UNIVERSITEIT TWENTE
FACULTEIT BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES
MASTER PSYCHOLOGY
PSYCHOLOGY OF CONFLICT, RISK AND SAFETY

Examining Rapport in Investigative Interviewing: The Effects of Number of Interviewers present and Veracity Conditions on Rapport.

N.W. BOELE

01-11-2017

Prof. Dr. E. Giebels
Dr. M. Stel

Abstract

This study is an empirical test of the way rapport is influenced when there are one or two interviewers present, when veracity conditions differ between truth or deception, and their impact on stress and cognitive load in these situations. It does so by testing these hypotheses in a controlled environment using an interactive interview setting that approaches the high stress, high cognitive load context found in police interviews. The analyses showed no significant difference in interviewee rapport, cognitive load or stress for the number of interviewers present, but interviewee rapport was significantly higher in truth conditions than in deception conditions. Cognitive load was found to be significantly higher in the deception conditions than in the truth condition. Stress was also significantly higher in the deception than in the truth condition. Theoretical and practical implications are discussed.

Investigative interviewing is one of the most important methods of information collection available to police and intelligence personnel. In fact, it is hard to overstate its importance (Borum, 2006, in Driskell, Blickensderfer & Salas, 2013). Yet there are still vast differences in the approaches the different police and intelligence agencies take to investigative interviewing. One of the main differences lies in the number of interviewers present during the investigative interview process. For example, in Canada only one interviewer is present during high profile cases such as murder investigations, , whereas in The Netherlands it is standard procedure for the Dutch National Police to have two interviewers present during the investigative interviews for such high-profile cases. Having become aware of this difference, the Dutch National Police put forth a simple question: "Should we conduct investigative interviews with one or two detectives present?" This question is difficult to answer, as little research focuses explicitly on the high stress, high cognitive load setting that is present in investigative interview settings. Few studies specifically address the differences between one-on-one and two-on-one interviewing in these circumstances. Some research has been done, but the findings differ. The current study adds to the literature by testing the hypotheses in an academic, controlled environment using an interactive interview setting that approaches the high stress, high cognitive load context found in police interviews.

For the purpose of this study, investigative interviewing follows the same definition as put forth by Driskell, Blickensderfer and Salas (2013). That is, investigative interviewing is defined as information-gathering interviews to obtain information that is useful for intelligence or investigation purposes. It is important to further distinguish investigative interviewing from interrogative interviewing, as the main goal of the latter is to obtain a confession (Williamson, 1993), whereas the main goal of an investigative interview lies in obtaining accurate, credible and reliable information conducive to finding the truth (Baldwin, 1993; Milne and Bull, 1999). The approach of investigative interviewing, emphasizing good rapport building between interviewer(s) and interviewee, and obtaining accurate, credible and reliable intelligence, is also adopted in The Netherlands.

A major part of the investigative interview process lies in the establishment and maintenance of rapport between the interviewer and the interviewee (Schollum, 2005). In fact, Fein (2006) concluded that rapport is the most critical element in investigative interviews, while also being the most difficult to establish. Although there is some research that suggests there may be advantages with regards to conducting interviews with two interviewers in terms of teamwork, the ability to pool resources and exchange information (e.g. Kincaid & Bright, 1957), others claim that the introduction of a second interviewer may actually be harmful, and that it may be more difficult to establish rapport with the interviewee (DACA, 2007, pp2-12; Department of the Army, 2006, in Driskell, Blickensderfer & Salas, 2013). The current study aims to quantify the effect, if any, of the introduction of a third person (i.e., a second interviewer) on the establishment of rapport during the interview process. In order to do so, group-dynamics research that has focused on this subject is discussed, the construct of rapport is defined, and an empirical examination of the effects of an additional interviewer on self-reported interviewee rapport, are presented.

The Effects of Group Size and the Presence of Others

Two-on-one interviewing is rather common within law enforcement, but a clear understanding of the advantages and disadvantages for both the interviewer(s) and the interviewee

