Through the lens of the camera:
Can hostile intent be identified by the observation of deviant behavior?

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Summary
An experiment was conducted to identify deviant behavior of persons with a hostile intent. Participants with and without hostile intent each carried a supposed illegal (or not) package past a police officer who delivered a signal. The signals intention was to deliver cognitive strain to the participants, resulting in deviant behavior of persons with a hostile intent. The police agent either used a strong (clearly aimed at theparticipants) or a weak (not directed at the participants) signal to elicit behavioral responses.
Results indicate a weak or stimulus can influence both people with and without hostile intent in terms of observed fidgeting. Further can strong stimulus elicit emotions as smiling and laughing by people with a hostile intent.
The conduction of the study was in parts flawed by a low agreement between the different observers, questioning some results. Implications and annotation are included at the end.

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Introduction

In December 2012, a bomb was planted in main station of Bonn, Germany (Rheinische Post, 2012). Although the train station is under video surveillance, it was not possible to catch a suspect on the spot or identify him afterwards. Only a mistake in the construction of the bomb prevented it from exploding and therefore a possible disaster. This raises concerns for the public safety and emphasizes the need to prevent instances like this and other violations of the law which endanger the public. But while many public places are already under video surveillance, research indicates that the simple monitoring through CCTV may be not enough to reduce the appearance of anti-social behavior (Fletcher, 2011). In addition, a study in 2009 found that CCTV has only a small effect on preventing crimes related to car theft in parking decks, but not to other crimes (Welsh and Farrington, 2009). While passive surveillance can be helpful, it may not be sufficient as the only measure in preventing crimes. The CCTV footage can help to identify delinquents afterwards, but it is then probably already too late to prevent the incident itself. This is not only a problem in terms of public safety, but also for other parts of the public where lawbreaking is a common problem, for example customs at airports or places with high crime rate in general. There are techniques which try to close this gap, like the SPOT program (Screening Passengers by Observation Technique) which is widely used by the Transportation Security Agency (TSA) in the United States ("TSA SPOT Program: Still Going Strong", 2010). The SPOT program is designed to identify people with hostile intentions by observing them for deviant behavior, but its use is controversial because of the small success rate which it provides (Weinberger, 2010). The reason is, that it is difficult to detect if someone tries to conceal his true intention.

Research shows that under normal circumstances people are good at concealing their intentions and keeping up a "normal" behavior, which makes is hard for security agents and observers to identify them as possible lawbreakers (Lousberg, Langelaan, Wetzer, & van Hemert, 2009). However, a number of factors can influence the ability to uphold the deception of a true intent. A person who is trying to conceal is influenced by his surroundings and will interpret cues and stimuli in a different way than someone who has nothing to hide (Gangestad & Snyder, 2000). The person's personal traits and abilities are playing major role (DePaulo, Kirkendol, Tang & O'Brien, 1988) in concealing, as well as their motivation (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton & Cooper, 2003). Further, keeping up this normal behavior is challenging in a cognitive way, as it makes increased use of the brain's *executive processes* which are responsible for a number of activities such as the working memory or management of information (Gombos, 2006). Baddeley (2000) describes these executive processes as a crucial aspect of complex cognitive tasks, such as decision making or problem solving.

The increased use of the executive processes can become problematic for the deceiver. Following the Cognitive Load Theory (CLT), the capacity of the executive processes like the working memory is limited (Paas, Renkl & Sweller, 2004). A so called *cognitive overload* may then happen, that means that the information which should be processed by the executive processes exceeds their capacity (Paas et. al, 2004). The executive processes of someone who tries to deceive his true intent can be occupied completely with maintaining the normal behavior. This leads to the proposition that stimuli can enlarge the cognitive load of someone to a point where a cognitive overload happens. The maintenance of normal behaviour is then not possible anymore and deviant behavior is likely to be shown. The main question is therefore:

Can a stimulus influence someone who tries to conceal his true intent in a way that deviant behavior will be shown?

There are three major points which have to be examined for this study. At first, a definition of “hostile intent” is given to lay down the extent in which the study operates. Second, several factors are described which are associated with deception and the concealing of a true intent. These factors influence the perception and processing of information of a deceiver and contribute to the accumulation of cognitive stress. Then the possible deviant behavior as consequence of the cognitive overload is presented.

Theoretical Framework

Hostile intention can have a very broad meaning within different settings such as political, social or military backgrounds. Stekkinger (2012) specifies hostile intention as the intent to do deliberate harm, pain or other forms of damage and mischief to reach a distinctive goal at a distinctive time. Examples can include but are not restricted to “terrorism, larceny, vandalism, loitering and other troublesome or crime related behavior“(Stekkinger, 2012, p.8). This includes a delinquent who is busy stealing a purse but also another one who scouts a place like a train station for its security measures to place a bomb in a terroristic act.

The attempt to conceal a hostile intent is comparable to other forms of concealing like lying or the hiding of a non observable stigma. A non observable stigma can include mental illness, having AIDS, unemployment, being homosexual and many other characteristics that can have a negative influence on the person’s life under particular circumstances like social isolation or loss of employment (Pachankis, 2007). A person who tries to conceal a stigma lives in a constant fear of disclosure, a state that is similar to hiding a hostile intent. The deceiver of a hostile intent has to fear severe consequences in case of uncovering as well, which could be a high fine or a criminal conviction to prison. This leads to a high amount of stress in both groups due to the constant occupation with the concealing of the secret.

The question is, if the cognitive load can become so high, that controlling the behavior to conceal is not entirely possible anymore, thus resulting in deviant behavior. Different factors can effectively influence the perception and cognition of someone with a hostile intent who tries to conceal it. These stimuli can come in various types and forms; they all strain the cognitive processes further.

These factors and stimuli can be grouped in three different categories which are named *motivation*, *risk perception* and *the role of the self*. These categories contain the theoretical background for the study which leads to the proposition of the hypotheses which will be tested.

