2008

Trust and Cheater Detection: Evolved Cognitive Mechanisms for Social Exchange

Kori James Stroub

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https://dx.doi.org/doi:10.21220/s2-75d0-4z81

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Trust and Cheater Detection: Evolved Cognitive Mechanisms for Social Exchange

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A Thesis presented to the Graduate Faculty of the College of William and Mary in Candidacy for the Degree of Master of Arts

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The College of William and Mary
January, 2008
This Thesis is submitted in partial fulfillment of
the requirements for the degree of

Master of Arts

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Approved by the Committee, August, 2007

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Social contract theory (Cosmides, 1989) hypothesizes that the presence of social exchange content activates the evolved cheater detection mechanism, which is specifically designed to monitor for violations of socially prescribed rules or contracts. More recently, Yamagishi (Yamagishi, 1998; Kiyonari & Yamagishi, 2000) has proposed a connection between general levels of trust towards others and sensitivity to information regarding the untrustworthiness of a potential interaction partner. The current study was designed to integrate social contract theory and Yamagishi's work on trust. It was hypothesized that if generalized trust influences the level of suspicion people hold towards others, then this should in turn influence the cheater detection mechanism. Yamagishi has also proposed that trust develops out of an individual’s socio-cultural experiences which can be operationalized as social intelligence. This prediction that social intelligence influences the relationship between trust and cheater detection was also tested.
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Acknowledgments

The author would like to thank Dr. Lee Kirkpatrick for his guidance and encouragement throughout the course of this project. The author would also like to express his gratitude to Dr. Todd Thrash and Dr. Constance Pilkington for their careful evaluation and critique of this manuscript.
Trust and Cheater Detection: Evolved Cognitive Mechanisms for Social Exchange

For over 25 years, evolutionary psychologists have been investigating the neurocognitive adaptations for human cooperation. One aspect of human cooperation in particular, social exchange, has received a large amount of attention from evolutionary-minded researchers (Cosmides, 1989; Cosmides & Tooby, 1992; Fiddick, Cosmides & Tooby, 2000; Gigerenzer & Hug, 1992). Social exchange can be defined as an interaction between two parties where one party provides a benefit to the other with the expectation that the act will be reciprocated. Social exchange is a broad category, including explicit or implicit agreements, immediate or deferred exchange, and may take place between individuals or more complex social structures (Cosmides, 2005). Thus social exchanges can take the form of a simple transfer of goods from one individual to another, or a more complicated relationship between an individual and a social institution. The common element present in all social exchanges is the presence of costs and benefits for all parties involved in the interaction.

Historically, evolutionary social exchange research can be divided into two methodological paradigms: the Wason task and the prisoner’s dilemma. These two research paradigms, both designed to address the issue of social exchange, focus on two separate but related adaptive problems. In order for reciprocal exchange to evolve, at least two conditions must be satisfied. First, individuals must be motivated to cooperate. That is, reciprocal exchange cannot take place if no one is interested in forming such relationships (Tooby & Cosmides, 1992). Second, once an exchange relationship has been formed, involved parties must possess the ability to detect and punish cheaters (Axelrod, 1984; Trivers, 1971). The prisoner’s dilemma is well suited to testing
hypotheses regarding how and when individuals will cooperate, while the Wason task is preferable when studying how and when people detect cheating.

Although both the motivation to cooperate and the ability to guard against exploitation are equally important (Tooby & Cosmides, 1992), research on cheater detection has overshadowed much of the prisoner's dilemma research on the motivation to engage in social exchange (Kiyonari & Yamagishi, 2000). The primary reason for this imbalance has to do with the particularly robust findings in the Wason task literature regarding the conditions under which humans effectively detect potential instances of cheating. Since 1985, Cosmides and colleagues have proposed and tested hypotheses regard the detection of cheating within social exchanges. This research program has led to the articulation and development of social contract theory (SCT). Social contract theory starts with the well established premise that mutual cooperation cannot evolve without the ability to detect and punish cheaters (Axelrod, 1984; Trivers, 1971). It goes on to hypothesize the existence of an evolved mechanism designed specifically to detect cheating within the context of social exchange (the cheater detection mechanism; CDM).

Recently Yamagishi and colleagues, primarily prisoner's dilemma researchers interested in the development of trust as a precursor to cooperation, have drawn attention to the fact that while cheater detection is important, it would be a useless skill if no one was motivated to cooperate in the first place (Kiyonari, Tanida, & Yamagishi, 2000). In other words, cheater detection is only beneficial once a person has decided to unilaterally cooperate. Starting with that simple observation, the two experimental paradigms are mapped onto Pruitt and Kimmel's (1977) goal/expectation theory of cooperation. According to this theory, before mutual cooperation can be obtained, two conditions have
to be satisfied: 1) the goal of the interaction must be transformed from the narrow pursuit of self-interest to one of mutual gain, and 2) the interaction partner must be expected to forego the narrow pursuit of self-interest as well. According to Yamagishi and colleagues, cheater detection research focuses on the second, “expectation” component of the theory.

Kiyonari, Tanida, and Yamagishi (2000) go on to hypothesize that if humans possess a CDM designed to protect against those who would break the “expectation” of cooperation, then we should also possess a mechanism designed to motivate us towards the goal of mutual cooperation. Yamagishi and colleagues call this second mechanism the **Social Exchange Heuristic (SEH)**. Yamagishi and colleagues have made several untested predictions about the nature of this mechanism, many of which have potential implications for SCT. It is the purpose of the current study to test these predictions, seeking a potential integration of SCT and the SEH. The following sections outline, in greater detail, the two theories and then discuss how they may be interrelated.

*Cheater Detection in Social Exchange*

The Wason selection task has been used since the 1960’s as a tool to understand the nature of human logical reasoning (Wason, 1966). Karl Popper postulated that science was based on the principles of hypothetico-deductive reasoning, that is, the search for examples that contradict a given hypothesis (Popper, 1959). Wason developed the selection task in an attempt to determine if humans use this same deductive logic in everyday life. Thus the Wason task tests a participant’s ability to search for violations of a hypothesis. The hypothesis in a Wason task is presented as a conditional rule of the form *If P then Q*. Participants are asked to look for potential violations of the rule by
examining a set of four facts, represented by four cards. The cards have information on both sides. The conditional hypothesis to be evaluated concerns the relationship between the information on both sides of the cards. It is the participant’s task to determine which cards need to be turned over in order to check for violations of the rule. The information visible to participants corresponds to $P$, $not P$, $Q$, and $not Q$. If a card has information about $P$ on one side, then the other side will have information about $Q$, and vice versa. Correctly solving the task requires participants to select the cards that represent $P$ and $not Q$.

Despite the apparent simplicity of the standard, abstract Wason task, it is very difficult for participants to solve correctly. It is not uncommon for fewer than 20% of participants to correctly solve standard versions of the task (Cosmides 1989; Gigerenzer & Hug, 1992). Since its inception, a large literature has emerged dedicated to understanding the source of the selection task’s difficulty and the ways in which performance can be improved. For example, it has been suggested that more realistic rules facilitate performance on the task (Wason & Shapiro, 1971). However tests of that hypothesis have failed to find such an effect (Manktelow & Evans, 1979). It has also been suggested that prior, real-world experience with a particular rule helps to facilitate task performance (Cox & Griggs, 1982), which has subsequently been ruled out as a plausible hypothesis (Cosmides, 1989). From this research, a confusing pattern began to emerge in which certain manipulations improved performance while others had no effect. Furthermore, no existing theory seemed to link together and effectively explain the various performance-enhancing manipulations.
However, in 1989, Cosmides analyzed the existing pattern of Wason results in terms of the type of tasks the human mind was designed to solve. This evolutionary task analysis ultimately led to the development of SCT, which currently provides the most comprehensive and parsimonious explanation of Wason task performance. Social contract theory is grounded in an evolutionary analysis of social cooperation and reciprocity which argues that human sociality could not evolve without the ability to detect and punish cheaters (Axelrod, 1984; Trivers, 1971). Based on this premise, Cosmides hypothesized that humans possess a “look for cheaters” algorithm (the CDM) which is activated during social exchange situations. Social exchanges can be expressed in the Wason task by a rule with the following structure: *If you take the benefit, then you must meet the requirements (i.e. pay the costs).* Cheating on this rule involves the taking of a benefit without paying the associated cost. Furthermore, solving a social contract Wason task correctly, choosing the *P* and *not Q* cards, is synonymous with correctly detecting potential instances of cheating.