is lacking (Driskell & Salas, 2015). With regards to the interviewer(s), existing research on the subject of group size tends to support the claim that two are better than one. Increases in group size can lead to increased overall productivity by pooling information, sharing resources, and checking for errors (Laughlin, Hatch, Silver & Boh, 2006; Driskell, Salas & Hughes, 2010). If those conditions are not met, however, increases in group size can also lead to more negative affect and dissatisfaction (Shaw, 1981). Simmel (1964) proposed that one-on-one and two-on-one relationships are fundamentally different in terms of intimacy, with the two-on-one relationship having each element operate as an intermediary to the other elements. This means that the two-on-one relationship is fundamentally less close or intimate when opposed to the one-on-one relationship. Or in other words, the addition of a second interviewer to a one-on-one interviewer-interviewee relationship may disrupt the development of rapport by the interviewee by negatively impacting the mutual involvement between interviewer and interviewee. This is further supported by the work of Mullen, Bryant and Driskell (1997) who argued that the presence of others, while it may provide resources for coping with a stressful situation, could also have negative effects in terms of increased apprehension and attentional conflict. This could be considered to be detrimental when it comes to building rapport, as one of the goals in establishing rapport is to create a positive atmosphere (Driskell, Blickensderfer & Salas, 2013). As one of the fundamental parts of the police interviewing techniques used in The Netherlands entails the creation of a positive atmosphere and the creation of good rapport between interviewer(s) and interviewee, yet important criminal investigations and thus police interviews are conducted in a two-on-one setting rather than a one-on-one setting. This study investigates both one-on-one and two-on-one investigative interviews. As the addition of the second interviewer disrupts the one-on-one relationship, it is expected that the addition of a second interviewer to an investigative interview will negatively impact rapport (H1).

Rapport

Rapport can be defined in different ways. Its linguistic use is different from the use in investigative interview techniques and models. Rapport has been defined as a “feeling state experienced in interaction with another as interest, positivity, and balance” (Cappella, 1990, p. 303), and as a harmonious relationship between interviewee and interviewer (Walsh and Bull, 2012). The most comprehensive definition was presented by Tickle-Degnen and Rosenthal (1990), which is the definition that will be used to operationalize rapport in this study. Tickle-Degnen and Rosenthal (1990) defined rapport as comprised of three core components: 1) *mutual attentiveness*, the expression of mutual attentiveness and involvement with the other, 2) *positivity,* feelings of mutual friendliness and warmth, and 3) *coordination*, harmony and synchrony of interaction. Tickle-Degnen and Rosenthal (1990) further noted that the relative importance of these three core components may vary depending on the stage of interaction. Positivity is argued to be most important to the perception of rapport, and thus is most important in the early stages of interaction. Coordination is more salient in later stages of interaction, while mutual attentiveness remains a constant throughout the interaction.

Often described and considered to be “the heart of the interview” (St. Yves, 2009), rapport is considered to be a prerequisite for the effective use of interrogation and investigative interviewing techniques. Rapport has a presence in most known approaches to interrogation and investigative interviewing techniques and models. The U.S. Army uses rapport during the approach phase to try and gain cooperation from a source (Department of the Army, 2006, p.8-1, in Abbe & Brandon, 2013).

Rapport is essential in Scotland's PRICE model, and to the PEACE investigative interview model used in England and Wales (Abbe & Brandon, 2013). Rapport is also considered to be the basis of an interrogation by the Federal Bureau of Investigation in the USA (Caproni, 2008, in Abbe & Brandon, 2014), and it's considered a core interviewer skill by the UK's National Policing Improvement Agency (Shawyer, Milne, and Bull, 2009). This is also the case in The Netherlands where building and maintaining rapport during investigative interviews is a key principle taught at the Dutch National Police Academy.

Rapport in suspects

As the act of being interviewed can take place in a tense and unnatural setting, the experience of being interviewed by police officers can cause feelings of stress and anxiety (Bull, 2014). It has been demonstrated that witnesses, when interviewed, provide more accurate information when good rapport has been established (Collins, Lincoln and Frank, 2002, 2005; Vallano & Compo, 2011), and when interviewers fail to establish rapport, witnesses report a greater amount of misinformation (Vallano & Compo, 2011). Suspects are likely to experience the feelings of stress and anxiety more strongly than witnesses do (Ord, Shaw and Green, 2011; Walsh and Bull, 2012). Building rapport can be further hindered by the high levels of cognitive load that suspects experience and report, meaning that suspects can be cognitively challenged when invited to talk freely about the subject at hand (e.g. Vrij, 2008; Vrij, Leal, Mann & Fisher, 2012; Ewens, Vrij, Leal, Mann, Jo & Fisher, 2016). Walsh and Bull (2012) argue that the cognitive load may be caused by reluctance to provide information, as doing so might incriminate the suspect. It is often argued, however, that good rapport is essential in encouraging the suspect to supply more information (Ord, Shaw and Green, 2014; St-Yves, 2006), and the importance of good rapport with suspects has been shown in both enhanced cooperation and an increase in quality and quantity of information (Bull, 2014).