The first factor is *motivation*, which refers to the determination of the deceiver. It should be noted that emphasis is placed on the intent of reaching a specific goal at a specific time. DePaulo et al. (2003) conducted a meta analysis about signs which show the deception of a true intent. They found motivation as one of the main impacting factors: motivated liars are more likely to show deviant cues which differ from the behavior of not or less motivated

liars. This can be attributed to the basic prerequisite of lying, which states that a liar has to purposefully produce the behavior which is displayed naturally by a truth teller (DePaulo et al., 2003). This means, that a liar has to actively act in a normal way, while simultaneously preparing the next steps or sentences in his mind. According to DePaulo et al. (2003), highly motivated deceivers are even more prone to overact or "may redouble their deliberate efforts at self-regulation, resulting in an even more debilitated performance"(p. 78).

It is likely that motivation plays an equally significant role in deception of a true intent outside of the scope of lying. Other deceivers such as thieves are in the same manner trying to act normal in order to avoid being detected. They may not have to uphold a conversation from person to person, but they have a similar interpersonal distance to their objects. Further, the range and number of their encounters can be much bigger or diverse (many different people are encountered), thus somewhat equally challenging in cognitive terms.

The second category, called *risk perception*, combines different effects which all influence the risk perception of a person who tries to deceive. Srull and Wyer (1979) detected that the accessibility of distinctive concepts and categories is one of the main factors which determines in what way information of the surroundings of a person is encoded. Further, the activation of a concept increases the chance to use this concept for the interpretation of other information or social stimuli in the future. Information like the sight of the sign "police" would be encoded within the lines of like "risk" or "danger" for someone an intention to deceive, because he fears the uncovering of his intention. Once activated, it is more likely that even normally neutral stimuli would be encoded under the impact of these concepts. In addition to that, Srull and Wyer (1979) found that the concept of hostility needs significant fewer instances for activation in comparison to the concept of kindness. A person with a hostile intent will therefore interpret stimuli of his surroundings in a way that accompanies with his activated concepts and also in a more often in a hostile way.

The experience of risk can influence the perception of a person in a situation of the concealment of true intents. Individuals who perceive more risk are faster in rating social situations and they are also prone to rate a situation more risky (Pilkington & Woods, 1999). This further supports the assumption that the concept of "risk" will be activated in the situation of concealment. Interpreting a large part of information in the terms of risk is likely to strain the cognitive ability of a deceiver, adding to chance of a cognitive overload.

A faster recognition of stimuli can also be attributed to an attentional bias. Stimuli that are relevant for a person at a present time are recognized faster. Papies, Stroebe and Aarts (2008) conducted a study with dieting patients who were exposed to palatable food cues. The patients recognized the food cues faster than other cues, because the concept of food was important to them and activated. In addition, the stimuli can change a current orientation goal on dieting to a contrasting orientation on eating. Their goal to lose weight, which serves as a self regulatory barrier against eating is inhibited by the mere exposure of food. The findings are transferrable to the case of deception. A person with the intent to deceive can be victim of an attentional bias, because of a concentration on information cues which are relevant for them at the time, for example a police agent. The directed attention can be dangerous for the deceiver when he only perceives these distinctive cues which enlarge his experience of risk. Additionally, opposing stimuli can challenge the persons goal of showing a normal behavior and then lead in combination with the foregoing to a cognitive overload.

Risk perception is further influenced by other factors. Pilkington and Woods (1999) detected that individuals with a high risk perception in social situation are more likely to interpret an ambiguous social stimulus in a more negative way. A possible delinquent would likely be very aware of his own surroundings, not only to scout possible spots for carrying out his planned act, but also do avoid unnecessary hold-ups. The deceiver will therefore also have a higher risk perception than the average. Dijksterhuis and Aarts (2003) conclude in their study that negative stimuli are also detected faster. They give an evolutionary explanation of the advantages of their discovery: It is more useful to detect a threatening danger like an approaching predator (negative) than to detect an edible source of food in the environment (positive). Time is the important matter which determines the own survival. The same is true for the deceiver of a hostile intent; the outcomes of uncovering can be quite severe. Going to prison or to paying a high fine are certain outcomes of a criminal conviction for offences like smuggling drugs, pick pocketing or placing a bomb. In some countries, even the death penalty is possible under those circumstances. Thus it can be concluded that the negative interpretation of stimuli certainly delivers a high amount of stress to the deceiver because he has to fear severe consequences when his deception would be debunked.

The ambiguity of information can also be itself cognitively straining for the deceiver. Moskowitz and Skurnik (1999) discovered that ambiguous information leads to contrast, which means that stimuli are interpreted in an opposite way to the accessible information. This is accord with the set-reset model of priming, which needs a sufficient cognitive effort. This means that the interpretation of stimuli can be more cognitively stressful if they are ambiguous.

The factor *role of the self* combines self-consciousness and self-perception, which play an influential role in reference to the interpretation of stimuli and information out of the surroundings of a person that conceals a hostile intention. The monitoring and controlling of expressions is fundamental for the creation of the public self appearance, the image that others are making of a person (Gangestad & Snyder, 2000). For the deception of a true intent is it congruously necessary to built up a public self appearance which disguises the truth, making self-monitoring a necessary requirement. Gangestad and Snyder (2000) argue that a number of *external criteria* determine the ability to self-monitoring, amongst others the ability of feigning emotions or to react to in accordance with the expectations of others. These are operations that require an active performance to generate an outcome for the person; a deceiver must register and process an emotion of his counterpart first and then think of an expression which will be suitable to reach his goal. While much of this will happen automatically within the cognitive processes, it is certainly demanding and stressful.

Self-consciousness is also influencing an effect called the *self-as-target bias.* This effect is defined by Fenigstein (1984) as „an egocentric bias in the extent to which external occurrences are perceived as being targeted toward the self“(p.860). His study finds that the higher the public self-consciousness, the more likely is it to be become a victim of this bias. If someone is preoccupied with himself, he will make the assumption that he is also the occupation of the attention of others (Fenigstein, 1984). More so, Fenigstein and Levine (1984) stated that the chance to attribute hypothetical outcomes to his own fate rises when the focus of attention lies on the self. This means that not only will a highly self-conscious deceiver will interpret external cues with the assumption that they are aimed at him, he will also attribute a hypothetical outcome to himself.