According to Cosmides, many of the studies that reported improved Wason performance in the past were unknowingly manipulating social exchange content, subsequently activating the CDM. For example, Cheng and Holyoak (1985) constructed a content-free Wason task that elicited high levels of performance. This abstract Wason task contained the rule *“If one is to take action A, then one must first satisfy precondition B.”* According to Cosmides (1989), Cheng and Holyoak’s rule, although abstract, contains an implicit cost-benefit structure. Saying someone must satisfy a precondition is just another way of saying that they must pay a cost or meet a requirement. Furthermore, paying a cost to be allowed to take a particular action is a linguistic cue that the action is
beneficial. Supporting her analysis, Cosmides constructed Wason tasks that were identical, manipulating only the presence of social exchange content. Consistent with her hypothesis, the social contract tasks facilitated performance to a significant degree. For example, Cosmides created the Grover School Wason task which has the following rule: "If a student is to be assigned to Grover school, then that student must live in Grover city." The content of each Wason task was identical except for one crucial manipulation: The presence of social exchange cues. In the non-social contract version, the participant was cued into the perspective of someone monitoring board of education volunteers who were given the task of assigning incoming students to the appropriate school. The scenario mentions two cities and their corresponding schools: Grover City, Grover school, Hanover City, and Hanover school. Volunteers are supposed to use the rule when assigning students. It is the task of the participant to make sure no violations of the rule occur. The social contract version includes two additional pieces of information. First, participants are told that Grover school is a much better school than Hanover. Second, each volunteer has a child enter the school system and each volunteer assigned their own child to a school. This additional information provides a motive for volunteers to cheat on the rule in order to ensure that their own child gets into the better of the two schools. Again, it is the task of the participant to monitor for violations of the rule. Simply adding the social exchange content to the Grover school task increased performance by 45 percent (30% correct in the non-social contract version versus 75% correct in the social contract version). Subsequently, Cosmides' original results have been replicated across many different experiments using a variety of Wason tasks (Cosmides & Tooby, 1992; Gigerenzer & Hug, 1993; Fiddick & Cummins, 2001).
In summary, SCT states that humans possess an evolved mechanism specifically designed to detect cheating in social exchange. This mechanism is activated by the presence of a social exchange, that is, a relationship involving the reciprocal exchange of benefits. The Wason task has been used to show that when social exchange content is present, participants are particularly adept at solving the task correctly, that is, detecting instances of potential cheating. However, the ability to detect cheating is not the only prerequisite for the evolution of human cooperation. Before the ability to detect cheating can have any significance at all, humans have to be motivated to cooperate, that is, to enter into social exchanges. Recently, Yamagishi and colleagues have begun analyzing this facet of the evolution of human cooperation. The resulting theoretical framework is a marriage of Yamagishi's earlier work on trust and the game theoretical approach to human cooperation (Kiyonari, Tanida, & Yamagishi, 2000; Yamagishi 1998; Yamagishi & Kikuchi, 2001).

The Social Exchange Heuristic and Trust

Trust, Gullibility, and Social Intelligence. A popular belief about highly trusting individuals is that they are naïve or gullible. Indeed, there exists empirical evidence to support this claim. For example, Gurtman and Lion (1982) have argued that high trust is an indicator of the indiscriminant acceptance of information provided by others. Similarly, Garske (1976) suggests that highly trusting individuals have a less complex cognitive structure than less trusting individuals which is less useful for interpreting the behavior of others. However intuitively convincing this view may be, a significant body of research does not support this connection between trust and gullibility (Rotter, 1980). The aforementioned conception of trust relies on defining trust as the willingness to
accept information provided by others. If trust equals acceptance of information, then by definition, trustful people are gullible. However, if as Rotter (1967) suggests, trust relates to an individual’s general *expectations* of other people’s trustworthiness than the connection between trust and gullibility is severed. Believing that other will generally tend to act in a trustworthy manner is logically independent from how likely one is to actually accept what others say. Thus, according to Rotter (1980), general trust can be defined as default expectations regarding other people’s trustworthiness, while gullibility is insensitivity to information suggesting untrustworthiness.

Building upon Rotter’s conceptual framework, Yamagishi and colleagues (Yamagishi, Kikuchi, & Kosugi, 1999) argue that under certain conditions, high-trusters are actually more vigilant than low-trusters when dealing with others. In a series of experiments, first conducted by Kosugi and Yamagishi (1998), participants’ sensitivity to information revealing the trustworthiness or untrustworthiness of others was analyzed. Participants were shown short vignettes and asked whether the person depicted in them would act in a trustworthy manner or not. When no information about the character in the story was provided, as expected, high-trusters rated the person more likely to act in a trustworthy manner than did low-trusters. Similarly, when content was added to the story relating positive information about the character, the same pattern emerged. However, when negative information was added suggesting that the person in the story had acted in an untrustworthy manner in the past, the pattern of results reversed. That is, high-trusters rated the person as being significantly less likely to act in a trustworthy manner than did low-trusters. Thus, when the person depicted in the story was portrayed as being
potentially untrustworthy, high-trusters were much more suspicion of the characters intentions as compared to low-trusters.

Kakiuchi & Yamagishi (1997) replicated this effect in the context of the prisoner’s dilemma (PD) paradigm. The classic PD is a type of non-zero-sum game in which two players choose to “cooperate” or “defect”, independent of what the other player does. The concern for both players is to maximize their payoff, without any concern for the other player. The standard payoff matrix in a PD results in defection being the optimal strategy, regardless of what the other player does. The iterated PD is a variant of the classic paradigm where two players engage in repeated trials. In the iterated PD, mutual cooperation can emerge as a result of the player’s ability to punish their partner’s defection on subsequent trials with a defection of their own.

Kakiuchi & Yamagishi (1997) conducted an iterated PD experiment with the added twist that in addition to choosing between cooperating and defecting, participants could adjust the structure of the payoff matrix in response to their partner’s behavioral decision. Participants were allowed the option to increase or decrease the size of their own monetary payoff. However, increasing the size of their own payoff had the additional effect of increasing their potential loss if the other player defected. Conversely, decreasing the size of one’s own payoff lowered the potential losses accrued if a partner defected. Thus, if trust was established between the two players, increasing the size of one’s own payoff was the optimal decision. However, if a participant could not trust his/her partner, reducing the size of their own payoff was the safest option. Participants played a series of three, 16-trial blocks. The results of this experiment supported the hypothesis that high-trusters are more sensitive to information suggesting
the untrustworthiness of another person. In the first block of the trials, high-trusters were much more likely to lower their own payoff when their partner defected, minimizing their losses. Low-trusters showed the opposite pattern and tended to increase their own payoff regardless of their partners behavior choice. It wasn’t until block two of the trials that low-trusters began to adjust their payoff matrix in accord with their partner’s behavior decisions. Across all three trials, high-trusters were much more responsive to their partner’s tendency to cooperate or defect, adjusting their own payoff matrix accordingly. As a result, as measured by the total amount of money earning in the game, high-trusters profited significantly more than low-trusters.

The rationale for Yamagishi’s sensitivity-to-information hypothesis comes from his earlier work on the emancipation theory of trust (Yamagishi & Yamagishi, 1994). According to the theory, trust and commitment formation represent alternative solutions to the problem of uncertainty in social exchange. Social uncertainty is a serious problem for the development of human cooperation. The potential benefits of cooperation, enhanced personal gain, come with the potential cost of exploitation. Yamagishi and Yamagishi (1994) define social uncertainty as existing for an actor when 1) their exchange partner has incentives to act in a way that imposes costs on the actor (i.e. cheat them), and 2) the actor does not have the requisite information to accurately predict his/her partner’s behavior.

Kollock’s (as cited in Yamagishi, Kikuchi, & Kosugi, 1999) analysis of the rice and rubber trades in Southeast Asia is a perfect illustration of the differences between trust and commitment relationships. The quality of rice is readily apparent, and as such, the buyer has little worry of being cheated by the seller. In contrast, it is impossible to
determine the quality of raw rubber until it has been processed. As a result, the buyers of raw rubber are at a significant risk of being cheated by unknowingly purchasing a low quality product. According to Kollock, the difference in social uncertainty in the trades of rice and raw rubber explain the dominant forms of trade for each good. Rice is traded in open markets among relative strangers, while the trade of raw rubber typically occurs in the context of long-term exchange relationships.

The rice trade is what Yamagishi (1998) would call a trust relationship, while raw rubber is traded by the formation of commitment relationships. Yamagishi suggests that Kollock's analysis, while instructive, is incomplete. Although he is in agreement with Kollock regarding commitment relationships as a solution to the problem of social uncertainty (Yamagishi, Cooke, & Watabe, 1998), Yamagishi draws attention to the influence of opportunity costs on social relationships and trust (Yamagishi, Kikuchi, & Kosugi, 1999). Commitment relationships trade opportunities to interact with alternate exchange partners for security (i.e. a long-term relationship). This is an effective means of solving the problem of social uncertainty only if the costs of missed exchange opportunities are less than the stability gains associated with commitment (i.e. reducing the likelihood of being cheated by your exchange partner). However, when opportunity costs are high – when the number of potential quality exchange partners is high – commitment relationships are a liability. The central tenet of the emancipation theory of trust is that high degrees of generalized trust act as a springboard, allowing individuals to break out of the constraints of a commitment relationship when higher quality exchange partners are present. Thus, trust acts to “emancipate” people from the stability of commitment relations despite the presence of social uncertainty.
However, deserting commitment relationships under conditions of social uncertainty is not without its costs. With each new exchange partner comes the potential for being exploited. Yamagishi (1998) argues that it is this combination of high social uncertainty and opportunity costs that explains high-truster’s sensitivity to trust-relevant information. In a social environment with a large number of exchange opportunities, trust, as conceptualized by Yamagishi, may prove advantageous for two reasons. First, having a high degree of generalized trust towards others would facilitate interaction between strangers. Second, it would help guard against the perils of a socially uncertain environment through increased informational sensitivity. By way of example, Yamagishi & Yamagishi (1994) compared the social structure of American and Japanese societies. They argue that Japanese society is largely organized around highly structured commitment relationships (i.e. the business practice of life-long employment), virtually eliminating social uncertainty and opportunity costs. In contrast, American society is much more “open”, and subsequently is characterized by a relatively large amount of social uncertainty and opportunity cost. Applying the emancipation theory of trust to American and Japanese society leads to a rather counter-intuitive prediction. That is, Americans should report average levels of generalized trust that are higher than the Japanese. Yamagishi and Yamagishi (1994) found support for this hypothesis by surveying a large number of American and Japanese college students. Their results are corroborated by a large-scale study conducted by The Institute of Statistical Mathematics over a decade earlier (Hayashi, Suzuki, Suzuki, & Murakami, 1982).

