premise (Cialdini, 2001). Agreeable individuals may be more likely to conform to public opinion and obey suggestions more readily than others; however, the extent to which agreeable individuals are more gullible (as opposed to superstitious; see Peng, Hsiung, & Chen, 2012) is currently unknown.

Machiavellianism. Gullibility might also be related to Machiavellianism. This construct refers to the tendency to hold a cynical, untrustworthy view of human nature, have a willingness to manipulate others, and engage in amoral behaviours to achieve goals (Christie & Geis, 1970). Accordingly, it was hypothesised that Machiavellianism might be negatively correlated with gullibility.

Aims and Hypotheses

Overall, the main aim of the study presented in this chapter was to reanalyse the original data from Study 2 of Teunisse (2015) and to establish the most parsimonious factor structure of the Gullibility Scale to qualify it for use in the studies reported in subsequent chapters of this thesis. The relationships between the Gullibility Scale and the potentially relevant constructs of social intelligence, agreeableness, and Machiavellianism were also explored.

Method

Participants

Respondents comprised 248 introductory psychology students and 152 community members. The student sample were undergraduates enrolled in an introductory psychology unit at Macquarie University and the community members found the study via online research forums and social media networks. Five student respondents were excluded due to incomplete data and a further 12 cases were excluded based on responses to the attentiveness check items. The mean age of the remaining 231 student respondents (195 women) was 20.59 years ($SD = 5.35$ years) and ranged from 17 to 53 years. Of the 152 community members, 28 cases were excluded due to incomplete data and a further 30 cases were removed based on responses to the attentiveness check items. The mean age of the remaining 94 community respondents (71 women) was 31.96 years ($SD = 14.51$ years) and ranged from 16 to 71 years. Just over 57% of respondents were from Australia, 29.8% were from the USA, 5.3% were

from the United Kingdom, and the remainder came from countries such as Singapore, Canada, India, Sweden, South Africa, and New Zealand.

The two sample groups (undergraduate and community respondents) were examined for significant differences in gullibility prior to combining them. Averaged across age, the students had significantly higher scores in gullibility ($M = 126.25$, $SD = 21.49$), than community respondents ($M = 116.64$, $SD = 24.78$, $F(1) = 10.59$, $p = .001$, partial $\eta^2 = .03$) on the 35-item version of the Gullibility Scale. Despite this, the samples were combined in order to achieve the minimum number of respondents needed for confirmatory factor analysis. The combined sample in Study 1 comprised a total of 325 respondents (266 women, 59 men), with a mean age of 23.88 years ($SD = 10.36$ years).

Procedure

This study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201500596, see Appendix F for the approval letter). Respondents gave informed consent and completed all the measures online using Qualtrics survey software. For the student sample, the study was posted on an introductory psychology unit's online discussion board. For the community sample, the study was posted online in different forums dedicated to advertising psychology research. Respondents completed the personality measures in random order. Presentation of items within each scale was also randomised. Information on age, gender, country of residence, and socio-economic status (including household income and education) were collected at the end of the online questionnaire.

Measures

Gullibility. To assess gullibility, the reduced 35-item version of the Gullibility Scale developed in Study 1 of Teunisse (2015) was used (see Appendix B for details on this version of the scale). Participants were asked to rate how true they believed each statement was of

themselves from 1 (*strongly disagree*) to 7 (*strongly agree*). Possible scores ranged from 35 to 245, with higher scores indicating higher levels of gullibility. These 35 items produced a reliable scale ($\alpha = 0.88$).

Trust. The 25-item Interpersonal Trust Scale (ITS; Rotter, 1967) was used to assess individual differences in trust (see Appendix B for details). Respondents were asked to rate their level of agreement with each statement on a 5-point Likert-style scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). The possible range of scores ranged from 25 to 125. Example items include: “*In dealing with strangers one is better off to be cautious until they have provided evidence that they are trustworthy*” and “*Most elected officials are really sincere in their campaign promises.*” For this study, the ITS was scored so that higher scores indicated higher levels of trust. Rotter (1967) reported a Cronbach’s $\alpha = .76$; in the present study the scale was considered reliable ($\alpha = .78$).

Agreeableness. The 10-item Agreeableness Scale from Goldberg’s International Personality Item Pool (Goldberg et al., 2006; IPIP, 2015) was used to assess agreeableness (see Appendix B for details). Respondents were asked to rate their agreement with each statement on a 5-point Likert-style scale ranging from 1 (*inaccurate*) to 5 (*accurate*) where higher scores indicated greater agreeableness. The possible range of scores ranged from 10 to 50. Example items include; “*Accept people as they are*” and “*Insult people.*” In the present study the Agreeableness Scale was considered reliable ($\alpha = 0.81$).

Machiavellianism. The Machiavellian Personality Scale (MPS; Dahling et al., 2008) was used to assess Machiavellianism (see Appendix B for details). The MPS is a 16-item scale wherein respondents are asked to rate their agreement with each statement on a 5-point Likert-style scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), where higher scores indicate higher levels of Machiavellianism. The possible range of scores ranged from 16 to 80. Example items include: “*I am willing to be unethical if I believe it will help me*

succeed” and *“I enjoy being able to control the situation.”* In the present study the MPS was considered reliable ($\alpha = 0.87$).

Social Intelligence. The 21-item English version (Grieve & Mahar, 2013) of the Tromsø Social Intelligence Scale (Silvera et al., 2001) was used to assess social intelligence (see Appendix B for details). The scale consists of three components: Social Information Processing, Social Skills, and Social Awareness. Respondents were asked to indicate how true each statement was on a 7-point Likert-style scale ranging from 1 (*describes me poorly*) to 7 (*describes me well*), wherein higher scores indicated higher levels of social intelligence. Scores range from 21 to 147, with higher scores indicating higher social intelligence. Example items include: *“I can predict other people’s behaviour”* and *“Other people become angry with me without me being able to explain why.”* In the present study, the Cronbach’s alphas were all considered reliable, with $\alpha = 0.83$ for social information processing, $\alpha = 0.88$ for social skills, and $\alpha = 0.74$ for social awareness.

Attentiveness Check. To detect inattentive responding, four items were presented along with the Gullibility items. The questions were inspired by the Directed Questions Scale (Maniaci & Rogge, 2014), and required a specific response on the rating scale (e.g., *“Please answer 2 to this question”*). Respondents who had two or more errors on these four attentiveness items were excluded from the final analysis ($N = 42$).

Overview of the Analyses

The descriptive statistics and the reliability of the Gullibility Scale were calculated with SPSS (version 21.0). The confirmatory factor analysis was conducted with Analysis of Moment Structures (AMOS; version 21.0). In this study two types of models were tested: A common factor model (wherein all the items loaded onto a single latent construct of gullibility) and a four-factor model (wherein items loaded onto the latent constructs which were correlated).

Results

Data Preparation

A correlation matrix of all 35 items was examined for cases of multicollinearity or singularity. Tabachnick and Fidell (2007) state that a correlation above .90 suggests multicollinearity; none of the correlations exceeded .7.

Confirmatory Factor Analysis

Several goodness-of-fit indices were used. The χ^2 (chi-square) goodness-of-fit statistic assesses the proposed model against the alternative that the variables are simply correlated by chance (Bentler & Bonett, 1980). Therefore, a rejection of this test (i.e., a significant p -value) would indicate a poor model fit. However, as this test is sensitive to sample size (Bentler & Bonett, 1980) some have suggested taking a ratio of the χ^2 to the degrees of freedom to minimise the effect of sample size. Wheaton, Muthen, Alwin, and Summers (1977) recommend a figure of five or less for this ratio, whereas Tabachnick and Fidell (2007) are more stringent, recommending a figure of less than two as appropriate.

Other measures of goodness-of-fit included in this analysis were the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Akaike Information Criterion (AIC), and the Root Mean Square Error of Approximation (RMSEA). Both CFI and TLI range from zero to one and Hu and Bentler (1999) recommend that values above .95 are sufficient for a well-fitting model. The RMSEA statistic estimates how well the covariances can be replicated from the model parameters (Socha, Cooper, & Mccord, 2010). It also ranges from zero to one, but here lower values represent a better model fit, with values below .06 deemed acceptable (Hu & Bentler, 1999). The AIC is a measure of fit that includes a parsimony adjustment; that is, it penalises a model for having more variables (Akaike, 1974; Field, 2013; Tabachnick & Fidell, 2007). Smaller values suggest a better fitting and more parsimonious model (Akaike, 1974; Tabachnick & Fidell, 2007).

Table 2.1 presents the goodness-of-fit indices for each model tested. The χ^2 statistic was significant (with $p < .0005$) for all models. However, as mentioned earlier, this test is sensitive to sample size. First, the common factor model (Model 1) was tested, wherein all 35 items were constrained to a single latent factor, and this model did not fit the data well. Although the model's ratio of χ^2 to the degrees of freedom was less than five, not all of the items had significant loadings onto the one latent variable. Overall, the common factor model was not a good fit for the data and provided further evidence that gullibility comprises more than one latent factor. For Model 2, wherein the items loaded onto the respective factors of Persuadability, Insensitivity, Unassertiveness, and Trustability, the ratio of χ^2 to the degrees of freedom was less than five, all the items loaded onto the latent variables significantly, and the AIC for this model was lower than that of Model 1.

Table 2.1

Fit Indices for Various Models

No.	Model	χ^2	<i>df</i>	χ^2/df	RMSEA	CFI	TLI	AIC
1	Common factor model	2512.32*	560	4.49	.10	.60	.58	2652.32
2	Four-factor model	1170.22*	554	2.11	.06	.87	.86	1322.22
3	Three-factor model (minus Trustability)	495.56*	249	1.99	.06	.93	.92	597.56
4	Common factor model (minus Trustability items)	797.66*	252	3.17	.08	.84	.83	893.66
5	Common factor model (minus Trustability and Unassertiveness)	376.99*	135	2.79	.07	.92	.91	448.99
6	Two-factor model (minus Trustability and Unassertiveness items)	272.05*	134	2.03	.06	.95	.95	346.05
7	Common factor model (12 item scale)	202.94*	54	3.76	.09	.93	.91	250.94
8	Two-factor model (2 factors with 6 items per factor)	129.46*	53	2.44	.07	.96	.95	179.46

Note. * $p < .0005$, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, AIC = Akaike Information Criterion

Removal of the Trustability factor. Although the four-factor model (Model 2) fit the data well, the standardised covariance between Persuadability and Trustability was not significant ($.04, p = .346$). Similarly, the covariance between Insensitivity and Trustability was not significant ($-.05, p = .363$). After removing the Trustability factor and its associated items (see Model 3, the three-factor model), the AIC was lower and the ratio of χ^2 to the degrees of freedom was less than two. The remaining goodness-of-fit indices were closer the cut-off of .95 (CFI = .93, TLI = .92) and an RMSEA of .06. The common factor model, without the items associated with the Trustability factor, was also tested (i.e., Model 4);

however, the three-factor model was still a better fit for the data. Consistent with the results of Study 1 in Teunisse (2015), the Trustability factor did not relate strongly to the remaining three factors of the Gullibility scale. As the Trustability factor items did not improve the model fit, while adding an unnecessary level of complexity to the model, the Trustability items were removed from the Gullibility Scale. Removing the 11 items increased the reliability from $\alpha = 0.88$ to $\alpha = 0.91$. This is where the original analysis in Teunisse (2015) finished with the assumption that the Gullibility Scale comprised 24 items and three factors.

Removal of the Unassertiveness Factor. Although this three-factor model fit the data well, four further models were tested based on the results of the correlations between the factors and variables as well as the theoretical grounding of the concept. The Unassertiveness factor had only a weak to moderate correlation with the other factors (see Table 2.4). Furthermore, based on the theoretical understanding of gullibility, this factor and its associated items did not fit. Therefore, a common factor model without the Trustability and Unassertiveness factor items (Model 5) and a two-factor model (i.e., without the Trustability factor and the Unassertiveness factor; Model 6) were tested. Again, the common factor model did not fit as well as the two-factor model, and the two-factor model fit the theoretical understanding of the concept.

Reducing the scale to 18 items both made theoretical sense (because the definitions of unassertiveness and trust did not relate to gullibility) and was supported by the data. However, this led to an unbalanced scale. There was unnecessary conceptual duplication in the Persuadability factor. Therefore, based on the factor loadings, the six lowest scoring items from that factor were removed to balance the number of items in each factor. The common factor model (Model 7) with 12 items fit moderately well, but the 2-factor model (Model 8) fit well and made theoretical sense. After removing the items that loaded onto the Trustability factor and the Unassertiveness factor as well as six of the Persuadability items, the Gullibility

Scale now comprised 12 items. The Cronbach's alpha increased to $\alpha = .92$ for the overall scale (Persuadability $\alpha = .90$ and Insensitivity $\alpha = .83$). Table 2.2 presents the factor loadings for each of the items onto their respective factors and Table 2.3 presents the means and standard deviations for Gullibility and the two factors. There were no gender differences.

Table 2.2

Factor Loadings for the Final 12-item Gullibility Scale

	P	I
I guess I am more gullible than the average person	.789	
If anyone is likely to fall for a scam, it's me	.758	
My friends think I'm easily fooled	.847	
My family thinks I am an easy target for scammers	.740	
People think I'm a little naïve	.737	
Overall, I'm pretty easily manipulated	.780	
I'm pretty good at working out when someone is trying to fool me*		.587
I'm not that good at reading the signs that someone is trying to manipulate me		.659
I'm pretty poor at working out if someone is tricking me		.738
It usually takes me a while to 'catch on' when someone is deceiving me		.817
I'm usually quick to notice when someone is trying to cheat me*		.564
I quickly realize when someone is pulling my leg*		.591

Note. * denotes a reverse-scored item, P = Persuadability, I = Insensitivity

Table 2.3

Descriptive Statistics for Gullibility Scale and its Two Factors

	Gender			<i>t</i>	<i>p</i>
	Total Mean (<i>SD</i>)	Male Mean (<i>SD</i>)	Female Mean (<i>SD</i>)		
Gullibility	36.24 (12.33)	35.53 (11.12)	36.39 (12.60)	-.489	.63
Persuadability	17.49 (7.36)	16.66 (6.05)	17.68 (7.62)	-1.109	.27
Insensitivity	18.74 (5.87)	18.86 (5.76)	18.72 (5.91)	.173	.86

Intercorrelations

Table 2.4 presents the intercorrelations between the personality measures and between the Gullibility Scale factors, both the three-factor scale and the two-factor 12-item version of the scale. The relationships of the Trustability factor with the other personality measures (not shown in Table 2.4) were all significant; Interpersonal Trust Scale, ($r = .620, p < .0005$), the Machiavellian Personality Scale ($r = -.524, p < .0005$), the Agreeableness scale ($r = .572, p < .0005$), Social Skills ($r = .310, p < .0005$), Social Awareness ($r = .399, p < .0005$), and Social Information Processing ($r = .133, p = .016$). However, the Trustability factor did not significantly correlate with the other three factors of the model; Persuadability ($r = .061, p = .272$), Unassertiveness ($r = -.097, p = .080$), and Insensitivity ($r = .056, p = .314$). It is noteworthy that the correlation of the Persuadability factor with the Gullibility Scale, in the 3-factor version, was strong and significant ($r = .96, p < .0005$). This was, in part, because half of the 24-item Gullibility Scale comprised the 12 Persuadability items, artificially inflating the correlation. When this factor was reduced to six items its correlation with the overall scale was similar to the Insensitivity factor.

Table 2.4
Study 1: Factor Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11
1. Gullibility	-	.957**	.681**	.758**	.133*	.073	-.046	-.232**	-.135*	-.122*	-.313**
2. Persuadability	.946**	-	.494**	.712**	.138*	.043	-.015	-.214**	-.140*	-.119*	-.267**
3. Unassertiveness	-	-	-	.277**	.043	.162*	-.140*	-.089	.059	-.005	-.285**
4. Insensitivity	.914**	.733**	-	-	.113*	-.041	.069	-.319**	-.325**	-.182*	-.279**
5. Agree	.121*	.112*	-	.113*	-	-.526**	.448**	.404**	.290**	.289**	.390**
6. MPS	.006	.043	-	-.041	-.526**	-	-.442**	-.306**	-.038	-.233**	-.454**
7. ITS	.041	.013	-	.069	.448**	-.442**	-	.231**	.037	.198**	.305**
8. SI	-.304**	-.255**	-	-.319**	.404**	-.306**	.231**	-	.751**	.848**	.759**
9. SIP	-.268*	-.189*	-	-.325**	.290**	-.038	.037	.751**	-	.447**	.400**
10. SS	-.183*	-.161*	-	-.182*	.289**	-.233**	.198**	.848**	.447**	-	.451**
11. SA	-.294**	-.269**	-	-.279**	.390**	-.454**	.305**	.759**	.400**	.451**	-

Note. Correlations above the diagonal line are from the three-factor Gullibility scale and correlations below the diagonal are from the two-factor gullibility scale, * $p < .05$, ** $p < .0005$, Agree = Agreeableness Scale, MPS = Machiavellian Personality Scale, ITS = Interpersonal Trust Scale, SI = Social Intelligence, SIP = Social Information Processing, SS = Social Skills, SA = Social Awareness

Discussion

Study 2 in Teunisse (2015) confirmed that the Gullibility Scale had a factorial structure comprising Persuadability, Trustability, Unassertiveness, and Insensitivity factors. However, as found in that study and here in the reanalysis of that data, the Trustability subscale was not strongly associated with the remaining Gullibility subscales. Moreover, the model of best fit was produced by excluding the Trustability items from the Gullibility scale. With the Trustability subscale items removed, the Gullibility Scale consisted of 24 items with three subscales. However, this reanalysis demonstrated that the Unassertiveness factor did not contribute anything theoretically to the scale and only had moderate to small relationships to the variables that correlated more strongly with the other factors. Therefore, removing those items (as well as six items from the Persuadability factor) created a balanced and theoretically driven 12-item scale. Overall, gullibility was associated with higher levels of agreeableness and lower levels of social intelligence. There was no significant relationship between gullibility and Machiavellianism, or gullibility and trust.

The Trustability factor was only weakly related to the other three factors of the Gullibility scale. However, the Trustability factor was strongly and positively related to the Interpersonal Trust Scale (Rotter, 1967), indicating that those items were most likely measuring trust. Removing the Trustability factor from the Gullibility Scale meant that gullibility no longer correlated with the Interpersonal Trust Scale. This is further evidence that trust and gullibility are not conceptually related. However, there was a weak, significant, and positive relationship between the Gullibility Scale and the Agreeableness Scale. Bègue et al. (2015) found a positive relationship between agreeableness and compliance. If there is a compliance element to gullibility, then this may be what the Agreeableness scale is correlating with. However, as the relationship was weak, this suggests that although

compliance may play a role in gullibility, acceptance of the false premise which may (or may not) motivate the behaviour is likely to be more important.

The relationship of the Unassertiveness factor with agreeableness was not significant (whereas it was for the other two factors). Similarly, the Unassertiveness factor had small significant relationships with Machiavellianism and trust (whereas the other two factors did not) and it was not related to social intelligence (whereas the other two factors had a moderately significant relationship to social intelligence). Considering these findings, it seems that this factor was not relating to these variables in the same way that the Persuadability and Insensitivity factors were. Assertiveness refers to a person's ability to confidently assert or stand up for themselves (Alberti & Emmons, 1970). This social skill has multiple dimensions (Lorr, Youniss, & Stefic, 1991) whereas unassertiveness is considered a lack of this skill (Kammrath et al., 2015). Conceptually, it does not appear to be related to detecting cues of untrustworthiness but rather to compliance behaviours. As the items in this factor did not contribute statistical or theoretical meaning to the scale they needed to be removed. Removing these items, and reducing the Persuadability factor down to six items, created a reliable and balanced scale.

There was no significant relationship between the 12-item Gullibility Scale and Machiavellianism or between the Gullibility Scale and trust; however, the relationship between Machiavellianism and the Interpersonal Trust Scale was negative and strong ($r = -.44$). Similarly, there was a strong negative relationship between the Machiavellianism measure and the Trustability factor ($r = -.52, p < .0005$) in the original 4-factor Gullibility Scale. Therefore, removing those Trustability items from the scale naturally weakened the relationship between Machiavellianism and gullibility. Perhaps the elements of Machiavellianism that are not related to trust would have a stronger relationship with gullibility. However, this is something future research should determine.

The relationships between the Gullibility Scale and the social intelligence subscales were moderate and negative. These relationships were strongest for the Social Awareness subscale, which focusses on a person's understanding and awareness of social interactions (Grieve & Mahar, 2013). This inability to discern other people's choices, predict their decisions, or understand the reasons behind their emotions could influence a person's ability to detect cues of untrustworthiness and thus make them more gullible. This finding supports the hypothesis that the more gullible a person is, the less socially intelligent they are. This correlation also provides evidence for the convergent validity of the Gullibility Scale. Further, the Insensitivity factor had a moderate, negative relationship with the Social Information Processing subscale. The Social Information Processing subscale measures a person's ability to deal with social information (Grieve & Mahar, 2013; Silvera et al., 2001). An inability to correctly process social information seems to be very similar to the inability, or unwillingness, to perceive cues of untrustworthiness (i.e., to be insensitive or not sceptical), except that the ability may be broad in scope, rather than specifically related to untrustworthiness detection. Therefore, this moderate relationship between the two scales provides further evidence for convergent validity.

Finally, it is worth noting that one factor of the three-factor scale, Persuadability, had a significant and strong correlation with the Gullibility Scale overall. This was attributed to the fact that half of the Gullibility Scale's items were purely from that factor, thereby artificially inflating the correlation coefficient. Further, this subscale had strong significant correlations with the other two factors. These two points could explain why Persuadability had such a high correlation with the Gullibility Scale overall. When this factor was reduced to only six items (the same number as the Insensitivity factor) it still had a significant and strong relationship with the overall scale, but now the Insensitivity factor's relationship was equally strong and significant.

In conclusion, the study presented in this chapter indicates that the revised Gullibility Scale has a two-factor structure, comprising Persuadability and Insensitivity, which load onto the superordinate concept of gullibility, rather than a single factor structure. Because the Trustability factor and Unassertiveness factor and their associated items from the earlier version of the scale were removed during the analysis in this study (as well as six items from the Persuadability factor), it was considered important to ascertain whether the factor structure would replicate when presented to a new sample without those items. Accordingly, the aim of the two studies reported in the next chapter was to ascertain whether the factor structure obtained here would hold when the scale was presented to a new sample without those items, and the data subjected to both exploratory and confirmatory factor analysis.

Chapter 3

Confirming the New Factor Structure of the Gullibility Scale

In the previous chapter, two factors of the original Gullibility Scale (Teunisse, 2015), the Unassertiveness and Trustability factors, as well as six items from the Persuadability factor were removed post-hoc during the analysis. This large change to the scale's factor structure was driven by the data. However, it was considered important to determine whether this new factor structure would emerge when those 12 items were presented by themselves. This chapter presents two studies that attempted to replicate this new factor structure. The convergent validity of the scale was also examined in relation to theoretically-relevant measures of social intelligence and trust (Study 2) and beliefs in the paranormal and social vulnerability (Study 3).

Study 2: Exploratory Factor Analysis of the Two-Factor Gullibility Scale

The first aim of Study 2 was to replicate the factor structure found in Study 1 (reported in the previous chapter) using exploratory factor analysis. The second aim was to a) examine whether the negative relationship between social intelligence and gullibility found in Study 1, would be replicated; and b) to further investigate the relationship between gullibility and trust.

Social intelligence. Social intelligence refers to understanding social situations and the ability to interpret social information that leads to accurate social inference (Grieve & Mahar, 2013). In Study 1 there was a significant negative relationship between gullibility and social intelligence. The Social Awareness subscale of the social intelligence measure, which focusses on a person's understanding and awareness of social interactions (Grieve & Mahar, 2013), had the largest correlation with the Gullibility Scale. This inability to discern other people's choices, predict their decisions, or understand the reasons behind their emotions

could influence a person's ability to detect cues of untrustworthiness and thus make them more gullible. Therefore, it was predicted that in this study there would be a negative relationship between the Gullibility Scale and social intelligence, replicating the results from the previous study.

Trust. Trust can be defined as a generalised expectancy held by individuals or groups that another party can be relied upon (Rotter, 1967), or that others will not knowingly act in a detrimental way towards our interests (Hardin, 2001; Sturgis et al., 2010). In common usage, people often equate gullibility with overly trusting individuals. However, in addition to the findings of Teunisse (2015), there is a growing body of work, as discussed in Chapter 1, which suggests that highly trusting individuals are not necessarily gullible (Carter & Weber, 2010; Rotter, 1980; Sturgis et al., 2010; Yamagishi, 2001; Yamagishi et al., 1999). Accordingly, it was decided to further examine the potential relationship between trust and gullibility in the following study using the new, two-factor scale.