The findings of a neural study further emphasize the importance of the self focus. A liar needs a longer time to react if he or she has to feign a response with autobiographical relation and will also need more cognitive control for the task (Nunez, Casey, Egner, Hare, & Hirsch, 2005). The hypothetical outcomes of detection can be severe for deceiver. The fact, that he is more likely to attribute them to his own fate, make it likely that he will exposed to a high amount of stress, which will then increase the potential to a cognitive overload.

Summarizing, these three different factors *motivation*, *risk perception* and *the role of the self* can influence the deceiver of a true intent by putting a significant load to the cognitive abilities, resulting in an overload. To make a forecast of possible the resulting deviant behavior, a look into the preceding research is necessary. A number of studies did research in the field of deception and associated nonverbal behavior. Deceiving of a true intent demands certain capacities over the body, likewise a person that tries to play a role. The deceiver plays the role of normal person and is occupied with the presentation of normal behavior or what he believes is normal (Vrij et al., 2008). The results of this behavior can be grouped into different categories, whereof two were chosen for an examination in this study: The categories of nervousness and emotions.

Nervousness can be an indicating factor for the deceiving of a true intent. Nervousness and an overall enlarged tense is associated with deceiving. The same is true for the display of fidgeting. De Paulo et al. (2003) found that liars will show more fidgeting overall than non-liars; however they found conflicting results for special kinds of fidgeting like object fidgeting, for example playing with a pencil, as well as self fidgeting like scratching. Fidgeting resembling gestures, like touching one's face, where also found to be connected by Stekkinger (2012). It is therefore proposed that nervousness as well as fidgeting will be indication for the deception of a malicious intent.

H1: A person with intent to deceive will show more nervousness and tension than a person without intent to deceive.
H2: A person with intent to deceive will show more fidgeting than a person without an intent to deceive.

The second group of deviant behaviors which draws a connection to the deceiving of a true intent is emotions. Stekkinger (2012) found that a deceiver is more likely to display laughing than a person without intent to deceive. He also found that a deceiving person is more likely to express shock in the moment when it is exposed to a relevant stimulus like eye-contact with a police agent. It is likely that the stimulus is perceived as threatening and therefore enlarging the cognitive strain, resulting in an overload which is displayed in the loss of control and showing of shock.

H3: A person with hostile intent will show more emotions like smiling and laughing than a person without a hostile intent.
H4: A person with hostile intent will more likely show an expression of shock than a person without a hostile intent.

A contributing factor to the display of deviant behavior is the appearance of the triggering stimulus, the so called *signal*. The aim of this study is to elicit deviant behavior from a person with hostile intent. This is done by providing a stimulus in form of a signal, which has the purpose to exceed the person's cognitive capability resulting in a cognitive overload. The appearance of the signal can influence is perception. A person will pay attention to possible stimuli from his or her surrounding if they are dangerous (Dijkstershuis & Aarts, 2003) or contrary to their current goals (Papies et al., 2008).

To make a noticeable difference between persons with and without a hostile intent, a differentiation in signals is advised. A strong signal, directly aimed at a person or group, leaves no uncertainty that a person or group is addressed. It should be perceived as threatening by a person with hostile intent and as a response to the own behavior (Fenigstein, 1984; Fenigstein & Levine, 1984). As a reaction to a strong signal, it is expected that a person with hostile intent will experience a definitive cognitive load and an increased display of deviant behavior in contrast to a reaction of weaker signal. The weaker signal is less target-oriented than the strong signal and is therefore less likely to be seen as consequence of the own behavior. In contrast to the strong signal, it is not expected that a person with hostile intent will show most likely deviant behavior as a reaction.

The display of fidgeting and nervousness is therefore expected to be higher for persons with a hostile intent and an exposure to a strong signal.

H5: An individual with hostile intent, exposed to a strong signal, will show more fidgeting than an individual with hostile intent, exposed to weak signal.

H6: An individual with hostile intent, exposed to a strong signal, will show more nervousness than an individual with hostile intent, exposed to weak signal.

Method

Participants and design. This study makes use of the video recordings of a preceding experiment. 35 persons took part in the experiment and were randomly assigned to the 2 (Hostile vs. Non-Hostile) x 2 (Strong vs. Ambiguous signal) design. The participants were all students of the University of Twente received credits for the participation (a necessary part of their bachelors degree) plus a chance to win an iPod. Those 35 participants were 12 men and 23 women. Due to technical failures in the recording as well as interruptions in the experimental sequence (for example contact with persons not belonging to the experiment condition), the exclusion of 7 participants was necessary. This left 28 participants, 12 men and 16 women with the mean age of 20.29 (*SD* = 1.86, *range* 17 - 25). Of the remaining participants were 18 of German nationality and 10 Dutch, all fluent in the Dutch language.

The video recordings of the experiments were then afterwards reviewed by three different observers and coded within predefined measures to examine the display of behavior through the participants. The study was conducted with a double blind design, were neither observers nor the participants self knew who to which of the four categories (Hostile vs. Non-Hostile and Strong vs. Weak signal) belonged. A trainings lesson was carried out to brief the observers, which consisted of a test record that was shown and rated

together. This was done in order to obtain a consistency in the ratings of the three observers. The whole video material was rated once by every observer, resulting in three different observations for every participant.

Procedure. The experiment was conducted on the campus of the University of Twente. Participants were welcomed, given the form of consent to read and sign, followed by short layout of the experimental outline. The participants were asked to wear a heart rate meter, Equivital™ EQ-01 Physiological Monitor[1], and place in front of a computer to view a prerecorded video briefing to give an outline of the content of the experiment. They were given the explanation that the experiments goal was an evaluation of an experimental training in behavioral analysis, given to police agents. The video briefing was further used to manipulate hostile intent; this took 5 minutes.