If generalized trust towards others is adaptive, that is, it helps to facilitate interaction between strangers as well as guards against potential exploitation, then how
does it develop? Yamagishi, Kikuchi, and Kosugi (1999) propose that social intelligence is responsible for calibrating both levels of trust and sensitivity to potential exploitation. Their argument is as follows: Those that grow up in a socially uncertain environment, with a high degree of opportunity costs devote more cognitive resources to the development of skills for discerning the trustworthiness of others. This view assumes generalized trust to be a byproduct of social intelligence. That is, having highly developed social intelligence allows trust to develop because of an increased ability to detect and interpret the behavior of others – particularly those cues that suggest untrustworthiness. However, in a stable social environment, such as traditional Japanese society, social intelligence is less likely to develop. The security offered by such an environment precludes the need for high levels of trust or vigilance.

The Social Exchange Heuristic. Recently, Kiyonari, Tanida, and Yamagishi (2000) have attempted to reformulate Yamagishi’s earlier work on trust and social intelligence into a pseudo-evolutionary theory of human cooperation. They begin by accepting Cosmides and Tooby’s (1992) argument that social exchange has played a central role in human evolutionary history and that the achievement of mutual cooperation was one of the most crucial adaptive tasks faced by our ancestors. Social contract theory focuses on only one aspect of this adaptive problem – the detection of cheaters. However, if individuals are not willing to enter into mutually cooperative relationships in the first place, the ability to detect cheating is inconsequential. Building upon the framework of Pruitt and Kimmels’s (1977) goal/expectation theory of cooperation, Kiyonari, Tanida, & Yamagishi (2000) posit that the achievement of mutual cooperation requires that 1) individuals be motivated to work towards the goal of
reciprocal exchange, and 2) they expect interaction partners to adopt a similar goal. Social contract theory’s focus is on the expectation components of the model – detecting cheating only makes sense if you expect a potential interaction partner to cooperate. The theoretical framework that Yamagishi and colleagues developed to explain the goal component of human cooperation is called the SEH.

The SEH, similar to the CDM, is hypothesized to be a cognitive mechanism that evolved for the specific purpose of facilitating human cooperation. The SEH is activated when cues to social exchange are present, and once activated leads individuals to transform an exchange opportunity from a situation in which the goal is the pursuit of strict self-interest to that of mutual cooperation. Research using the standard prisoner’s dilemma paradigm illustrates the activation of the SEH. Recall that in the standard prisoner’s dilemma the behavioral decision of non-cooperation or defection is the rational choice. However, experimental studies repeatedly show that participants do not act rationally, and in fact, tend to cooperate at much higher levels than logic would suggest. In fact, when asked, participants tend to prefer the outcome of mutual cooperation despite lower personal gains (Kollock, 1994). Yamagishi and colleagues argue that prisoner’s dilemma games are social exchanges and activate the SEH. As such, participants transform the optimal outcome of the game from one in which their own gains are maximized, to one in which mutual cooperation is preferred. A series of prisoner’s dilemma experiments were conducted in order to illustrate the operation of the SEH as well as rule out alternative hypotheses (see Kiyonari, Tanida, & Yamagishi, 2000). The overall message of these experiments was that the majority of participants played the standard prisoner’s dilemma game “irrationally” – they behaved as if the optimal payoffs
were obtained when mutual cooperation was achieved (when both players cooperated). In short, perceiving the game as a social exchanged caused participants to adopt the goal of mutual cooperation, instead of the pursuit of strict self-interest.

*Trust and the Social Exchange Heuristic.* Recall that Yamagishi’s emancipation theory of trust argues that high levels of generalized trust motivate people to seek out new exchange partners when opportunity costs are high. This high level of trust is also associated with increased informational sensitivity that leads to higher levels of suspicion regarding potentially untrustworthy interaction partners. Similarly, in the context of the prisoner’s dilemma, activation of the SEH results in adopting the goal of mutual cooperation. Yamagishi and colleagues have hypothesized that individuals with high levels of generalized trust have a stronger or “more activated” SEH. This makes sense if the purpose of generalized trust is to facilitate social exchange between strangers under conditions of social uncertainty. Furthermore, if the detection of cheaters within social exchange is just as important as adopting the goal of mutual cooperation, the two mechanisms should be intimately linked. A central, untested research issue that emerges from this potential link is the rather counter-intuitive hypothesis that individuals with a strong SEH (i.e. high-trusters) are particularly good at detecting cheaters within the context of social exchange.

*Trust and Cheater Detection*

It is this link between trust and cheater detection that the current study is meant to explore. Yamagishi’s theorizing about trust’s role in social exchange has clear implications for SCT. The most obvious similarity between Yamagishi’s SEH and the CDM is that they are both hypothesized to be activated within the context of a social
exchange relationship. If that is indeed true, then both mechanisms should be activated in tandem. This proposition makes sense not only from a logical perspective, but theoretically as well. Yamagishi (Kiyonari, Tanida, & Yamagishi, 2000) and Cosmides (Cosmides and Tooby, 1992) have argued that both the desire for reciprocal exchange and the ability to detect cheaters are crucial for the evolution of human cooperation.

However, much of the focus has been on the ability to detect cheaters and SCT has remained relatively unchanged since its introduction nearly 20 years ago. Given that the SEH and the CDM operate within the same domain of human cooperation and are hypothesized to be activated by the same social cues, it is the primary purpose of the current study to explore trust’s role in the ability of humans to detect cheating within the context of social exchanges.

If activation of the SEH results in increased informational sensitivity when engaged in social exchange, then it is plausible that such increased suspicion or vigilance would translate into enhanced cheater detection. However, outside of exchange relationships, there is no theoretical reason to expect such a relationship between trust and cheater detection since neither the SEH nor the CDM would be active. Study 1 is designed to answer this important preliminary question: does trust moderate the relationship between social exchange and cheater detection? That is, do high trusters, with a potentially stronger SEH, excel at detecting cheating within the context of a social exchange?

**Hypothesis 1:** High-trusters will be more likely to correctly solve social contract Wason tasks than low trusters. However, this effect will disappear when social exchange content is removed.
If trust does influence the ability to detect cheaters then several additional questions emerge. First, is it that generalized trust directly influences the CDM, or is the relationship mediated by the sensitivity-to-information effect? Yamagishi would argue that trust increases sensitivity to information, which would raise the level of suspicion or vigilance an individual might have towards others. This increased suspicion may result in a stronger CDM response. Study 2 proposes and tests a mediational model that is consistent with the above hypothesis.

*Hypothesis 2:* High-trusters will have significantly more suspicion towards others when information suggesting the untrustworthiness of others is present, which will result in enhanced cheater detection.

An additional research question that can be derived from an integration of the SEH and SCT is whether or not Yamagishi’s prediction that socio-cultural context (i.e. the degree of social uncertainty and opportunity cost) calibrates generalized levels of trust, in turn moderates the ability to detect cheaters. Specifically, Yamagishi argues that a high degree of generalized trust is beneficial in an environment characterized by social uncertainty and high opportunity costs. When social uncertainty and opportunity cost are low, a high degree of generalized trust becomes less beneficial. Based on this analysis, Study 3 seeks to determine if socio-cultural context moderates the relationship between trust and cheater detection.

*Hypothesis 3:* High-trusters will outperform low-trusters on Wason tasks scenarios that are characterized by high social uncertainty and opportunity costs. However, the trust effect will disappear when social uncertainty and opportunity costs are low.
Study 3 also tests Yamagishi’s prediction that social intelligence is the primary factor responsible for the development of generalized trust. Yamagishi’s analysis of social intelligence is from a cognitive-developmental perspective. That is, when individuals are faced with a complex social environment (i.e. high social uncertainty and opportunity cost) the acquisition of social intelligence results in enhanced cognitive functioning in regards to picking up on cues of untrustworthiness. This increased vigilance allows for the development of trust relationships since high-trusters are better protected from the costs of exploitation. If social intelligence is responsible for this enhanced sensitivity to information, it is plausible that it is also at the root of cheater detection. Study 3 provides a test of a model that is consistent with the above analysis.

Hypothesis 4: The relationship between social intelligence and cheater detection is mediated by generalized trust.

Study 1

Study 1 was designed to test the prediction that high-trusters are better able to detect cheaters than low-trusters within the context of a social exchange. If high levels of generalized trust are associated with increased sensitivity to trust-relevant information about others (Yamagishi, Kikuchi & Kosugi, 1999), then it is plausible to hypothesize that this increased apprehension translates into more accurate cheater detection. However, in line with SCT, the CDM should only be activated within the context of a social exchange (Cosmides, 1989).

To test this prediction, a Wason task was used to measure participant’s ability to detect cheaters. Two versions of the Wason task were created. In one version of the task participants were cued into a situation involving a social contract, while the second
version of the task lacked a social-contract component. Roughly half of the participants received the social contract task, while the remainder solved the non-social contract task. Participants were also given a trust scale designed to measure generalized levels of trust towards others. It was hypothesized that generalized trust would moderate the relationship between social exchange and cheater detection. Specifically, levels of trust should affect Wason task performance only for those participants who are in the social contract condition. In addition, according to Yamagishi’s predictions, higher levels of trust should be associated with increased Wason task performance.

A secondary, more exploratory analysis was also conducted in Study 1. By limiting the analysis to only those participants who solved the Wason task incorrectly, it is possible to determine if there is a relationship between generalized trust and the identification of instances of potential cheating. In other words, who is more likely to see potential instances of cheating, regardless of accuracy, high-trusters or low-trusters? The total number of cards selected by each participant was used as a measure of how suspicious they were of the potential for cheating. In a typical Wason task, the number of chosen cards corresponds to the number of perceived or potential instances of cheating. No a priori predictions were made for this secondary analysis. It is plausible to hypothesize that either high or low-trusters would be more suspicious of the potential to cheat given the right circumstances. Intuitively, it makes sense that low trusters would be more cautious, and thus assume higher levels of potential cheating. However, Yamagishi and colleagues have shown that high-trusters may be more sensitive to trust-relevant information than low-trusters (Kikuchi, Watanabe & Yamagishi, 1997; Kosugi & Yamagishi, 1998), making the reverse hypothesis tenable: High trusters, when faced with
an uncertain situation, will be more vigilant and select more cards than there less trusting counterparts.