Considering that a police interviewer can be faced with a multitude of situations in which interviewees can be telling the truth or be lying to various degrees, it is important to realize that the process of lying evokes more stress and is more cognitively challenging than truth telling (Caso et al., 2005). However, as Ströfer, Ufkes, Noordzij and Giebels (2016) effectively summarize, lying is often not necessary to deceive, and in natural situations deceivers stick to the truth as closely as possible, only misleading by basing deceptive accounts on previous experiences. For the purposes of this study, the latter process is referred to as an intention to lie. In both cases, lying and intention to lie, cognitive and emotional resources will have to be spent on aspects such as keeping the story straight, keeping control of behaviour so as to avoid giving cues of deception, and for example feelings of nervousness or being afraid to be found out (Stöfer, Ufkes, Noordzij & Giebels, 2016). It is therefore hypothesized that self-reported interviewee rapport is lower in the situation where the interviewee is being deceptive, versus when the interviewee is being truthful (H2). Furthermore, it is hypothesized that stress and cognitive load act as mediators in the association between veracity conditions and rapport (H3).

Method

The current study was set up to investigate the differences in interviewee rapport in an interactive interview setting that mimics police interview settings, aiming at differences in rapport between one interviewer being present and two interviewers being present. To achieve this goal, the study uses two main veracity conditions, truth and deception, which are split into four veracity conditions, truth telling, lying, intention to lie on certain questions, and being falsely accused. A paradigm, a newly developed assessment center test (ACT; Sackett & Dreher, 1982), was used as a cover story for the participants. In this ACT, participants were put in a situation in which signing a document which they shouldn't sign was enticing, however, it also constituted fraud. This transgression was then used within the context of the interactive interview setting, which was presented to the participants as an interview that was part of an investigation into their transgression. To further mimic police investigative interview settings, participants were advised on the best strategy to follow, which was made up of one of four veracity conditions; Lie, intention to lie on certain questions, be truthful, or, if a participant had not signed, be falsely accused. In the case of falsely accused participants, they were advised to tell the truth.

Participants

This study was done in cooperation with Ströfer, Ufkes, Noordzij and Giebels (2016). A total of 83 participants were included, all of whom were students participating in return for course credit. Mean age was 20,95, SD = 2.64, range 18-30 years, of which 59 participants were female. Participants were randomly allocated to a veracity condition (Truth, Intention to Lie, Lie). As was the case in Ströfer and colleagues experiment (2016), nineteen participants refused to sign said document. The experiment was completed fully in all nineteen cases however, and these cases were subsequently assigned to a new veracity condition (False accusation).

Analyses are based on 83 participants, which were equally distributed across conditions (Truth condition: n = 19**;** Lie condition: n = 21; Intention condition: n = 24; False accusation: n=19).

Experimental design

The experiment consisted of a 2 (1 interviewer or 2 interviewers) x 2 (main veracity condition: truth, deception) design. The number of interviewers and veracity condition were a between subject-factor to which participants were randomly assigned, with the exception of the false accusation condition. Self-reported rapport, cognitive load and stress were assessed as independent variables.

Procedure

Participants provided written informed consent and the institutional review board approved the experimental protocol. The study was presented to participants as being a test case for a newly developed assessment centre test (ACT; Sackett and Dreher, 1982). The advantages of taking part in the study were made clear by offering a cash prize for the top three participants, and by emphasizing the head start participants would get on the job market by having experienced an ACT. This cover story was created in order to ensure a realistic, high stress situation similar in terms of perceived stress and cognitive load to investigative interviews.

The experiment was run by an experiment leader and two or three confederates; one acted as 'experiment assistant', one acted as the 'interviewer', and the last confederate acted as 'secondary interviewer'. Only the experiment leader and the experiment assistant knew the true purpose of the study. Participants were greeted and escorted to the study room by the experiment assistant, who made the participants feel at ease and gave the participant the informed consent paper and the prize money signup sheet, before informing the experiment leader of the presence of the participant, who in turn acted more formally while explaining the experiment. This division of roles between experiment leader and experiment assistant was done to create a bit of rapport between the experiment assistant and the participant. Participants were informed by the experiment leader that the ACT consisted of multiple exercises, some of which were in a different room, all of which counted towards the decision who would win the prize money. It was also clearly stated that participants would be informed when the experiment was finished. Experimental sessions lasted for approximately 1,5 hours on average.

Participants were debriefed by e-mail only after all study sessions were conducted. The cover story was unfolded, and it was explained that the prize money was merely used to increase motivation to participate in the study and do well on the various tasks. Participants were also given an explanation on the measurements performed as part of the Ströfer and colleagues (2016) experiment, and were informed that the prize money was allotted randomly among all participants. Finally, participants were given feedback on their performance on the in-basket task, as this particular task is often part of a modern ACT (Dukericht et al, 1990).