The participants were instructed to bring a package from one point on campus to another. Participants in the hostile intent condition were instructed that they would be carrying a package containing supposedly illegal material. They were instructed that if they were stopped by the police agents, standing alongside the route, they would be detained for questioning and following paperwork. The experiment would then take longer for them; they would get no compensation for the additional time and lose their chance to win an iPod. On the other hand, if they were not detained by the police agents, they would get an extra ticket, doubling their chances to win. Participants in the nonhostile intent condition would simply carry a normal (e.g. not illegal) package and if they would be stopped and detained by the police, it would have no effect (neither would they have to stay longer, nor are there chances to win the iPod affected). Instead, the participants would get an extra ticket simply for finishing the course, respectively the experiment. Other instructions were identical. The packages were all carried in identical white paper bags.

The alleged police agent, who was placed alongside the route, provided a fundamental problem for the participants with a hostile intention. The detention a questioning for paperwork would make them lose time without compensation and the chance to win the iPod, while the participants without hostile intent could just continue without those disadvantages. Of participants, nobody was in fact stopped and detained.

Following the video briefing the experimenter escorted the participants to the starting point. There they received additional instructions for the increasing of cognitive load (for example the remembering and later retrieving of a six digit locker number) plus instructions to strain their short term memory for a feeling of pressure and to add to their cognitive loads. Those instructions consisted remembering a locker number (one letter and two digits) and a six-digit code. Additionally, the participants were instructed not to run, but to keep a steady pace.

The first view of the police agent was right after turning a first corner. When the participants crossed a predefined marker on the ground, the police agent would initialize the signal stimulus. There were two different signals for evoking a response in behavior (strong vs. weak). The phrase “Code red perceived” (Dutch = “Code rood gezien”) was spoken by the police agent in his or her radio. In the strong signal experiment condition, the phrase was accompanied by the police agent looking in the direction of the participants while simultaneously avoiding eye-contact with individuals. In the weak signal condition the police agent looked away from the participants while saying the phrase. The experiment was

[1] The analysis of the collected data from the heart monitors delivered no useful results

videotaped from a few moments before the participants came around the corner until approximately 10 meters alongside the path after passing the police agent (during and after the signal) using a high-definition camera from a high vantage point.

At the end of the route the first experimenter was waiting for them and escorted them back to the room where they were briefed in the beginning. The participants received a funneled debriefing with open questions to examine if they were aware of the true intent of the experiment. The results give no indication that any of the participants was aware of the true intent of the experiment.

Measures

Video Coding. The coding scheme used here is partly adopted from Stekkinger (2012) and his study but with several additional items to examine deviance and changes in the participants' behavior, for example the item group *nervousness* (De Paulo et al., 2003). The coding scheme was reduced from originally three points of measurement in the study of Stekkinger, to two points of measurement in this study. The measuring points two and three in Stekkingers coding scheme, during the stimulus and after the stimulus, where joint together. This was done in order to encounter the changed perspective of this study. Stekkinger laid focus on deviant behavior like an orienting reflex towards the police agent by the participants, which made the differentiation in three points of measurement in his study necessary.

To distinguish between the participants' behavior before and after the given stimulus and to measure accurately if they show deviant behavior as a reaction, this study uses two points of measurement. The first being before the stimulus *("Before the stimulus: From the period the person turns around the corner till the stimulus is given"* translated from Dutch), comprising the time segment from the moment when the participants turn around the corner till they reach the marker, the second, after the stimulus (*"After the stimulus: the period from the stimulus till the end"* translated from Dutch), covering the time from the moment the stimulus is given till the participants are out of the range of the camera.

A foregoing evaluation and pilot testing of the video material made a modification of the way the individual items were coded necessary. The three point answer options were introduced to manage the difficulties of the technical circumstances. The distance of recording and resolution of the video material made a scale with more answer options impractical, as it was already difficult to spot and recognize the behavior in general. The answering scale to measure the display of deviant behaviors reaches from "explicity not" (*"Expliciet niet"* in Dutch) as point score 1, "indifferent" (*"Indifferent"* had no Dutch translation) as point score 2 up to "explicity well" (*"Expliciet wel"* in Dutch) as point score 3.

Nervousness. The first group contained eight items in total, respectively four for both time periods. The scheme contained of an item to evaluate the persons overall nervousness (*"The subject shows signs of nervousness and tension"* translated from Dutch), one item for fidgeting in general (*"The subject shows signs of fidgeting in general"* translated from Dutch) and one item each for both object fidgeting and self fidgeting (*"The subject shows signs of object fidgeting"* and *"The subject shows signs of self fidgeting"* translated from Dutch). Each of those four items was measured twice, before and after the given stimulus.

Emotions. The second group contained six items in total and measured the participants' express of laughter and shock. The first instance of measurement (before the stimulus) contains four items, evaluating the expression of laughter and shock both at the moment of the participants turning the corner and at first sight of the police agent ("*Facial expression at the corner: Shock"*, "*Facial expression at the corner: Laughter", "Facial expression at sight of the agent: Shock", "Facial expression at sight of the agent: Laughter"* all translated from Dutch). The expressions were evaluated once in the second time period with two items ("*Facial expression after the stimulus: Shock"* and "*Facial expression after the stimulus: Laughter"* both translated form Dutch*)*.

Inter-rater Reliability. The consistency between the three observers which conducted the coding of the video material plays an important role for the interpretation of the results. The whole video material was rated three times in total, once by every observer. An interrater reliability analysis using the Kappa statistic was performed for the measurement of every single item to examine consistency between the observers and to rule out possible exceptions.

Results

Inter-rater Reliability. The results of the inter-rater reliability analysis for the single items showed no overall convincing consistency. To rule out the possibility that the overall reliability was influenced negatively by one observer, another the inter-rater analysis was conducted. The consistency between every combination of two observers for every item was measured (observer 1 + 2, obeserver 1 + 3 and obeserver 2 + 3). For a number of items, one observer could be identifyed as a possible reason for low consistency. For those items, only the average of the consistent observers was used for the analysis of main and interaction effects of intent and stimulus. All other items were analysed for with the mean score of all three observers for every participant.

The reduction was done for the four items 6, 10, 12 and 13 (*"Fidgeting overall before the stimulus"*, *"Facial expression after the stimulus: Laughter"*, *"Fidgeting overall after the stimulus"* and *"Object fidgeting after the stimulus"*).