Method

Participants

Two-hundred and three undergraduates (110 females, 93 males) enrolled in an introductory psychology course at The College of William and Mary participated in the experiment. Students did not receive compensation for their participation. However, participation was entirely voluntary and anonymous.

Material

Trust scale. Yamagishi’s trust scale is designed to measure the general degree of trust respondents feel for others (Yamagishi & Yamagishi, 1989; Yamagishi & Yamagishi, 1994). It is an 11-item, self-report questionnaire that asks respondents to rate, on a seven-point likert scale, the extent to which they agree or disagree with 11 trust-related statements (1 = strongly agree, 7 = strongly disagree). Such statements include, “most people are basically honest” and “in today’s society, if you are not careful, people will use you” (reverse scored). Yamagishi has validated his trust scale across several studies (Yamagishi & Yamagishi, 1989) and established convergent validity with the more commonly used trust scale developed by Rotter (Yamagishi & Yamagishi, 1994).

Wason task. The Wason task used in Study 1 was a modified version of Cosmides’ (1989) Grover School scenario. The Grover school scenario includes a social contract condition and a non-social contract condition. All participants received either the social contract or non-social contract version of the Grover school task. Both
versions use the rule “if a student is to be assigned to Grover High School, then that student must live in Grover City.” The card choices, along with the correct answer, remain constant across both conditions. From left to right, the card choices read: Grover High School (p card), Town of Hanover (not-q card), Hanover High School (not-p card), and Grover City (q card). Solving the task requires selecting both the p and not-q cards.

In the social contract version, the background story describes Grover High as being a superior school to Hanover High. Participants are cued into the perspective of someone assigned to monitor the individuals whose job it is to allocate students to particular high schools based on the rule. Furthermore, these individuals each have children entering high school and just happen to be responsible for their assignment. Thus a motive exists for cheating on the above rule by placing ones own child in the better of the two schools, regardless of what city they live in. The non-social contract version has the same structure of the social contract rule except that the motive to cheat is removed by omitting any information regarding the differences between the two schools. However, the scenario is given a sense of importance of urgency by stating that population statistics are used to allocate the appropriate number of teachers to each school. Violations of the rule could lead to some schools getting too few teachers.

Procedure

Study 1 was conducted in an introductory psychology course, at the beginning of a regularly scheduled class period. With the consent of the instructor, materials were handed out to participants as they entered the classroom and were told to keep them face down until instructed to turn them over. Students were informed that their participation in the study was completely voluntary and in no way would their identities be known to
the experimenter. After a brief set of verbal instructions they were given ten minutes to complete the experimental packet. Participants were debriefed at the end of the semester through a mass email.

**Design**

Binary logistic regression was used to predict the probability of a participant correctly solving the Wason task. Binary logistic regression is the appropriate analysis when, 1) the criterion variable is dichotomous, and 2) some predictor variables are continuous, while others are categorical (Thrash, 2007). The predictor variables in the analysis were the Wason task version (Social contract versus Non-Social contract), the participant’s aggregated trust scale score, and a trust by Wason version interaction term.

Linear regression was used to determine if there was a relationship between the total number of cards a participant selected and his/her aggregated trust score. The criterion variable was the total number of cards selected and the predictors in the equation were Wason version, generalized trust scores, and the interaction between Wason version and trust.

**Results**

**Manipulation Check**

A chi-squared analysis was used to test the null hypothesis that there was no difference in Wason task performance between the social contract and non-social contract conditions. The results indicated a rejection of the null hypothesis, with the social contract group significantly outperforming the non-social contract group, $\chi^2 = 20.08$ (1, N = 203), $p < .001$. Specifically, 49.5% (50/101) of participants correctly solved the social contract Wason task, compared to only 19.6% (20/102) in the non-social contract
condition. Overall, participants who were given the social contract Wason task were four times more likely to solve it correctly compared to those in the non-social contract condition. Although the percentage of participants solving the social contract Wason task correctly is somewhat lower than typically reported, the overall size and direction of the effect is highly consistent with previous research (Cosmides & Tooby, 1992; Gigerenzer & Hug, 1992).

**Trust Moderating Social Exchange and Cheater Detection**

Binary logistic regression was used to test the hypothesis that generalized trust moderates the relationship between social exchange and cheater detection (see Figure 1 for a diagram of the model). Wason task performance (correct, incorrect) was regressed on the Wason task version variable (social contract, non-social contract), participants’ generalized trust scores, and the trust by Wason version interaction. Wason version was found to significantly predict Wason performance, $\beta = .722, p < .001$. When controlling for the other variables in the model, participants in the social contract condition were 2.06 times more likely to solve the Wason task correctly when compared to those in the non-social contract condition. Participant trust scores failed to significantly predict Wason performance, $\beta = .090, p > .05$. Finally, the trust by Wason version interaction was a significant predictor of Wason performance, $\beta = .404, p < .05$ (see Table 1 for mean trust scores by condition). As depicted in Figure 2, trust scores were a significant predictor of Wason performance only in the social contract condition, $\beta = .495, p < .05$. The odds ratio for the relationship between trust scores and Wason performance within the social contract condition was 1.64, meaning that every point of increase in a participant’s trust scores was associated with them being just over one and a half times more likely to solve
the Wason task correctly. As predicted, trust scores had no effect on Wason performance in the non-social contract condition, $\beta = -.312, p > .05$.

Trust and Suspicion

The total number of card selections made among those participants who solved the Wason task incorrectly was regressed on the Wason task version variable, participants' generalized trust scores, and the trust by Wason version interaction. None of the variables were found to significantly predict the number of cards selected. Thus, in the context of the Wason task paradigm, generalized trust scores do not seem to be predictive of the level of suspicion participants have regarding the potential for cheating, as measured by the number of cards selected.

Discussion

The above results support hypothesis 1, that generalized trust moderates the relationship between social exchange and cheater detection. High-trusters were significantly better at solving the Wason task than low-trusts when social exchange content was present. This outcome supports Yamagishi's suggestion that trusting individuals may be better at detecting cheaters than their less trusting counterparts (Kiyonari, Tanida, & Yamagishi, 2000). High-trusters are not only more sensitive to trust-relevant information, but appear to translate this vigilance into more accurate cheater detection. The finding that trust influences the activation of the CDM is a significant addition to SCT. Since its introduction, the proponents of SCT have argued that social exchange was the key to understanding the activation of the CDM. While study 1 supports this assertion, it goes beyond this aspect of SCT, suggesting that the CDM itself is calibrated by a personality variable (generalized trust) which Yamagishi
hypothesizes to be a component of a larger cognitive system for the regulation of social exchange. This larger social exchange mechanism is made up of the SEH and the CDM. Both systems are essential, and represent adaptive solutions for the two primary obstacles on the road to the evolution of human cooperation: 1) having the motivation to adopt the goal of mutual cooperation, and 2) being able to detect and punish those who break the agreed upon contract of a social exchange.

Establishing a link between generalized trust and cheater detection, while consistent with both SEH and SCT, leaves several important questions unanswered. First, is it that generalized trust affects cheater detection independent of Yamagishi’s sensitivity-to-information effect, or does this sensitivity-to-information mediate the relationship between trust and the CDM? That is, does generalized trust lead to increased levels of suspicion, which subsequently enhance cheater detection ability, or is generalized trust simply a common cause of suspicion and enhanced cheater detection? Second, Yamagishi conceives of trust as being calibrated by socio-cultural context, through the development of social intelligence. Does trust and its effect on cheater detection change based on socio-cultural context as Yamagishi predicts? And finally, is social intelligence ultimately responsible for the calibration of trust and the CDM? Study 2 is designed to test the first question, while Study 3 addresses other two.

Study 2

Yamagishi has provided support for the hypothesis that high-trusters are more sensitive than low-trusters to information suggesting the untrustworthiness of an individual (Yamagishi, Kikuchi & Kosugi, 1999). However, this effect only occurs when negative information regarding the character of another person is presented. When
positive or neutral information is presented about a target individual, the pattern reverses to a more intuitive outcome: low-trusters rate individuals as being more untrustworthy. Yamagishi explains this interaction between generalized trust and information type as a result of the SEH. That is, individuals with a stronger SEH (those exhibiting higher levels of trust) are more motivated to cooperate. In addition to adopting the goal of mutual cooperation, individuals with strong SEH's expect interaction partners to cooperate as well. According to Yamagishi, the expectation that others will cooperate results in an increased sensitivity to cues that point towards an individual's untrustworthiness, resulting in increased levels of suspicion and vigilance when such cues are present. Yamagishi does not hypothesize a specific mechanism by which this informational sensitivity operates, nor does he provide evidence that this increased suspicion actually translates into an enhanced ability to detect instances of cheating. In light of these unanswered questions, Study 2 has two goals: 1) to provide a replication of Yamagishi's hypothesized interaction between trust and information type, and 2) to test the hypothesis that suspicion scores mediate the relationship between generalized trust and cheater detection.

To provide a replication of Yamagishi's sensitivity effect, participants were given trust scenarios (modeled off of Yamagishi's original materials) and Yamagishi's generalized trust scale. Three versions of the trust scenarios were created where information type was manipulated: Participants were assigned to a positive, negative or neutral information condition. They were asked to rate the probability of the person in the story acting in a trustworthy manner. A replication of Yamagishi's findings will result if there is a significant information condition by generalized trust score interaction.
That is, high-trusters should only have significantly lower scenario scores (more suspicion that the person in the story will act in an untrustworthy manner) than low-trusters in the negative information condition.