Method

Participants

Study 2 included 193 students enrolled in an introductory psychology unit and 274 community respondents collected via online research forums. Of the student responses, four respondents were excluded due to incomplete data and a further 23 cases were excluded based on the response to the attentiveness check items. The mean age of the remaining 166 student respondents (138 women) was 20.92 years ($SD = 5.95$ years) and ranged from 18 to 51 years. Of the 274 community respondents, 92 cases were excluded due to incomplete data and a further 22 cases were removed due to their responses on the attentiveness check items. The mean age of the remaining 160 community respondents (117 women) was 30.89 years ($SD = 11.46$ years) and ranged from 17 to 66 years. Fifty percent were from Australia, 22.5%

were from the United States of America, 10.6% were from the United Kingdom, and the remainder came from countries such as Canada, France, Germany, and Mexico.

The two samples were examined for significant differences in gullibility prior to combining them. There was no difference between the student sample ($M = 36.73$, $SD = 12.63$), and those respondents in the community sample ($M = 34.06$, $SD = 12.51$, $F(1) = .963$, $p = .33$, partial $\eta^2 = .003$) when controlling for age. The two samples (undergraduate and community) were combined for the analyses in Study 2 to produce a total of 326 respondents (255 women), with a mean age of 25.81 years ($SD = 10.35$ years).

Procedure

This study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201500596, see Appendix F for the approval letter). Respondents gave informed consent and completed all the measures online using Qualtrics survey software. For the student sample, the study was posted on an introductory psychology unit's online discussion board. For the community sample, the study was posted online in different forums dedicated to advertising psychology research. Respondents completed the measures in random order. Presentation of items within each scale was also randomised. Information on age, gender, country of residence, and socio-economic status (including household income and education) was collected at the end of the online questionnaire.

Measures¹

Gullibility. To assess gullibility, the 12-item Gullibility Scale was used (see Appendix B). The possible range of scores ranged from 12 to 84, wherein higher scores related to higher levels of gullibility. The Cronbach's alpha in the present study was $\alpha = .92$.

¹ Participants in this sample also completed the short version of the Autism Quotient measure (Hoekstra et al., 2011). This was done in an attempt to measure Theory of Mind which can be considered a core feature of Autism Spectrum Disorders. Theory of Mind could be considered purely a cognitive ability, compared with social intelligence which consists of both behavioral and cognitive components. However, over and above the Theory of Mind deficits, there are other autism spectrum related behaviors (such as social and communicative deficits, preference for routine etc.) considered in the AQ-Short which can obscure the measurement of Theory

Trust. To assess trust the same 25-item Interpersonal Trust Scale (Rotter, 1967) as used in Study 1 (see Appendix B). In the present study the scale was considered reliable ($\alpha = .78$).

Social Intelligence. The same 21-item English version (Grieve & Mahar, 2013) of the Tromsø Social Intelligence Scale (Silvera et al., 2001) as used in Study 1 was used to assess social intelligence (see Appendix B). In the present study, the Cronbach's alphas were all considered reliable, with $\alpha = 0.88$ for social information processing, $\alpha = 0.88$ for social skills, and $\alpha = 0.80$ for social awareness.

Attentiveness Check. To assess acquiescent and inattentive responding, the same four items were presented with the Gullibility Scale as used in Study 1 in the previous chapter. An additional two attentiveness items were presented elsewhere in the study. Respondents who made two or more errors on these six attentiveness items were excluded ($N=45$).

Overview of Analyses

All analyses were conducted using SPSS (Version 21.0). Pearson correlations were run to compare the relationships between the factors of the scale as well as to compare the Gullibility Scale to the other variables measured. A factor analysis using principal axis factoring extraction and oblimin rotation was applied to these data. This was selected as the most appropriate data reduction approach, considering the high likelihood of correlations between the factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Field, 2013).

of Mind. Therefore, the results were not presented here. However, the results of these analyses are available in Appendix D.

Results

Exploratory Factor Analysis

A principal axis factor analysis was conducted on the 12 items, with an oblimin rotation. A parallel analysis with Principal Components analysis using the rawpar.sps program by O'Connor (2000) suggested that two factors should be extracted. The data were read into the parallel analysis and, rather than using normally distributed random numbers, permutations on the original dataset were used. Similarly, the point of inflection on the scree plot suggested a two-factor solution. The two-factor solution explained 56.50% of the variance with only one item loading significantly on both factors. The two-factor solution had the same factor structure as the one from Study 1 (see Table 3.1), with all the items loading onto their respective factors of Insensitivity (Factor 1) and Persuadability (Factor 2). One item loaded onto both factors (*"I guess I am more gullible than the average person"*). This item had previously been associated with the Persuadability factor. A possible reason for this cross-load is that it has the word "gullible" in the item (it is the only item that does). As both the factors load onto the concept of gullibility (and they are highly intercorrelated), it makes sense that this particular item would load onto both factors. As this item's factor loading score was still higher for the Persuadability factor and it had previously been associated with this factor, the item remained part of the Persuadability factor. Table 3.2 presents the descriptive statistics for the Gullibility Scale and the two subscales. For all the variables, women scored significantly higher than men.

Table 3.1

Study 2: Rotated Factor Matrix for 2-factor Gullibility Scale

	1	2
I'm pretty good at working out when someone is trying to fool me*	.822	
I'm usually quick to notice when someone is trying to cheat me*	.799	
I'm pretty poor at working out if someone is tricking me	.706	
I quickly realize when someone is pulling my leg*	.705	
It usually takes me a while to 'catch on' when someone is deceiving me	.635	
I'm not that good at reading the signs that someone is trying to manipulate me	.515	
My family thinks I am an easy target for scammers		.798
If anyone is likely to fall for a scam, it's me		.758
My friends think I'm easily fooled		.709
Overall, I'm pretty easily manipulated		.603
People think I'm a little naïve		.493
I guess I am more gullible than the average person	.356	.490

Note. * denotes a reverse-scored item

Table 3.2

Study 2: Summary of Descriptive Statistics for Gullibility Scale and Two Factors

	Gender			<i>t</i>	<i>p</i>
	Total	Male	Female		
	(N = 326)	(N = 71)	(N = 255)		
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)		
Gullibility	35.42 (12.62)	31.89 (11.91)	36.40 (12.66)	-2.69	.01
Persuadability	16.67 (6.88)	14.65 (6.16)	17.23 (6.97)	-2.83	.01
Insensitivity	18.75 (6.84)	17.24 (6.93)	19.17 (6.77)	-2.11	.04
SIP	34.60 (7.13)	34.99 (8.07)	34.49 (6.68)	0.51	.61
Social Skills	30.86 (8.51)	31.76 (9.36)	30.61 (8.26)	1.01	.31
Social Awareness	33.98 (7.12)	33.56 (7.82)	34.09 (6.92)	-0.56	.58
Trust	64.11 (9.98)	65.13 (11.80)	63.82 (9.41)	0.97	.33

Note. *SD* = Standard Deviations, SIP = Social Information Processing

Intercorrelations

There were significant negative relationships between gullibility and Social Information Processing ($r = -.337, p < .005$), gullibility and Social Skills ($r = -.228, p < .005$), and gullibility and Social Awareness ($r = -.280, p < .005$), replicating the results of Study 2. The pattern of results was similar for both the factors; Persuadability and Social Information Processing ($r = -.276, p < .005$), Social Skills ($r = -.222, p < .005$), and Social Awareness ($r = -.275, p < .005$) and Insensitivity and Social Information Processing ($r = -.331, p < .005$), Social Skills ($r = -.197, p < .005$), and Social Awareness ($r = -.257, p < .005$). There was no relationship between gullibility and trust ($r = .085, p = .127$). Again, this was replicated in both factors: Persuadability $r = .077, p = .167$, and Insensitivity $r = .079, p = .154$.

Discussion

Overall, the factor structure of the Gullibility Scale found in Study 1 was replicated. This demonstrates that removing the Trustability factor and Unassertiveness factor (as well as six Persuadability items) in Study 1 did not affect the integrity of the factor structure of the Gullibility Scale. Furthermore, it was once again demonstrated that there is no relationship between the Gullibility Scale and trust, as measured by Rotter's (1967) Interpersonal Trust Scale. The replication of this finding suggests that gullibility and trust are independent and that a reliable measure of gullibility should not include items that relate purely to trust. This differentiation of gullibility from trust was originally suggested by Yamagishi et al. (1999) who demonstrated that high trusters were more sensitive to untrustworthy cues than low trusters. They argued that if trust is considered a person's default expectation of another person's trustworthiness, then it should be logically independent of the ability to detect cues of untrustworthiness (i.e., being gullible).

Relatedly, the results of this study replicated those of Study 1 in that the Gullibility Scale was negatively correlated with social intelligence. Specifically, of the three subscales in

the Tromsø Social Intelligence Scale (Grieve & Mahar, 2013; Silvera et al., 2001), Social Information Processing (e.g., *I can predict other people's behaviour*) was the most strongly related to gullibility. This relationship suggests that the inability to perspective-take, or accurately process social information, is related to the inability to detect cues of untrustworthiness. Overall, these findings provide further evidence that the newly developed Gullibility Scale has a stable factor structure and is a reliable and valid measure of gullibility. However, this new structure needed to be confirmed with a new sample using a confirmatory factor analysis. This was carried out in Study 3.

Study 3: Confirmatory Factor Analysis of the Two-Factor Gullibility Scale

Theoretical Background

Social vulnerability. As mentioned in Chapter 1, the most relevant scale for measuring gullibility, as it is defined here, is the Social Vulnerability Scale (Pinsker et al., 2011). Building upon Greenspan and colleagues' work (Greenspan, 2009b; Greenspan et al., 2001), this 15-item scale was developed to identify older adults with dementia or other cognitive impairments who might be vulnerable to financial abuse (Pinsker et al., 2011, 2006). The Social Vulnerability Scale comprises two factors, with the first factor ("Gullibility") comprising eight behavioural indicators of financial exploitation such as "signed up for dubious investments" and the second factor ("Credulity") comprising seven items measuring a predisposition to unquestioningly believe verbal or written information, even after having been repeatedly misled or exploited by the same source. Although the Social Vulnerability Scale provides a useful tool for identifying credulous older adults at risk of financial exploitation, it has limitations as a general measure of gullibility across contexts (e.g., romance scams) and populations. First, it is based on Greenspan's (2009a) theoretical position, wherein he separates beliefs from behaviours. Taking this approach does not clarify whether a person who engages in a gullible act is truly gullible, or whether they are compliant

but fully aware that their behaviour would make them appear gullible. Further, the Social Vulnerability Scale was specifically designed for use with cognitively impaired individuals and has not been tested on non-impaired samples. Hence, this scale may have limited utility as an instrument for assessing gullibility in the general population.

Paranormal Beliefs. Although research on individual differences in gullibility has been sparse, enquiry into why people believe the implausible has enjoyed a long tradition in psychology. The first empirical investigations of the prevalence of pseudoscientific beliefs, for example, were conducted in the early years of psychological science (e.g., Conklin, 1919; see Zusne & Jones, 1989 for a review). Other research has identified both cognitive (e.g., Gilovich, 1991) and motivational (e.g., Case et al., 2004) factors that might lead to superstitious or magical thinking (see Vyse, 2013 for a review). One main finding to emerge from this research is that belief in superstition and magical processes is widespread (Vyse, 2013). Given that many such culturally endorsed superstitious beliefs enjoy mainstream popularity, even among the well-educated, obvious untrustworthiness cues accompanying premises based on superstition are often absent. Gullibility is the acceptance of a false premise in the presence of untrustworthiness cues. As such, acceptance of widely held superstitions might not reflect gullibility. However, while gullibility is not purely confined to premises that incorporate paranormal or pseudoscientific content, it is possible that the propensity to believe in a range of superstitious phenomena might be positively associated with the tendency to be gullible.

Aims and Hypotheses

This study had two aims. The first aim was to confirm the factor structure of the two-factor Gullibility Scale using confirmatory factor analysis. The second aim was to examine the relationship between the Gullibility Scale and measures of social vulnerability and paranormal beliefs. It was hypothesised that there will be a small positive relationship

between gullibility and paranormal beliefs and a small to moderate positive relationship between gullibility and social vulnerability.

Method

Participants

The sample comprised undergraduate students and community members. The 431 undergraduate students were enrolled in an introductory psychology unit. Of those students, 25 respondents were excluded due to incomplete data. After examining the remaining student data for biased responding, using items included to assess attentiveness, another 27 cases were excluded. The mean age of the remaining 379 (296 women, 82 men, one person who elected not to specify a gender) student respondents was 21.24 years ($SD = 4.71$ years) and ranged from 18 to 50 years. The 172 community respondents found the study via online psychology research forums and social media networks (e.g., Psychological Research on the Net, The Inquisitive Mind, and Online Psychology Research). From the initial sample, 21 respondents were excluded due to incomplete data. After examining the remaining sample for biased responding using the attentiveness check items, another 29 cases were excluded. The mean age of the remaining 122 (93 women, 21 males, eight people who elected not to specify a gender) community respondents was 28.88 years ($SD = 11.51$ years) and ranged from 18 to 73 years; 31.1% were from the United States, 20.5% were from Australia, 19.7% were from the United Kingdom, and the remainder were from Canada, India, Germany, Sweden, and Singapore.

The two groups were examined for significant differences in gullibility prior to combining them. There was no significant difference between the students ($M = 33.61$, $SD = 11.50$) and the community respondents ($M = 34.04$, $SD = 12.12$, $F(1) = 1.63$, $p = .202$, partial $\eta^2 = .003$) controlling for the effect of age on the 12-item version of the Gullibility Scale. Therefore, the samples were combined to achieve the minimum number of respondents

needed for confirmatory factor analysis. The final sample comprised 501 respondents (389 women, 103 males, and 9 people who elected not to specify a gender), with a mean age of 23.10 years ($SD = 7.72$ years).

Procedure

The procedure was identical to the previous study. This study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201800086, see Appendix F for the approval letter). After completing the scales, demographic questions (age, gender, and education level) were presented.

Measures

Gullibility. To assess gullibility, the 12-item Gullibility Scale was used (see Appendix B). The possible range of scores ranged from 12 to 84, wherein higher scores related to higher levels of gullibility. The Cronbach's alpha in the present study was $\alpha = .91$ (Persuadability $\alpha = .87$, Insensitivity $\alpha = .86$).

Paranormal Beliefs. To measure paranormal and superstitious beliefs the 26-item Revised Paranormal Belief Scale (Tobacyk, 2004) was used (see Appendix B). Participants were asked to rate their level of agreement with each statement from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). The possible range of scores ranged from 26 to 182, with higher scores indicating higher endorsement of paranormal beliefs. Example items include "*Black magic really exists*" and "*Black cats can bring bad luck*". The Cronbach's alpha for the scale has been reported as $\alpha = 0.93$ (Drinkwater, Denovan, Dagnall, & Parker, 2017) and in the present study was $\alpha = 0.93$.

Social Vulnerability. Social vulnerability was assessed using the 15-item Social Vulnerability Scale (Pinsker et al., 2011). Originally this scale was designed to be completed by informants of the participants (i.e., a friend or family member). The 15-item scale has two factors; a gullibility factor (with 8 items relating to behaviours) and a credulity factor (with 7

items relating to cognitions). The items were adapted so they could be used in a self-report context (see Appendix B for the adapted items). For example, the item “*Persuaded to purchase unneeded items*” was amended to read “*I have been persuaded to purchase unneeded items*”. Participants were asked to rate the frequency of the behaviour on a 5-point Likert-style scale; 0 (Never), 1 (Rarely), 2 (Sometimes), 3 (Often), and 4 (Always). The possible range of scores ranged from 0 to 60, with higher scores indicating higher levels of social vulnerability. The Cronbach’s alpha for the scale as a whole has been reported as $\alpha = 0.90$, with $\alpha = 0.85$ for the Gullibility factor and $\alpha = 0.86$ for the Credulity factor (Pinsker et al., 2011). In the present study, overall it was $\alpha = 0.81$, with $\alpha = 0.67$ for the Gullibility factor and $\alpha = 0.77$ for the Credulity factor.

Attentiveness Check. To assess acquiescent and inattentive responding, the same four items were presented with the Gullibility Scale as used in the previous 2 studies. Respondents who made two or more errors on these four attentiveness items were excluded ($N=56$).

Overview of the Analyses

To test the hypotheses, the Statistical Package for Social Sciences (SPSS; version 21.0) was used to analyse the data. Univariate and bivariate descriptive statistics (including correlations) were run to assess if the data violated any assumptions. The confirmatory factor analysis was conducted with AMOS (version 21.0). In this study one model was tested: the two-factor model.

Results

Confirmatory Factor Analysis

The same goodness-of-fit indices as used in Study 1 were used here. The χ^2 (chi-square) goodness-of-fit statistic was significant ($\chi^2(53) = 187.89, p < .0005$); however this test is sensitive to sample size (Bentler & Bonett, 1980). The ratio of the χ^2 to the degrees of

freedom was less than the recommended cut-off of five (3.55; Wheaton et al., 1977) but not less than Tabachnick and Fidell's (2007) more stringent cut-off of two. Although Hu and Bentler (1999) recommend that RMSEA should fall below .06, both they and Browne and Cudeck (1993) suggest that figures falling between .05 and .08 still indicate a fair fit of the model. Hence, this model's RMSEA of .07 still falls within an acceptable range, as does the CFI (.95) and TLI (.94).

Descriptive and Demographic Statistics

Table 3.3 presents the descriptive statistics for the Gullibility Scale, the two subscales, as well as the two other variables used in the study.² In all the variables, except for the Social Vulnerability Scale, women scored significantly higher than men.

Table 3.3

Study 3: Summary of Descriptive Statistics for Gullibility, the Subscales, Paranormal Beliefs, and the Social Vulnerability Scale

	Gender			t	p
	Total (N=501) Mean (SD)	Male (N=103) Mean (SD)	Female (N=389) Mean (SD)		
Gullibility	33.71 (11.65)	31.57 (9.51)	34.18 (12.06)	-2.33	.02
Persuadability	15.77 (6.49)	14.72 (5.54)	16.05 (6.72)	-2.07	.04
Insensitivity	17.84 (6.10)	16.85 (4.96)	18.13 (6.23)	-2.18	.03
SVS	10.92 (5.72)	10.54 (5.04)	11.07 (5.92)	-.83	.41
Paranormal	72.10 (26.78)	63.67 (26.00)	74.44 (26.47)	-3.69	.00

Note. SVS = Social Vulnerability Scale

² The nine participants who elected not to specify a gender were not included in the analysis were not included in the gender comparison.

Intercorrelations

There was a weakly significant, positive correlation between the Gullibility Scale and the Paranormal Beliefs Scale (see Table 3.4). There was also a significant, positive, and strong relationship between the Social Vulnerability Scale and the Gullibility Scale. The Social Vulnerability Scale has two subscales, Gullibility and Credulity. The correlation between the Gullibility Scale and the Social Vulnerability Scale's Gullibility subscale was significant, positive, and moderate to strong ($r = .403, p < .0005$) and it was similar for the Credulity subscale ($r = .636, p < .0005$).

Table 3.4

Study 3: Factor Correlation Matrix

	1	2	3	4	5	6	7
1. Gullibility	-	.930**	.921**	.198**	.617**	.403**	.636**
2. Persuadable		-	.713**	.268**	.609**	.422**	.610**
3. Insensitivity			-	.093*	.530**	.322**	.566**
4. Paranormal Beliefs				-	.201**	.144**	.197**
5. SVS					-	.824**	.903**
6. SVS – Gull.						-	.501**
7. SVS – Cred.							-

Note. * $p < .05$, ** $p < .0005$, SVS = Social Vulnerability Scale, GTQ = General Trust Question

Measurement Invariance

In order to ensure measurement invariance of the Gullibility Scale across the groups (i.e., males and females, students and community members), the four samples from Studies 1 of Teunisse (2015) and Studies 1-3 of this thesis were combined. Testing for measurement invariance allows researchers to determine whether items in the Gullibility Scale are being perceived the same way by members of different groups (Cheung & Rensvold, 2002), such as participant type (students or community members) or gender. This combined sample ($N =$

1523) provided adequate sample size for the smaller groups, such as males ($N = 323$) and community members ($N = 481$), whereas the within-study sample sizes were smaller.

Conducting a multiple-groups factor analysis in AMOS on the final 12-item scale for males and females as well as students and community members found multiple-groups measurement invariance (gender: $\chi^2 = 4.144$, $p = .941$, participant type: $\chi^2 = 6.770$, $p = .747$). This suggests that although there may sometimes be significant differences between group members in particular studies, when this difference is examined with larger samples through a multiple-group confirmatory factor analysis, this difference disappears.

Discussion

This study had two aims: to confirm the new factor structure of the two-factor Gullibility Scale and to explore its relationship with paranormal beliefs and social vulnerability. Overall, the factor structure of the Gullibility Scale found in Study 1 was replicated. This demonstrates that removing the Trustability factor, the Unassertiveness factor, and six Persuadability items did not affect the integrity of the factor structure of the Gullibility Scale. Study 3 also provided further evidence for the convergent validity of the Gullibility Scale: Specifically, the Gullibility Scale was positively correlated with a measure of social vulnerability. However, although the relationship between the two scales was moderately strong, it only explained 38% of the variance. This indicates that the Gullibility Scale was indeed explaining additional variance over and above the Social Vulnerability Scale. Furthermore, and as predicted, there was a significant relationship between gullibility and holding paranormal beliefs. However, this relationship was weak, indicating that belief in the paranormal does not necessarily equate to being gullible. Overall, these findings provide further evidence that the newly developed gullibility scale has a stable factor structure and is a reliable and valid measure of gullibility.

In conclusion, the two studies in this chapter replicated and confirmed the factor structure of the Gullibility Scale and provide further evidence of its convergent validity. The next step in the development of the scale was to examine its criterion validity and test-retest reliability, and the studies exploring these features are presented in the next chapter.

Chapter 4

Criterion Validity and Test-Retest Reliability of the Gullibility Scale

The previous chapter demonstrated that the Gullibility Scale comprises two factors (Persuadability and Insensitivity) and provided good evidence for its convergent validity. The aim of the present chapter is to present evidence for the criterion validity and test-retest reliability of the Gullibility Scale.

Study 4: Criterion Validity of the Gullibility Scale

Studies 2 and 3, reported in Chapter 3, replicated the factor structure and presented evidence for the convergent validity of the Gullibility Scale. The aim of Study 4 was to investigate the criterion validity of the scale. To do this, two distinct samples were sought: A sample of people who had reportedly been victims of scams, and members of a critical thinking interest group (i.e., the Skeptics). The Skeptics are an interest group that investigates paranormal and pseudo-scientific claims from a scientific viewpoint and attempts to debunk these claims (Australian Skeptics, 2019). Theoretically, if a person has previously fallen victim to a scam, they could be considered gullible, and so should obtain relatively high gullibility scores. Conversely, people who are members of a critical thinking self-interest group might be more vigilant to potential scams than others and obtain relatively low gullibility scores. Accordingly, in the current study scores on the Gullibility Scale for both the Skeptic group and the scam victim group were compared with scores from the samples of student and community members obtained in Study 2 to provide criterion validity for the Gullibility Scale. Overall, it was expected that individuals who reported having been victims of a scam would obtain higher scores on the Gullibility Scale than individuals who valued thinking critically (Skeptics) or the students and community sample obtained in Study 2.

Further, Skeptics were expected to obtain lower gullibility scores than both scam victims and the students and community sample.

Method

Procedure

Once this study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201700088, see Appendix F for the approval letter), it was advertised and completed online. For the Skeptic sample, the study was advertised in online groups for Skeptics and via the Australian Skeptic's email list. For the scam victim sample, the study was advertised in various online Facebook groups targeted at people who had fallen victim to scammers, shared on Twitter, promoted during an interview on national radio (and advertised on the website of the Australian Broadcasting Corporation's radio program *Life Matters*) and on a podcast (*Scamapalooza*). Respondents in both samples gave informed consent and completed all measures online.

Despite these public recruitment drives, scam victims were difficult to recruit. It is possible that scam victims had become overly suspicious of any appeals to participate in online information gathering, or they may have been embarrassed to report that they had been scammed. Anticipating this difficulty, the study was kept as short as possible to increase questionnaire completion rates.