Item 6 (*"Fidgeting overall before the stimulus"*) showed a fair agreement between observer 1 and 2 with Kappa 0.359 ($p < 0.05$), yet next to no agreement between observer 1 and 3 with Kappa 0.010 (p = ns.) and only little agreement 2 and 3, Kappa 0.187 ($p < 0.05$). Therefore the scores of observer 3 were taken out for the analysis.

The same was done for item 10 (*"Facial expression after the stimulus: Laughter"*), were observer 1 and 2 showed a moderate agreement of Cohen's Kappa 0.538, ($p < 0.001$). Observer 1 and 3 (Kappa 0.166, p = ns.) and 2 and 3 (Kappa 0.154, $p < 0.05$) showed only slight agreement. Again, the ratings of observer 3 were taken out to improve the results.

Item 12 (*"Fidgeting overall after the stimulus"*) had a fair agreement for observer 2 and 3 with Kappa 0.210 (p = ns.) and next to no agreement for observer 1 and 2, Kappa -0.057 (p = ns.) as well as observer 1 and 3, Kappa 0.084 (p = ns.). The ratings of observer 1 were left out for the analysis.

Item 13 (*"Object fidgeting after the stimulus"*) showed fair agreement for observer 2 and 3 with Kappa 0.324 ($p < 0.001$). Next to no agreement was found between observer 1 and 2, Kappa 0.059 (p = ns.) and only little agreement between observer 1 and 3, Kappa 0.103 (p = ns.). The ratings of observer 1 were therefore left out for the analysis in order to improve the outcomes.

It was not possible to conduct this inter-rater reliability for all items. In some cases (Items 1,2,3,4 and 9) at least one of the observers was a constant, meaning that his ratings did not differ between participants. More precisely, the observer or observers did not notice the particular deviant behavior of the items (for example "*Facial expression at sight of the agent: Shock")*, while the remaining one or two did. This can be seen as an indication that there was no real agreement over the rating of the display of possible deviant behavior. A possible cause could be a mistake in the training lesson. The implications are discussed below.

The items 6, 10, 12 and 13 were analysed with adjusted means of the observers, leaving out one observer as the possible reason for low agreement. All other items were analysed for with the mean score of all three observers for every participant. A full overview of the inter-rater analysis can be found in the appendix, table 1.1.

Nervousness. A multivariate variance analysis (MANOVA) with the two independent variables intent and strength of stimulus brought no significant results for any of the dependent variables of the first time period, being nervousness, overall fidgeting, object fidgeting and self fidgeting with F (1, 24) < 1, ns.) for *Intent* and F (1, 24) < 1, ns.) for *Stimulus.* The same is true for the second time period, where an multivariate variance analysis (MANOVA) with the two independent variables intent and strength of stimulus was conducted as well for the independent variables, resulting in *Intent* F (1, 24) < 1, ns., and *Stimulus* F (1, 24) < 1, ns..

In two cases results showed a trend in a certain direction, yet no real significance. There were possible main effects found for item 6, *nervousness before the stimulus* (F (1, 24) = 2.99, p = 0.096). Nervousness seems to be more prevalent with persons with hostile intent before the stimulus is given ($M_{\text{HostileIntent}}$ = 2.36, SD = 0.33 versus $M_{\text{Non-HostileIntent}}$ = 2.14, SD = 0.34; F (1, 24) = 2.99, p = 0.096), yet there is no significant difference between them and the persons without hostile intent after the stimulus was given ($M_{\text{HostileIntent}}$ = 2.14, SD = 0.36 versus $M_{\text{Non-HostileIntent}}$ = 2.17, SD = 0.28; F (1, 24) < 1 , ns.).

The item number 13, *Fidgeting overall after the stimulus,* shows a main effect for the variable *Stimulus* which is close to significance, F (1, 24) = 3,55, p = 0.072. The results indicate that overall fidgeting seems to be more prevalent in general if a weak stimulus is given ($M_{\text{HostileIntent}}$ = 1.89, SD = 0.27 versus $M_{\text{Non-HostileIntent}}$ = 1.95, SD = 0.13; F (1, 24) = 3.55, p = 0.072), than if a strong stimulus was given ($M_{\text{HostileIntent}}$ = 1.71, SD = 0.21 versus $M_{\text{Non-HostileIntent}}$ = 1.76, SD = 0.37; F (1, 24) = 3.55, p = 0.072). There is no indication in the results that a person's intent influences the expression of fidgeting (F (1, 24) < 1, ns). A possible clarification is given below.

Because the result show only a close to significant difference for the expression of nervousness *before* the stimulus was given, there is no reason to see hypothesis number 1 ("A person with intent to deceive will show more nervousness and tension than a person without intent to deceive.") as confirmed. Further is there no confirmation of hypothesis number 2 ("A person with intent to deceive will show more fidgeting than a person without intent to deceive"). Fidgeting seems to be in general more prevalent after a weak stimulus is

given, but there are no results which show a link to the intent. There is a possible explanation for this occurrence which is discussed in the following passage.

A multivariate variance analysis (MANOVA) for the independent variables Intent and stimulus gave no overall interaction effects for the second time period (F (1, 24) < 1, ps.). There was a close to significant interaction effect found for the first time period (before the stimulus) between the intent to deceive, express of nervousness and fidgeting, and the stimulus condition, F (1, 24) = 2,66, p = 0.061). A univariate variance analysis (ANOVA) found a likewise almost significant interaction effect for self fidgeting in the first time period (before the stimulus) with F (1, 24) = 4.004, p = 0.057.

Planned comparisons were carried out, but did not show significance for a difference between the two intent groups, but for the stimulus. Results indicate that people with a hostile intent show more signs of self fidgeting before they are exposed to an ambiguous stimulus ($M_{\text{HostileIntent}}$ = 2.17, SD = 0.35 versus $M_{\text{Non-HostileIntent}}$ = 1.86, SD = 0.26; F (1, 24) = 3.32, p = 0.081) in comparison to people with hostile intent before they are exposed to the strong stimulus ($M_{\text{HostileIntent}}$ = 1.75, SD = 0.29 versus $M_{\text{Non-HostileIntent}}$ = 1.90, SD = 0.32; F < 1, ns.).