To test the hypothesis that Yamagishi’s sensitivity to information effect ultimately mediates the relationship between generalized trust and cheater detection, participants in Study 2 were also asked to solve a social contract Wason task. A moderated-mediational model is posited, with trust scenario scores (suspicion scores) mediating the relationship between the trust by information condition interaction and cheater detection as measured by Wason task performance. Specifically, high levels of generalized trust, and its associated informational sensitivity, activate the SEH more readily, which causes individuals to simultaneously adopt the goal of mutual cooperation and expectation of cooperation by others. As a consequence, the CDM is activated, increasing suspicion and the resulting ability to better detect instances of cheating. However, this effect should be strongest in the negative information condition, where high-trusters have been shown to be particularly vigilant.

**Method**

**Participants**

One-hundred and eleven (65 females, 46 males) participants were recruited from an introductory psychology course at The College of Williams and Mary. Again, no compensation was awarded and participation was voluntary and anonymous.

**Materials**

*Trust Scale.* The version of Yamagishi’s Generalized Trust Scale used in Study 2 was identical to the one used in Study 1.
**Wason Task.** The Grover School Wason task described in the Method section of Study 1 was used. However, only the social contract version of the task was used.

**Trust Scenarios.** Each participant received three short vignettes and was asked to estimate the probability that the person depicted in the story would act in a trustworthy manner. Participants were assigned to one of three conditions: the neutral information condition, the positive information condition, or the negative information condition. The neutral condition served as a baseline measure and consisted of a description of the situation with which the character in the story was confronted. In the positive and negative conditions, additional information about the person in the story was provided. The positive condition included information suggesting that the character in the story has acted trustworthy in the past, while the negative condition presents evidence calling the trustworthiness of the central character into question. For each of the three vignettes participants rated the probability (0-100%) that the person in the story would act in a trustworthy manner. Participant scores were calculated by summing their responses across the three stories. Higher scores indicate higher attributions of trustworthiness.

**Procedure**

Study 2 employed the exact same procedure as Study 1 except that it was conducted in an alternate introductory psychology class.

**Design**

To replicate Yamagishi’s results, linear regression was used to predict suspicion scores from generalized trust scores, information type, and the crucial trust by information type interaction. Since there were three conditions within the information type variable, a set of orthogonal contrasts was created. The first contrast compares the
negative information condition to the remaining two conditions, and the second contrast compares the positive and neutral information condition with each other. A hierarchical regression was conducted, in which the first step included generalized trust and the two aforementioned contrasts. In step two of the analysis, two interaction terms were entered into the equation, each representing the interaction between generalized trust and one of the contrast variables.

Logistic regression was employed to test the moderated-mediational model predicting cheater detection from suspicion scores and the generalized trust by information condition interaction. The model was tested by carrying out four smaller analyses that tested for the hypothesized mediation within each information type condition, as well as an overall effect, averaging across information condition. PRODCLIN was used to test for a significant indirect mediation for each of the four proposed models.

Results

Replication of Yamagishi

A pair of orthogonal contrasts was created from the information condition variable to test Yamagishi’s hypothesis that the relationship between generalized trust and levels of suspicion is moderated by information type (see Figure 3 for a diagram of the model). The first contrast compares the negative information condition to the other two conditions, whereas the second compared the positive information condition with the neutral condition. A two-step hierarchical regression was used to determine if generalized trust interacted with the information condition contrasts. In step one of the analysis, suspicion scores were regressed on generalized trust and the two information
condition contrasts. The overall model tested in step one was significant ($F = 7.508, p < .001$), $R^2 = .174$. Step two of the analysis added the two crucial trust by contrast interactions. As measured by the change in $R^2$, model 2, with the interaction terms included, was a better predictor of suspicion scores than step one of the analysis, $R^2 = .655$ ($F = 23.41, p < .001$). Table 2 provides a list of all the beta values for both steps of the analysis. Importantly, both contrasts significantly interacted with generalized trust to predict suspicion scores. As Figure 4 shows, low-trusters are more suspicious of others than high-trusters in the neutral and positive information conditions. However, as Yamagishi predicts, the pattern reverses in the negative information condition, with high-trusters becoming more vigilant (see Table 3 for mean suspicion scores by condition). These results provide a convincing replication of Yamagishi's sensitivity-to-information effect despite using an abridged version of his original materials.

Connecting Informational Sensitivity to Cheater Detection

The second analysis in Study 2 tested a model in which information type moderated the role of suspicion scores as a mediator between generalized trust and cheater detection (see Figure 5 for a diagram of the model). Path A of the model corresponds to the interactive effects of generalized trust and information type on suspicion scores, while path B represents how well Wason performance can be predicted from suspicion scores when controlling for generalized trust. Beta weights were calculated for each path and PRODCLIN was used to test for indirect mediated effects. The analysis was broken up into four parts: the overall effect when averaging across information type, and one analysis for each information condition. Table 4 shows the path coefficients for each of the four models. No evidence of indirect mediation was
found in any of the tested models. As expected, generalized trust was a significant predictor of suspicion scores in each of the four analyses.

Discussion

One plausible causal model that results from combining the predictions of the SEH and SCT is that trust interacts with information type to predict levels of suspicion (informational sensitivity), which in turn predict the accuracy of cheater detection. Although the design of Study 2 is not sufficient to decisively confirm or rule out such a causal model, the specific pattern of results are not consistent with the proposed hypothesis. That is, the relationship between the generalized trust/information type interaction and cheater detection was not found to be mediated by suspicion scores. Although Yamagishi’s sensitivity to information effect was replicated in study 2, it failed to predict Wason performance about and beyond generalized trust alone. A participant’s level of suspicion was not related to Wason performance regardless of the type of information they were given. The results of Study 2 are more consistent with an alternative explanation: that generalized trust separately influences suspicion and cheater detection and there is no causal path leading from generalized trust, to suspicion scores, and finally to cheater detection. In other words, it does not seem to be the case that levels of suspicion, as measures by Yamagishi’s trust scenarios have anything to do with the activation of the CDM.

One potential reason for the dissociation between suspicion and cheater detection is the nature of Yamagishi’s trust scenarios. They essentially ask participants to rate how suspicious they are of the trustworthiness of a character in a story. The person depicted in the story is not a potential exchange partner and a very limited amount of information
is provided. Perhaps if the measure of suspicion were obtained in such a way as to make the "other's" degree of trustworthiness more personally salient to participants, a connection between trust, suspicion, and cheater detection would be found.

Study 3

Yamagishi has shown that levels of generalized trust are calibrated in an adaptive way towards an individual's specific socio-cultural environment (Yamagishi, Kikuchi, & Kosugi, 1999). High-trusters exhibit increased sensitivity to trust-relevant information as a result of an environment with high levels of social uncertainty and opportunity cost. Such a dynamic and unpredictable environment requires high levels of trust to facilitate cooperative interaction, and also a high degree of vigilance against exploitation. On the other hand, low-trust is better suited to an environment characterized by low levels of social uncertainty and opportunity cost. The stability of such an environment precludes the need for high levels of trust and vigilance.

To test if the above relationship holds when high and low trusters are actually asked to detect instances of cheating, a social contract Wason task was administered to participants. In one condition the Wason task describes a situation in which there is a high degree of social uncertainty and opportunity cost (HC version). The scenario in the second version is characterized by low levels of social uncertainty and opportunity cost (LC version). If high levels of trust and its resulting sensitivity to information are particularly beneficial when opportunity cost and social uncertainty are high, then high-trusters should outperform low-trusters on the HC Wason task. Trust should not affect performance on the LC version of the task since the increased vigilance associated with high levels of trust is not as advantageous within such a predictable context.
A second purpose of Study 3 is to test Yamagishi’s suggestion that trust may be calibrated through repeated interaction within a given socio-cultural context (i.e. HC versus LC). One mechanism by which trust may develop is through the acquisition of social intelligence (Yamagishi, 1998). Social intelligence affects an individual’s ability to accurately read a social situation and act accordingly. Yamagishi has argued that HC environments, characterized by a high degree of uncertain interactions with others, results in the development of higher levels of social intelligence. Conversely, individuals in LC environments have fewer opportunities to develop social intelligence since interactions are fewer and much more predictable. To test the relationship between trust and social intelligence, participants were given the Tromso Social Intelligence Scale. It is hypothesized that generalized trust scores will mediate the relationship between social intelligence and Wason performance. The preceding hypothesis tests a model consistent with Yamagishi’s suggestion that social intelligence drives generalized trust levels, which in turn calibrate the CDM.

Method

Participants

One-hundred and two undergraduates were recruited from the Psychology department subject pool, which is made up of students enrolled in introductory psychology courses at the College of William and Mary. Students were awarded course credit for their participation in the study. Participants signed up for the study voluntarily and their identities remained anonymous.
Materials

The experimental packet handed out to participants in Study 3 contained a consent form, Yamagishi’s Generalized Trust Scale, the Tromso Social Intelligence scale, and a Wason task.

Trust Scale. The version of Yamagishi’s Generalized Trust Scale used in Study 3, was identical to the one used in Studies 1 and 2.

Social Intelligence Scale. The English version of the Tromso Social Intelligence Scale (TSIS) was used. The TSIS is a 21-item self-report measure designed to assess abilities related to the social intelligence construct. Participants rate, on a 7-point likert scale, the degree to which a given statement describes them (1 = describes me poorly, 7 = describes me extremely well). Such statements include, “I can predict other people’s behavior” and “I know how my actions will make others feel.” The TSIS has been shown to have good internal reliability and be reasonably free of response bias (Silvera, Martinussen, & Dahl, 2001).