Participants

Skeptics. Of the full Skeptic sample ($N = 340$), 30 respondents were excluded due to incomplete data and 16 respondents were excluded as they indicated that they were not Skeptics. A further 70 respondents were excluded as, although they claimed they were Skeptics, they also indicated that they had fallen for a scam.³ The mean age of the remaining

³ Thus, it is unclear if the reason for joining the Skeptics was related to having been a victim; their interest in the Skeptics might have represented an attempt to overcome any existing gullibility. Hence, these respondents were excluded.

224 respondents was 51.63 years ($SD = 14.57$ years) and ranged from 18 to 80 years. There were 141 men and 83 women. 95.1% were from Australia, 2.7% were from the United States of America, 1.8% were from the United Kingdom, and one respondent was from Canada.

Scam Victims. In the sample of scam victims ($N=121$), 28 were excluded due to incomplete data and 28 were excluded as they had not fallen for a scam. The mean age of the remaining 65 respondents was 36.09 years ($SD = 19.38$ years) and ranged from 17 to 76 years. There were 19 men and 46 women. 69.2% were from Australia, 9.2% were from the United States of America, 9.2% were from the United Kingdom, and the remainder came from countries such as Canada, Malaysia, and Singapore.

Community and Student Sample. The same 326 respondents from Study 2 in Chapter 3 were used.

Measures

Gullibility. Gullibility was assessed using the 12-item Gullibility Scale described in Study 3 (see Appendix B). The Cronbach's alpha in the present study for the scam victims was $\alpha = .92$ ($\alpha = .89$ for Persuadability and $\alpha = .84$ for Insensitivity) and for Skeptics was $\alpha = .87$ ($\alpha = .81$ for Persuadability and $\alpha = .79$ for Insensitivity), and for the entire sample $\alpha = .92$ ($\alpha = .88$ for Persuadability and $\alpha = .86$ for Insensitivity).

Scam questions. Three questions relating to scams were included: "*Have you ever been the victim of a scam?*", "*How many times have you been scammed?*", and "*How long has it been since the scam took place?*" We also asked the respondents to categorise the scam that they had fallen victim to according to the ten categories defined by the Australian Competition and Consumer Commission (Australian Competition & Consumer Commission, 2013). Each category was presented, along with a definition; e.g., "*Advance Fee Fraud Scam: It includes any scam where a scammer requests fees upfront or personal information in return for goods, services, money or rewards that they never supply.*"

Demographic questions. Demographic information on age, gender, country of residence, and education were collected at the end of the survey. For the Skeptic sample, an extra question was included in the survey “Do you consider yourself a Skeptic? (e.g., you subscribe to *The Skeptic* magazine or you are sympathetic to the views of the Skeptics).”

Overview of the Analyses

To test the hypothesis, the Statistical Package for Social Sciences (SPSS; version 21.0) was used to analyse the data. Univariate and bivariate descriptive statistics were run to assess if the data violated any assumptions. An Analysis of Covariance (ANCOVA) was run as the primary independent variable was categorical (i.e., participant type), the covariates of gender was also categorical and age was continuous, and the dependent variable was continuous (i.e., scores on the Gullibility Scale).

Results

Descriptive and Demographic Data

Table 4.1 presents the number of scam victims in each scam category. The biggest category was the Advance Fee Fraud scam type, followed closely by Dating Scams. These two categories comprised nearly half of all the victims (i.e., 44.46%).

Table 4.1

Number of Scam Victims in Each Scam Category

Type of Fraud	No.	%
Advance Fee Fraud (It includes any scam where a scammer requests fees upfront or personal information in return for goods, services, money, or rewards that they never supply.)	16	24.6
Computer Hacking (e.g., Phishing emails wherein you were tricked into giving a scammer access to your computer. Or a social networking scam, which was initiated via a phishing email that asked you to enter your account password on a fake copy of the networking site's login page.)	8	12.3
Online Shopping, Classifieds and Auction Scam (e.g., a scammer will sell a product and send a faulty or inferior quality item, or nothing at all. They may also pretend to sell a product just to gather your credit card or bank account details.)	8	12.3
Banking, Credit Card and Online Account Scam (e.g., Card skimming is the copying of information from the magnetic strip of a credit card or ATM card or Card-not-present fraud is where scammers use your credit card number and details to pay for a product or service without them physically having your card.)	4	6.2
Small Business Scam (e.g., a false billing scam or an office supply scam when you received and were charged for products that you did not order.)	3	4.6
Job and Employment Scam (You received offers to work from home or set up and invest in a "business opportunity". Scammers promised a job, high salary, or large investment return following initial upfront payments.)	1	1.5
Golden Opportunity and Gambling Scam (e.g., Investment Opportunity scam or a Pyramid scheme)	3	4.6
Charity and Medical Scam (e.g., Charity scams involve scammers collecting money by pretending to work for a legitimate cause or charity, or a fictitious one they have created. Or Miracle cure/Weight loss scams offer a range of products and services that can appear to be legitimate alternative medicines, usually promising quick and effective remedies for serious medical conditions or obesity. They treatments are often promoted using false testimonials from people who have been 'cured'.)	5	7.7
Dating and Romance Scam (e.g., common dating and romance scams involve scammers creating fake profiles on legitimate dating websites.)	13	20.0
No Scam Type Selected	4	6.2
Total	65	100.0

Table 4.2 presents the descriptive statistics for the Gullibility Scale for the entire sample as well as by group, controlling for the effect of age. There was a significant gender difference in total scores on the Gullibility Scale in both the Study 2 sample and Skeptics sample but not in the scam victim sample ($F(1, 610) = .686, p = .411, 95\% \text{ CI } [-9.98, 4.13]$, partial $\eta^2 = 0.01$), controlling for the effect of age. On average, women in the Study 2 sample had significantly higher gullibility scores than men, $F(1, 610) = 6.423, p = .01, 95\% \text{ CI } [-7.54, -.95]$; however, it represented a small-sized effect, partial $\eta^2 = 0.02$. Similarly, women in the Skeptics sample had significantly higher gullibility scores than men, $F(1, 610) = 6.35, p = .01, 95\% \text{ CI } [-5.69, -.70]$, partial $\eta^2 = 0.03$. For the total sample, including the Skeptics, Scam victims, and Study 2 respondents, women had significantly higher scores on the Gullibility Scale than the men, $F(1, 610) = 11.61, p < .001, \text{ CI } [-5.59, -1.50]$, partial $\eta^2 = 0.02$. However, in Chapter 3 I tested for measurement invariance for gender across all the studies conducted thus far (using all the participants from Studies 1 of Teunisse (2015) and Studies 1-3 in this thesis on the 12-item Gullibility Scale) and found that, overall, both men and women respond to the items in the same way. Therefore, any differences in gender found within a single study appear to be due to the under-representation of males at an experiment-level rather than a function of gender influencing responses to the Gullibility Scale.

Table 4.2

Study 4: Summary of Descriptive Statistics for Gullibility Scale by Sample Group

		Gender							
		Male				Female			
		N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	<i>t</i>	<i>p</i>
Scam Victims	Gullibility	65	40.57 (13.12)	19	37.95 (12.63)	46	41.65 (13.28)	-1.037	.30
	Persuadability		19.52 (7.72)		19.05 (8.42)		19.72 (7.49)	-.314	.76
	Insensitivity		21.05 (6.31)		18.89 (5.47)		21.93 (6.47)	-1.929	.06
Study 2 Sample	Gullibility	326	35.41 (12.62)	71	31.89 (11.91)	255	36.40 (12.66)	-2.690	.01
	Persuadability		16.67 (6.88)		14.65 (6.16)		17.23 (6.97)	-2.830	.01
	Insensitivity		18.75 (6.84)		17.24 (6.93)		19.17 (6.77)	-2.113	.04
Skeptics	Gullibility	224	27.94 (9.07)	141	26.72 (8.56)	83	30.02 (9.57)	-2.673	.01
	Persuadability		11.83 (4.49)		11.12 (3.97)		13.02 (5.05)	-2.941	.00
	Insensitivity		16.12 (5.45)		16.00 (5.42)		17.00 (5.42)	-1.872	.06
Total	Gullibility	615	33.24 (12.27)	231	29.23 (10.61)	384	35.65 (12.58)	-6.493	.00
	Persuadability		15.21 (6.77)		12.86 (5.72)		16.62 (6.96)	-7.271	.00
	Insensitivity		18.03 (6.50)		16.37 (6.00)		19.03 (6.60)	-5.006	.00

Note. SD = Standard Deviation

Analysis of Covariance (ANCOVA)

As there were significant effects of gender, $F(1, 610) = 11.612, p < .001$, partial $\eta^2 = .02$, and of age, $F(1, 610) = 6.159, p = .013$, partial $\eta^2 = .01$, both variables were included as covariates in a one-way analysis of variance. Controlling for gender and age, there was a significant effect of participant group type on Gullibility Scale score, $F(2, 610) = 17.40, p < .0005, \eta^2_p = .06$. As expected, scam victims scored significantly higher on the Gullibility Scale than Skeptics ($t(610) = 5.897, p < .0005, \eta^2_p = .06$) and Study 2 respondents obtained higher mean gullibility scores than Skeptics ($t(610) = 2.755, p = .006, \eta^2_p = .01$).

Discussion

Using three distinct samples (scam victims, Skeptics, and Study 2 respondents) Study 4 demonstrated that Skeptics, on average, scored the lowest on the Gullibility Scale while scam victims scored significantly higher than Skeptics or Study 2 respondents. These results provide evidence for the criterion validity of the scale, indicating that it is appropriate as a self-report measure of gullibility. However, a limitation of this study was that the participants were already victims of scams upon recruitment. Potentially, this meant that the victims may have viewed themselves as more gullible after the fact of being scammed. Therefore, more convincing evidence of the criterion validity of the scale would be to demonstrate that scores on the Gullibility Scale could predict gullible behaviour. This will be addressed in Chapter 7 of this thesis.

Study 5: Test-Retest Reliability of the Gullibility Scale

The first three studies in this thesis have provided evidence for the construct validity of the Gullibility Scale, while Study 4 has demonstrated its criterion validity. The final element needed to validate the scale was test-retest reliability, and this was the aim of Study 5.

Method

Participants

The participants were undergraduate students who consented to provide data, on average, 12 weeks apart as part of a classroom exercise. Originally, in the initial testing phase, there were 244 participants. However, 41 participants did not finish the study and a further 15 made errors on the attentiveness items included in the study. Lastly, a further 48 participants were familiar with the scale and were therefore excluded, leaving the final sample size for Time 1 at 139 participants (36 males and 103 females with an average age of 22.33 years ($SD = 4.30$). Of this sample, only 60 participants completed the study at both time-points. There were 15 males and 45 females with an average age of 22.07 years ($SD = 2.00$).

Procedure

Once this study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201830943467, see Appendix F for the approval letter), the study was conducted in the classroom of a third-year psychology unit. Participants were asked twice over the semester, once at the beginning and once at the end, to complete the study with approximately 12 weeks between testing points. Respondents gave informed consent and completed questionnaire online using Qualtrics survey software. The presentation of items within the Gullibility Scale was randomised. Information on age and gender were collected at the end.

Measure

Gullibility. Gullibility was assessed using the 12-item Gullibility Scale described in Study 3 (see Appendix B). The Cronbach's alpha in the present study at time 1 was $\alpha = .91$ (Persuadability $\alpha = .86$ and Insensitivity $\alpha = .85$) and at time 2 was $\alpha = .90$ (Persuadability $\alpha = .86$ and Insensitivity $\alpha = .85$).

Results

Descriptive Statistics

The standardised skew of the variables (calculated by dividing the skew by its standard error) and the standardised kurtosis (calculated the same way) for gullibility exceeded 1.96 at both time-points (Field, 2013; McQueen & Knussen, 2006), indicating a slight positive skew to the data. The Shapiro-Wilk test of normality was significant for the Gullibility Scale (Shapiro Wilk Time 1 = .93, $p = .002$, Shapiro Wilk Time 2 = .96, $p = .032$), indicating that the distributions significantly differed from a normal distribution, violating the assumption of normality. However, the QQ plot did not demonstrate excessive snaking from the line and so this violation appeared to be minor. Table 4.3 presents the descriptive statistics.

Table 4.3

Summary of Descriptive Statistics

	Gender			t	p
	Total (N=60)	Male (N=15)	Female (N=45)		
	Mean (SD)	Mean (SD)	Mean (SD)		
Time 1					
Gullibility	35.35 (10.95)	30.13 (7.99)	37.09 (11.32)	-2.199	.03
Persuadability	18.32 (5.56)	16.80 (4.41)	18.82 (5.86)	-1.224	.23
Insensitivity	17.03 (6.19)	13.33 (4.95)	18.27 (6.11)	-2.826	.01
Time 2					
Gullibility	35.65 (10.57)	30.13 (6.94)	37.49 (10.99)	-2.428	.02
Persuadability	18.55 (5.49)	16.73 (4.57)	19.16 (5.68)	-1.494	.14
Insensitivity	17.10 (6.05)	13.40 (3.60)	18.33 (6.22)	-3.756	.00

Bivariate Statistics

Table 4.4 presents the correlations between the variables from Time 1 and Time 2. All the correlations were significant. Overall the correlation between scores on the Gullibility Scale at Time 1 and at Time 2 was strong, positive, and significant ($r = .80, p < .0005$). These correlations were also similar for the two Gullibility subscales.

Table 4.4
Factor Correlation Matrix

	Gull T1	Pers T1	Insens T1	Gull T2	Pers T2	Insens T2
Gull T1	-					
Pers T1	.923*	-				
Insens T1	.939*	.734*	-			
Gull T2	.797*	.691*	.789*	-		
Pers T2	.748*	.726*	.670*	.907*	-	
Insens T2	.714*	.548*	.770*	.924*	.677*	-

Note. * $p < .0005$, T1 = Time 1, T2 = Time 2, Gull = Gullibility, Pers = Persuadability, Insens = Insensitivity

Examining the Intraclass Correlation Coefficient using a one-way random effects model, the single measure coefficient was .80 (with a 95% Confidence Interval ranging from .69 to .86, $p < .0005$). This figure is above the recommended .70 (Terwee et al., 2007) demonstrating that the Gullibility Scale has excellent test-retest reliability over a period of 3 months.

Discussion

Study 5 presented the Gullibility Scale to participants twice with a 12-week gap between presentations. The correlation between the two time points (using both the Pearson's R and the Intraclass Correlation Coefficient) were strong, indicating that the Gullibility Scale has excellent test-retest reliability. Overall, these studies have demonstrated that the Gullibility Scale is a reliable and valid measure of gullibility. In the next chapter, this thesis

will use the Gullibility Scale in conjunction with a paradigm from behavioural economics in order to determine if gullibility can be manipulated in the laboratory.

Chapter 5

Individual Differences in Gullibility and Responding in the Prisoner's Dilemma

The previous chapters presented five studies that demonstrated the test-retest reliability, criterion validity, and convergent validity of the Gullibility Scale as a self-report measure of gullibility. This chapter presents two empirical studies designed to investigate the predictive validity of the Gullibility Scale in the laboratory, using the Prisoner's Dilemma paradigm. Both studies further explored the relationship between gullibility and trust.

Study 6: Prisoner's Dilemma and Gullibility

Theoretical Background

Game Theory and the Prisoner's Dilemma. Game theory is an area of research originating from behavioural economics. A game is any interaction between agents that is governed by a set of rules specifying the possible moves for each player and a set of outcomes for all those possible moves (Hargreaves-Heap & Varoufakis, 2004). This concept can be expanded to include any social interaction wherein a person can have some understanding of how an outcome can be affected not only by their own actions but by the actions of others (Hargreaves-Heap & Varoufakis, 2004). Some of the games developed within this area include the Ultimatum Game, the Trust Game, and the Prisoner's Dilemma (Binmore, 2007; Hargreaves-Heap & Varoufakis, 2004). All these paradigms have been used in psychological research.

One game that is relevant for the purposes of investigating gullibility is the commonly used Prisoner's Dilemma. The Prisoner's Dilemma paradigm has been widely used within social psychology (e.g., Brosig, 2002; Declerck, Boone, & Kiyonari, 2014; e.g., Hirshleifer & Rasmusen, 1989; Oskamp & Kleinke, 1970; Reed, Zeglen, & Schmidt, 2012; Sparks, Burleigh, & Barclay, 2015). In the classic version of the game, a participant is told that they

and their partner have been arrested for a major crime. The two criminals have been separated and each is told:

If you confess and your accomplice fails to confess, then you go free. If you fail to confess but your accomplice confesses, then you will be convicted and sentenced to the maximum term in jail. If you both confess, then you will both be convicted, but the maximum sentence will not be imposed. If neither confesses, you will both be framed on a tax evasion charge for which a conviction is certain. (Binmore, 2007, p.17)

The participant must decide whether to confess (i.e., cooperate) or stay silent (i.e., defect).

Essentially, both players decide simultaneously, choosing to either cooperate or defect.

Although mutual cooperation is an altruistic (but less rewarding) choice, a participant can obtain a better outcome by defecting (i.e., making a selfish decision) when their partner cooperates (Binmore, 2007; Declerck et al., 2014; Hargreaves-Heap & Varoufakis, 2004).

Mutual defection is generally the least rewarding for both participants. Typically, in research, the Prisoner's Dilemma is played with monetary gains or points as the outcome rather than years served in prison. As can be seen in the example in Figure 1, when both participants cooperate (i.e., divide), they each receive 80 points. When they both defect (i.e., take), they each receive 20 points. However, when one cooperates (i.e., divides) and the other defects (i.e., takes), the defector receives 200 points whereas the participant who cooperated receives nothing.

		PARTNER	
		Divide	Take
YOU	Divide	80 80	200 0
	Take	0 200	20 20

Figure 1 The payoff matrix for a prisoner's dilemma

In interpreting the behaviour of players, game theorists make the following three assumptions: i) people are instrumentally rational, ii) they have common knowledge of this rationality, and iii) they know the rules of the game (Hargreaves-Heap & Varoufakis, 2004). The ideal “rational” player is often dubbed “Homo economicus,” a figurative person who is consistently rational, ultimately self-interested, and who acts instrumentally to satisfy and maximise his or her preferences (Binmore, 2007; Hargreaves-Heap & Varoufakis, 2004; Moisan, ten Brincke, Murphy, & Gonzalez, 2017).

Game theory assumes that players make rational choices in order to maximise their payoffs (Binmore, 2007). However, it is unknown whether a gullible person would be more likely to make an irrational decision (i.e., more likely to cooperate) than a person who is not gullible. Considering that gullibility involves an inability to detect cues of untrustworthiness, it may be that a gullible person is unable to predict whether their partner will be more likely to cooperate or defect in the prisoner's dilemma. Studies by Frank, Gilovich, and Regan (1993) and by Sparks, Burleigh, and Barclay (2015) found that when participants had the opportunity to meet with their partner and interact for a set amount of time (between 10 to 30 minutes) they were significantly more accurate at predicting that partner's decision on a Prisoner's Dilemma. However, these studies did not isolate the variables that led to this

prediction. There may also be personality factors such as a preference for being pro-social, and biological factors, such as the effect of intranasal oxytocin, that could influence decisions on the Prisoner's Dilemma (Declerck et al., 2014). Such variables were previously shown by Declerck et al. (2014) to affect the frequency of cooperative decisions made on a Prisoner's Dilemma. In the current study, the personality variables of gullibility, trust, and social value orientation (SVO) were selected to determine if they influenced decisions on this task.

Social Value Orientation. SVO is a personality trait in which a person has stable preferences for a certain pattern of outcomes for either the self or for others such as being pro-self or pro-social (Bogaert, Boone, & Declerck, 2008; Van Lange, De Bruin, Otten, & Joireman, 1997). A person's SVO has been found to affect levels of cooperation in both a simultaneous and sequential version of the Prisoner's Dilemma (Declerck et al., 2014). In a simultaneous version of the game, participants make the decision to cooperate or defect simultaneously. However, in a sequential version, one participant decides and reveals their decision to the second participant, who then must decide whether to cooperate or defect. In a simultaneous Prisoner's Dilemma, participants who were pro-social cooperated more (50% of the time) than those who were pro-self (who only cooperated 18% of the time; Declerck et al., 2014). Similarly, a review by Bogaert, Boone, and Declerck (2008) suggested that people with pro-social orientations behave more cooperatively in social dilemma games.

Although it has been demonstrated that SVO can predict behaviour within a social dilemma, it is not clear if other personality aspects can similarly influence decisions within that dilemma (i.e., gullibility) or even if a personality trait (e.g., gullibility) can predict if a person is more likely to be pro-self or pro-social. Perhaps a person could be considered gullible if that they decide to be kind or altruistic and give someone the benefit of the doubt (when they clearly did not deserve it). Therefore, it may be that people who are higher in gullibility are more likely to be pro-social rather than pro-self. Interestingly, some research

has found that certain personality traits such as honesty-humility, kindness, and agreeableness are more likely to be related to a pro-social orientation (Hilbig, Glöckner, & Zettler, 2014; Hilbig, Thielmann, Hepp, Klein, & Zettler, 2015; Thielmann & Hilbig, 2015). Similarly, Zhao and Smillie (2015) found in a review that a predictor of pro-social decision making was agreeableness, and a small, but significant, positive correlation was found between agreeableness and gullibility (Teunisse, 2015). Given these suggestive findings and speculations, the relationship between gullibility and the pro-social and pro-self aspects of the SVO were investigated in the current study.

Trust. Although Study 1 in this thesis and Teunisse (2015) both found no relationship between trust and gullibility, it was considered important in the current study to control for trust when determining if gullibility affects decisions within the Prisoner's Dilemma. The reasoning for this was that the relationship between trust and performance in the Prisoner's Dilemma has been mixed. Macdonald, Kessel, and Fuller (1972) found that Rotter's (1967) Interpersonal Trust Scale and the Prisoner's Dilemma measured independent constructs, with no relationship between a person's score on the Interpersonal Trust Scale and their behaviour in the Prisoner's Dilemma game. In contrast, Schlenker, Helm, and Tedeschi (1973) found that participants who scored highly on Rotter's scale were significantly more likely to cooperate than defect compared with those who scored very low on that scale. Accordingly, it was necessary to control for trust in order to determine the relationship between gullibility and decisions in a Prisoner's Dilemma game.

Aims and Hypotheses

The present study had two aims. The first aim was to replicate the null relationship between gullibility and trust, and to investigate whether gullibility is related to SVO. The second aim was to discover whether gullibility influences cooperation in the Prisoner's Dilemma. In view of these aims, three hypotheses were generated. Firstly, it was predicted

that participants with higher gullibility scores should be more likely to make more cooperative decisions in the Prisoner's dilemma than participants with lower gullibility scores (H1). Consistent with the results of Study 2, gullibility was not expected to be related to trust (H2). Finally, it was predicted that participants with higher gullibility scores would be more likely to have a pro-social orientation on the SVO, whereas participants with lower gullibility scores would be more likely to have a pro-self orientation on the SVO (H3).

Method

Participants

One hundred and sixteen first-year psychology students, enrolled in an introductory psychology unit at Macquarie University, volunteered to complete the study in return for course credit. Of the original sample, five participants did not complete the entire experiment and were excluded from the analysis. After examining the remaining sample for biased responding, using items included to assess honesty and attentiveness (see below), another seven cases were excluded. The total mean age for the final sample of 104 participants was 20.04 years ($SD = 4.24$) and ranged from 17 to 46, with 26 males, 77 females, and one participant that did not specify their gender⁴.

Measures and Procedure

This two-part study, in which participants completed measures online in Part 1 and completed the laboratory-based Prisoner's Dilemma in Part 2, was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201600381, see Appendix F for the approval letter). The study was advertised on a departmental online psychology participation site in which students clicked on the link, completed Part 1 online via Qualtrics. In Part 1, respondents gave informed consent and were asked to complete measures of gullibility, interpersonal trust, and SVO (presented in a randomised order).

⁴ This participant was excluded in any analyses that included gender as a covariate or variable of interest.

Furthermore, the items within each scale were randomised. Information on age, gender, and education level were collected at the end of this part.⁵

Gullibility. Gullibility was assessed using the 12-item Gullibility Scale (See Appendix B for the scale) from Study 3 in this thesis. Participants were asked to rate how true they believed each statement was of themselves from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). The possible range of scores fell between 12 and 84, wherein higher scores related to higher levels of gullibility. The Cronbach's alphas in the present study were $\alpha = 0.91$, Persuadability $\alpha = .88$, Insensitivity $\alpha = .87$.