The findings cannot be replicated for the second time period (F (1, 24) < 1, ns.). There is no significant difference found in the means between the exposition to a strong stimulus ($M_{\text{HostileIntent}}$ = 1.71, SD = 0.33 versus $M_{\text{Non-HostileIntent}}$ = 1.76, SD = 0.32; F (1, 24) < 1, ns.) and a weak stimulus ($M_{\text{HostileIntent}}$ = 1.83, SD = 0.28 versus $M_{\text{Non-HostileIntent}}$ = 1.95, SD = 0.23; F < 1, ns.). It is therefore unlikely that an interaction effect between hostile intent and being either exposed to a strong or weak stimulus is present.

The findings give no reason to see neither hypothesis number 5 (“An individual with hostile intent, exposed to a strong signal, will show more fidgeting than an individual with hostile intent, exposed to weak signal.”) nor hypothesis number 6 (An individual with hostile intent, exposed to a strong signal, will show more nervousness than an individual with hostile intent, exposed to weak signal.) as confirmed.

Emotions. A multivariate variance analysis (MANOVA) with the two independent variables intent and strength of stimulus brought no significant results for any of the dependent variables of the first time period, being the expression of laughter and shock when turning the corner and at first sight of the police agent, with F (1, 24) < 1, ns.) for *Intent* and with F (1, 24) < 1, ns.) for *Stimulus.* The same is true for the second time period, where an multivariate variance analysis (MANOVA) with the two independent variables intent and strength of stimulus was conducted as well for the independent variables and the *Intent* (F (1, 24) < 1, ns.) and *Stimulus* (F (1, 24) < 1, ns.).

No overall significant interaction effects could be found with a multivariate variance analysis (MANOVA) for the first time period F (1, 24) < 1 , ns.), but a multivariate variance analysis (MANOVA) for the second time period gave results very close to significance with F (1, 24) = 3.25 , p = 0.057) that indicate an interaction effect.

A univariate variance analysis (ANOVA) showed a close to significant result for the item 10, *Facial expression after the stimulus: Laughter*, with F (1, 24) = 3.74, p = 0.065. Planned comparisons were carried out and revealed an almost significant difference between people with and without hostile intention in the strong stimulus condition ($M_{\text{HostileIntent}}$ = 2.31, SD = 0.14 versus $M_{\text{Non-HostileIntent}}$ = 1.93, SD = 0.15; F (1, 24) = 3.46, p = 0.075) compared to the weak stimulus condition ($M_{\text{HostileIntent}}$ = 2.08, SD = 0.16 versus $M_{\text{Non-HostileIntent}}$= 2.29, SD = 0.15; F (1, 24) < 1, ns.). This means, that a person with hostile intent shows more laughing after being exposed to a strong stimulus than to a weak stimulus. The

outcomes further indicate a possible crossover effect, because it seems that a person without a hostile intent expresses more laughter after being exposed to a weak stimulus ($M_{\text{Non-HostileInten t}}$= 2.29, *SD* = 0.15) than being exposed to a strong stimulus ($M_{\text{Non-HostileIntent}}$ = 1.93, *SD* = 0.15). A possible explanation for this occurrence is given in the following passage.

Because the results showed no main effects that came close to significance, hypothesis number 3 ("A person with hostile intent will show more emotions like smiling and laughing than a person without a hostile intent") cannot be fully confirmed. We found an almost significant interaction effect for the expression of laughter in relation to the strength of the stimulus, which indicates an at least partly conformation. No results were found for a confirmation of hypothesis number 4 ("A Person with hostile intent will more likely show an expression of shock than a person without a hostile intent"). The implications are discussed in the following passage.

Discussion

The goal of this study was the identification of behavioral differences between people with and without a hostile intent. People with a hostile intent were expected to show more signs of nervousness and fidgeting in general than people without hostile intent. We could not confirm these hypotheses with our outcomes. The same is true for our hypotheses over the display of emotions. The expectation was that a hostile intent in a person would lead to an overall increased expression of laughter and shock. The results fail in general to certify those speculations and give no reason convincingly confirm the hypotheses 1, 2, 3 and 4. There is a marginal result that indicates a partly conformation of hypothesis 3 ("A person with hostile intent will show more emotions like smiling and laughing than a person without a hostile intent"), this is discussed below.

The question is why were we not able to confirm the hypotheses? A number of causes can be identified through the analysis of the data. As mentioned in the results, the overall agreement for the three observers is very low. The calculated values of Cohen's Kappa were in no case (for no item variable) found to be substantial convincing and range mostly between zero and 200. Those are not satisfying results. We tried to identify if one observer (out of three) was a possible reason for the low agreement and then adapted the data for the variance analysis. This was done in several cases but led only one time ("*Facial expression after the stimulus: Laughter*") to marginal significant findings. In all other cases, the adaption brought no better results. The other results that were found came from the unedited data (ratings of all three observers) which questions the credibility: if only little to no agreement exists between the observers, the found results could attributed to many different causes and are not convincing for the hypotheses.

A reason for the low agreement lies in the inter-rater analysis. For several items, reliability could not be calculated because one or more of the observers rated every participant the same. One explanation is that the observer could not identify the particular behavior for a single participant. This is quite possible, as certain deviant behavior was hard or impossible to recognize for the first time period, for example the facial expression of shock (see below). But if this is the case, every observer should not have been able to identify the behavior. This would result in the impossibility to identify differences between them because they all rated every participant the same. The results show that this is not the

case. Multiple times were the ratings of one or two observers were almost the same for every participant, while one observer rated otherwise.

We tried to reach a high agreement between the observers by holding a training lesson beforehand and to avoid outcomes like the ones we found. The results show that this was not successful. The three point answer scale which our study featured is probably prone for misunderstandings. What one observer rated possibly as the absence of the expression of an emotion ("Explicit not") rated another as "indifferent" because the person did not show the contrary emotion, the person showed simply not the emotion asked. The trainings session should have encountered those misunderstandings, but that was obviously not accomplished.