In-basket Exercise

Participants were told to assume the role of a manager of a transport company, and to pick up the work that had been left lying around due to the regular employee being on extended sick leave without a clear date of return. Participants were given a physical in-box, consisting of four separate trays, in which lay the four assignments the participants had to perform. A time limit of 15 minutes was given to the participants, and the experiment leader stressed that performing all four tasks within the time limit was virtually impossible. The time limit was kept by the experiment assistant on the same stopwatch app for the duration of all study sessions, and participants' times were recorded to further increase the engagement of participants in the ACT. Participants were also told to stop when the 15 minutes were over.

The third in-box tray contained the basis for the interview which was to follow the in-basket exercise. In this in-box tray lay a contract, to which a note was attached stressing the importance of signing the contract today by the employee on sick leave. The majority of the participants (77%) signed the contract because it was the easiest way to solve this problem. Signing a document under a different name is not legally allowed under these circumstances in The Netherlands, and it was this transgression that served as the input for the deception experiment. In case the participant did not sign the contract, or hesitated, the experiment assistant attempted to persuade the participant directly after the in-box exercise had ended, and prior to the next phase of the study. This was done by emphasizing the experiment assistant would sign it if it were up to him, by stressing its importance to the prize money, and how easy it was to sign the contract. Participants (n = 19) who did not sign

were led to the next room, and the experiment assistant signed the contract under the participants name. These participants were subsequently moved into the False Accusation condition.

Waiting period and Confrontation

Due to the combined nature of this study, prior to the interview being taken, skin conductance sensors were attached to the participants. The participants were then asked to sit and relax for five minutes, and wait for the next part of the experiment to take place. This was done to get a baseline measurement, which is explained in detail in Ströfer and colleagues (2016). For the purposes of this study, participants were led to believe they were attached to a lie detector test (the EDA equipment), in order to heighten the stressfulness of the situation so that it would be more comparable to a real world police interview.

After the five minute waiting period, the experiment leader re-entered the interview room, informing the participant of a potential problem with the output of the in-basket exercises, specifically with regards to the contract. The experiment leader then confronted the participant with the (possible) transgression made by the participant, and informed the participant that either a person or persons were going to interview the participant about the (possible) transgression.

Experimental Manipulation

Directly after confronting the participants with the (possible) transgression, the experiment leader handed the participant a letter which advised on the best approach for the participant to take in the upcoming interview. This letter formed the experimental manipulation consisting of the three veracity conditions; truth, lie, and intention to lie.

Number of interviewers present

Participants were randomly assigned to be in the *one interviewer* condition, where the participant was always interviewed by the same male interviewer, or in the *two-interviewer* condition, where the participant was interviewed by the same male interviewer, who was accompanied by a female interviewer. The female interviewer's role was to be present in the seat next to the male interviewer, take notes of what was said during the interview, and provide non-verbal communication to the interviewee as would be the case in a real-world police interview. In all cases, the participants were seated on one end of the table and the interviewer or interviewers at the opposite end of the table. In between the interviewee and interviewer(s) was an omni-directional microphone and the EDA-equipment, which was attached to the interviewees dominant hand.

Veracity conditions

Participants were allocated to the truthful or the deceptive condition. The truthful condition consisted of two veracity conditions, truth and false accusation. The deceptive condition was also made up of two veracity conditions, lie and intention to lie.

In the *truth* condition, the participant was told to answer truthfully on all questions, including questions about whether or not the participant signed the contract. In the *lie* condition, participants were told to lie on *all* questions, including questions about the contract. The *intention to lie* condition told the participant to answer truthfully on all questions *except* for questions about the signing of the

contract. The participant was instructed to *lie* about whether or not the participant had signed the contract. Finally, participants who refused to sign the contract and were thus put in the *false accusation* condition were given the same letter as participants in the *truth* condition. The *false accusation* condition was added in after the third participant refused to sign the document due to having prior legal knowledge. In order to be able to get closer to the conditions under which a real world police interview is conducted, it was subsequently decided that any future participants who refused to sign, would have the document signed in their name and be moved into the *false accusation* veracity condition. The question regarding the signature on the contract was highlighted in all conditions, in order to prevent this question from only getting special meaning in the *intention to lie* condition. The aim was to prevent differences in prospective memory demands between conditions. Finally, participants were reminded by the experiment leader that the participant's performance in the interview would affect the chance for the prize money.