Wason Task. The novel Wason tasks created for Study 3 were adapted from Kollock’s (1994) analysis of the rubber trade in Southeast Asia. The rubber scenario had two conditions, a low opportunity cost, low social uncertainty condition (LC), and a high opportunity cost, high social uncertainty condition (HC). Both versions of the rubber scenario were social contracts. All participants received either the LC or HC scenario. The two versions of the task shared the following rule: “if rubber is to be sold for a high price, then it must be of a high quality.” The card choices, along with the correct answer, remain constant across both conditions. From left to right, the card choices read: High Price (p card), Low Price (not-q card), High Quality (not-p card), and Low Quality (q
As with the previous versions of Wason tasks used, solving the task requires selecting both the $p$ and $not-q$ cards.

Both versions of the Rubber scenario share a background story that cue the participant into the perspective of a member of a small Indonesian community that specializes in the processing of raw rubber. The participant holds the important job of traveling to a nearby market to purchase raw rubber for the community. The purchasing of raw rubber is a difficult task because it is nearly impossible to determine the quality of raw rubber until after it is processed. Low quality raw rubber would result in low quality finished products, jeopardizing the community’s primary source of income. In the LC version, the community has a long standing relationship with one of the only nearby raw rubber merchant (low opportunity cost); his prices tend been fair, and his raw rubber has been of a consistently high quality (low social uncertainty). However, in the HC version, there are many raw rubber merchants to choose from (high opportunity cost), and it is a well know fact that these merchants tend to lie about the quality of their rubber (high social uncertainty).

**Procedure**

As partial satisfaction of a course requirement, undergraduates enrolled in introductory psychology classes signed up for Study 3 through the Psychology department’s online research participation system. Three experimental sessions were held over the course of one week in a medium sized classroom. Upon arrival, participants were handed out the experimental packet and allowed as much time as they needed to finish. Generally, the experiment took 10-15 minutes to complete. When finished, participants were given a short debriefing form and allowed to leave.
**Design**

Binary logistic regression was used to determine if there was a relationship between socio-cultural context and trust when detecting instances of cheating. The criterion variable was Wason task performance, and the predictors in the equation were Wason version (LC, HC), generalized trust scores, and a Wason version by trust score interaction term.

As an initial test of Yamagishi’s hypothesis that social intelligence calibrates levels of trust based on socio-cultural context, a model was tested in which generalized trust scores were hypothesized to mediate the relationship between social intelligence and Wason task performance. The criterion variable was Wason performance, and the predictors in the model were participant generalized trust and social intelligence scores.

**Results**

**Manipulation Check**

Since both versions of the Wason task used in Study 3 described social contracts, there should be no performance differences across the two conditions. A chi-squared analysis revealed no difference in correct answers between the HC and LC conditions, $\chi^2 = .538 (1, N = 102), p > .05$. Participants in the LC condition solved the task correctly 58% (29/50) of the time, while the HC version of the task was solved correctly in 52% (27/52) of the cases.

**Socio-cultural Context Moderates Trust and Cheater Detection**

Binary logistic regression was used to test the hypothesis that socio-cultural context moderates the relationship between trust and cheater detection (see Figure 6 for a diagram of the model). Wason performance was regressed on the Wason task variable...
(HC, LC), generalized trust scores, and a Wason version by trust score interaction term (see Table 5 for mean trust scores by condition). Consistent with the manipulation check, Wason version was not found to be a significant predictor of Wason performance, $\beta = .004, p > .05$. However, generalized trust scores significantly predicted Wason task performance, $\beta = .702, p < .05$. Every point of increase in a participant’s generalized trust score was associated with them being 2.02 times more likely to correctly solve the Wason task, regardless of the version with which they were presented. Finally, as hypothesized, the interaction between Wason version and generalized trust was found to significantly predict Wason performance, $\beta = .937, p < .01$. As shown in Figure 7, trust failed to predict Wason performance on LC version of the task, $\beta = -.249, p > .05$. However, among those given the HC version of the task, trust significantly predicted Wason performance, $\beta = 1.616, p < .01$. Specifically, for every one point increase in participants trust scores, they were 5.03 times more likely to solve the HC Wason task correctly.

**Social Intelligence as a Developmental Precursor of Trust**

PRODCLIN was used to test the significance of the model where generalized trust mediates the relationship between social intelligence and cheater detection (see Figure 8 for a diagram of the model). Path A denotes the relationship between social intelligence and trust, while path B represents the relationship between trust and Wason performance when controlling for social intelligence. Path A, regressing trust scores on the social intelligence variable, failed to produce a significant effect, $\beta = .177, p > .05$. Path B of the model was consistent with the previous analyses. That is, when controlling for social intelligence, generalized trust was found to significantly predict Wason performance, $\beta =$
.461, \( p < .05 \). Participants were 1.6 times more likely to solve the Wason task correctly for every point of increase in their trust scores. The mean trust score for those who solved the Wason task correctly was 47.9 (SD = 7.24), and 44.5 (SD = 7.62) for those who solved the task incorrectly. Using PRODCLIN, the product of the coefficients for paths A and B failed to reach statistical significance at an alpha level of .05. These results are inconsistent with the hypothesis that generalized trust mediates the relationship between social intelligence and cheater detection.

**Discussion**

The results of Study 3 are consistent with the hypothesis that socio-cultural context moderates the previously established relationship between generalized trust and cheater detection. High-trusters appeared better equipped than low-trusters to detect cheating when presented with a social contract Wason scenario characterized by a high degree of social uncertainty and opportunity cost. However, when the Wason scenario presented a much more stable social environment, the trust effect went away. These results are consistent with Yamagishi’s argument that levels of trust are calibrated by the interaction of an individual with his social environment (Yamagishi, Kikuchi, & Kosugi, 1999). Under conditions of social uncertainty and high opportunity cost, developing a high degree of generalized trust acts as a social lubricant, motivating individuals to enter into social exchange with strangers. However, given the unpredictable nature of such an environment, it would be essential to be vigilant of the potential to be exploited. Thus, if high-trusters are more familiar with and better adapted to such unpredictable environments, they should outperform low-trusters when presented with the task of detecting cheaters under such conditions. On the other hand, if trust and cheater
detection are less important in a social environment characterized by low levels of uncertainty and opportunity cost, high-trusters will lose their performance advantage.

The second analysis of Study 3 tested a causal model in which social intelligence was responsible for calibrating both generalized trust and the CDM. The results were not consistent with this hypothesis. Social intelligence failed to significantly predict generalized trust scores and Wason performance. Three potential reasons exist for these null findings. First, the Tromso social intelligence scale was originally published in Italian and there have been a limited number of studies validating the scale in English. Second, social intelligence as a construct is ill defined and significant disagreement exists regard its usefulness as a construct. Given the fragmentary nature of social intelligence research and the lack of a consistent operational definition with a well established measurement tool, it is often a problematic construct to apply (Landy, 2006). Finally, it may be the case that social intelligence is unrelated to the development of generalized trust and cheater detection. Neither Yamagishi's SEH or the connection between generalized trust and the CDM hinge on social intelligence being a common causative factor. In fact, there may be no need to evoke an additional construct at all when hypothesizing about the development of the SEH or the CDM. Indeed, SCT specifically proposes that the CDM is a cognitive mechanism designed, that is, pre-equipped, with the necessary “algorithms” to perform its task (Cosmides & Tooby, 1992). The very idea of an evolved cognitive module or mental organ implies that it is automatically sensitive to a certain domain of information (i.e. the domain of social exchange).
General Discussion

The current study found mixed results in regard to its central focus: the integration of the SEH and SCT. Generalized trust was found to moderate cheater detection in the predicted direction – high-trusters were better at solving social contract Wason tasks than low-trusters. These results are consistent with the hypothesis that the CDM is influenced by generalized levels of trust. In addition, socio-cultural context was found to moderate the relationship between generalized trust and Wason performance, suggesting that environmental cues may adaptively calibrate generalized trust and the CDM. Despite replicating Yamagishi’s sensitivity-to-information effect, levels of suspicion were not related to Wason performance, indicating that vigilance and cheater detection may be separate constructs. Finally, social intelligence was not found to be predictive of generalized trust or cheater detection, results that are inconsistent with the causal model proposed by Yamagishi.

Despite mixed findings, the pattern of results suggests that the SEH and the CDM are linked in an adaptive way. Specifically, the results are consistent with the prediction that generalized trust seems to be calibrated by one’s socio-cultural environment, which in turn influences the activation of the CDM within social exchanges. The SEH predicts that generalized trust is regulated by two social exchange variables: social uncertainty and opportunity costs (Kiyonari, Tanida, & Yamagishi, 2000). High levels of generalized trust are fostered when social uncertainty and opportunity costs are high (such as in the United States). These high levels of trust are meant to facilitate exchange between potential interaction partners. At the same time, Yamagishi argues that given the unpredictable nature of such an environment, one must be particularly vigilant of
exploitation. As such, high-trusters also have to be more sensitive to cues to a potential interaction partner’s untrustworthiness. Yamagishi does not hypothesize about a particular mechanism by which this vigilance occurs. However, it is presently hypothesized that, consistent with SCT, it is the CDM that facilitates the enhanced detection of cheaters. Although evidence for a direct causal path between generalized trust, suspicion scores, and cheater detection was not found in the current study, cheater detection appears to be closely linked to the relationship between socio-cultural context and generalized trust. For example, in an environment characterized by high social uncertainty and high opportunity cost, high generalized trust and accurate cheater detection are particularly beneficial. This is precisely what the results of Study 3 support. High-trusters significantly outperformed low-trusters in the detection of cheaters when they were presented with a Wason task characterized by high social uncertainty and opportunity cost. The benefits of high generalized trust and its subsequent enhanced cheater detection disappeared when participants were asked to solve a Wason task characterized by low-levels of social uncertainty and opportunity cost.