In Addition to that, the experiments design is also prone for failure. Although the record was overall quite good and too flawed recordings were thrown out of the rating, it was quite difficult to rate the persons expression of emotions in the first time period. The faces were simply too small and unrecognizable to satisfactory rate the expression when they turned the corner. This adds to the question how one observer can differentiate from the two others in the ratings of the items 1-4, which were directed at the facial expressions of the participants. Furthermore, the sample size was very small. The experiment had only 35 participants from which the material of 28 could be used. This is a very low number of participants for a between subject design with four categories.

Apart from the low agreement between the observers, we found results that were not significant but marginal. The results indicate that people with a hostile intent show more nervousness before the stimulus is given, but not afterwards (independent of the stimulus strength). This could contradict our theory that the stimulus intensifies the cognitive strain, resulting in more expression of nervousness, because we could not find those results for the time after the stimulus. But the associated rating item showed no substantial agreement for the observers, making the results only little convincing.

Something similar was found for fidgeting. The outcomes point to an interaction effect between intent and stimulus. More self fidgeting was shown by persons with a hostile intent before they were exposed to a weak stimulus in contrast to a strong stimulus. This is somewhat confusing, because there is apparent reason for this. The participants were at this point not yet exposed to the stimulus, indicating that the difference between strong and weak is random or an error in the measurement. The low agreement between the observers for this item supports this assumption.

Other marginal outcomes that were found with our study have a more convincing appeal. We found that participants showed more overall fidgeting in general after they were exposed to a weak stimulus. This was not connected to the presence of hostile intent, as participants with and without a hostile intention showed this behavior. Because the expression of the behavior was not limited to the participants with hostile intent, we cannot speak of deviant behavior.

Yet another explanation for those outcomes exists. A strong signal, directly aimed at a person or group, leaves no ambiguity that a person or group is addressed. We expected that a person with hostile intent, exposed to a strong signal, should express deviant behavior, because the strong signal should leave no doubt that the person is addressed. A person without hostile intent, exposed to the strong signal, should interpret the signal not in a way that he is addressed, but that another person within the addressed group (namely one

with a hostile intent). A weaker signal on the other hand has more ambiguity. It is not directly addressed at person, leaving more space for doubt who in the group was addressed. It can be proposed, that a weaker more ambiguous signal, raises doubt and cognitive strain in both participants with and without hostile intent. This would mean that in reality no "weak" signal existed in our experiment. Both groups (hostile and no hostile intent) that were exposed to an ambiguous signal were affected by a cognitive overload and expressed more fidgeting as a result.

Our other marginal finding relating to the express of laughing supports the thesis that no real difference existed between the strong and the weak signal. People with a hostile intent showed more expression of laughing if they are exposed to a strong stimulus, which, in some extent, indicates a correctness of hypothesis number 3 ("A person with hostile intent will show more emotions like smiling and laughing than a person without a hostile intent"). On the other hand we found that people without a hostile intention expressed more laughing after they were exposed to a weaker stimulus. This would be consistent with our theory that a weak, ambiguous stimulus can even lead to a cognitive strain and overload if the person has in reality nothing to hide. It fails however to explain why this is not true for people with hostile intent.

A possible explanation lies in the experiments design. The participants were told that, if detected, they would be stopped and searched. In fact, no participant was stopped in the study. It is possible that the increased expression of laughter for people with a hostile intent was not a reaction to the stimulus, caused by a cognitive overload and the inability to control the own expressions, but an expression of success. Laughing is known as a reaction to successful deception of true intent (Vrij et al., 2008). Because no person with hostile intent was stopped, they saw themselves as successful in the experiment. However we cannot be sure that this is true.

Conclusion

The study failed to confirm the proposed hypotheses. This can be attributed to flaws in procedure and design. To encounter the failures that were made during the study, a different approach is advised. First of all, the overall agreement between observers was too low or nonexistent. The inter-rater reliability between observers is crucial for reliable outcomes; otherwise we cannot trust the results. To ensure that reliability is obtained, a collective training lesson is necessary for all observers to adjust the ratings. Although this was done for the study, no positive influence is visible in the results. The evaluation of the reasons is indispensable to avoid these flaws for a successive study. A collective interview with the observers could give information about their reasoning behind their ratings and is strongly advised.

Regarding the experiments design, an increase in the number of participants is strongly advised. 28 people are insufficient for a between subject experiment. We cannot speak of high validity, because with such a small number, the found results can be attributed to external factors for which the study did not test. Additionally, a second point of record could deliver better results regarding the first time period. With second camera, which lays focus on the first reactions of the participants when turning the corner, the possible deviant behavior would be better to recognize.

Our results indicate the possibility that no substantial difference existed between the strong and weak (ambiguous) signal. If both people with and without hostile intent reacted to the ambiguous signal, it has no function in the identification of possible deceivers of a true intent. The introduction of a third stimulus category is advised. This third category should contain no stimulus at all and shall act as a control group. A significant difference in reactions between the groups with stimulus and the control group can give more information about influence on people with and without hostile intent. The results have only practical use if deceivers differ from the rest, otherwise the shown behavior cannot help to identify them.

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Appendix

Appendix 1: VIDEO CODING SCHEME

A) Voor de prikkel: Van de periode dat men om de hoek komt totdat de prikkel wordt gegeven

Waarneming en Oogcontact

1. De agent wordt waargenomen na X aantal seconden als men de hoek is omgekomen.

1 Seconden	2 Seconden	3 Seconden	4 Seconden	5 Seconden
1	2	3	4	5

2. Aantal keer dat de agent direct wordt aangekeken.
Aantal keer:

3. De positie van het hoofd van de proefpersoon is:

Weg van de agent	Rechtvooruit	In richting van de agent
1	2	3

4. De PPN mijdt oogcontact met de politieagent

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Positie en lopen

5. Positie ten opzichte van de anderen (van voor naar achter).

Voor de persoon	Midden (naast elkaar)	Achter
1	2	3

6. Positie ten opzichte van agent (Uiterst links (langs de muur) t/m Uiterst rechts).

Uiterst links	Midden	Uiterst Rechts
1	2	3

7. Loopt bij de groep **zodra men de hoek om komt.**

Nee	Ja
1	2

8. Loopt bij de groep **zodra de PPN de agent ziet.**

Nee	Ja
1	2

Emoties

9. Gezichtsuitdrukking **bij de hoek omkomen**: Geschrokken.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

10. Gezichtsuitdrukking **bij de hoek omkomen**: Lachen.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

11. Gezichtsuitdrukking **bij zien van agent**: Geschrokken.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

12. Gezichtsuitdrukking **bij zien van agent**: Lachen.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Zenuwachtigheid en Fidgeting