Trust. The 25-item Interpersonal Trust Scale (ITS; Rotter, 1967) was used to assess individual differences in trust (see Appendix B for details). Participants were asked to rate their level of agreement with each statement on a 5-point Likert-style scale ranging from 1 (*Strongly Agree*) to 5 (*Strongly Disagree*). The possible range of scores fell between 25 and 125. Example items include; "*In dealing with strangers one is better off to be cautious until they have provided evidence that they are trustworthy*" and "*Most people answer public opinion polls honestly*". Of the 25 items, 13 items were reverse scored. For this study, the ITS was scored so that higher scores indicated higher levels of trust. Rotter (1967) reported a Cronbach's $\alpha = .76$; in the present study the scale was considered reliable ($\alpha = .75$).

Social Value Orientation. SVO was measured using Van Lange, De Bruin, Otten, and Joireman's (1997) 9-item triple dominance decomposed measure (see Appendix B for the SVO). This measure distinguishes between cooperative, individualistic, and competitive orientations. A participant is classified as one of these three orientations if they select six or

⁵ In this study, participants also completed the short version of the Autism Quotient measure (Hoekstra et al., 2011). This was done to measure Theory of Mind which can be considered a core feature of Autism Spectrum Disorders. Theory of Mind could be considered purely a cognitive ability, compared with social intelligence which consists of both behavioural and cognitive components. However, over and above the Theory of Mind deficits, there are other autism spectrum related behaviours (such as social and communicative deficits, preference for routine etc.) considered in the AQ-Short which can obscure the measurement of Theory of Mind. Therefore, the results were not presented here. However, the results of these analyses are available in Appendix D.

more of the nine choices consistent with that orientation. Then, if a participant was categorised as having either a competitive or individualistic orientation, they were grouped together and labelled as having a *pro-self* orientation, as suggested by Declerck, Boone, and Kiyonari (2014). The cooperative orientation is considered the *pro-social* orientation. Sixteen participants (15.4%) could not be classified, as they did not make choices consistent with any orientation. The SVO is a reliable and valid measure and this has been discussed in detail elsewhere (Bogaert et al., 2008).

Attentiveness Check. Compared with socially desirable responding, inattentive responding is a distinct construct which can reduce power and add additional error variance above and beyond socially desirable responding (Maniaci & Rogge, 2014). Eight additional items were presented within the Gullibility Scale, the AQ-Short, and the ITS to detect acquiescent and inattentive responding. The questions were inspired by the Directed Questions Scale (Maniaci & Rogge, 2014), and required a specific response on the rating scale (e.g., “Please answer 2 to this question”). Participants who had two or more errors on these eight attentiveness items were excluded from the final analysis ($n = 7$).

In Part 2, participants came into the laboratory two to 14 days after completing Part 1 and were tested in groups (ranging in size from 2 – 4 participants per group). Each group was divided in half and taken to different rooms to complete this portion of the experiment on computers. Participants completed a “self-description” task (see below) and were instructed that their answers would be shared with a random participant in the other room who would be their partner in the experiment.

Self-Description Task. In this task, participants were required to answer 6 forced-choice personality questions (See Appendix B for the items). They were told that these responses would be shared with their partner as a way of getting to know them. The researchers devised these questions. An example item: Participants are asked “How would

you describe yourself?” and are given the option of either selecting *“I am a friendly person”* or *“I can get really competitive”*.

After completing the items, they received their partner's responses to the same questions (which, in fact, were answers prepared by the experimenters, to see the responses prepared by the experimenters see Appendix B) and instructed to read it carefully. A pilot test ($N = 25$) found that the “partner” response that was presented to participants had a mean of 6.5 out of 10 on a scale of trustworthiness (with higher scores indicating higher levels of untrustworthiness), demonstrating that this pattern of responses was of a moderate level of untrustworthiness. Following this introduction, participants then underwent a training session explaining how to play the Prisoner's Dilemma. The training sessions included six questions participants had to answer correctly before moving to the next section. After training, the participants played two versions of the Prisoner's Dilemma.

Simultaneous and Sequential Prisoner's Dilemma Games. In this study, there were two versions of the Prisoner's Dilemma: a simultaneous version followed by a sequential version of the game (as used by Declerck et al., 2014). In the present study, the game was referred to as the Divide/Take game, as can be seen in the example in Figure 1. As mentioned earlier, in the Prisoner's Dilemma both players usually decide simultaneously to either cooperate or defect. Although mutual cooperation is an altruistic (but less rewarding) choice, a participant can obtain a better outcome by defecting (i.e., making a selfish decision) when their partner cooperates (Binmore, 2007; Declerck et al., 2014; Hargreaves-Heap & Varoufakis, 2004). Mutual defection is generally the least rewarding for both participants. When both participants cooperate (i.e., divide), they each receive 80 points. When they both defect (i.e., take), they each receive 20 points. But when one cooperates (i.e., divides) and the other defects (i.e., takes), the defector receives 200 points whereas the participant who

cooperated receives nothing. In both games, the payoff matrix was identical (as displayed in Figure 1).

In the first game, participants were told that it was a simultaneous game and they would make their decisions at the same time. In the second game, they were told it was a sequential game. Essentially, one participant would be randomly allocated to make the first choice. The second participant would see what the decision was and then make their own decision. In the simultaneous game, participants were asked to predict what move their partner would make ("divide" or "take"), then asked what move they themselves would make. After this decision, all participants were told that their "partner" had elected to "take" (i.e., defected). Participants who were lower in gullibility were expected recall their "partner's" personality profile and focus on the untrustworthy cues in it and make a pro-self decision (i.e., electing to defect) on the next round based on those cues. In contrast, a participant higher in gullibility would not recall those untrustworthy cues in the profiles they received, because they had not detected them in the first place, and hence their decision could either be to defect or cooperate.

In the second game, the sequential Prisoner's Dilemma, participants were deceptively told that they had been randomly selected to make the second move (all participants received the second move). Their "partner", having made the first move, had elected to cooperate (i.e., divide). Participants were then asked whether they would cooperate ("divide") or defect ("take").

After playing the two games, the participants were presented with the same six self-description questions from the beginning of this part of the experiment and asked to recall their partner's responses to those questions. This was a manipulation check to ensure that they had read and understood their partner's personality profile. Finally, participants were debriefed, informed of the deception, and consent was gained once more.

Overview of the Analyses

All descriptive and bivariate statistics were run using the Statistical Package for Social Sciences (SPSS; version 21.0). Logistic regression was used to assess whether scores on the Gullibility Scale are associated with SVO (as SVO is categorical). Furthermore, to address the first hypothesis (i.e., that participants higher in gullibility will make more cooperative decisions) the outcome of the simultaneous and sequential Prisoner's Dilemmas was combined to create a single dependent variable that could vary from 0 (cooperative decisions) to 2 (cooperative decisions). This was then used in an analysis of covariance.

Results

Univariate and Bivariate Descriptive Statistics

The means and SD for the Gullibility Scale and trust can be seen in Table 5.1. There were no significant differences between the genders on Gullibility, but there was for trust, with females scoring significantly higher on the trust measure than males.

Table 5.1
Summary of Descriptive Statistics

	Gender			t	p
	Total (N = 104) Mean (SD)	Male (N = 26) Mean (SD)	Female (N = 77) Mean (SD)		
Gullibility	39.23 (12.25)	37.77 (11.67)	39.60 (12.50)	-.66	.51
Persuadability	18.93 (7.16)	17.62 (6.67)	19.35 (7.35)	-1.06	.29
Insensitivity	20.30 (6.38)	20.15 (6.30)	20.25 (6.43)	-.06	.95
Trust	64.62 (8.83)	60.46 (9.22)	65.95 (8.35)	-2.82	.01

Note. SD = Standard Deviations

Histograms of these variables suggested normal distributions and kurtosis. Furthermore, the standardised skew of these variables (calculated by dividing the skew by its standard error) and the standardised kurtosis (calculated the same way) did not exceed 1.96

for all the variables (the cutoff recommended by Field, 2013; McQueen & Knussen, 2006), indicating no significant skew and meso-kurtic distributions (Skewness; Gullibility: 0.82, Persuadability: 1.34, Insensitivity: .57, Trust: -0.78 and Kurtosis; Gullibility: -1.32, Persuadability: -1.86, Insensitivity: -1.46, Trust: 1.07). Furthermore, all the scales were subjected to Shapiro-Wilk tests and none of them violated the assumptions of normality.

Table 5.2 presents the SVO categories and the number of participants in each category. A Chi Square test revealed that there were no more participants in any cell than expected by chance ($\chi^2(4) = 9.13, p = .06$).

Table 5.2
Social Value Orientation

	Total	Male	Female
	N	N	N
Pro-social	55	15	40
Pro-self	33	11	21
Total	104	26	77

There was no significant relationship between gullibility and trust ($r = .01, p = .92$) with the subscales performing similarly to the overall scale; Persuadability ($r = -.01, p = .95$) and Insensitivity ($r = .03, p = .79$).

Binary Logistic Regression with Gullibility Predicting SVO

The results for the first logistic regression are presented in Table 5.3. This analysis was to test the hypothesis that participants with higher gullibility scores should be more likely to have a pro-social orientation, whereas participants with lower gullibility scores should be more likely to have a pro-self orientation. Controlling for trust, gullibility did not determine if a participant was more likely to be pro-social or pro-self. The model had low predictive strength (Nagelkerke pseudo $R^2 = .02$) and failed to reach statistical significance. The

participants who could not be categorised as either pro-social or pro-self were excluded from these analyses.

Table 5.3
Binary Logistic Regression for Social Value Orientation

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	1.403 (1.74)	.651	.420		4.069	
Trust	-0.025 (.03)	1.059	.303	.929	.975	1.023
Gullibility	-0.008 (.02)	.170	.680	.956	.992	1.030

Note. $R^2 = .01$ (Cox & Snell), .02 (Nagelkerke). Model $\chi^2 (2) = 1.25$, $p = .53$.

Analysis of Covariance with Total Number of Cooperative Decisions Made

The Analysis of Covariance (ANCOVA) was run with two main effects, SVO (pro-self, pro-social) and gullibility score to determine if these variables affected the total number of cooperative decisions made over the two Prisoner's Dilemmas. A participant could make zero cooperative decisions, one cooperative decision, or two cooperative decisions across the two games, providing a continuous dependent variable. The results are presented in Table 5.4.

Table 5.4
ANCOVA with Gullibility and SVO

	B	SE	F	<i>p</i>	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	1.268	.271	14.592	.002	.728	1.808	.204
Gullibility	-.003	.006	.231	.632	-.016	.010	.003
SVO	-.566	.154	13.522	.000	-.873	-.260	.137

Note. R Squared = .141 (Adjusted R Squared = .121)

Only SVO had a significant effect on the number of cooperative decisions made. Participants who were pro-social made significantly more cooperative decisions ($M = 1.42$, $SD = .74$) than participants who were pro-self ($M = 0.85$, $SD = .62$, $p < .0005$, $CI [-.873, -.260]$). Gullibility did not significantly influence the number of cooperative decisions participants made.

Logistic Regressions were also run on the two Prisoner's Dilemma games separately. Table 5.5 presents the results for the logistic regressions on the simultaneous Prisoner's Dilemma. Controlling for SVO, gullibility did not appear to affect the likelihood of a participant cooperating in a Prisoner's Dilemma. However, SVO appeared to have a significant effect on the decision made in the simultaneous Prisoner's Dilemma. The model had low predictive strength (Nagelkerke pseudo $R^2 = .19$) but reached significance. Comparing pro-social participants with pro-self participants, the odds ratio of consistency indicates that if the participant was pro-social they were 5.4 times more likely to cooperate on the simultaneous Prisoner's Dilemma than participants with a pro-self orientation, with the 95% confidence interval indicating that it could be as low as 2.1 times and as high as 13.5 times as likely to cooperate.

Table 5.5
Binary Logistic Regression for Simultaneous Prisoner's Dilemma

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	.233 (.81)	.083	.773		1.262	
Gullibility	-.010 (.48)	.238	.626	.953	.990	1.030
SVO	1.669 (.48)	12.175	.000	2.078	5.305	13.543

Note. $R^2 = .14$ (Cox & Snell), $.19$ (Nagelkerke), Model $\chi^2 (2) = 13.53$, $p = .001$.

Table 5.6 presents the results for the logistic regressions testing sequential Prisoner's Dilemma. Controlling for SVO, gullibility did not affect the likelihood of a participant cooperating in a sequential Prisoner's Dilemma. Similarly, controlling for gullibility, SVO

did not have a significant effect on the likelihood of a participant cooperating in a sequential Prisoner's Dilemma.

Table 5.6

Binary Logistic Regression for Sequential Prisoner's Dilemma

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	-.259 (.77)	.113	.737		.772	
Gullibility	-.004 (.02)	.056	.814	.959	.996	1.033
SVO	-.739 (.46)	2.642	.104	.196	.477	1.164

Note. $R^2 = .03$ (Cox & Snell), $.04$ (Nagelkerke), Model $\chi^2 (2) = 2.75$, $p = .253$.

Discussion

This study had two aims: to determine the relationship between gullibility and SVO, and to discover whether gullibility would influence cooperation in a Prisoner's Dilemma. These aims were achieved by having participants complete measures of gullibility and SVO, and then playing two versions of the Prisoner's Dilemma in the laboratory.

Firstly, the total number of cooperative decisions was examined. It was predicted that participants with higher gullibility scores would be more likely to make cooperative decisions than participants with lower gullibility scores. This hypothesis was not supported. Scores on the Gullibility Scale did not predict cooperation or defection. However, participants with pro-social orientations made significantly more cooperative decisions than participants with a pro-self orientation. This differs from the findings of Balliet, Parks, and Joireman (2009). In a meta-analysis of 82 studies assessing the relationship between SVO and cooperation in social dilemmas, they found that people with a pro-social orientation do cooperate significantly more on these types of games (Balliet et al., 2009). However, when comparing one-shot games with iterated games the effect size of SVO was essentially the same, suggesting that the type of game (i.e., one-shot or iterated) does not moderate the relationship between SVO and cooperation. This is interesting because the results of this study demonstrate that pro-

socials cooperated significantly more in the initial game, but thereafter SVO ceased to have a significant effect on decision-making in the game.

The second hypothesis that there should be no correlation between trust and gullibility was supported. This replicates the results from Study 1 and Study 2 that presented evidence for the divergent validity of the two concepts. Gullibility was not related to SVO, failing to support the third hypothesis (i.e., that participants with higher gullibility scores should be more likely to have a pro-social orientation, whereas participants with lower gullibility scores should be more likely to have a pro-self orientation). Since personality traits such as agreeableness tend to predict pro-social behaviour in a Prisoner's Dilemma (Zhao & Smillie, 2015), it was expected that gullible participants would be more likely to have a pro-social orientation. Previous research has found a small but significant relationship between agreeableness and the Gullibility Scale (Teunisse, 2015), suggesting that people higher in gullibility might be more likely to be pro-social than pro-self. However, this relationship between gullibility and agreeableness was weak in Teunisse (2015). Agreeableness describes the tendency to be concerned with the needs and feelings of others, a motivation to maintain positive social relationships, and includes altruism, compliance, and trust (Zhao & Smillie, 2015). Considering this, perhaps the fact that gullibility was not related to SVO is not entirely unexpected, as gullibility focuses on a person's ability to detect cues of untrustworthiness and not on the tendency to maintain positive social relationships. Even so, it may appear to external observers that a person's agreeable behaviour reflects gullibility, rather than a reluctance to "say no".

Although the present study confirmed the relationship between SVO and behaviour in a Prisoner's Dilemma, there is a limitation worth considering. There was no behavioural baseline of each individual participant decision on a Prisoner's Dilemma prior to giving them information about their "partner". David (1995), in a meta-analysis, found that the mean

cooperation rate in a Prisoner's Dilemma was 47.7%. However, she found that if the participants were psychology students, the payoff involved real money, or the participants played fewer versions of the game, the cooperation rate increased. In the present study the sample did comprise psychology students and only two rounds of the game; therefore, one could expect higher rates of cooperation from the participants. However, it would not be entirely accurate to compare the results of this study to baseline rates extracted from the literature. Because many individual factors affect cooperation, the evidence for the effect of partner trustworthiness would be more convincing if each participant were compared to their own baseline behaviour in a Prisoner's Dilemma prior to receiving any information about their partner. Otherwise it is impossible to determine if the participants' behaviour changed due to the partner profile they received, because they received it prior to making their decisions on both Prisoner's Dilemma games. Overall, although SVO had an effect on decisions made in the Prisoner's Dilemma (i.e., participants with a pro-social orientation were significantly more likely to cooperate than participants with a pro-self orientation), the effect of gullibility could have been obscured due to the lack of a behavioural baseline. The next study attempted to address this limitation.

Study 7: Gullibility and the Prisoner's Dilemma

Considering the mixed results of the previous study, a new study was designed to address the limitation. In Study 7, participants decided on the Prisoner's Dilemma prior to receiving information about their partner (to establish a baseline) and then they were given the option to change their decision.

Theoretical Background

Trust. Previous research has demonstrated that there is no relationship between the gullibility and trust (Teunisse, 2015). However, in both studies conducted, Rotter's (1967) Interpersonal Trust Scale was used to measure trust. Bulloch (2013) has argued that there are

two types of trust; moralistic trust and strategic trust. Moralistic trust is “a belief in the benevolence of human nature in general and this is not limited to particular objects” (Yamagishi & Yamagishi, 1994 p. 139), whereas strategic trust is considered a strategically evaluated action (Bullock, 2013). Information and experience are central to strategic trust and it considers the notion of risk. That is, trust is given where there is sufficient information about the general trustworthiness of the other person or persons to diminish the potential risks involved in trusting. Bullock (2013) argued that there is a gender difference on these two types of trust, with women trusting more than men when assessed with questions relating to moralistic trust. However, when assessed in terms of strategic trust, men trusted more than women. Examining Rotter's (1967) scale, there are items that relate both to moralistic trust and strategic trust. This may explain the results of previous studies, as only one of those types of trust may relate to gullibility, and by using a scale that measures both, the relationship between the concepts is not clearly elucidated. As strategic trust is considered strategically evaluated action (i.e., a person must evaluate a situation, consider the evidence presented, and then decide to trust) it could be conceptually related to gullibility. With gullibility, a person must be able to detect cues of untrustworthiness and these cues could be detected during an evaluation of a situation and consideration of the evidence presented. Hence, one aim of this study is to measure both types of trust and to determine their relationship to gullibility.

Aims and Hypotheses

The experiment had two separate aims. The first aim of this experiment was to determine if gullibility can influence a participant's decision in a Prisoner's Dilemma game. The second aim was to examine the relationship between gullibility and specific forms of trust: moralistic and strategic trust. Considering these aims, the present study had three hypotheses. Firstly, in terms of the Prisoner's Dilemma game, it was expected that after receiving information about their partner and being able to either change their answer or

leave it the same, it was predicted that participants who are lower in gullibility would be more likely to change their answer to defect, than participants who are higher in gullibility (H1). This is because participants lower in gullibility would be able to detect the cues of untrustworthiness within the partner profile they receive. It was also hypothesised that scores on the Gullibility Scale and measures of moralistic trust would not be correlated (H2), and that scores on the Gullibility Scale and measures of strategic trust would be negatively correlated (H3). This is because moralistic trust is a generalised trust applying to a person's general outlook on people whereas strategic trust is context-specific and would apply to situations when a person could potentially be gullible.

Method

Participants

The 103 participants were first-year psychology students enrolled in an introductory psychology unit at Macquarie University. After examining the remaining sample for biased responding, using the same items and cut-offs as used in the previous study to assess honesty and attentiveness, seven cases were excluded. The total mean age for the final sample was 18.60 years ($SD = 1.49$) and ranged from 17 to 25, with 25 males and 71 females.

Measures

Gullibility. This was the identical scale used in Study 6 (see Appendix B). In the present study, the Cronbach's Alpha was $\alpha = 0.87$, Persuadability $\alpha = .85$, Insensitivity $\alpha = .79$.

Social Value Orientation. To measure SVO the same 9-item triple dominance decomposed measure (Van Lange et al., 1997) was used as in the previous study. In this study, 11 participants (11.5%) could not be classified, as they did not make choices consistent with any orientation.

Trust. There were five items to measure both strategic and moralistic trust taken from Bulloch (2013). The first item (Trust 1) was the General Trust Question: “*Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?*” This item was scored dichotomously, with participants respond either “*Most people can be trusted*” or “*You can’t be too careful in dealing with people*” as recommended by Uslaner (2016). The second item (Trust 2) asked participants if they could trust people in their neighbourhood, “*Would you say that many of the people in your neighbourhood can be trusted?*” Participants then had to select one of four options: many can be trusted, some can be trusted, a few can be trusted, or that none of the people in your neighbourhood can be trusted. The remaining three questions were all measured on a 4-point Likert-style scale: “*On balance, would you say that most people can’t be trusted, or that most people can be trusted?*” (Trust 3), “*Do you think that most people would try to take advantage of you if they got a chance, or would they try to be fair?*” (Trust 4), and “*Would you say that most of the time people try to be helpful or are they mostly looking out for themselves?*” (Trust 5).

Bulloch (2013) has argued that the items referring to people who can/cannot be trusted (i.e., Trust 3), perceived helpfulness (i.e., Trust 4), and perceived fairness (i.e., Trust 5), all measure moralistic trust. Whereas, the item referring to trusting people in your neighbourhood is measuring strategic trust (i.e., Trust 2). Further, the GTQ is argued to measure both, with the first half of the question (i.e., “*In general, most people can be trusted*”) relating to moralistic trust, but the second half (i.e., “*You can’t be too careful in dealing with people*”) priming notions of caution and strategic trust. When these were combined into a single measure the Cronbach’s alpha was low ($\alpha = .69$) suggesting that all these items are measuring slightly different concepts.

Attentiveness Check and Demographic questions. The attentiveness check items, and the demographic questions were identical to Study 3.

Prisoner's Dilemma. The payoff matrix used in the experiment can be seen in Figure 2. Participants were told that their participation would gain them a single entry into a raffle for a \$100 voucher. However, every additional point that they earned would give them an additional entry into the raffle, thereby increasing their odds of winning the prize. Participants played a one-shot game.

		PARTNER	
		divide	take
YOU	divide	4 4	10 0
	take	0 10	1 1

Figure 2 The payoff matrix used in this experiment

Self-Description Task. In this task, participants were required to answer the same six forced-choice personality questions (see Appendix B) as in the previous study. They were told that these responses would be shared with their partner as a way of getting to know them. An example item: Participants are asked “*How would you describe yourself?*” and are given the option of either selecting “*I am a friendly person*” or “*I can get really competitive*”.

Procedure

This two-part study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201700082 see Appendix F for the approval letter). The study was advertised on a departmental online psychology participation site in which students clicked on the link, completed part one of the study online, and were granted course credit for their participation. In Part 1, respondents completed all the measures online

using Qualtrics. First, participants were offered ethics information and were given the opportunity to provide informed consent. Next, measures of gullibility, SVO, and trust were presented next in random order. Furthermore, the items within each scale were randomised. Lastly, the demographic questions were presented.

In Part 2, participants came into the laboratory two to seven days after completing part one and were tested in groups (ranging in size from two – six participants per group). Each group was split in half and taken to different rooms and completed this portion of the experiment on a computer. Participants were told that a random participant in the other room would be their partner. They first had a training session explaining how to play the Prisoner's Dilemma. The training sessions included six questions participants had to answer correctly before moving to the game. They played one round of the Prisoner's Dilemma. After making their decisions, all participants completed the self-description task and were instructed that their answers would be shared with their partner in the other room. After completing the items, they received their partner's responses to the same questions (the same untrustworthy items used in the previous study). After this "introduction", the participants were then told that they would return to the original game and asked to play it again, now that they knew a little more about their partner. Once again, they were asked if they would "divide" or "take".

Overview of the Analyses

SPSS (version 21.0) was used to analyse the data. A series of binary logistic regressions were run due to the categorical nature of the primary dependent variables to address the first hypothesis. Pearson's correlations were run to address the second and third hypotheses. For the measures of trust, as outlined by Bulloch (2013), Trust 1 (*Most people can be trusted/You can't be too careful in dealing with people*) and Trust 2 (*Would you say that many of the people in your neighbourhood can be trusted?*) were combined to form

“Strategic Trust.” The other three items were combined to form “Moralistic Trust.” See Appendix C for the Spearman’s correlations for these five trust items.