*Implications for Social Exchange Theory and the Social Exchange Heuristic*

The results of the current study have implications for both SCT and the SEH. Since its development, SCT has sought to uncover the design features of the hypothesized CDM. However, research has focused entirely on the external cues that *activate* the CDM – the presence of a social contract. However, the current research identifies an additional, developmental, design feature of the CDM. That is, the CDM may have evolved to be sensitive to consistent patterns of social relationships within an individual’s environment. Levels of social uncertainty and opportunity cost and their subsequent
effect on generalized trust act to fine tune one’s ability to detect cheating. Put simply, if highly accurate cheater detection ability is needed, more cognitive resources are invested in its development. However, if one’s environment is relatively stable and predictable, resources may be invested elsewhere.

In regards to the SEH, the present results suggest that Yamagishi’s adoption of the goal/expectancy framework was valid. When looked at in conjunction with his research, the present study argues for a connection between the motivation to cooperate (strong SEH) and the ability to detect cheaters. However, Yamagishi’s sensitivity-to-information effect, which provided the impetus for many of his later predictions, did not appear to be related to cheater detection. Although it intuitively makes sense that those who are more suspicious of other’s trustworthiness would excel at the detection of cheaters, there is no theoretical reason why this would be the case. The activation of the CDM is not hypothesized to be a conscious process, and as such, there is no reason that it need be associated with identifiable behavioral markers, such as increased suspiciousness.

Conclusion

As Yamagishi (1998) suggests, the relationship between the SEH and the CDM is best captured by the goal/expectation theory of cooperation (Pruitt & Kimmel, 1977). To achieve consistent mutual cooperation within a social exchange, two conditions have to be met. First, individuals have to be motivated to abandon the strict pursuit of self-interest and adopt the goal of mutual cooperation. Second, to protect from the costs of exploitation, individuals must be capable of detecting cheaters. The SEH, which is hypothesized to facilitate cooperative interaction, results in the adoption of mutual benefit as a goal. Once that has been established individuals need a way to ensure that their
exchange partner will cooperate as well. The CDM is responsible for solving this adaptive problem. As the results of Yamagishi and the current author suggest, trust is a component of the goal/expectation model. As levels of generalized trust increase, both the goal and expectation of mutual cooperation become stronger (a stronger SEH) and consequently the CDM becomes more finely tuned to an environment where the potential to be exploited is more prevalent.
References


PRODCLIN - (MacKinnon, D. P., Fritz, M. S., Williams, J., & Lockwood, C. M. Distribution of the product confidence limits for the indirect effect program PRODCLIN. *In Press, Behavioral Research Methods*).


Table 1

*Mean Trust Scores by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Social Contract</th>
<th>Non-Social Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>M</em></td>
<td><em>SD</em></td>
</tr>
<tr>
<td>Wason Correct</td>
<td>45.82</td>
<td>7.99</td>
</tr>
<tr>
<td>Wason Incorrect</td>
<td>42.29</td>
<td>7.50</td>
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</table>
Table 2

*Variables Predicting Wason Performance*

<table>
<thead>
<tr>
<th></th>
<th>Step 1</th>
<th></th>
<th></th>
<th>Step 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>S.E</td>
<td>$p$</td>
<td>$\beta$</td>
<td>S.E</td>
<td>$p$</td>
</tr>
<tr>
<td>Generalized Trust</td>
<td>0.318</td>
<td>4.095</td>
<td>0.001</td>
<td>0.689</td>
<td>4.257</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Contrast 1</td>
<td>-0.258</td>
<td>4.293</td>
<td>0.025</td>
<td>-0.242</td>
<td>3.619</td>
<td>0.013</td>
</tr>
<tr>
<td>Contrast 2</td>
<td>6.432</td>
<td>0.318</td>
<td>0.006</td>
<td>0.262</td>
<td>5.422</td>
<td>0.007</td>
</tr>
<tr>
<td>Trust X C1</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>-0.752</td>
<td>3.619</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Trust X C2</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>0.515</td>
<td>5.694</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Note.* Contrast 1 = negative information vs. positive/neutral information; Contrast 2 = positive information vs. neutral information.
Table 3

Mean Suspicion Scores by Condition

<table>
<thead>
<tr>
<th></th>
<th>Neutral Information</th>
<th>Negative Information</th>
<th>Positive Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>High Trust</td>
<td>162.00</td>
<td>27.75</td>
<td>85.56</td>
</tr>
<tr>
<td>Low Trust</td>
<td>75.56</td>
<td>22.97</td>
<td>130.00</td>
</tr>
</tbody>
</table>
Table 4

*Path Coefficients for Moderated Mediational Model*

<table>
<thead>
<tr>
<th></th>
<th>Overall Model</th>
<th>Neutral Info</th>
<th>Negative Info</th>
<th>Positive Info</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>β</td>
<td>S.E.</td>
<td>p</td>
<td>β</td>
</tr>
<tr>
<td>Path A</td>
<td>0.332</td>
<td>0.090</td>
<td>&lt;.001</td>
<td>0.581</td>
</tr>
<tr>
<td>Path B</td>
<td>0.245</td>
<td>0.237</td>
<td>&gt;.05</td>
<td>0.331</td>
</tr>
</tbody>
</table>

*Note.* Path A = Predicting suspicion scores from generalized trust; Path B = Predicting Wason performance from suspicion scores while controlling for generalized trust.
Table 5

*Mean Trust Scores by Condition*

<table>
<thead>
<tr>
<th></th>
<th>LC</th>
<th>HC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Wason Correct</td>
<td>46.41</td>
<td>6.44</td>
</tr>
<tr>
<td>Wason Incorrect</td>
<td>48.19</td>
<td>8.74</td>
</tr>
</tbody>
</table>
Figure Captions

Figure 1. Model predicting that generalized trust moderates the relationship between social exchange and cheater detection ability.

Figure 2. Interactive effects of generalized trust and Wason version on Wason performance.

Figure 3. Model Predicting that information type moderates the relationship between generalized trust and level of suspicion.

Figure 4. Interactive effects of generalized trust and information type on Wason performance.

Figure 5. Model predicting that information type moderates the mediation of generalized trust and cheater detection by level of suspicion.

Figure 6. Model predicting that socio-cultural context moderates the relationship between generalized trust and cheater detection ability.

Figure 7. Interactive effects of generalized trust and socio-cultural context on Wason performance.

Figure 8. Model predicting that generalized trust mediates the relationship between social intelligence and cheater detection ability.
Cheater Detection

Generalized Trust

Social Exchange
Socio-Cultural Context

Cheater Detection

Generalized Trust
Appendix A – Study 1 Materials

Social Contract Wason Task

Imagine you are a member of your county’s Board of Education, supervising four volunteers who work for the Board. Part of your job is to double-check the assignment of students to the appropriate school by these volunteers, who are supposed to follow certain rules for assigning students from various towns to the appropriate school district.

Students are to be assigned either to Grover High School, which is located in Grover City, or to Hanover High School, which is located in the town of Hanover. It is important that certain rules for assigning students from various towns to the appropriate school district are followed, because parents would much rather have their children attend Grover High than Hanover High. Grover High is a great school with an excellent record for getting students placed in good colleges. In contrast, Hanover High is a mediocre school with poor teachers and decrepit facilities.

The Board of Education took these factors into account when it created rules to determine which school a student is to be assigned to. The most important of these rules is:

“If a student is to be assigned to Grover High School, then that student must live in Grover City.”

Each volunteer is the parent of a teenager who is about to enter high school, and each processed his own child’s document. The volunteers were supposed to follow this rule when processing all student documents—including the documents of their own children. It is your job to make sure that the volunteers did not deliberately break the rule when assigning their own children to high schools.

Imagine the boxes below represent cards that have information about the documents of the four volunteer’s children. Each card represents the child of one volunteer. One side of a card tells what school the volunteer assigned to their child, and the other side of the card tells what town that student lives in. Please circle “yes” on only those card(s) you definitely need to turn over to see if the documents of any of these students violate the rule and circle “no” for the cards that do not need to be turned over.

<table>
<thead>
<tr>
<th>Grover School</th>
<th>Town of Hanover</th>
<th>Hanover School</th>
<th>Grover City</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>
Imagine you are a member of your county's Board of Education, supervising four
volunteers who work for the Board. Part of your job is to double-check the assignment of
students to the appropriate school by these volunteers, who are supposed to follow certain rules
for assigning students from various towns to the appropriate school district.

Students are to be assigned either to Grover High School, which is located in Grover
City, or to Hanover High School, which is located in the town of Hanover. It is important that
certain rules for assigning students from various towns to the appropriate school district are
followed, because the population statistics they provide allow the Board of Education to decide
how many teachers need to be assigned to each school. If these rules are not followed some
schools could end up with too many teachers, and other schools with too few.

The Board of Education took these factors into account when it created rules to determine
which school a student is to be assigned to. The most important of these rules is:

"If a student is to be assigned to Grover High School, then that student
must live in Grover City."

Your volunteers were supposed to follow this rule when processing all student
documents. However, mistakes can happen. It is your job to make sure that the volunteers did
not inadvertently break the rule when assigning any students to high schools.

Imagine the boxes below represent cards that have information about the documents of
four children. Each card represents one child. One side of a card tells what school the volunteer
assigned the child to, and the other side of the card tells what town that student lives in. Please
circle "yes" on only those card(s) you definitely need to turn over to see if the documents of any
of these students violate the rule and circle "no" for the cards that do not need to be turned over.