13. De PPN laat teken van zenuwachtigheid en inspanning zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

14. De PPN laat overal fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

15. De PPN laat object fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

16. De PPN laat self-fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Beweging en Gebaren

17. De PPN laat leg/foot movement zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

18. De PPN laat gebaren zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

19. De PPN laat arm/hand movement zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

20. De proefpersoon grijpt naar de tas.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

21. Positie tas.

Aan de kant van agent	Aan de kant van de muur	Voor de persoon
1	2	3

22. De persoon haalt zijn of haar schouders op of schokschoudert (Achselzucken):

Expliciet niet	Indifferent	Expliciet wel
1	2	3

23. De persoon maakt bewegingen met zijn of haar postuur:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

24. De persoon tilt zijn of haar kin de lucht in:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

B) Na de prikkel: periode vanaf de prikkel tot eind

Waarneming en Oogcontact

25. De positie van het hoofd van de proefpersoon is:

Weg van de agent	Rechtvooruit	In richting van de agent
1	2	3

26. Aantal keer dat de agent direct wordt aangekeken.
Aantal keer:

27. De PPN mijdt oogcontact met de politieagent

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Positie en Lopen

28. Positie ten opzichte van de anderen (van voor naar achter).

Voor	Midden (naast elkaar	Achter
1	2	3

29. Positie ten opzichte van agent (Uiterst links (langs de muur) t/m Uiterst rechts).

Uiterst links	Midden	Uiterst Rechts
1	2	3

30. Als reactie op de prikkel past de proefpersoon, zichtbaar, zijn of haar looptempo aan.

Langzamer	Gelijk	Sneller	Stopt
1	2	3	4

31. Als reactie op de prikkel verandert de PPN zijn looprichting weg van agent.

Weg van de agent	Rechtvooruit	In richting van de agent
1	2	3

Emoties

32. Gezichtsuitdrukking **Achter de Prikkel**: Geschrokken.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

33. Gezichtsuitdrukking **Achter de Prikkel**: Lachen.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Zenuwachtigheid en Fidgeting

34. De PPN laat teken van zenuwachtigheid en inspanning zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

35. De PPN laat overal fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

36. De PPN laat object fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

37. De PPN laat self-fidgeting zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Beweging en Gebaren

38. De PPN laat leg/foot movement zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

39. De PPN laat gebaren zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

40. De PPN laat arm/hand movement zien:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

41. De proefpersoon grijpt naar de tas.

Expliciet niet	Indifferent	Expliciet wel
1	2	3

42. Positie tas.

Aan de kant van agent	Aan de kant van de muur	Voor de persoon
1	2	3

43. De persoon haalt zijn of haar schouders op of schokschoudert (Achselzucken):

Expliciet niet	Indifferent	Expliciet wel
1	2	3

44. De persoon maakt bewegingen met zijn of haar postuur:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

45. De persoon tilt zijn of haar kin de lucht in:

Expliciet niet	Indifferent	Expliciet wel
1	2	3

Tables and Figures

Table and Figures 1: Inter-rater analysis with Cohen's Kappa for every measured item

	Cohen's Kappa		
Measurement Items	Observer 1 + 2	Observer 1 + 3	Observer 2 + 3
Item 1 - Facial expression at the corner: Shock	Obs 1 +2 are both constants	Kappa 0.000 Obs 1 is a constant	Kappa 0.000 Obs 2 is a constant
Item 2 - Facial expression at the corner: Laughter	Kappa 0.000 Obs 2 is a constant	Kappa 0.099 p = 0.019	Kappa 0.000 Obs 2 is a constant
Item 3 - Facial expression at sight of the agent: Shock	Kappa 0.000 Obs 2 is a constant	Kappa -0.087 p = 0.189	Kappa 0.000 Obs 2 is a constant
Item 4 - Facial expression at sight of the agent: Laughter	Kappa 0.000 Obs 2 is a constant	Kappa -0.032 p = 0.701	Kappa 0.000 Obs2 is a constant
Item 5 - Nervousness before the stimulus	Kappa -0.043 p = 0.815	Kappa 0.000 p = 1,000	Kappa -0.118 p = 0.316
Item 6 - Fidgeting overall before the stimulus	Kappa 0.359 p = 0.012	Kappa 0.010 p = 0.876	Kappa 0.187 p = 0.020
Item 7 - Object fidgeting before the stimulus	Kappa 0.272 p = 0.071	Kappa 0.110 p = 0.129	Kappa 0.124 p = 0.132
Item 8 - Self fidgeting before the stimulus	Kappa -0.024 p = 0.778	Kappa 0.038 p = 0.334	Kappa 0.027 p = 0.423
Item 9 - Facial expression after the stimulus: Shock	Kappa 0.000 Obs2 is a constant	Kappa 0.097 p = 0.259	Kappa 0.000 Obs2 is a constant
Item 10 - Facial expression after the stimulus: Laughter	Kappa 0.538 p < 0.001	Kappa 0.166 p = 0.079	Kappa 0.154 p = 0.022
Item 11 - Nervousness after the stimulus	Kappa 0.172 p = 0.295	Kappa -0.023 p = 0.834	Kappa -0.016 p = 0.858
Item 12 - Fidgeting overall after the stimulus	Kappa -0.057 p = 0.645	Kappa 0.084 p = 0.248	Kappa 0.210 p = 0.114
Item 13 - Object fidgeting after the stimulus	Kappa 0.059 p = 0.658	Kappa 0.103 p = 0.304	Kappa 0.324 p = 0.001
Item 14 - Self fidgeting after the stimulus	Kappa -0.029 p = 0.678	Kappa 0.005 p = 0.860	Kappa 0.029 p = 0.718

Table and Figures 2: Chart for the crossover effect in item 10