Interview and Follow up Questionnaire

As soon as the participant had finished reading the letter and returned the letter to the experiment leader, the experiment leader left the room and the interviewer or interviewers entered the room. The interview was fully standardized, with the interviewer asking a total of 10 questions (see Table 1). The interviewers were also trained to behave similarly in all interviews, and to ask the questions in a neutral but not monotonous manner and intonation. Every interview started with a number of general questions and gradually worked towards the key question, where the evidence in the form of the signed contract was revealed: "Is this your signature on this document?" (Question 8). After which the interview was concluded following two closing questions. Question 8 was what participants in the *intention to lie* veracity condition were instructed to lie about.

Question	Content
1	Can you tell me about your link with the university? How often and why are you here? What exactly are you doing here?
2	Why did you come to the university today?
3	Can you describe step by step what you have done after your entry?
4	Did you encounter other people? Who?
5	Can you describe other additional information?
6	Did you participate in an assessment center test?
7	Have you seen this document before?
8	Is this your signature?
9	Do you want to add something?
10	Was everything clear?

The interview consisted of 10 questions. Questions 9 and 10 were only included for analyses regarding the intelligence gathered during the interview.

Table 1. Interview questions.

The laptops were shielded from the participant's view. All interviews were recorded with the same omni-directional microphone, and were transcribed after completion of the study.

As soon as the interview was finished, the interviewer(s) left the room and the experiment leader and experiment assistant entered the room again. Participants were then asked to fill in a final questionnaire assessing self-reported cognitive load, stress, and rapport.

Measures

Questionnaires

Four different self-report questionnaires were used, rapport, cognitive load, and stress. The results of these questionnaires were compared using independent samples t-test and ANOVA for normally distributed variables, and Mann-Whitney and Kruskal Wallis tests for skewed or non-parametric variables. The mediation analysis was performed using PROCESS for SPSS v2.16.3 (Hayes, 2013). All analyses were performed using IBM SPSS 24.0.

Rapport

Self-reported rapport was assessed using a ten item scale, $\alpha = .85$, based on the questionnaire of Abbe and Brandon (2013). An explorative factor analysis on these ten items (method: maximum likelihood, based on Eigenvalues greater than 1) revealed three underlying factors, as expected, explaining 71.18% of the variance. As these factors showed high correlation, $r = .82$, rapport was considered as an overall variable.

Cognitive Load

Self-reported cognitive load was assessed with a scale consisting of 5 items, $\alpha = .86$. Of these five items, two were based on items used in a study by Cierniak, Scheiter and Gerjets (2009). These items were 'How difficult was the interview?' and 'To what extent did you had to concentrate during the interview?'. As was the case in the study performed by Ströfer et al (2015), the other three items were based on items used in a study by Caso et al (2005). These items were 'How much mental effort did the interview require?', 'To what degree was the interview mentally demanding?' and 'To what extent did you had to think about the answer of the questions?'. An explorative factor analysis on these five items (method: maximum likelihood, based on Eigenvalues greater than 1) revealed one underlying factor, explaining 75.08% of the variance.

Stress

Self-reported stress was assessed using a four item scale, $\alpha = .83$. The items were derived from the Perceived Stress Scale (Cohen et al., 1983). As was the case in the study by Ströfer and colleagues (2015), the items were adjusted to the interview setting used in the current study. The items were 'To which extent did you feel upset during, or directly after the interview?', 'To which extent did you feel nervous during, or directly after the interview?', 'To which extent did you feel that the stress during, or directly after, the interview increased to such high levels that you could not let go of it?' and 'To which extent did you feel tension during, or directly after the interview?' (e.g., Giebels and Janssen 2005). All items were measured on 7-point Likert scales ranging from 1 (not at all) to 7 (to a great extent). An explorative factor analysis on these four items (method: maximum likelihood, based on Eigenvalues greater than 1) revealed one underlying factor, explaining 72.78% of the variance.

Mediation analysis

Cognitive load and stress were examined as possible mediators between veracity condition and rapport. Preacher and Hayes (2004, 2009, 2013) procedures were used to test the significance and magnitude of mediation. First the total effect of cognitive load on rapport was estimated by

performing a regression analysis of condition with cognitive load. Second, the indirect effect of veracity condition on rapport, via cognitive load was obtained by computing the product of two coefficients that were obtained after regression analysis of rapport with veracity condition, and rapport with cognitive load. Third, significance of the indirect effect (product of coefficients) was tested by computing bias-corrected bootstrapped confidence intervals with 5000 repetitions. Finally, the magnitude of mediation was calculated by dividing the coefficient of the indirect effect by the total effect (Figure 1). The procedure was repeated with stress as a mediator and with both cognitive load and stress as mediators. Significance of mediation was proven with $p<.05$ if zero was not between the lower and upper bound of the 95% confidence interval of the indirect effect.