Results

Univariate Descriptive Statistics

The means, SD, and counts for Gullibility, the trust measures, and SVO are in Tables 5.7 and 5.8. There was a significant difference between the genders on gullibility. On average, females had higher gullibility scores than males and this difference was significant. A Chi Square test revealed that there were not significantly more participants in any cell than expected for SVO.

Table 5.7
Summary of Descriptive Statistics

	Gender			t	p
	Total (N = 96) Mean (SD)	Male (N = 25) Mean (SD)	Female (N = 71) Mean (SD)		
Gullibility	36.26 (10.68)	31.32 (6.59)	38.00 (11.32)	-3.551	.01
Persuadability	17.44 (6.56)	15.00 (4.42)	18.30 (7.00)	-2.719	.01
Insensitivity	18.82 (5.47)	16.32 (4.18)	19.70 (5.62)	-2.751	.01
Strategic Trust	4.65 (1.04)	4.80 (1.26)	4.59 (0.95)	.756	.46
Moralistic Trust	8.05 (1.64)	8.12 (1.74)	8.03 (1.62)	.239	.81

Table 5.8
Chi Square Test for Social Value Orientations and Gender

		Total N	Male N	Female N	χ^2	p
SVO	None	11	1	10	1.85	.40
	Pro-social	53	15	38		
	Pro-self	32	9	23		
	Total	96	25	71		

A Shapiro-Wilk test of normality was significant for the Gullibility Scale (Shapiro Wilk = .97, $p = .044$), indicating that the distribution significantly differed from a normal distribution, violating the assumption of normality. However, an inspection of the histograms

suggests normal distributions and the standardised skew of these variables (calculated by dividing the skew by its standard error) and the standardised kurtosis (calculated the same way) did not exceed 1.96 (Field, 2013; McQueen & Knussen, 2006), indicating no significant skew and mesokurtic distributions. Moreover, the QQ plot did not demonstrate excessive snaking from the line, so this violation appeared to be minor. Furthermore, logistic regressions and ANCOVAs are generally robust to such violations (Field, 2013; Howell, 2012). Thus, the raw untransformed scores were used for the Gullibility Scale.

Bivariate Descriptive Statistics

Table 5.9 presents the inter-correlations and bivariate statistics for the relationship between the Gullibility Scale and the trust measures. There was no significant relationship between gullibility and its subscales with either measure of trust.

Table 5.9
Correlation Matrix of the Gullibility and Trust Variables

	Gullibility	Persuadability	Insensitivity	Moralistic Trust	Strategic Trust
Gullibility	-	.907**	.863**	.097	.179
Persuadability		-	.571**	.075	.189
Insensitivity			-	.123	.099
Moralistic Trust				-	.487*
Strategic Trust					-

Note. * $p < .05$, ** $p < .0005$

Prisoner's Dilemma Task

Binary Logistic Regressions. Logistic Regressions were run on the two Prisoner's Dilemma games separately. Table 5.10 presents the results for the first logistic regression on the initial Prisoner's Dilemma. Controlling for SVO and trust, gullibility did not appear to affect the likelihood of a participant cooperating in a Prisoner's Dilemma. However, SVO appeared to have a significant effect on the decision made in the initial Prisoner's Dilemma. The model had low predictive strength (Nagelkerke pseudo $R^2 = .24$) but reached

significance. Comparing pro-social participants with pro-self participants, the odds ratio of consistency indicates that if the participant was pro-social they were 8.7 times more likely to cooperate on the simultaneous Prisoner's Dilemma than participants with a pro-self orientation, with the 95% confidence interval indicating that it could be as low as 2.9 times and as high as 26.1 times as likely to cooperate. Similarly, Strategic Trust (but not Moralistic Trust) appeared to have a significant effect on the decision made in the initial game such that people who were higher in strategic trust were 2.3 times more likely to cooperate (with the 95% confidence interval indicating that it could be as low as 1.2 times and as high as 4.7 times more likely to cooperate).

Table 5.10

Binary Logistic Regression for Initial Prisoner's Dilemma

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	-3.276 (1.88)	3.04	.08		.038	
Gullibility	-.004 (.03)	.02	.89	.947	.996	1.048
Strategic Trust	.853 (.36)	5.75	.02	1.168	2.346	4.712
Moralistic Trust	-.387 (.20)	3.67	.06	.457	.679	1.009
SVO	2.166 (.56)	14.97	.000	2.912	8.725	26.139

Note. $R^2 = .24$ (Cox & Snell), $.33$ (Nagelkerke), Model $\chi^2(4) = 23.29$, $p = .000$.

The results of the second logistic regression run on the second Prisoner's Dilemma (i.e., after the participant had received information about their "partner") are presented in Table 5.11. As with the initial Prisoner's Dilemma, only SVO and Strategic Trust significantly predicted the likelihood of a participant cooperating. However, the odds ratios are nearly half what they were in the initial game.

Table 5.11

Binary Logistic Regression for Second Prisoner's Dilemma

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	-4.049 (1.83)	4.90	.03		.017	
Gullibility	-.005 (.02)	.05	.83	.952	.995	1.040
Strategic Trust	.656 (.30)	4.80	.03	1.072	1.926	3.462
Moralistic Trust	-.175 (.17)	1.02	.31	.598	.840	1.179
SVO	1.609 (.51)	9.89	.002	1.834	4.997	13.618

Note. $R^2 = .17$ (Cox & Snell), $.23$ (Nagelkerke), Model $\chi^2 (4) = 15.85$, $p = .003$.

To test whether participants who are lower in gullibility are more likely to change their answer to defect than participants who are higher in gullibility four groups were created (as can be seen in Table 5.12). The "Take/Take" group has participants who defected both in the initial decision and in the second decision. The "Take/Divide" group has participants who defected initially but then changed their answer to cooperate after receiving information about their partner. The "Divide/Take" group has participants who cooperated initially but then changed their answer to defect after receiving information about their partner. Lastly, the "Divide/Divide" group has participants who elected to cooperate both times.

Table 5.12

Decision Groups Means

	N	Gullibility (SD)	Persuadability (SD)	Insensitivity (SD)	Strategic Trust (SD)	Moralistic Trust (SD)
Take/Take	41	35.39 (11.53)	17.07 (7.50)	18.31 (5.17)	4.80 (0.98)	8.07 (1.51)
Take/Divide	22	36.68 (9.13)	17.23 (5.52)	19.45 (4.83)	4.64 (1.09)	8.05 (1.76)
Divide/Take	6	40.00 (12.03)	19.33 (4.63)	20.67 (7.74)	5.50 (0.84)	8.67 (1.51)
Divide/Divide	27	36.41 (10.68)	17.74 (6.40)	18.67 (6.03)	4.22 (0.97)	7.89 (1.83)

The participants of interest were the ones who elected to change their answer upon receiving information about their partner compared to the ones who did not change their

answer. Thus, the four groups above were reduced to two groups: participants who changed their answer (i.e., Take/Divide and Divide/Divide), and participants who did not change their answer (i.e., Take/Divide and Divide/Divide). A logistic regression (see Table 5.13) found that neither the trust measures nor gullibility score could predict participant category membership.

Table 5.13

Logistic Regression results of people who changed their answer compared with those who did not

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	-2.268(1.43)	2.523	.112		.104	
Gullibility	.010 (.02)	.236	.627	.969	1.010	1.054
Strategic Trust	.226(.26)	.767	.381	.756	1.254	2.080
Moralistic Trust	-.008(.16)	.002	.962	.727	.992	1.355

Note. $R^2 = .01$ (Cox & Snell), .02 (Nagelkerke). Model $\chi^2 (3) = 1.401$, $p = .705$

Discussion

This study aimed to examine the relationship between gullibility and trust and to determine if gullibility and SVO can influence a participant's decision in a Prisoner's Dilemma. This aim was achieved by having participants complete measures of gullibility, trust, SVO, and a Prisoner's Dilemma task.

In the initial Prisoner's Dilemma (prior to receiving information about their "partner"), Strategic Trust, but not Moralistic Trust, predicted whether a participant would cooperate or defect in the Prisoner's Dilemma. Similarly, Macdonald, Kessel, and Fuller (1972) failed to find a relationship between the Rotter Trust Scale and a Prisoner's Dilemma. Rotter (1971) suggests that the reason individual difference measures such as interpersonal trust fail to predict behaviour on these types of experiments (such as the Prisoner's Dilemma) is that they produce a specific reaction which is characteristic of competitive games but not of realistic interactions. Essentially, he argued that the Prisoner's Dilemma has low ecological

validity. However, SVO did predict whether participants would cooperate or defect. Pro-social participants were significantly more likely to cooperate in the both the Prisoner's Dilemma games than pro-self participants. This replicates the results of Study 6 and other studies (Balliet et al., 2009; Bogaert et al., 2008; Declerck et al., 2014) wherein pro-social participants are significantly more likely to cooperate rather than defect in a Prisoner's Dilemma.

After making the initial decision in the Prisoner's Dilemma, participants then were presented with an untrustworthy personality profile of their partner. Trust and gullibility were predicted to affect whether the participant would change their answer or remain the same. However, neither the trust variables nor gullibility predicted whether a participant would change their answer or remain the same after receiving untrustworthy cues from their partner. Perhaps this could have been due to the information they received about their partner. The partner profile consisted of the six self-description forced-choice questions, with a specific set of answers selected that described the participant's "partner". Although the pilot test of this profile demonstrated that people found it moderately untrustworthy (6.5 out of 10, see study 6 for details), this was not confirmed in the study. Perhaps the participants in this study found the "partner" description neither trustworthy nor untrustworthy. As a result, there were no untrustworthiness cues to influence their decision – thereby negating any influence gullibility could have on the results.

Previous research both in Teunisse (2015) and reported in Chapters 2 and 3 of this thesis have found that gullibility is not related to trust, as measured by the Interpersonal Trust Scale (Rotter, 1967). Bulloch (2013) argued that there were two types of trust; moralistic trust (a belief in the kindness of humanity in general which is not limited to specific entities; Yamagishi & Yamagishi, 1994) and strategic trust (a strategically evaluated action; Bulloch, 2013). Using the five items as used by Bulloch (2013), the intention was to create the two

measures of trust as she did. The relationships between all the trust items were significant (see Appendix C for the Spearman's correlations), except between one item from the Moralistic Trust scale (*Do you think most people would try and take advantage of you?*) and one item from the Strategic Trust scale (*Would you say that many people in your neighbourhood can be trusted*) – which is to be expected if those items indeed measure strategic trust and moralistic trust. However, examining the relationships between the trust variables, there was no clear distinction between the items that purported to measure moralistic trust and strategic trust. Hence, the correlations did not reveal two distinct measures of trust. Furthermore, the reliability of these items as a single scale was low. Therefore, it is likely that these five items outlined by Bulloch (2013) may not have sufficient validity as measures of two types of trust. Considering these results, the hypothesis relating specifically to moralistic trust was supported (i.e., H2: scores on the Gullibility Scale and measures of moralistic trust scale would not be correlated) and the hypothesis related to strategic trust was not supported (i.e., H3: scores on the Gullibility Scale and measures of strategic trust would be negatively correlated). There were no significant relationships between gullibility, or its subscales, with either of the trust scales. Hence, even if these two trust scales are not valid measures of strategic or moralistic trust, they behave the same way as the Interpersonal Trust Scale (Rotter, 1967) in terms of gullibility. Thus, this is further evidence that gullibility is distinct from trust.

General Discussion

The two studies presented here had two aims: to further investigate the relationship between gullibility and trust and to test if the Prisoner's Dilemma could be a useful behavioural measure of gullibility. Essentially, both studies found that there is no relationship between the Gullibility Scale and trust. This supports Yamagishi, Kikuchi, and Kosugi's (1999) argument that these concepts are logically independent. Trust is an expectation held

by an individual or group of people that a person can be relied upon (Rotter, 1971) whereas gullibility is an insensitivity to cues of untrustworthiness (Yamagishi et al., 1999). Thus, one should have no bearing on the other.

It was predicted that SVO could be related to a person's gullibility. That is, a person has a consistent preference for outcomes that benefit the self (i.e., pro-self) or others (i.e., pro-social; Bogaert et al., 2008; Van Lange et al., 1997). People who are more gullible (i.e., less sensitive to cues of untrustworthiness) should be more likely to be pro-social. However, this was not the case. It could be that preferences for outcomes, whether they be selfish or altruistic, do not affect a person's ability to detect cues of untrustworthiness. Perhaps a selfish person is just as likely to fall for a scam (e.g., a scam involving inheriting or winning money) as a selfless person (e.g., a scam that purports to be a charity). Therefore, a person's SVO could not predict their gullibility. Similarly, there was no relationship between trust and SVO.

Using a paradigm from behavioural economics research, the Prisoner's Dilemma, initially appeared to be a simple way to measure gullibility behaviourally. This paradigm failed in the first study, but it was thought that this failure was due to not having a baseline for each participant to compare to. Hence, in the second study, participants were asked to decide on the Prisoner's Dilemma prior to receiving any information about their partner. Then, upon receiving that information, it was predicted that the less gullible a participant was the more likely they would choose to defect. This is because the partner profile that they received was quite untrustworthy. However, there was no relationship between participant responses and gullibility. This could have been because the partner profiles may have been perceived as neither trustworthy nor untrustworthy. Although pilot testing had determined that the profile was moderately untrustworthy, this was not confirmed in either Study 6 or 7.

The studies described in this chapter further demonstrate that gullibility is not related to trust. The relationship between the Gullibility Scale and trust has now been measured with

both Rotter's (1967) Interpersonal Trust Scale as well as trust items suggested by Bulloch (2013) and still there is no significant relationship, suggesting that these concepts are independent of each other. Furthermore, this chapter has found that there is no relationship between decisions on a Prisoner's Dilemma and gullibility, suggesting that this paradigm might not serve as a useful measure gullibility in the laboratory.

Overall, there was no relationship between gullibility and the number of cooperative decisions made on a Prisoner's Dilemma, but a participant's SVO did predict the number of cooperative decisions; such that a pro-social person was significantly more likely to cooperate than a pro-self person. Study 7 found that, once again, there was no relationship between gullibility and trust. Furthermore, gullibility did not affect a person's likelihood of changing their answer on a Prisoner's Dilemma upon receiving untrustworthy information about their partner. Therefore, as the results regarding the Prisoner's Dilemma and gullibility were inconclusive, the next chapter will examine gullibility's relationship to the intention to reply to scam emails.

Chapter 6

Cognitive Ability, Intention to Comply with Scam Emails, and Gullibility

Chapter 4 of this thesis presented evidence for criterion validity of the Gullibility Scale. Skeptics and scam victims completed the Gullibility Scale and it was found that scam victims scored significantly higher on the scale compared to a sample of Skeptics and a sample of students and community members. However, a limitation of this study was that the participants were already victims of scams upon recruitment. Potentially, this meant that the victims may have viewed themselves as more gullible after the fact of being scammed. It was determined that more convincing evidence would be required to demonstrate that scores on the Gullibility Scale could predict gullible behaviour. This chapter attempted to provide that evidence by examining the relationship between gullibility and intention to reply to scam emails. Although there has been some research investigating the elements of scam emails that affect the likelihood of compliance (e.g., Williams & Polage, 2018), none has specifically examined whether the personality trait of gullibility has influenced the likelihood of falling for these scams. Therefore, one aim of this chapter was to see if scores on the Gullibility Scale are related to how participants rate example scam emails. A second aim was to explore the relationship between gullibility and cognitive ability.

Study 8: Cognitive Ability, Gullibility, and Intention to Comply with Scam Emails

Theoretical Background

Cognitive ability. One potentially important aspect that might be relevant both for gullibility and for succumbing to email scams is cognitive ability. Greenspan, Loughlin, and Black (Greenspan et al., 2001) argued that people with lower intelligence, caused by developmental delays and intellectual disability, are more likely to find themselves in situations wherein they could be described as gullible. In contrast, Charlton (2009) argued

that it is people with higher cognitive ability who are more likely to be gullible. Specifically, he suggests that people with higher IQs are more likely to over-use general intelligence to solve problems – overriding behaviours that are often considered common sense. As a result, they are more susceptible to being made a fool of. Neither Greenspan et al. (Greenspan et al., 2001) or Charlton (2009) empirically tested these assertions using measures of cognitive ability or gullibility. Raven’s Advanced Progressive Matrices (Arthur & Day, 1994) measures fluid intelligence and is not reliant on specific cultural knowledge, hence its suitability for measuring cognitive ability. Another measure that is often used as an indication of cognitive ability is the Cognitive Reflection Test (CRT; Frederick, 2005). It is a test that measures a person’s ability to override their intuitions and to use a more critical and deliberative thinking style. Pennycook, Cheyne, Barr, Koehler, and Fugelsang (2015) found that people with a more intuitive thinking style tend to score higher on their Bullshit Receptivity Scale. The present study aimed to determine if there was a relationship between gullibility and cognitive ability.

Pseudo-Profound Bullshit. Another phenomenon that could be related to gullibility is the tendency to rate pseudo-profound statements as profound. Pennycook et al. (2015) investigated endorsement of pseudo-profound statements using their so-called “Bullshit Receptivity Scale.” Pseudo-profound bullshit is distinct from nonsense as it “is something that implies but does not contain adequate meaning or truth” (Pennycook et al., 2015, p. 549). They suggested that the tendency to not only rate randomly generated sentences as profound (i.e., the Bullshit Receptivity Scale), but also mundane statements as profound, is driven by a general gullibility factor. Overall, they found a relationship between cognitive ability and the tendency to believe pseudo-profound bullshit, such that lower cognitive ability leads to rating the statements as more profound. Further, they found that people with a more intuitive thinking style, as measured by the CRT (Frederick, 2005), tended to score higher on their

Bullshit Receptivity Scale. However, they did not include a measure of gullibility in their study. Therefore, the present study aimed to explore the relationship between gullibility and bullshit receptivity.

Aims and Hypotheses

The first aim of this study is to determine if there is a relationship between gullibility and the intention to comply with scam emails. The second aim is to examine if there is a relationship between cognitive ability, acceptance of pseudo-profound statements, and gullibility. It is predicted that participants higher on gullibility will find scam emails significantly more trustworthy, persuasive, and rate that they will be more likely to respond to them than participants who are lower on gullibility. It is also expected there would be a negative correlation between the measures of cognitive ability (i.e., the CRT and scores on the Raven's Advanced Progressive Matrices) and scores on the Gullibility Scale, and a positive correlation between scores on the Bullshit Receptivity Scale and scores on the Gullibility Scale.

Method

Participants

Respondents were 156 individuals recruited via Amazon's Mechanical Turk (MTurk). One person was excluded for biased responding (assessed using attentiveness items). The mean age of the remaining 155 (56 females and 99 males) participants was 36.46 years ($SD = 9.88$ years) and ranged from 22 to 67 years.

Procedure

This study was approved by the Human Research Ethics Committee at Macquarie University (Reference Number: 5201838146527 see Appendix F for the approval letter). Once this study was approved, it was advertised and completed online using the MTurk platform. After giving informed consent, respondents were presented with 12 email stimuli in

random order and were asked to rate each for how likely it was that they would have clicked on the hyperlink in the email if they had received the unsolicited email in their inbox. They also made several other ratings of the emails, such as how trustworthy it appeared and how persuasive it was (see Appendix B for details). Then, they completed measures of gullibility, bullshit receptivity, and cognitive ability presented in random order. Demographic information on age, gender, and country of residence was collected at the end of the survey.

Measures

Gullibility. The 12-item Gullibility Scale described in the previous 2 chapters was used. The Cronbach's alphas $\alpha = 0.95$, with $\alpha = 0.93$ for Persuadability and $\alpha = 0.89$ for Insensitivity.

Pseudo-Profound Bullshit. Pennycook et al.'s (2015) 10-item Bullshit Receptivity Scale (BRS) was used (see Appendix B for details). Respondents were asked to rate how profound they found each statement to be from 1 (*Not at all profound*) to 5 (*Very profound*) and higher scores reflected more acceptance of bullshit statements as profound. An example item is "*We are in the midst of a high-frequency blossoming of interconnectedness that will give us access to the quantum soup itself.*" ($\alpha = .92$).

Cognitive Ability. Two measures of cognitive ability were used: the 12-item version of Raven's Advanced Progressive Matrices (APM; Arthur & Day, 1994) and the CRT (Frederick, 2005). Raven's APMs (Arthur & Day, 1994) comprise a reliable measure of fluid intelligence and are not dependent on specific cultural knowledge ($\alpha = .70$). For the CRT, this study used the original three questions developed by Frederick (2005) as well as three additional questions created by Primi, Morsanyi, Chiese, Donati, and Hamilton (2016) (see Appendix B for details). Each item was marked as either correct (1) or incorrect (0), and the scores were summed with higher scores indicating a more deliberate, reflective, or Type 2

(Frederick, 2005) thinking style (as compared with the intuitive and spontaneous Type 1 style; $\alpha = .77$).

Email Stimuli. Williams and Polage (2018) created 20 email stimuli based on the content and layout of phishing emails they had received or found online. The content varied on three points: the influence technique (reward-based or loss-based persuasion techniques), the authentic design cues (e.g., including relevant logos or copyright statements at the bottom of the email), and referring to salient current events (e.g., the Rio Olympics). The present study excluded the emails referring to the Rio Olympics (as it was no longer a salient current event) and used the remaining 12 stimuli. Respondents were asked to rate how likely it would be that they would respond to each email, how trustworthy they found the email, and how persuasive they found the email on a Likert-style scale from 1 (*Very Unlikely/Very Untrustworthy/Not Persuasive at all*) to 7 (*Very Likely/Very Trustworthy/Very Persuasive*).

Attentiveness Check. The measures of attentiveness were identical to the ones used in Study 6 and Study 7 (in Chapter 5). Respondents who had two or more errors on these four attentiveness items, were excluded from the final analysis ($N = 1$). In addition, information on age, gender, and education level were collected.

Results

Univariate Statistics

Table 6.1 presents descriptive statistics and results from independent samples *t* tests comparing male and female participants for all variables tested. Women scored significantly higher than men on the Gullibility Scale, but there were no other gender differences.

Table 6.1

Descriptive Statistics for all the Variables Tested

	Gender			<i>t</i>	<i>p</i>
	Total Mean (<i>SD</i>)	Male Mean (<i>SD</i>)	Female Mean (<i>SD</i>)		
Gullibility	25.90 (12.85)	24.08 (11.66)	29.13 (14.28)	2.253	.03
Persuadability	11.61 (6.41)	10.89 (6.08)	12.89 (6.84)	1.884	.06
Insensitivity	14.29 (7.12)	13.19 (6.30)	16.23 (8.06)	2.432	.01
BRS	27.39 (10.37)	27.52 (9.98)	27.18 (11.12)	-.193	.85
APM	6.06 (2.57)	6.14 (2.64)	5.91 (2.47)	-.535	.59
CRT	4.19 (1.82)	4.23 (1.90)	4.11 (1.67)	-.411	.68

Histograms of these variables do not suggest normal distributions and kurtosis for gullibility or its subscales. The standardised skew of these variables (calculated by dividing the skew by its standard error) and the standardised kurtosis (calculated the same way) exceeded 1.96 (the cutoff recommended by Field, 2013; McQueen & Knussen, 2006), indicating a positive significant skew (wherein most participants have low scores on the Gullibility Scale). Only the measures of cognitive ability had mesokurtic distributions (Skewness; Gullibility: 7.47, Persuadability: 8.02, Insensitivity: 6.88, BRS: -0.28, APM: -0.50, CRT: -4.19 and Kurtosis; Gullibility: 5.11, Persuadability: 5.74, Insensitivity: 4.74, BRS: -2.83, APM: -1.78, CRT: -1.29). Furthermore, all the scales were subjected to Shapiro-Wilk tests and all of them violated the assumptions of normality. However, ANOVAs and regressions are generally robust to such violations (Field, 2013; Howell, 2012).

Intercorrelations

Table 6.2 presents the intercorrelations among the cognitive ability measures, the BRS, and the Gullibility Scale. As gullibility violated the assumption of normality the correlations were also conducted with Spearman's Rho. However, the results were very

similar and therefore, Pearson's correlations are presented below. It was predicted that gullibility would be positively related to the acceptability of pseudo-profound bullshit and negatively related to the measure of cognitive ability (Raven's APM and the CRT). However, no relationships between the Gullibility Scale (or its subscales) and the three variables tested were found. The two measures of cognitive ability had a moderate to strong positive relationship with each other and the measure of pseudo-profound bullshit had a weak to moderate negative relationship with both measures of cognitive ability, replicating the results found by Pennycook et al. (2015).