<table>
<thead>
<tr>
<th>Grover School</th>
<th>Town of Hanover</th>
<th>Hanover School</th>
<th>Grover City</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
Yamagishi Generalized Trust Scale

Directions: Indicate the degree to which you agree or disagree with each statement by using the following scale:
1 = strongly agree
2 = moderately agree
3 = mildly agree
4 = agree and disagree equally
5 = mildly disagree
6 = moderately disagree
7 = strongly disagree

1. Most people are basically honest.
   1  2  3  4  5  6  7

2. Most people are trustworthy.
   1  2  3  4  5  6  7

3. People always think about their own gain.
   1  2  3  4  5  6  7

4. Most people trust a person if the person trusts them.
   1  2  3  4  5  6  7

5. In today’s society, if you are not careful, people will use you.
   1  2  3  4  5  6  7

6. In today’s society, we do not have to worry about being used by someone.
   1  2  3  4  5  6  7

7. Most people are basically good-natured and kind.
   1  2  3  4  5  6  7

8. Most people trust others.
   1  2  3  4  5  6  7

9. Most people really do not like to make the effort to help others.
   1  2  3  4  5  6  7

10. If we assume everyone has the capacity to be malicious, we will not be in trouble.
    1  2  3  4  5  6  7

11. Generally, I trust others.
    1  2  3  4  5  6  7
Neutral Suspicion Scenario

Directions: Please read the following three scenarios carefully and respond to the questions as accurately as possible.

Scenario 1:
Nate, an American traveling abroad, stayed three nights in a London hotel. Upon checking out, Nate realized he was only charged for one night. The hotel was very busy and Nate knew that if he didn’t speak up, the hotel clerk would not catch the mistake.

What is the probability that Nate will notify the hotel clerk that he has been undercharged for the room?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 2:
Matt has just finished up lunch at his favorite restaurant. After paying in cash, the waiter returns with Matt’s change. Matt notices that the waiter has miscounted the change, leaving him too much money. The waiter did not realize his mistake and Matt knows that he will be able to get away with the extra change if he wants.

What is the probability that Matt will notify the waiter that he has been given too much change?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 3:
John has just purchased a new car with the basic warranty. Once home, John noticed that the dealership had unknowingly given him the extended warranty without tacking on any extra charges to his bill. Since the contract had been signed, John knew that the dealership had to honor the upgraded warranty even though John didn’t pay for it.

What is the probability that John will notify the dealership that he has accidentally been given the extended warranty?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Positive Suspicion Scenario

Directions: Please read the following three scenarios carefully and respond to the questions as accurately as possible.

Scenario 1:
Nate, an American traveling abroad, stayed three nights in a London hotel. The hotel is very busy and Nate had to wait in line to check out. While in line, Nate allowed an elderly guest to cut in front of him. Upon checking out, Nate noticed he was only charged for one night. Since the hotel was very busy, Nate realized that if he didn’t speak up, the hotel clerk would never catch the mistake.

What is the probability that Nate will notify the hotel clerk that he has been undercharged for the room?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 2:
Matt has just finished up lunch at his favorite restaurant. Before settling his bill, Matt goes to the bathroom to wash his hands. On the way back to his table Matt picks up a piece of trash on the floor and throws it away. After paying in cash, the waiter returns with Matt’s change. He notices that the waiter has miscounted the change, leaving him too much money. The waiter did not realize his mistake and Matt knows that he will be able to get away with the extra change if he wants.

What is the probability that Matt will notify the waiter that he has been given too much change?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 3:
John has just purchased a new car with the basic warranty. While driving home in his new car John allowed an impatient driver to pass him on the freeway. Once home, John noticed that the dealership had unknowingly given him the extended warranty without tacking on any extra charges to his bill. Since the contract had been signed, John knew that the dealership had to honor the upgraded warranty even though John didn’t pay for it.

What is the probability that John will notify the dealership that he has accidentally been given the extended warranty?
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Negative Suspicion Scenario

Directions: Please read the following three scenarios carefully and respond to the questions as accurately as possible.

Scenario 1:
Nate, an American traveling abroad, stayed three nights in a London hotel. The hotel is very busy and Nate had to wait in line to check out. Instead of getting in the back of the line, Nate cut in front of another hotel guest. Upon checking out, Nate noticed he was only charged for one night. Since the hotel was very busy, Nate realized that if he didn’t speak up the hotel clerk would never catch the mistake.

What is the probability that Nate will notify the hotel clerk that he has been undercharged for the room?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 2:
Matt has just finished up lunch at his favorite restaurant. Before settling his bill, Matt goes to the bathroom to wash his hands. On the way back to his table Matt empties the trash in his pockets onto the restaurant floor. After paying in cash, the waiter returns with Matt’s change. He notices that the waiter has miscounted the change, leaving him too much money. The waiter did not realize his mistake and Matt knows that he will be able to get away with the extra change if he wants.

What is the probability that Matt will notify the waiter that he has been given too much change?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Scenario 3:
John has just purchased a new car with the basic warranty. While driving home in his new car John cuts off a slower driver on the highway. Once home, John noticed that the dealership had unknowingly given him the extended warranty without tacking on any extra charges to his bill. Since the contract had been signed, John knew that the dealership had to honor the upgraded warranty even though John didn’t pay for it.

What is the probability that John will notify the dealership that he has accidentally been given the extended warranty?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Appendix C – Study 3 Materials

Tromso Social Intelligence Scale

Directions: Indicate the degree to which the statements below describe you by using the following scale:

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

1. I can predict other peoples’ behavior.
   1 2 3 4 5 6 7

2. I often feel that it is difficult to understand other’s choices.
   1 2 3 4 5 6 7

3. I know how my actions will make others feel.
   1 2 3 4 5 6 7

4. I often feel uncertain around new people who I don’t know.
   1 2 3 4 5 6 7

5. People often surprise me with the things they do.
   1 2 3 4 5 6 7

6. I understand other peoples’ feelings.
   1 2 3 4 5 6 7

7. I fit in easily in social situations.
   1 2 3 4 5 6 7

8. Other people become angry with me without me being able to explain why.
   1 2 3 4 5 6 7

9. I understand others’ wishes.
   1 2 3 4 5 6 7

10. I am good at entering new situations and meeting people for the first time.
    1 2 3 4 5 6 7
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 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 behavior.

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.
HC Wason Task

Imagine you are a member of a small community in Thailand that specializes in the processing of raw rubber into simple products. It is your job to travel to a large market several miles away in order to purchase raw rubber for your community. The buying of raw rubber is a difficult task because it is nearly impossible to determine the quality of the rubber until after it is processed and manufactured. Since the quality of the finished product is highly dependent on the quality of raw rubber used, purchasing high quality raw rubber is of vital importance for the livelihood of your community.

The market has many different raw rubber merchants, and none of them offer guarantees on their product. To make matters worse, the raw rubber trade is a volatile business with new merchants coming and going all the time.

To help ensure that raw rubber merchants do not attempt to cheat their customers the market has the following rule in place:

"If rubber is to be sold for a high price, then it must be of a high quality."

Despite this rule, many merchants tend to over-price low quality raw rubber, knowing that it is nearly impossible to detect. On this particular occasion you are comparing the raw rubber from four different merchants. It is your task to make sure that none of the bundles you are interested in have been over-priced.

Imagine the boxes below represent cards that have information about the raw rubber of four merchants. Each card represents information for one merchant. One side of a card tells the price of the rubber, and the other side of the card tells the quality of the raw rubber. Please circle "yes" on only those card(s) you definitely need to turn over to see if any of the merchants violated the rule and circle "no" for the cards that do not need to be turned over.

<table>
<thead>
<tr>
<th>High Price</th>
<th>Low Price</th>
<th>High Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
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</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>
LC Wason Task

Imagine you are a member of a small community in Thailand that specializes in the processing of raw rubber into simple products. It is your job to travel to a large market several miles away in order to purchase raw rubber for your community. The buying of raw rubber is a difficult task because it is nearly impossible to determine the quality of the rubber until after it is processed and manufactured. Since the quality of the finished product is highly dependent on the quality of raw rubber used, purchasing high quality raw rubber is of vital importance for the livelihood of your community.

To ensure that your community only gets high quality raw rubber, you have formed a long-standing relationship with a single raw rubber merchant. You have dealt with this single merchant for several years and have resisted the temptation to purchase cheaper raw rubber, of unknown quality, from other merchants.

You and this particular rubber merchant have a rule in place to ensure that the raw rubber you purchase for your community is of a high quality. The rule is as follows:

“If rubber is to be sold for a high price, then it must be of a high quality.”

On this particular occasion the raw rubber merchant you have formed a relationship with has four bundles of rubber. They are priced differently and you are not certain why. It is your task to make sure that none of the bundles you are interested in have been over-priced.

Imagine the boxes below represent cards that have information about the four bundles of raw rubber. Each card represents information for one bundle. One side of a card tells the price of the rubber, and the other side of the card tells the quality of the rubber. Please circle “yes” on only those card(s) you definitely need to turn over to see if any of the bundles of raw rubber violate the rule and circle “no” for the cards that do not need to be turned over.

<table>
<thead>
<tr>
<th>High Price</th>
<th>Low Price</th>
<th>High Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
</tbody>
</table>
Vita

Kori James Stroub

Kori Stroub was born in San Luis Obispo, CA on September 26, 1977. He completed his undergraduate studies at the University of California at Santa Barbara in May of 2001, graduating with Honors in Anthropology. In August 2005, he entered the College of William and Mary to pursue a Master’s degree in Experimental Psychology. Kori defended his thesis in August of 2007 and plans to apply to doctoral programs in Educational Research.