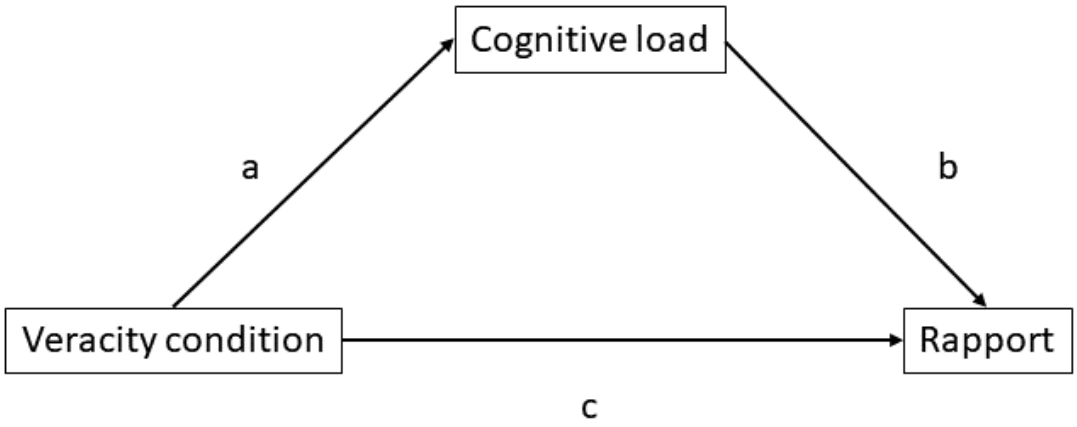


Figure 1. Mediation analysis on the relationship of veracity condition with rapport. a, b and c are the standardized regression coefficients between variables. The indirect effect (through cognitive load) is calculated as a*b. Total effect is a*b + c. Magnitude of mediation is calculated as indirect effect divided by total effect.

Results

The mean and standard deviation of participant scores on rapport, cognitive load and stress with their correlations are listed in table 2. The correlations between rapport and cognitive load, rapport and stress, and cognitive load and stress are all significant and in the expected direction.

	M	SD	1.	2.	3.
1. Rapport	3.72	.96	.85		
2. Cognitive load	3.04	.83	-.446*	.86	
3. Stress	3.44	1.33	-.465*	.666*	.83
N= 83					
*= $p < .01$					

Table 2. *Mean, standard deviations, reliability and correlations between the variables.*

Rapport was significantly higher in males (M= 4.11, SE= .18) than in females (M= 3.56, SE= .12, $F(1,81)= .334$, p = .016). Cognitive load did not differ between males and females ($F(1,81)=4.936$, p = .379). The self-reported post-interview stress was higher in females (M=3.66, SE= .16) than in males (M= 2.93, SE= .31, $F(1,80)=4.579$, p = .023). There were 45 participants in the deception condition and 38 in the truth condition. Gender and mean age did not differ significantly between the veracity conditions (gender, p = 1.0, age $F(1,81) =.573$, p = .552).

For the number of interviewers present there was no significant difference in self-reported rapport ($F(1,84)=.097$, p = .756), cognitive load ($F(1,84)=1.025$, p = .314) or stress ($F(1,83)=.647$, p= .424) between subjects who had one or two interviewers present. Self-reported rapport levels were significantly higher in truth (M=3.99, SD= .90), than for the deception condition (M=3.49, SD= .97, $F(1,81) =.145$, p = .016). Cognitive load was significantly higher in the deception (M=3.24, SD= .93) than in the truth condition (M=2.82, SD= .63, $F(1,81) =6.315$, p = .021). Stress was significantly higher in the deception (M=3.93, SD= 1.25) than in the truth (M=2.88, SD= 1.19, $F(1,80)= .153$, p = <.001) condition.

Next, veracity condition and number of interviewer present were combined and mean self-reported levels of rapport, cognitive load and stress are listed in table 3.

	Deception + 1		Deception + 2		Truth + 1		Truth + 2		F	df	p
	M	SD	M	SD	M	SD	M	SD			
Rapport	3.60	1.17	3.36[a]	.64	3.78	.85	4.13[a]	.91	.334	81	.016
Cognitive load	3.21	1.12	3.27	.69	3.01	.52	2.68	.68	4.936	81	.379
Stress	3.99[b]	1.26	3.87[c]	1.28	2.97	1.20	2.82[b,c]	1.20	4.578	80	.023

Table 3. Mean self-reported rapport, cognitive load and stress by veracity condition and number of interviewers present.
a= truth +2 vs deception +2 p = .042
b= deception +1 vs truth +2 p = .011
c= deception +2 vs truth +2 p = .036

Mediation analysis

Cognitive load was examined as a possible mediator in the association between veracity condition and rapport (see table 4). Mediation analysis showed that cognitive load was indeed a mediator in the association of veracity condition with rapport, as 39% of the association of veracity condition with rapport was explained by cognitive load. In addition, stress was also a mediator (67%) in the association

between veracity condition and rapport. When both mediators were combined in a single mediation model it was found that stress remained a significant mediator (42%) but that cognitive load was no longer a mediator. This indicates that stress has a stronger effect on the association between veracity condition and rapport than cognitive load.