Table 6.2

Intercorrelations among the Two Factors of the Scale and the Other Variables

	Gullibility	Persuadability	Insensitivity	BRS	APM	CRT
Gullibility	-					
Persuadability	.944*	-				
Insensitivity	.955*	.803*	-			
BRS	-.012	.037	-.054	-		
APM	-.023	-.016	-.028	-.285*	-	
CRT	-.037	-.057	-.016	-.337*	.495*	-

Note. * $p < .0005$

Multiple Linear Regressions

Three multiple linear regressions were run to determine which variables significantly predicted scores on each of the dependent variables: the likelihood of responding, the perceived trustworthiness of the email, and the persuasiveness of the email (see Table 6.3). The residuals were examined for each dependent variable. None of them appeared to have excessive deviations on the P-P plots, nor did the scatterplots of the predicted values against the residuals exhibit distinctive fanning and so they were considered normal. Overall, the regression equations were significant for the likelihood of responding to the unsolicited

email, $F(4, 150) = 11.59, p < .0005, R^2 = .24$, the trustworthiness of the email, $F(4, 150) = 4.50, p = .002, R^2 = .12$, and the persuasiveness of the email, $F(4, 150) = 11.24, p < .0005, R^2 = .23$. Scores on the Gullibility Scale significantly predicted how persuasive respondents found the emails, with higher scores associated with finding the emails more persuasive. Further, scores on the Gullibility Scale significantly predicted the likelihood of responding to the emails, with higher scores associated with an increased likelihood of responding. However, scores on the Gullibility Scale did not predict how trustworthy respondents found the email stimuli (although the p -value was close to the critical value: $p = .08$). Although these effect sizes are small, they nonetheless demonstrate that the personality trait of gullibility can influence how persuasive people find unsolicited emails, as well as their intention to respond to those emails.

Table 6.3

Linear Regressions testing three dependent variables

	Unstandardised					
	Coefficients		Standardised	t	p	r ²
	B	Std. Error	Beta			
Likelihood of Responding						
Constant	27.55	4.95		5.56	.000	
Gullibility	.16	.07	.16	2.19	.030	.03
BRS	.27	.10	.21	2.74	.007	.05
APM	-.78	.42	-.15	-1.85	.067	.02
CRT	-1.68	.61	-.23	-2.76	.007	.05
Trustworthiness of the Email						
Constant	33.70	4.97		6.79	.000	
Gullibility	.13	.07	.14	1.77	.079	.02
BRS	.11	.10	.09	1.11	.268	.01
APM	.01	.42	.00	0.02	.988	.00
CRT	-1.67	.61	-.25	-2.74	.007	.05
Persuasiveness of the Email						
Constant	25.69	5.45		4.71	.000	
Gullibility	.30	.08	.27	3.75	.000	.09
BRS	.35	.11	.25	3.27	.001	.07
APM	.13	.46	.02	.29	.773	.00
CRT	-1.93	.67	-.24	-2.87	.005	.05

Discussion

This study had two aims: to determine if gullibility could influence the perception of and intention to reply to scam emails, as well as to determine the relationship between gullibility, cognitive ability, and pseudo-profound bullshit receptivity. Overall, this study

found that participants who scored higher on the Gullibility Scale found examples of scam emails significantly more persuasive than participants who scored lower on the scale. Similarly, those participants also indicated that they were more likely to respond to such emails. Therefore, this study provided further evidence for the criterion validity of the Gullibility Scale.

Cognitive ability is a broad term that could be defined in many ways. In the present study cognitive ability was operationalised with Raven's matrices and the CRT. These two measures cover aspects of cognitive ability such as fluid intelligence and thinking style. Given that neither of these was associated with gullibility, but that significant correlations were found in Studies 1 and 2 between gullibility and social intelligence, it may be that gullibility is highly contextual, such that even the most cognitively intelligent individuals may lack the ability and/or motivation to detect socially-relevant untrustworthiness cues (e.g., a romance scam). These conclusions are supported by the finding that gullibility was not associated with the tendency to accept a "bullshit" statement as profound or meaningful, and the finding that lower bullshit acceptance and higher cognitive ability were correlated. Overall, these results suggest a need for further research on the relationships between gullibility and explicitly social intelligence measures such as emotional intelligence (e.g., Mayer, Salovey, Caruso, & Sitarenios, 2003) and potentially, Autism Spectrum Disorder (ASD; e.g., Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). In particular, gullibility may require more context-dependent intelligence, or the ability to detect socially relevant untrustworthiness cues, rather than simply a high IQ. Related to this specificity, one study utilising functional Magnetic Resonance Imaging (fMRI) found that people with ASD (a disorder affecting social communication) had less activation in the regions of the brain associated with social intelligence compared with controls (Baron-Cohen et al., 1999). Together, these findings suggest that an important avenue for future research would be to

determine the types of untrustworthiness cues that are most frequently missed or misinterpreted by gullible individuals (e.g., a lack of body language skills; or an inability to understand social scripts relevant to interpersonal manipulation). Such deficits could potentially be remediated with social skills and emotional intelligence training.

Interestingly, there was no relationship between Raven's APM and any of the dependent variables measured, suggesting that fluid intelligence may not be related to responses to unsolicited emails. However, scores on the CRT did significantly predict the trustworthiness, persuasiveness, and likelihood of responding to, unsolicited emails, suggesting that thinking style rather than fluid intelligence may influence reactions to unsolicited emails. High scores on the BRS, like the Gullibility Scale, significantly predicted the likelihood of responding and the persuasiveness of the emails but not how trustworthy respondents found the emails.

In the present study, participants were asked "how likely is it that you would respond to this email?" and the participants indicated their preference on a Likert-style scale.

Although this method found a relationship between gullibility and the intention to comply with a scam email, there is often a gap between the intention to complete a behaviour and actually completing that behaviour (e.g., Sheeran & Webb, 2016). In an attempt to address this in the present study, a preliminary pilot study was undertaken with 47 undergraduate psychology students. The students completed the Gullibility Scale and within 2 weeks of completing that scale they were sent a scam email by the researchers (see Appendix E for details). In that scam email (which detailed that their Facebook page had a security issue that the participant needed to rectify) there was an opportunity for the participants to click a URL, which then directed them to a new page and asked them to enter personal details. Although the sample size was too small to detect any differences, the participants who clicked on the URL in the email and then entered their details on the false Facebook security page ($N = 4$)

had a trend for higher gullibility scores ($M = 37.00$, $SD = 9.42$) than students who did not click on the URL or enter their details ($N = 43$, $M = 34.03$, $SD = 12.59$). These results suggest that not only does the Gullibility Scale predict intention to comply with scam emails, it may also predict actual compliance with scam emails. This paradigm could be an avenue for future research. However, this type study would require an extremely large sample size as only a very small proportion of participants actually complied with the scam email.

Overall, Study 8 found that participants who scored higher on the Gullibility Scale indicated that they were more likely to respond to the scam emails they viewed. Further, they also found those emails to be significantly more persuasive than participants who scored lower on gullibility. This is further evidence to support the validity of the Gullibility Scale as it can predict behavioural intention to comply with scam emails. Although the intention to comply with a scam email is different from complying with a scam email, this is the first attempt at predicting gullible behaviour and future research can support this finding with further developments of this paradigm.

Chapter 7

General Discussion

This thesis aimed to develop a reliable and valid measure of gullibility, explore which personality variables were related to gullibility, and begin preliminary investigations into a behavioural paradigm to examine the outcomes of gullibility. This chapter provides an overview and integration of the findings outlined in the preceding chapters and makes suggestions for future research in this area.

The thesis began by relaying the story of Arthur Stimpson, a man who received an email in 2007 telling him he had won the Spanish National Lottery (Bracchi, 2011). Arthur not only sent the scammers over £50,000 of his own money, but he also borrowed over £1.1million from 13 people in his village (which only has a population of 140) and forged his wife's signature in order to borrow more money from the bank (Bracchi, 2011). At the end of 2010, in August, two and a half years after receiving that initial email, Arthur declared himself bankrupt and handed himself over to the police. He was jailed for four years for fraud, a victim of a scam email (Bracchi, 2011). Why did Arthur reply to the email when most people would have deleted it without a second thought? Perhaps he had a dispositional tendency—gullibility—that influenced him to overlook obvious cues of untrustworthiness. In an attempt to better understand why some people are more susceptible to scams than others, this thesis presented the development and validation of a self-report measure of gullibility.

The Gullibility Scale

Study 1 reanalysed data from Teunisse (2015) and determined that the Gullibility Scale consisted of two factors. The original scale had 35 items and four factors (Persuadability, Insensitivity, Trustability, and Unassertiveness). The Trustability factor was not strongly associated with the other subscales and the model of best fit was produced when

the Trustability items were excluded from the analysis. Furthermore, the Unassertiveness factor did not contribute theoretically to the scale and only had small to moderate relationships with the other factors in the scale. Therefore, this factor was removed from the scale. A further six items were removed from the Persuadability factor as there was unnecessary conceptual duplication within those items. This process created a 12-item scale that was both balanced and theoretically driven. Informed by the re-analysis, the new factor structure of the scale was investigated in Studies 2 and 3 (presented in Chapter 3) to determine if the new factor structure would replicate when those items were presented by themselves. Using exploratory and confirmatory factor analysis, the factor structure was replicated. This finding demonstrated that the Gullibility Scale is indeed comprised of two factors: Persuadability and Insensitivity.

Although confirming that the Gullibility Scale consisted of two factors aligned with the result obtained by Pinsker et al. (2011) and the dual-factor structure of their Social Vulnerability Scale, these scales are fundamentally different. Pinsker et al. (2011) defined the Gullibility factor in their scale through behavioural examples whereas the Credulity factor was purely based on beliefs. This was influenced by Greenspan's (Greenspan, 2009a; Greenspan et al., 2001) definition of the concept. This simple distinction between behaviours and beliefs did not appear in the Gullibility Scale. The items in the Gullibility Scale seem to be divided into the category of speed and ability to detect untrustworthiness cues (i.e., Insensitivity) and the category of self-beliefs about susceptibility to persuasion (i.e., Persuadability). Furthermore, considering gullibility purely in terms of behaviours does not easily distinguish it from compliance behaviours, hence the factors in the Gullibility Scale may be more useful in understanding the concept. However, a similarity between the Social Vulnerability Scale (Pinsker et al., 2011) and the present Gullibility Scale is that neither measures contain items pertaining to trust, instead purely focusing on beliefs and behaviours

that make a person socially vulnerable. This is further evidence that suggests a person's disposition to trust may not be related to his or her ability to detect cues of untrustworthiness. Although there are similarities between the Social Vulnerability Scale and the Gullibility Scale, the Gullibility Scale has been developed and validated on a neurotypical population and is a simple, reliable, and valid self-report measure. This is in contrast to the Social Vulnerability Scale, which was designed for and validated on participants with neurocognitive deficits such as dementia (Pinsker et al., 2011) and requires informants (such as friends or relatives of the participant) in order to complete it. Hence, making the Gullibility Scale a more suitable tool for research on non-impaired samples that require self-administration.

The two studies presented in Chapter 4 provided further evidence for the validity and reliability of the Gullibility Scale. In Study 4 the Gullibility Scale was presented to three distinct samples: scam victims, Skeptics (i.e., members of a critical thinking interest group), and psychology undergraduates and community members. People who identified as scam victims scored significantly higher on the Gullibility Scale than psychology undergraduates or community members. Furthermore, Skeptics scored significantly lower on the Gullibility Scale than psychology undergraduates or community members. These findings provided evidence of the criterion validity of the scale. Study 5 demonstrated that the Gullibility Scale has excellent test-retest reliability over a 12-week interval.

Throughout these five studies, the Gullibility Scale was presented to participants with other personality measures to determine the construct validity (i.e., convergent and divergent validity) of the scale. There were significant positive relationships between the Gullibility Scale and agreeableness (Study 1), social vulnerability (Study 3), and paranormal beliefs (Study 3). The strengths of these correlations ranged from small to moderate. These findings demonstrated that these phenomena each were related to gullibility but did not explain all of

the variance, indicating that gullibility was indeed a distinct personality trait. There was a consistent negative relationship between gullibility and social intelligence (Studies 1 and 2). This relationship suggested that a lack of social intelligence is related to being gullible, and the effect size was small to moderate. Thus, once again, social intelligence was related to gullibility, but it is not the same construct. There was no relationship between gullibility and Machiavellianism (Study 1) or trust (Studies 1 and 2). These results, discussed in more depth in their respective chapters, further demonstrate the validity of the scale. Overall, gullibility appears to be an individual difference that comprises being easily persuaded and having an insensitivity to cues of untrustworthiness. These five studies demonstrated that the Gullibility Scale is a valid and reliable measure of this construct. The remaining studies in this thesis aimed to develop a behavioural paradigm to measure gullibility.

The Prisoner's Dilemma

The two studies in Chapter 5 aimed to investigate the predictive validity of the Gullibility Scale using a Prisoner's Dilemma paradigm. In both studies, participants were presented with information regarding their "partner." This information was manipulated to make the "partner" appear to be untrustworthy. Then, the participants played a version of the Prisoner's Dilemma. Unfortunately, the Gullibility Scale did not predict whether a person would choose to defect or cooperate in the game. Only a person's social value orientation (i.e., if they were pro-self or pro-social) had any predictive value regarding the Prisoner's Dilemma: A person who was pro-social was more likely to cooperate and a person who was pro-self was more likely to defect. Both studies found that there was no relationship between trust and gullibility; Study 6 used Rotter's (1967) trust scale and Study 7 used Bulloch's (2013) measure and neither of them were correlated with the Gullibility Scale. This demonstrated that trust is logically independent from gullibility, as predicted by Yamagishi et al. (1999). Furthermore, there was no relationship between gullibility and social value

orientation. That is, gullibility could not predict the likelihood of a person being pro-self or pro-social. Rotter (1971) has argued that behavioural economics games such as the Prisoner's Dilemma produce a specific reaction in participants that is characteristic of competitive gaming situations but is not generalisable to interpersonal interactions. Although situations in which people could be gullible might involve a monetary outcome (e.g., the Prince of Nigeria scam) like many versions of the Prisoner's Dilemma, perhaps scam emails do not produce the same competitive atmosphere. Therefore, the Prisoner's Dilemma may be examining people's behaviour in a specific competitive environment that does not generalise to situations related to gullible behaviour (such as complying with scam emails). This may be the reason why scores on the Gullibility Scale were not related to behaviour in the games and why a Prisoner's Dilemma may not be an ideal paradigm for testing gullibility.

The Intention to Reply to Scam Emails

Study 4 (in Chapter 4) presented evidence of the criterion validity of the Gullibility Scale: scam victims scored significantly higher on the scale than a sample of psychology undergraduate students and community members who, in turn, scored significantly higher than a sample of Skeptics. However, a potential limitation of that study was that the participants were already scam victims upon recruitment. Therefore, these participants could have potentially viewed themselves as more gullible because they had been scammed. Study 8 (presented in Chapter 6) aimed to demonstrate the criterion validity of the Gullibility Scale. Participants rated 12 example scam email stimuli (taken from Williams & Polage, 2018) for their trustworthiness, their persuasiveness, and how likely it would be that they would respond to that email. Then, the participants completed measures of gullibility, cognitive ability, and acceptance of pseudo-profound statements. Overall, the study found that the more gullible the participants were the more persuasive they found the scam emails. Furthermore, gullible participants indicated that they were significantly more likely to respond to those

emails than participants who were lower in gullibility. As such, this study provided evidence of criterion validity of the Gullibility Scale, although no relationship between gullibility and cognitive ability or bullshit receptivity was observed.

Overall, the studies in this thesis provided evidence that the Gullibility Scale is a reliable and valid measure. In addition, initial evidence was obtained suggesting that the Gullibility Scale has the potential to predict susceptibility to scams.

Future Directions

The findings presented in this thesis suggest several avenues for future research. One clear direction is to further develop a behavioural measure of gullibility based on the scam email paradigm from Study 8. Sending scam-type emails and recording whether the recipient clicks on a hyperlink contained in the email could serve as a behavioural measure of gullibility. The findings from Study 4 that Skeptics were significantly less gullible than a sample of psychology undergraduate students or community members suggests that investigating the consequences of priming a sceptical mindset on gullibility might be another fruitful avenue for future research. Moreover, Study 3 found a small but significant correlation between gullibility and holding paranormal beliefs. Future research could determine how gullibility relates to anti-scientific or conspiracy beliefs. Since Studies 1 and 2 in this thesis found a negative correlation between gullibility and social intelligence, the link between social and emotional intelligence, Theory of Mind, and gullibility might be another potentially fruitful direction for future research. This also has implications for how people might be trained to be less gullible. Relatedly, future research could integrate gullibility into wider frameworks of victimhood and vulnerability. Each of these suggestions for future research will be explored in the subsequent section.

Scam Emails as a Behavioural Measure of Gullibility. In Study 8, participants viewed and rated examples of scam emails. Although there was a relationship between the

intention to reply to those scam emails and scores on the Gullibility Scale, there is often a gap between the intention to act and actually completing that behaviour (e.g., Sheeran & Webb, 2016). A pilot study mentioned in the discussion section of Chapter 6 described a paradigm wherein participants completed the Gullibility Scale and were sent a scam email within a two-week period. Although the sample size was too small to test for significance, the mean gullibility score for those participants who clicked on the link in the email and entered their details ($N = 4$) was higher than those who did not click on the link ($N = 43$). However, there were several technical problems with this study (email servers blocking the scam emails from being sent, spam filters preventing the emails from being received, and domain names for the emails were frequently taken down by the host provider). Therefore, future researchers should find a way to circumvent these technical issues while still conforming to ethical guidelines. Furthermore, this type of study would require an extremely large sample size as, typically, only a very small proportion of people respond to scam emails. For example, in the pilot test, only 8.5% of participants who received the email clicked on it and entered their details. Despite these challenges, this paradigm may be a fruitful avenue for future research as the results from Study 8 suggest that this method may be a simple and ecologically valid behavioural index of gullibility; thus, this paradigm could provide a firm test of the real-world usefulness of the Gullibility Scale.

Priming Sceptical Mindsets. In Chapter 4, Sceptics (i.e., members of a critical thinking interest group) were found to score significantly lower on the Gullibility Scale than a sample of psychology undergraduates or community members. This demonstrated that having a critical outlook may make a person less gullible and less likely to fall for scams. In contrast, it was argued in Chapter 1 that the cognitive perspective on gullibility suggests that people have a default gullible mindset which accepts all incoming information and requires active negation to counter or correct that information (Gilbert et al., 1993; Mercier, 2017). Although

Mayo (2019a) agrees with this perspective, she argues that human minds have the ability to spontaneously reject information which may protect us from being gullible. For example, a Skeptic may be presented with a new idea (e.g., the world is flat) and automatically reject this notion until they are later presented with convincing evidence. She argues that two independent factors contribute to spontaneous belief (i.e., a sceptical mindset); possessing contradicting knowledge and distrust (Mayo, 2019a). Regarding distrust, Mayo (2019b) found that both dispositional distrust, as well as priming distrust, lead to people using a sceptical mindset. Following on from Mayo's (2019a, 2019b) work, priming participants with untrustworthy cues, such as faces, may make participants less gullible and future research could confirm this using the Gullibility Scale.

Relatedly, in terms of priming a sceptical mindset, Schwarz and Lee (2019) found that priming participants with a fishy smell increased their suspicion, triggering a sceptical mindset (c.f., Mayo, 2019b). They argue that this is due to the strong metaphors that relate ideas of suspicion to bad smells (e.g., something smells "fishy" or it does not "pass the smell test"). Notably, this is specific to fishy smells and not other bad smells (e.g., a fart smell). They argue that people draw on their current emotional state to inform their present judgment. Therefore, a suspicious, fishy smell would trigger scepticism in a person's mind. They presented the results of a number of studies to support these claims, suggesting that a fishy smell (compared with a bad smell or a control) makes people less socially cooperative, better at solving the "Moses illusion"⁶, less likely to implant false memories, and more likely

⁶ The Moses Illusion is a task developed by Erickson and Mattson (1981) that is designed to test a participant's sensitivity to misleading information. For example, how many of each animal did Moses take onto the ark? Most people answer "two" even though it was Noah and not Moses who built the ark. Schwarz and Lee (2019) describe a study wherein participants were presented with the Moses illusion. In one condition, there was a fishy smell in the experimental booth and the other condition was a control. In the control condition, over 83% of participants failed to notice the error in the question, whereas in the fishy smell condition only 58% failed to notice the error.

to create disconfirming guesses in the Wason (1960) rule discovery task^{7,8}. Conversely, participants were better able to identify a fishy smell when they had been primed with suspicion compared to a neutral condition (Schwarz & Lee, 2019). This evidence demonstrates that there is a link between fishy smells and being suspicious. Thus, if fishy smells can prime a sceptical mindset, future research could determine if it can make a person less gullible. Perhaps giving participants a fishy smell (as opposed to another bad smell or a control) could reduce their scores on the Gullibility Scale or even make them more suspicious of scam emails.

Anti-Scientific Beliefs and Conspiracy Theorists. Belief in the paranormal was explored in Study 3. Although the correlation between paranormal beliefs and gullibility was small, it may be that there is a stronger relationship between gullibility and belief in conspiracy theories or anti-scientific beliefs. Believing in mind-reading, astrology, or telekinesis may not be strongly influenced by gullibility; however anti-scientific beliefs, understanding why people believe vaccinations cause Autism, or that the world is flat may be an interesting area of future research. These types of beliefs may have stronger or more obvious cues to their untrustworthiness (such as the numerous pictures of the earth from space) or may rely on people being easily persuaded (such as ignoring the overwhelming evidence that demonstrates that vaccines are safe). However, misinformation can be difficult to rebut and despite efforts to counter this fear of vaccinations, the World Health Organization listed vaccine hesitancy as one of the top ten threats to global health; it has

⁷ Wason's (1960) rule discovery task is typically an example of confirmation bias. Participants are asked to discover the rule underlying a 3-digit number series (2-4-6). Most assume the rule is "increasing by twos" and simply guess "6-8-10" when the actual rule is "any ascending number sequence." As a result, most participants end up convincing themselves of the incorrect rule. The study described by Schwarz and Lee (2019) found that although most participants still made more confirmatory than disconfirmatory guesses, participants with the fishy smell were significantly more likely to make more disconfirmatory guesses compared to the neutral condition.

⁸ Mayo (2019b) also found that priming participants with untrustworthy faces also resulted in them making more disconfirmatory guesses in the Wason rule discovery task compared to participants who viewed a trustworthy face.

contributed to a 30% increase in cases of measles globally (World Health Organization, 2019). Therefore, these alternative anti-scientific beliefs are not harmless.

Those who espouse anti-scientific conspiracy theories often argue that they are critical thinkers. For example, those who believe that the Earth is flat argue that NASA routinely manipulates satellite pictures and they hunt down testimonials from pilots who have confirmed that they cannot see the Earth's curvature at high altitudes (van Prooijen, 2019). However, van Prooijen (2019) reviewed the literature and found evidence that people who endorse conspiracy theories also have a higher number of superstitions and paranormal beliefs. Similarly, people who found meaningless phrases profound (i.e., unable to detect bullshit) also had increased belief in the paranormal and conspiracy theories (Pennycook et al., 2015). The results of the research indicated that critical and deliberative thinking decreased belief in conspiracy theories and negative emotions, such as lacking control or uncertainty, increase the belief in conspiracy theories (van Prooijen, 2019). Overall, the review by van Prooijen suggests that those who believe in conspiracies are not extremely critical thinkers, and instead tend to rely on heuristic processing, intuitive thinking styles, and are influenced by negative emotions. However, gullibility could influence these thinking styles. If people who believe in conspiracy theories rely on heuristic processing, then they may not be good at detecting cues of untrustworthiness. Similarly, as seen in Study 3, there is a small positive relationship between gullibility and paranormal beliefs. Therefore, the reason people may have these conspiracy beliefs could be partly due to gullibility and future research should address this.

Emotional Intelligence and Theory of Mind. In Study 8, there was no relationship between measures of cognitive ability (i.e., Raven's Advanced Progressive Matrices and the Cognitive Reflection Test) and gullibility. However, in Studies 1 and 2 there was a significant negative correlation between gullibility and social intelligence. This suggests that the ability

and willingness to detect cues of untrustworthiness may be highly contextual. Although there is a relationship between social intelligence and gullibility, it is not yet clear whether the ability to detect and manage emotions could influence a person's gullibility. Ciarrochi, Chan, and Caputi (2000) found that there was no relationship between emotional intelligence and cognitive ability (as measured by Raven's Progressive Matrices). This suggests that emotional intelligence may be more like social intelligence rather than other cognitive abilities. Therefore, future research could confirm this by examining the relationship between emotional intelligence (e.g., Mayer et al., 2003) and gullibility. Similarly, if there is a relationship between emotional intelligence and gullibility, perhaps gullibility could be reduced with an intervention aimed at improving emotional or social intelligence. Although there is little empirical research on improving social intelligence through training, there is some preliminary evidence that the related construct, emotional intelligence, may be improved with specific interventions (e.g., Ciarrochi & Mayer, 2013; Dacre Pool & Qualter, 2012; Nelis, Quoidbach, Mikolajczak, & Hansenne, 2009). Therefore, if it is a lack of social or emotional intelligence that is leading a person to being unable to detect cues of untrustworthiness, perhaps interventions designed to improve social intelligence may also lead to a decrease in gullibility.

Similarly, research would benefit from examining the relationship between gullibility and Theory of Mind. As mentioned in Chapter 1, Theory of Mind refers to the knowledge and understanding of other people's mental states (Charlton, 2001), which appears to be a central component of social intelligence. Future research may benefit from investigating the gullibility of people with autism. Baron-Cohen (2000), in a review on Theory of Mind and autism, described that children with autism often struggle to understand when they are being deceived. Similarly, they also struggle to deceive other people, as both detecting deception and attempting to deceive others requires the ability to understand other people's perspectives

(i.e., Theory of Mind). Perhaps improving a person's Theory of Mind or social intelligence could decrease their gullibility. There is mixed research on whether Theory of Mind can be improved. Some studies suggest that it may be improved with an intervention for people with autism (Gantman, Kapp, Orenski, & Laugeson, 2012). However, a systematic review of Theory of Mind interventions found that although it may be taught, the learned skills are mostly not maintained and do not generalise to other settings (Fletcher-Watson, McConnell, Manola, & McConachie, 2014). This suggests that levels of Theory of Mind may be static and unchangeable in the long-term. Hence, if someone has low Theory of Mind, they may be less able to detect cues of untrustworthiness, making them more vulnerable to being gullible, and this may be a relatively stable individual difference. However, this is something for future research to confirm.

Victimhood and vulnerability. There has been an abundance of research investigating the Dark Triad of personality (see Furnham, Richards, & Paulhus, 2013 for a review). The Dark Triad consists of three personality styles: psychopathy, narcissism, and Machiavellianism. These personality traits have been shown to be highly intercorrelated, yet distinct traits (Paulhus & Williams, 2002). Although research has focused on people who possess these personality traits, very few have examined the victims of members of the Dark Triad to determine if several personality traits or individual differences can converge to make some people more likely to become a victim of a psychopath.

The personality of victims has been under-researched, however social vulnerability (as discussed in Chapters 1, 2, and 3) could be relevant. Social vulnerability refers to the difficulty certain people have with detecting potentially harmful social situations (Seward et al., 2018). Typically, this has been viewed as a single personality construct. A measure of social vulnerability has been developed for older adults (Pinsker et al., 2011) and for children (Seward et al., 2018). The adult measure, the Social Vulnerability Scale (discussed in Chapter

3) was designed for people with cognitive impairments or developmental delays. Essentially, it is argued that social vulnerability is due to this impairment in detecting harmful social situations. Seward et al. (2018), in their study on the development of a social vulnerability questionnaire for children, argued that social vulnerability is not simply a lack of social skills, instead, it is a construct for understanding social risk. Although this may be the case, most of the research on social vulnerability has either looked at elderly populations (Pinsker & McFarland, 2010; Pinsker et al., 2011) or children (Seward et al., 2018; Sofronoff, Dark, & Stone, 2011), which are inherently more vulnerable than a typically functioning adult population. Although children and the elderly may be at more risk of being victimised, there are still many typically functioning adults who become victims of scammers or psychopaths. Therefore, the research on social vulnerability must broaden to include them to fully understand this construct.

Although there has been a paucity of research on victimhood, especially in terms of personality traits, some studies have found some individual differences in victims compared to non-victims. One study by Glasø, Matthiesen, Nielsen, and Einarsen (2007) examined victims of workplace bullying and found that victims tended to be less agreeable, less conscientious, less extroverted, less open to experience, and less emotionally stable than non-victims. However, this study only examined personality in terms of openness (i.e., intellect), conscientiousness, extraversion, agreeableness, and neuroticism (i.e., emotional stability). It could be that a victimhood profile consists of measures or individual differences other than the Big Five (such as gullibility).

Therefore, it could be that those with Dark Triad traits cast their net far and wide, but it is only those with particularly vulnerable personality traits or individual differences (such as gullibility) that are caught in it. Perhaps, just as there is a Dark Triad, there may be several individual differences that converge making someone more likely to become a victim of a

psychopath, domestic violence, a scam, or join a cult. Logically, being easily persuaded and unable to detect cues of untrustworthiness should be part of the reason why some people are more likely to become a victim than others. Future research should determine if such a vulnerable framework exists and if gullibility is part of it.

Conclusion

In summary, the studies in this thesis developed a valid and reliable measure of gullibility, a significant and novel contribution to the existing literature. Prior to this, there was no measure of gullibility that focused on a typical non-impaired adult population. Gullibility was related to measures of agreeableness, social intelligence, social vulnerability, and paranormal beliefs, but not trust. Scam victims scored significantly higher on the Gullibility Scale than a sample of psychology undergraduates and community members or Skeptics, demonstrating the criterion validity of the scale. In addition, people who scored higher on the Gullibility Scale rated scam emails as significantly more persuasive and indicated that they were significantly more likely to respond than people who scored lower on the Gullibility Scale. Moreover, the scale had excellent internal reliability and test-retest reliability. Although the initial attempts at developing a behavioural paradigm of gullibility did not succeed (e.g., using a Prisoner's Dilemma paradigm), the final study of this thesis presented a paradigm that future research could develop into a reliable behavioural measure. Suggestions for future research included priming sceptical mindsets and examining the relationship between gullibility and anti-scientific beliefs or emotional intelligence. Lastly, this initial research into gullibility could be expanded into developing a framework of victimhood. Above and beyond situational variables, certain personality traits or individual differences might make some people more susceptible than others to becoming victims. As this thesis has demonstrated, gullibility can influence how scam emails are perceived and possibly the intention to reply to those scam emails. By investigating gullibility scientifically,

we will hopefully come to understand how to help those who are most vulnerable to protect themselves from exploitation. Exploitation, or victimhood, may be the result of a calculating scammer stealing a person's money, a cruel abuser convincing their partner to stay in abusive relationship, or an enigmatic cult leader denying a person their liberties or encouraging them to take their own lives. It is incumbent upon us not to underestimate the power of gullibility.

“Gullibility is a knife at the throat of civilization”

- David Wong, *John Dies at the End*, 2010

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Appendices

Appendix A: Gullibility Scale Original Items

Please complete the following questionnaire on your beliefs and behaviours. Do not think too long about your responses. Read each carefully and indicate how true these statements are of you on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

1. I guess I am more gullible than the average person
2. If anyone is likely to fall for a scam, it's me
3. I have been tricked by someone, even though my friends or family warned me ^a
4. I have been taken in repeatedly by a person's lies ^a
5. I'm easily persuaded to buy things I don't need ^a
6. Please answer 2 to this question
7. I have invested money in ventures that seemed too good to be true
8. I have been persuaded to make donations to charities when I couldn't really afford it ^a
9. I have supplied my bank account details to a stranger ^a
10. I am often put in a situation where I have to pay for others
11. I usually offer to pay for others, even when I don't have much money
12. People often take advantage of my generosity
13. I have been persuaded to subscribe to unwanted books/magazines/periodicals ^a
14. I often end up doing other people's work
15. It makes me angry to know that I have been tricked or made a fool of* ^a
16. When someone takes advantage of me, I just try to put it behind me and move on ^a
17. I feel stupid when I think about occasions where I was tricked or duped* ^a
18. I'm pretty good at working out when someone is trying to fool me*
19. People almost always say what they mean ^a
20. I'm not that good at reading the signs that someone is trying to manipulate me
21. If you are reading this question, please answer 7
22. I am often surprised when people are untrustworthy
23. I'm pretty poor at working out if someone is tricking me
24. I rarely suspect people of trying to manipulate me ^a
25. I often feel it is difficult to understand why others are trying to dupe me ^a

26. I begin by assuming that all people have dishonest intentions*^a
27. I usually think about a person's possible hidden motivations before deciding to believe them*^a
28. I rarely take a person at face value*^a
29. It usually takes me a while to 'catch on' when someone is deceiving me
30. I often fall for things when I should know better.
31. If my best friends told me that my partner was cheating, I would believe them over my partner^a
32. I'm usually quick to notice when someone is trying to cheat me*
33. I often take people too literally^a
34. I quickly realise when someone is pulling my leg*
35. I am probably a little too quick to believe others
36. I believe things that most others think are untrue^a
37. In general, the news is reported objectively in the media^a
38. I am pretty good at working out if a story/rumour is actually an urban myth*^a
39. Answer this question with a 1
40. If something sounds too good to be true, it probably isn't true*^a
41. My friends think I'm easily fooled
42. My family think I am an easy target for scammers
43. My friends often play tricks on me^a
44. My work colleagues think I tend to make foolish decisions^a
45. My friends think I'm too trusting
46. My family think I'm overly cynical about people*^a
47. People say I'm overly optimistic^a
48. People think I'm a little naïve
49. My family thinks I am easily led
50. People say I will agree to anything
51. I trust what people say
52. I believe most people are honest
53. I assume others will have my best intentions at heart^a
54. When dealing with strangers, it is better to wait until they have proved themselves trustworthy*^a
55. Most people only look out for themselves*
56. If you are not careful, people will try to take advantage of you*

- 57. People are usually honest the various aspects of their lives ^a
- 58. I believe most people can be relied upon to keep their word
- 59. Most people have good intentions
- 60. Most people are kind ^a
- 61. Completely trusting someone is asking for trouble*
- 62. Usually people don't try to take advantage of others
- 63. When people compliment me, it is because they want something from me*
- 64. Overall, I'm pretty easily manipulated
- 65. I believe people are sincere when they flatter me
- 66. If you are reading this question, please answer 4
- 67. People often use me to get what they want
- 68. When debating an idea, I am easily convinced of another person's point of view
- 69. I believe salespeople are generally truthful* ^a
- 70. My opinions don't change easily* ^a

* Denotes a reverse-scored item, ^a item removed during initial EFA

Appendix B: Scales Used

35-item Gullibility Scale (used in Study 1)

Please complete the following questionnaire on your beliefs and behaviours. Do not think too long about your responses. Read each carefully and indicate how true these statements are of you on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

1. I guess I am more gullible than the average person
2. If anyone is likely to fall for a scam, it's me
3. I have been persuaded to make donations to charities when I couldn't really afford it
4. I am often put in a situation where I have to pay for others
5. I usually offer to pay for others, even when I don't have much money
6. People often take advantage of my generosity
7. I often end up doing other people's work
8. Please answer 2 to this question
9. I'm pretty good at working out when someone is trying to fool me*
10. I'm not that good at reading the signs that someone is trying to manipulate me
11. I am often surprised when people are untrustworthy
12. I'm pretty poor at working out if someone is tricking me
13. It usually takes me a while to 'catch on' when someone is deceiving me
14. I often fall for things when I should know better
15. I'm usually quick to notice when someone is trying to cheat me*
16. If you are reading this question, please answer 6
17. I quickly realise when someone is pulling my leg*
18. I am probably a little too quick to believe others
19. My friends think I'm easily fooled
20. My family think I am an easy target for scammers
21. My friends think I'm too trusting
22. People think I'm a little naïve
23. My family thinks I am easily led
24. Answer this question with a 3
25. People say I will agree to anything

26. I trust what people say
27. I believe most people are honest
28. Most people only look out for themselves*
29. If you are not careful, people will try to take advantage of you*
30. People are usually honest in all aspects of their lives
31. I believe most people can be relied upon to keep their word
32. If you are reading this question, please answer 5
33. Completely trusting someone is asking for trouble*
34. Usually people don't try to take advantage of others
35. When people compliment me, it is because they want something from me*
36. Overall, I'm pretty easily manipulated
37. I believe people are sincere when they flatter me
38. People often use me to get what they want
39. When debating an idea, I am easily convinced of another person's point of view

* Denotes a reverse-scored item

12-item Gullibility Scale (used in Studies 2, 3, 4, 5, 6, 7, and 8)

Please complete the following questionnaire on your beliefs and behaviours. Do not think too long about your responses. Read each question carefully and indicate how true these statements are of you on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

Strongly Disagree 1 2 3 4 5 6 7 Strongly Agree

1. I'm pretty good at working out when someone is trying to fool me
2. I'm usually quick to notice when someone is trying to cheat me
3. I'm pretty poor at working out if someone is tricking me
4. Answer this question with a 3
5. I quickly realise when someone is pulling my leg
6. It usually takes me a while to 'catch on' when someone is deceiving me
7. I'm not that good at reading the signs that someone is trying to manipulate me
8. My family think I am an easy target for scammers
9. If anyone is likely to fall for a scam, it's me
10. My friends think I'm easily fooled
11. If you are reading this question, please answer 5
12. Overall, I'm pretty easily manipulated
13. People think I'm a little naïve
14. I guess I am more gullible than the average person

Interpersonal Trust Scale (used in Studies 1, 2, and 6)

Directions: Indicate the degree to which you agree or disagree with each statement by using the following scale:

1= strongly agree

2 = mildly agree

3 = agree and disagree equally

4 = mildly disagree

5 = strongly disagree

Strongly Agree 1 2 3 4 5 Strongly Disagree

1. Hypocrisy is on the increase in our society*
2. In dealing with strangers one is better off to be cautious until they have provided evidence that they are trustworthy*
3. This country has a dark future unless we can attract better people into politics*
4. Fear and social disgrace or punishment rather than conscience prevents most people from breaking the law*
5. Using the honour system of not having a teacher present exams would probably result in increased cheating*
6. Parents usually can be relied on to keep their promises
7. The United Nations will never be an effective force in keeping world peace*
8. The judiciary is a place where we can all bet unbiased treatment
9. Most people would be horrified if they know how much news that the public hear and sees is distorted*
10. It is safe to believe that in spite of what people say most people are primarily interested in their own welfare*
11. Even though we have reports in newspapers, radio, and T.V., it is hard to get objective accounts of public events*
12. The future seems very promising
13. If we really knew what was going on in international politics, the public would have reason to be more frightened than they now seem to be*
14. Most elected officials are really sincere in their campaign promises
15. Many major national sports contests are fixed in one way or another*

16. Most experts can be relied upon to tell the truth about the limits of their knowledge
17. Most parents can be relied upon to carry out their threats of punishments
18. Most people can be counted on to do what they saw they will do
19. In these competitive times one has to be alert or someone is likely to take advantage of you*
20. Most idealists are sincere and usually practice what they preach
21. Most salesmen are honest in describing their products
22. Most students in school would *not* cheat even if they were sure of getting away with it
23. Most repairmen will not overcharge even if they think you are ignorant of their speciality
24. A large share of accident claims filed against insurance companies are phony*
25. Most people answer public opinion polls honestly

* Denotes a reverse-scored item

Agreeableness Scale (used in Study 1)

Please complete the following questionnaire. Do not think too long about your responses.

Read each question carefully and indicate how true these statements are of you on a scale of 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Strongly Disagree 1 2 3 4 5 Strongly Agree

1. Have a good word for everyone
2. Believe that others have good intentions
3. Respect others
4. Accept people as they are
5. Make people feel at ease
6. Have a sharp tongue*
7. Cut others to pieces*
8. Suspect hidden motives in others*
9. Get back at others*
10. Insult people*

* Denotes a reverse-scored item

Machiavellianism Scale (used in Study 1)

Please complete the following questionnaire. Do not think too long about your responses.

Read each question carefully and indicate how true these statements are of you on a scale of 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Strongly Disagree 1 2 3 4 5 Strongly Agree

1. I am willing to be unethical if I believe it will help me succeed
2. I am willing to sabotage the efforts of other people if they threaten my own goals
3. I would cheat if there was a low chance of getting caught
4. I believe that lying is necessary to maintain a competitive advantage over others
5. The only good reason to talk to others is to get information that I can use to my benefit
6. I like to give the orders in interpersonal situations
7. I enjoy being able to control the situation
8. I enjoy having control over other people
9. Status is a good sign of success in life
10. Accumulating wealth is an important goal for me
11. I want to be rich and powerful someday
12. People are only motivated by personal gain
13. I dislike committing to groups because I don't trust others
14. Team members backstab each other all the time to get ahead
15. If I show any weakness at work, other people will take advantage of it
16. Other people are always planning ways to take advantage of the situation at my expense

Social Intelligence Scale (used in Studies 1 and 2)

Please complete the following questionnaire. Do not think too long about your responses.

Read each question carefully and indicate how true these statements are of you on a scale of 1 (*Describes me poorly*) to 7 (*Describes me well*).

Describes me poorly 1 2 3 4 5 6 7 Describes me well

1. I can predict other peoples' behaviour
2. I often feel that it is difficult to understand others' choices
3. I know how my actions will make others feel
4. I often feel uncertain around new people who I don't know
5. People often surprise me with the things they do
6. I understand other peoples' feelings
7. I fit in easily in social situations
8. Other people become angry with me without me being able to explain why
9. I understand others wishes
10. I am good at entering new situations and meeting people for the first time
11. It seems as though people are often angry or irritated with me when I say what I think
12. I have a hard time getting along with other people
13. I find people unpredictable
14. I can often understand what others are trying to accomplish without the need for them to say anything
15. It takes a long time for me to get to know others well
16. I have often hurt others without realizing it
17. I can predict how others will react to my behaviour
18. I am good at getting on good terms with new people
19. I can often understand what others really mean through their expression, body language etc.
20. I frequently have problems finding good conversation topics
21. I am often surprised by others' reactions to what I do

Revised Paranormal Belief Scale (used in Study 3)

Please indicate how much you agree or disagree with each item. Use the numbers as indicated below. There are no right or wrong answers. This is a sample of your own beliefs and attitudes. Thank you.

- | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----------------------|------------------------|----------------------|-----------|-------------------|---------------------|-------------------|
| Strongly
Disagree | Moderately
Disagree | Slightly
Disagree | Uncertain | Slightly
Agree | Moderately
Agree | Strongly
Agree |
1. The soul continues to exist though the body may die.
 2. Some individuals are able to levitate (lift) objects through mental forces.
 3. Black magic really exists.
 4. Black cats can bring bad luck.
 5. Your mind or soul can leave your body and travel (astral projection).
 6. The abominable snowman of Tibet exists.
 7. Astrology is a way to accurately predict the future.
 8. There is a devil.
 9. Psychokinesis, the movement of objects through psychic powers, does exist.
 10. Witches do exist.
 11. If you break a mirror, you will have bad luck.
 12. During altered states, such as sleep or trances, the spirit can leave the body.
 13. The Loch Ness monster of Scotland exists.
 14. The horoscope accurately tells a person's future.
 15. I believe in God
 16. A person's thoughts can influence the movement of a physical object.
 17. Through the use of formulas and incantations, it is possible to cast spells on persons.
 18. The number "13" is unlucky.
 19. Reincarnation does occur.
 20. There is life on other planets.
 21. Some psychics can accurately predict the future.
 22. There is a heaven and a hell.
 23. Mind reading is not possible.
 24. There are actual cases of witchcraft.
 25. It is possible to communicate with the dead.
 26. Some people have an unexplained ability to predict the future.

Social Vulnerability Scale (used in Study 3)

Please complete the following questionnaire on your beliefs and behaviours. Do not think too long about your responses. Read each question carefully and indicate how true these statements are of you on a scale of 0 (*Never*) to 4 (*Always*).

Never	Rarely	Sometimes	Often	Always
0	1	2	3	4
1. I have been persuaded to purchase unneeded items				
2. I have paid for items that never arrived				
3. I have signed up for dubious investments				
4. I have been persuaded to make large donations				
5. I have been taken in by postal scams				
6. I have supplied my bank account details to a stranger				
7. I have been tricked into paying others' bills				
8. I have been persuaded to subscribe to unwanted books				
9. I unquestioningly believe what I am told				
10. I believe things that are clearly untrue				
11. I believe everything I read				
12. I have been repeatedly deceived				
13. I have been taken in by repeated lies				
14. I am easily fooled				
15. I believe rumours unquestioningly				

Social Value Orientation (used in Study 6 and 7)

In this task we ask you to imagine that you have been randomly paired with another person, whom we will refer to simply as the "Other." This other person is someone you do not know and that you will not knowingly meet in the future. Both you and the "Other" person will be making choices by selecting either the letter A, B, or C. Your own choices will produce points for both yourself and the "Other" person. Likewise, the other's choice will produce points for him/her and for you. Every point has value: The more points you receive, the better for you, and the more points the "Other" receives, the better for him/her.

Here's an example of how this task works:

	A	B	C
You get	500	500	550
Other gets	100	500	300

In this example, if you chose A you would receive 500 points and the other would receive 100 points; if you chose B, you would receive 500 points and the other 500; and if you chose C, you would receive 550 points and the other 300. So, you see that your choice influences both the number of points you receive and the number of points the other receives.

Before you begin making choices, please keep in mind that there are no right or wrong answers--choose the option that you, for whatever reason, prefer most. Also, remember that the points have value: The more of them you accumulate, the better for you. Likewise, from the "other's" point of view, the more points s/he accumulates, the better for him/her.

For each of the nine choice situations, select A, B, or C, depending on which column you prefer most:

(1)	A	B	C
You get	480	540	480
Other gets	80	280	480

(2)	A	B	C
You get	560	500	500
Other gets	300	500	100

(3)	A	B	C
You get	520	520	580
Other gets	520	120	320

(4)	A	B	C
You get	500	560	490
Other gets	100	300	490

(5)	A	B	C
You get	560	500	490
Other gets	300	500	90

(6)	A	B	C
You get	500	500	570
Other gets	500	100	300

(7)	A	B	C
You get	510	560	510
Other gets	510	300	110

(8)	A	B	C
You get	550	500	500
Other gets	300	100	500

(9)	A	B	C
You get	480	490	540
Other gets	100	490	300

Self-Description Task (used in Studies 6 and 7)

You are going to answer questions about yourself. Your answers will be sent to your partner and you will receive your partner's answers. This is so you can be more familiar with the person you are going to play a game with.

How would you describe yourself?

1. I am a friendly person/I can get really competitive
2. I can be indecisive/I can be impulsive

If you had to choose, would you rather:

3. Lie to your parents/Cheat on your partner
4. Trust no one/Trust everyone

What is more important?

5. Caring for yourself/Caring for others
6. Being an emotional person/Being an intellectual person

Prepared Answers for Untrustworthy Profile (used in Studies 6 and 7)

How would you describe yourself?

I am a friendly person

I can get really competitive

How would you describe yourself?

I can be indecisive

I can be impulsive

If you had to choose, would you rather:

Lie to your parents

Cheat on your partner

If you had to choose, would you rather:

Trust no one

Trust everyone

What is more important?

Caring for yourself

Caring for others

What is more important?

Being an emotional person

Being an intellectual person

Cognitive Reflection Test (used in Study 8)

In this section of the study we will be asking you complete measures of thinking style.


1. A bat and a ball cost \$1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? ____ cents
2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ minutes
3. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days
4. If three elves can wrap three toys in hour, how many elves are needed to wrap six toys in 2 hours?
5. Jerry received both the 15th highest and the 15th lowest mark in the class. How many students are there in the class?
6. In an athletics team, tall members are three times more likely to win a medal than short members. This year the team has won 60 medals so far. How many of these have been won by short athletes?

Email Rating Task (used in Study 8)

In the first part of the experiment we will be presenting you with several emails. Your task is to read each email and then to rate it on the three questions below it.

[Here is one example of the stimuli used by Williams and Polage (2018). There were 12 different emails in the study]

From:	eBay (do_not_reply@surveys.ebay.com)
Date:	Wed, 22 Jun 2016 12:23:55 +0200
Subject:	Tell us what you think to win \$500



Hello!

Here at eBay we are developing our customer service and want to know what you think. Just complete our short online survey to tell us anything you would like to change about eBay and we'll enter you into a free prize draw to win \$500!

Just click [HERE](#) to be in with a chance to win.

Thank you from eBay!

Sincerely,

eBay Customer Service

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How likely is it that you would respond?

Very Unlikely			Neutral			Very Likely
1	2	3	4	5	6	7

How trustworthy is this email?