Mediator		Coefficient (95% CI, bc)	Proportion mediated (%)
Cognitive load (1)			
	Indirect effect	.1961 (.0516 - .4139)	39
	Total effect	.5058 (.0983 - .9134)	
Stress (2)			
	Indirect effect	.3294 (.1615 - .5782)	67
	Total effect	.4902 (.0794 - .9010)	
Cognitive load + stress			
	Indirect effect (1)	.1081 (-.0003 - .3350)	ns
	Indirect effect (2)	.2080 (.0275 - .5053)	42
	Total effect	.4902 (.0794 - .9010)	

Table 4. Mediating effect of cognitive load and stress on the association of veracity condition with rapport.
ns = not significant.

Sensitivity analyses

To further investigate the effect of veracity conditions on rapport, cognitive load, stress and gathered intelligence the results were also analysed with participants in four veracity conditions: truth, lie, intention to lie and false accusation. The results of these sensitivity analyses are listed in the supplemental data file. In sum, the sensitivity analyses showed similar results to the main analyses, yet due to the increased number of veracity condition there was not enough power to show significant differences in rapport, cognitive load and stress between the groups and number of interviewers present.

Discussion

The current study investigated the difference in interviewee rapport in an interactive interview setting that mimics police interview settings, aiming at differences in rapport between one interviewer or two interviewers being present, and between two veracity conditions (truth and deception). Furthermore, differences in cognitive load and stress in all these settings and veracity conditions were investigated. For rapport, this study showed no significant difference for participants who had one or two interviewers present. This can be explained in part by the limited amount of interaction, meaning that during the initial stage of rapport building there is not yet a measurable difference in rapport between subjects with one or two interviewers present. There were significant differences between the veracity conditions. Namely, subjects in the truth condition reported higher levels of rapport than participants in the deception condition. These findings suggest that rapport is influenced by whether a person is being truthful or being deceptive, with truthful participants having more resources available to spend on building rapport than deceptive participants. For cognitive load, this study showed no significant differences for participants who had one or two interviewers present. With regards to the veracity conditions, participants in the deception condition reported significantly higher levels of cognitive load than participants in the truth condition. Finally, for stress, this study showed no

significant differences for participants who had one or two interviewers present. Self-reported stress was higher for participants in the deception condition than participants in the truth condition. For both cognitive load and stress these results could indicate that the maximum amount of resources available to a deceptive participant are already being spent, and thus the addition of another interviewer does not make an impact. With regards to a truthful participant, the results suggest it may not matter whether they are being interviewed by one or two interviewers with regards to cognitive load and stress levels. Mediation analysis found that both cognitive load and stress were mediators in the association between veracity condition and rapport, but in a model including both mediators only stress remained as a significant mediator. This could be explained by the fact that cognitive load and stress go hand in hand in an investigative interview.

There is a very limited amount of research on the topic of the impact of one or two interviewers on interviewee rapport. A study by Driskell, Blickensderfer and Salas (2013) used linguistic analysis methods of real world police interviews to determine differences in various stages of rapport between a 'dyadic or triadic interview'. The outcome of this study showed no significant differences between the stages of rapport as proposed by Tickle-Degnen and Rosenthal (1990) and whether an interview was conducted by one or two interviewers being present. These findings are largely in accordance to the findings of the current study in which interviewee rapport only significantly differed between veracity conditions and not by the number of interviewers present. Secondly, Driskell and Salas (2015) looked at various parts, such as cognitive demand, story cues and use of open-ended questions, regarding the performance and deception detection ability of a tandem interview versus an individual interview. As this study was also conducted under experimentally controlled settings, and used a rapport questionnaire for the interviewee, the findings are more easily compared to the current study. Similar to the current study, Driskell and Salas's 2015 study showed less interviewee rapport in the tandem interview. This finding is contradicted by the findings in this study, where the differences between a one-on-one or two-on-one interview were not significant.