Very Untrust-worthy			Neutral			Very Trust-worthy
1	2	3	4	5	6	7

How persuasive is this email?

Not persuasive at all			Neutral			Extremely persuasive
1	2	3	4	5	6	7

Bullshit Receptivity Scale (used in Study 8)

We are interested in how people experience the profound. Below are a series of statements taken from relevant websites. Please read each statement and take a moment to think about what it might mean. Then please rate how “profound” you think it is. Profound means “of deep meaning; of great and broadly inclusive significance.

Not at all profound	Somewhat profound	Fairly profound	Definitely profound	Very profound
1	2	3	4	5

1. Hidden meaning transforms unparalleled abstract beauty.
2. Good health imparts reality to subtle creativity.
3. Wholeness quiets infinite phenomena.
4. Please answer 2 to this question
5. The future explains irrational facts.
6. Imagination is inside exponential space time events.
7. We are in the midst of a self-aware blossoming of being that will align us with the nexus itself.
8. Consciousness consists of frequencies of quantum energy. “Quantum” means an unveiling of the unrestricted.
9. If you are reading this question, please answer 6
10. Consciousness is the growth of coherence, and of us.
11. We are in the midst of a high-frequency blossoming of interconnectedness that will give us access to the quantum soup itself.
12. Today, science tells us that the essence of nature is joy.

Appendix C: Spearman's Correlations

Study 7

Table 1

Spearman's Correlations of the trust items

	Trust 1	Trust 2	Trust 3	Trust 4	Trust 5
Trust 1	-				
Trust 2	.431**	-			
Trust 3	.566**	.411**	-		
Trust 4	.334*	.143	.325*	-	
Trust 5	.286*	.249*	.289*	.300*	-

Note. * $p < .05$, ** $p < .0005$

Appendix D: Additional analyses for AQ-Short

Study 2

Theory of Mind. In order to assess Theory of Mind a short version of the Autism-Spectrum Quotient (AQ-Short; Hoekstra et al., 2011) was used. The AQ-short (Hoekstra et al., 2011) have been found to be a useful self-report instrument to quantify where a participant is situated on a spectrum ranging from normality to autistic. Respondents were asked to rate their agreement on the 28 items with each statement on a 4-point Likert-style scale ranging from 1 (*Definitely agree*) to 4 (*Definitely disagree*) where higher scores indicated greater endorsement of autistic traits. Possible scores ranged from 28 to 112. Example items include: “*I find it hard to make new friends*” and “*I find it difficult to work out people’s intentions.*” Of the 28 items, 14 were reverse scored. In the present study, the AQ-short was considered reliable ($\alpha = 0.78$). Table 2 presents the descriptive statistics.

Table 2

Study 2: Summary of Descriptive Statistics for Gullibility Scale and Two Factors

	Gender			<i>t</i>	<i>p</i>
	Total (N = 326)	Male (N = 71)	Female (N = 255)		
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	Mean (<i>SD</i>)		
Gullibility	35.42 (12.62)	31.89 (11.91)	36.40 (12.66)	-2.69	.01
Persuadability	16.67 (6.88)	14.65 (6.16)	17.23 (6.97)	-2.83	.01
Insensitivity	18.75 (6.84)	17.24 (6.93)	19.17 (6.77)	-2.11	.04
SI	99.44 (18.02)	100.31 (21.10)	99.20 (17.11)	0.46	.65
AQ-Short	63.27 (9.30)	63.34 (10.65)	63.25 (8.91)	0.07	.95
Trust	64.11 (9.98)	65.13 (11.80)	63.82 (9.41)	0.97	.33

Note. *SD* = Standard Deviations, *SI* = Social Intelligence

Intercorrelations

Table 3 presents the intercorrelations among the factors. As can be seen in the table, there was no relationship between trust and gullibility, replicating the results of Study 1. Further, there was a significant positive relationship between the Gullibility Scale and the AQ-Short— indicating that the more gullible a person is, the more autism-like qualities they are likely to report such as low Theory of Mind. Also, there was a significant negative relationship between gullibility and social intelligence; again, indicating that the more social intelligence a person has, the less gullible they are likely to be, replicating the results of Study 1. However, partial correlations revealed that the relationship between gullibility and Theory of Mind was no longer significant when controlling for social intelligence ($r = .04, p = .50$). Further, when controlling for Theory of Mind, the relationship between gullibility and social intelligence was still significant ($r = -.23, p < .0005$). Hence, the Theory of Mind measure did not explain any unique variance of gullibility over and above the measure of social intelligence.

Table 3

Study 2: Factor Correlation Matrix

	Gullibility Scale	Persuadable	Insensitivity	AQ-Short	ITS	SI	SIP	SS	SA
Gullibility Scale	-	.921**	.920**	.279**	.085	-.355**	-.337**	-.228**	-.289**
Persuadable		-	.694**	.260**	.077	-.323**	-.276**	-.222**	-.275**
Insensitivity			-	.254**	.079	-.331**	-.344**	-.197**	-.257**
AQ-Short				-	-.183**	-.718**	-.516**	-.736**	-.420**
ITS					-	.175**	.067	.152**	.195**
SI						-	.834**	.800**	.739**
SIP							-	.514**	.495**
SS								-	.314**
SA									-

Note. * $p < .05$, ** $p < .0005$, ITS = Interpersonal Trust Scale, SI = Social Intelligence, SIP = Social Information Processing,

SS = Social Skills, SA = Social Awareness

Overall, the Gullibility Scale was positively correlated with a measure of Autism, suggesting that people who are gullible also have less Theory of Mind. This perspective-taking ability could be crucial when detecting cues of untrustworthiness. Baron-Cohen (2000), in a review on Theory of Mind and Autism, described that children with Autism often struggle to understand when they are being deceived. Similarly, they also struggle to deceive other people, as both detecting deception and attempting to deceive others requires the ability to understand other people's minds (i.e., Theory of Mind). Relatedly, the results of this study replicated those of Study 1 in that the Gullibility Scale was negatively correlated with social intelligence, even when controlling for the effect of Theory of Mind. However, when controlling for social intelligence, Theory of Mind ceased to have a significant relationship with gullibility. This finding suggests that social intelligence not only accounts for the effects of Theory of Mind in gullibility, but it also explains more unique variance in this relationship.

In terms of the link between gullibility and social intelligence, of the three subscales in the Tromsø Social Intelligence Scale (Grieve & Mahar, 2013; Silvera et al., 2001), the Social Information Processing (e.g., *I can predict other peoples' behaviour*) had the strongest relationship with the Gullibility Scale. The items in that subscale were similar to items on the AQ-Short used to measure Theory of Mind (*"I find it difficult to work out people's intentions"*). This suggests that this inability to perspective-take, or not processing social information, is related to the inability to detect cues of untrustworthiness. Theory of Mind has been understood as an evolved mechanism that is concerned with understanding, predicting, and manipulating the behaviours of others (Charlton, 2001). It is a means by which observable behaviours are understood in terms of inferred mental attributes (Charlton, 2001). If a person is lacking in this skill, then perhaps specific training could improve this skill and, as result, lead to an increase in the ability to detect cues of untrustworthiness, making them less gullible.

There is mixed research on whether Theory of Mind can be improved. Some studies suggest that it may be improved with an intervention for people with Autism Spectrum Disorder (Gantman et al., 2012; Ozonoff & Miller, 1995). However, a systematic review of Theory of Mind interventions found that although it may be taught, the learned skills are mostly not maintained and do not generalise to other settings (Fletcher-Watson et al., 2014). This suggests that levels of Theory of Mind may be static and unchangeable in the long-term. Hence, if someone has low Theory of Mind, they may be less able to detect cues of untrustworthiness, making them more vulnerable to being gullible, and this may be a relatively stable individual difference.

However, if it is a lack of social intelligence rather than Theory of Mind, that is making a person vulnerable to being gullible, this perhaps can be remedied with learning through experience. The partial correlations demonstrated that, when controlling for the effects of Theory of Mind, social intelligence still had a significant relationship with gullibility. However, the converse did not (i.e., when controlling for the effects of social intelligence, Theory of Mind no longer had a significant relationship with gullibility). This disparity suggests that although issues with Theory of Mind may affect gullibility, overall lower levels of social intelligence will have more of an effect on a person's gullibility. Although there is little empirical research on improving social intelligence through training, there is some preliminary evidence that the related construct, emotional intelligence, may be improved with specific interventions (e.g., Dacre Pool & Qualter, 2012; Nelis et al., 2009). Therefore, if it is a lack of social intelligence that is leading a person to being unable to detect cues of untrustworthiness, perhaps interventions designed to improve social intelligence may also lead to a decrease in gullibility. However, the relationship between both the AQ-Short and the social intelligence measure with the Gullibility Scale was moderate at best, hence it is not the only factor associated with gullibility.

Study 6

Theory of Mind. Theory of Mind is considered to be the ability to infer another person's mental state, such as beliefs, desires, emotions, and intentions, which can motivate actions (Baron-Cohen, 2001). A distinctive feature of Autism Spectrum Disorders is a difficulty with understanding other minds (Baron-Cohen, 2001). Having a diminished ability to interpret another person's behaviour in terms of their mental states but also to interact in complex social groups and close relationships, to empathise with others, and to predict how others will think, feel, and behave may leave a them more vulnerable to being gullible. Furthermore, this inability to perspective-take could be related to behaviour in a Prisoner's Dilemma. One study using fMRI had participants completing both Prisoner's Dilemma and Ultimatum Games found that the same areas of the brain were utilised in those decision-making games as were used in other Theory of Mind tasks (Rilling, Sanfey, Aronson, Nystrom, & Cohen, 2004).

To assess Theory of Mind the abridged version of the Autism-Spectrum Quotient (AQ-Short) was used (Hoekstra et al., 2011). This version has only 28 items compared with 50 items in the original scale (Baron-Cohen et al., 2001). Participants were asked to indicate how true the statements were of them from 1 (*Definitely Agree*) to 4 (*Definitely Disagree*). The possible range of scores fell between 28 and 112, with higher scores indicating higher levels of Autism (suggestive of lower levels of Theory of Mind). Example items include "*I frequently get strongly absorbed by one thing*" and "*I find it hard to make new friends*". Past Cronbach's alphas have been reported as $\alpha = .78$ (Hoekstra et al., 2011) and in the present study was considered reliable ($\alpha = 0.76$).

Results

Univariate Descriptive Statistics

The means and SD for the Gullibility Scale, the Autism Quotient measure (AQ-Short), and trust can be seen in Table 4. There were no significant differences between the genders on Gullibility or Autism, but there was for trust, with females scoring significantly higher on the trust measure than males.

Table 4

Summary of Descriptive Statistics

	Gender			t	p
	Total (N = 104)	Male (N = 26)	Female (N = 77)		
	Mean (SD)	Mean (SD)	Mean (SD)		
Gullibility	39.23 (12.25)	37.77 (11.67)	39.60 (12.50)	-.66	.51
Persuadability	18.93 (7.16)	17.62 (6.67)	19.35 (7.35)	-1.06	.29
Insensitivity	20.30 (6.38)	20.15 (6.30)	20.25 (6.43)	-.06	.95
AQ-Short	65.29 (8.51)	67.12 (9.86)	64.53 (7.93)	1.35	.18
Trust	64.62 (8.83)	60.46 (9.22)	65.95 (8.35)	-2.82	.01

Note. SD = Standard Deviations

Bivariate Descriptive Statistics for Gullibility, Theory of Mind, and Trust

As expected, there was a significant positive relationship between gullibility and the autism measure (AQ-short), ($r = .38, p < .0005$). The relationship subscales of the Gullibility Scale to the autism measure were very similar to the overall scale, Persuadability ($r = .30, p = .002$) and Insensitivity ($r = .39, p < .0005$). Nor was there a significant relationship between the autism measure and trust ($r = -.13, p = .19$).

Analysis of Covariance with Total Number of Cooperative Decisions Made including the AQ-Short

The Analysis of Covariance (ANCOVA) was run with three main effects, SVO (pro-self, pro-social, no SVO), AQ score, and gullibility score to determine if these variables affected the total number of cooperative decisions made over the two Prisoner's Dilemmas. A participant could make zero cooperative decisions, one cooperative decision, or two cooperative decisions across the two games, providing a continuous dependent variable. The results are presented in Table 5.

Table 5

ANCOVA with Gullibility, AQ, and SVO

	B	SE	F	p	95% Confidence Interval		
					Lower Bound	Upper Bound	Partial Eta Squared
Intercept	.406	.602	1.351	.248	-.791	1.602	.005
Gullibility	.001	.007	.046	.830	-.012	.015	.001
AQ	.006	.010	.370	.545	-.013	.025	.004
SVO	.569	.155	13.537	.000	.261	.877	.139

Note. R Squared = .145 (Adjusted R Squared = .114)

Only SVO had a significant effect on the number of cooperative decisions made. Participants who were pro-social made significantly more cooperative decisions ($M = 1.42$, $SE = .10$) than participants who were pro-self ($M = 0.85$, $SE = .16$, $p < .0005$, CI [.263, .883]). There was no difference in number of cooperative decisions between participants who had no SVO ($M = 1.18$, $SE = .18$) and pro-social ($M = 1.42$, $SE = .10$, $p = .235$, CI [-.639, .161]), or between participants with no SVO ($M = 1.18$, $SE = .18$) and pro-self ($M = .85$, $SE =$

.12, $p = .126$, CI [-.095, .763]). Neither gullibility nor AQ scores significantly affected the number of cooperative decisions participants made.

Logistic Regressions were also run on the two Prisoner's Dilemma games separately. Table 6 presents the results for the logistic regressions on the simultaneous Prisoner's Dilemma. Controlling for AQ and SVO, gullibility did not appear to affect the likelihood a participant cooperating in a Prisoner's Dilemma. However, SVO appeared to have a significant effect on the decision made in the simultaneous Prisoner's Dilemma. The model had low predictive strength (Nagelkerke pseudo $R^2 = .18$) but reached significance. Comparing pro-social participants with pro-self participants, the odds ratio of consistency indicates that if the participant was pro-social they were 5.4 times more likely to cooperate on the simultaneous Prisoner's Dilemma than participants with a pro-self orientation, with the 95% confidence interval indicating that it could be as low as 2.1 times and as high as 14.0 times as likely to cooperate. Similarly, participants with no orientation were 4.4 times more likely to cooperate than participants with a pro-self orientation.

Table 6

Binary Logistic Regression for Simultaneous Prisoner's Dilemma

				95% CI for Odds Ratio		
	B (SE)	Wald	<i>p</i>	Lower	Odds	Upper
Constant	.502 (1.67)	.090	.764		1.652	
AQ	-.018 (.03)	.439	.507	.931	.982	1.036
Gullibility	.008 (.02)	.188	.665	.971	1.008	1.047
SVO		13.050	.001			
Pro-social ¹ vs. None	.208 (.62)		.737	.365	1.231	4.159
Pro-self vs. None ¹	1.486 (.66)	5.114	.024	.1.219	4.420	16.025
Pro-self vs. Pro-social ¹	1.694 (.48)		.000	2.121	5.443	13.965

Note. $R^2 = .13$ (Cox & Snell), .18 (Nagelkerke), Model $\chi^2(4) = 14.45$, $p = .006$. ¹ The reference category

Table 7 presents the results for the logistic regressions testing sequential Prisoner's Dilemma. Controlling for AQ and SVO, gullibility did not appear to affect the likelihood a participant cooperating in a sequential Prisoner's Dilemma. Similarly, controlling for gullibility and AQ, SVO did not have a significant effect on the likelihood of a participant cooperating in a sequential Prisoner's Dilemma.

Table 7

Binary Logistic Regression for Sequential Prisoner's Dilemma

	B (SE)	Wald	<i>p</i>	95% CI for Odds Ratio		
				Lower	Odds	Upper
Constant	.601 (1.59)	.143	.706		1.824	
AQ	-.014 (.03)	.281	.596	.937	.986	1.038
Gullibility	.000 (.02)	.000	.988	.966	1.000	1.036
SVO		3.576	.167			
Pro-social ¹ vs. None	.825 (.58)	2.016	.156	.730	2.283	7.134
Pro-self ¹ vs. None	.078 (.61)	.016	.899	.326	1.081	3.586
Pro-self vs. Pro-social ¹	.748 (.46)	2.692	.101	.865	2.112	5.160

Note. $R^2 = .04$ (Cox & Snell), $.05$ (Nagelkerke), Model $\chi^2 (4) = 3.89$, $p = .421$.¹ The reference category

Appendix E: Pilot Study of Sending Scam Emails

The aim of the study was to see if there is a relationship between scores on the gullibility scale and if participants click on a URL in a fake scam email sent to them. The participants were selected from the first-year psychology pool to participate in the study. No mention of gullibility was included in the advertisement or study information. After giving informed consent the participants completed several personality measures online including the 12-item Gullibility Scale.

In the consent form and at the end of the study the students were told that within 14 days of completing the experiment they would receive a follow-up email about the experiment. They were asked to provide an email address for this purpose. Within the 14-day window we sent an email that looked like a fraudulent email. It notified them that there were security issues with their Facebook account and the participant was asked to click through and enter their details to rectify this situation. If the participants clicked through and entered their details, a page appeared to inform them that this was part of the experiment, that their details were secure, and gave them information about phishing scams. Then, at the end of the 14 days, every participant was sent an email asking them if they noticed our email and provided them with more information about the study and how to avoid phishing scams. It was predicted that participants with higher gullibility scores are more likely to click the hyperlink and enter their details on the scam email than participants lower in gullibility.

A total of 47 participants, with a mean age of 22.40 years ($SD = 5.81$) completed the study (16 males, 30 females, and one person elected not to specify a gender). The mean gullibility of the participants who did not enter their details into the scam emails ($N=43$, $M=34.34$, $SD=12.73$) was lower than the mean gullibility of the participants who did enter their details ($N=4$, $M=37.00$, $SD= 9.42$). However, the sample size was too small to proceed with any significance testing of this difference.

Appendix F: Ethics approval letters

Studies 1 and 2

Office of the Deputy Vice-Chancellor
(Research)

Research Office
Research Hub, Building C5C East
Macquarie University
NSW 2109 Australia
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<http://www.research.mq.edu.au/>
ABN 90 952 801 237



10 August 2015

Dr Trevor Case
Department of Psychology
Faculty of Human Sciences
Macquarie University
NSW 2109

Dear Dr Case

Reference No: 5201500596

Title: *Social Perceptions and Trust*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)) at its meeting on 31 July 2015 at which further information was requested to be reviewed by the Ethics Secretariat.

The requested information was received with correspondence on 5 August 2015.

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted at:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated March 2014) (the *National Statement*).

This letter constitutes ethical and scientific approval only.

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement*, which is available at the following website:

<http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White

Director, Research Ethics & Integrity,
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

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

Study 3

Office of the Deputy Vice-Chancellor
(Research)

Research Services
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26 February 2018

Dear Dr Case

Reference No: 5201800086

Title: *Personality and beliefs*

Thank you for submitting the above application for ethical and scientific review. Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)) considered your application.

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted by Ms Alessandra Teunisse under the supervision of Dr Trevor Case.

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated May 2015) (the *National Statement*).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement*, which is available at the following website:

<http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol and associated documents must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White

Director, Research Ethics & Integrity,
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

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

Study 4

Office of the Deputy Vice-Chancellor
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Macquarie University
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ABN 90 962 801 237



15 March 2017

Dear Dr Case

Reference No: 5201700088

Title: *Scam Compliance and Personality Styles*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)).

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted by:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated May 2015) (the *National Statement*).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement*, which is available at the following website:

<http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol and associated documents must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White

Director, Research Ethics & Integrity,

Chair, Human Research Ethics Committee (Human Sciences and Humanities)

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

Study 5

Human Sciences Ethics Subcommittee
Macquarie University, North Ryde
NSW 2109, Australia



23/07/2018

Dear Dr Case,

Reference No: 5201830943467
Project ID: 3094
Title: Testing the Reliability of a New Scale

Thank you for submitting the above application for ethical review. The Faculty of Human Sciences Human Research Ethics Subcommittee has considered your application.

I am pleased to advise that ethical approval has been granted for this project to be conducted by Dr Trevor Case.

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research 2007 (Updated July 2018).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the National Statement, available from the following website:
https://www.nhmrc.gov.au/_files_nhmrc/file/publications/national-statement-2018.pdf.
2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol. You will be sent an automatic reminder email one week from the due date to remind you of your reporting responsibilities.
3. All adverse events, including unforeseen events, which might affect the continued ethical acceptability of the project, must be reported to the subcommittee within 72 hours.
4. All proposed changes to the project and associated documents must be submitted to the subcommittee for review and approval before implementation. Changes can be made via the [Human Research Ethics Management System](#).

The HREC Terms of Reference and Standard Operating Procedures are available from the Research Services website:
<https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics>

It is the responsibility of the Chief Investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the [Faculty Ethics Officer](#).

The Human Sciences Ethics Subcommittee wishes you every success in your research.

Yours sincerely,

Dr Naomi Sweller

Chair, Human Sciences Ethics Subcommittee

The Faculty Ethics Subcommittees at Macquarie University operate in accordance with the National Statement on Ethical Conduct in Human Research (2007), [Section 5.2.22].

Study 6

OFFICE OF THE DEPUTY VICE-CHANCELLOR
(RESEARCH)
Research Office
C5C East Research HUB, Level 3



17 August 2016

Dr Trevor Case
Department of Psychology
Faculty of Human Sciences
Macquarie University NSW 2109

Reference: 5201600381(D)

Dear Dr Case,

FINAL APPROVAL

Title of project: Game playing and personality styles

Thank you very much for your response. Your response has addressed the issues raised by the Faculty of Human Sciences Human Research Ethics Sub-Committee and approval has been granted, effective 30th June 2016. This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

<https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

The following personnel are authorised to conduct this research:

Chief Investigator: Dr Trevor Case
Co-Investigator: Ms Alessandra Kiri Teunisse

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).
2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 30th June 2017
Progress Report 2 Due: 30th June 2018
Progress Report 3 Due: 30th June 2019
Progress Report 4 Due: 30th June 2020
Final Report Due: 30th June 2021

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/application_resources

OFFICE OF THE DEPUTY VICE-CHANCELLOR
(RESEARCH)
Research Office

C5C East Research HUB, Level 3



3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

<http://www.mq.edu.au/policy>

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide Macquarie University's Research Grants Officer with a copy of this letter as soon as possible. The Research Grants Officer will not inform external funding agencies that you have final approval for your project and funds will not be released until the Research Grants Officer has received a copy of this final approval letter.

Yours sincerely,

Dr Anthony Miller
Chair
Faculty of Human Sciences Ethics Review Sub-Committee
Human Research Ethics Committee

Study 7

Office of the Deputy Vice-Chancellor
(Research)

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ABN 90 952 801 237



15 March 2017

Dear Dr Case

Reference No: 5201700082

Title: *Game Playing, Face Perception, and Memory*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)).

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted by:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated May 2015) (the *National Statement*).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement*, which is available at the following website:

<http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research>

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol and associated documents must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White

Director, Research Ethics & Integrity,
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

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

Study 8

Faculty of Human Sciences Human Research Ethics Subcommittee
Macquarie University, North Ryde
NSW 2109, Australia



04/12/2018

Dear Dr Case,

Reference No: 5201838146527

Project ID: 3814

Title: Personality, Thinking Styles, and Unsolicited Emails

Thank you for submitting the above application for ethical review. The Human Sciences Subcommittee has considered your application.

I am pleased to advise that ethical approval has been granted for this project to be conducted by Dr Trevor Case, and other personnel: Ms Alessandra Teunisse.

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research 2007, (updated July 2018).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the National Statement, available from the following website:
<https://nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018>.
2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol. You will be sent an automatic reminder email one week from the due date to remind you of your reporting responsibilities.
3. All adverse events, including unforeseen events, which might affect the continued ethical acceptability of the project, must be reported to the subcommittee within 72 hours.
4. All proposed changes to the project and associated documents must be submitted to the subcommittee for review and approval before implementation. Changes can be made via the [Human Research Ethics Management System](#).

The HREC Terms of Reference and Standard Operating Procedures are available from the Research Services website:
<https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics>.

It is the responsibility of the Chief Investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the [Faculty Ethics Officer](#).

The Human Sciences Subcommittee wishes you every success in your research.

Yours sincerely,

Dr Naomi Sweller

Chair, Human Sciences Ethics Subcommittee

The Faculty Ethics Subcommittees at Macquarie University operate in accordance with the National Statement on Ethical Conduct in Human Research 2007, (updated July 2018), [Section 5.2.22].