Regarding the topic of being interviewed by one or two interviewers, no literature was found about the influence of this on either cognitive load or stress. In line with existent literature (see for example Caso et al., 2005; Vrij et al. 2006a, 2006b) the current study found higher levels of cognitive load and stress when participants were being deceptive compared to when participants were being truthful, although the cognitive load differences reported in this study did not differ significantly. Ströfer and colleagues reported in 2016 that this non-significant difference could be due to the way the current study was set up, in that no interview was without transgression on part of the participant. This does not apply to the current study, as this study also included participants who did not transgress and were thus falsely accused. In addition, mediation analysis showed that stress completely mediated the link of cognitive load on rapport, suggesting that stress is a stronger predictor of rapport than cognitive load.

Strengths and limitations

Several strengths and limitations of the current study must be noted. Strengths of this study are that this study is one of few to specifically focus on the role of an additional interviewer present during investigating interviewing with regards to rapport, cognitive load and stress. Second, the experiment in this study was conducted under academic, controlled circumstances, thus improving the reproducibility of the results. Third, this study also included a subgroup of participants of whom was

objectively established that these participants were falsely accused. Finally, the primary interviewer always asked the same questions, never following through on what a participant said. The most important limitation of this study was the limited sample size which may have hampered the ability to find significant differences between the subgroups, especially when investigating participants based on four veracity conditions instead of two. Second, the participants were instructed to follow a certain veracity condition, whereas in real-life scenarios truth and lies are mixed and deceivers strategically choose when to lie and when to tell the truth. Therefore, the results of this study should be interpreted with caution.

Future research could improve upon these limitations by providing participants with a choice when to lie and when to tell the truth, enabling participants to build up a coherent deceptive story more realistically (see also Sip, Roepstorff, McGregor & Frith, 2008), while simultaneously allowing the interviewer more freedom to follow through on specific questions thereby increasing comparability to actual police investigative interviews. Something that would benefit all research on this topic would be the development of a less intrusive, more real-time way to measure stress and cognitive load during an interview. Current research focuses on self-report questionnaires which take a relative long time to complete and are not usable in real-world settings.

In conclusion, the original question posed by the National Dutch Police was “Should we conduct investigative interviews with one or two detectives present?”. In sum, the current study found that the number of interviewers present in an investigative interview had no effect on the levels of rapport, cognitive load or stress. There were significant differences in terms of stress reported by participants, and a deceptive participant had significantly lower rapport than a truthful participant. Therefore this study did not find the presence of two detectives superior to one detective present with regards to building rapport.

Acknowledgments I would like to thank Sabine Ströfer, Dirk Berentsen, Anna-Maria Bachmann, Ricarda Baumhof and Maren Bethke for their assistance in conducting the experiment, and Frans Braam of the Dutch National Police for asking the right question.

References

Abbe, A. & Brandon, S. E. (2013). The Role of Rapport in Investigative Interviewing: A Review. *Journal of Investigative Psychology and Offender Profiling*, *10*, 237-249.

Abbe, A. & Brandon, S. E. (2014). Building and maintaining rapport in investigative interviews, *Police Practice and Research, 15*(3), 207-220, doi:10.1080/15614263.2013.827835

Bull, R. (2014). *Investigative Interviewing*. New York: Springer.

Baldwin, J. (1993). Police interview techniques: establishing truth or proof? *British Journal of Criminology, 33*, 325-351.

Caso, L., Gnisci, A., Vrij, A. & Mann, S. (2005). Processes underlying deception: An empirical analysis of truth and lies when manipulating the stakes. *Journal of Investigative Psychology and Offender Profiling, 2*(3), 195-202.

Cappella, J. N. (1990). On defining conversational coordination and rapport. *Psychological Inquiry, 1*, 303-305. doi:10:1207/s15327965pli0104_5

Driskell, J. E., Salas, E., & Hughes, S. (2010). Collective orientation and team performance: Development of an individual differences measure. *Human Factors, 52,* 316–328. http://dx.doi.org/10 .1177/0018720809359522

Driskell, T., Blickensderfer, E.L., & Salas, E. (2013). Is Three a Crowd? Examining Rapport in Investigative Interviews. *Group Dynamics: Theory, Research, and Practice, 17*(1), 1-13. doi:10.1037/a0029686

Driskell, T. & Salas, E. (2015). Investigative Interviewing: Harnessing the Power of the Team. *Group Dynamics: Theory, Research, and Practice, 19*(4), 273-289. doi: 10.1037/gdn0000036

Ewens, S., Vrij, A., Leal, S., Mann, S., Jo, E. & Fisher, R. P. (2016). The effect of interpreters on eliciting information, cues to deceit and rapport. *Legal and Criminological Psychology, 21*, 286-304.

Hayes, A.F. (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs, 76*(6), 408-420.

Hayes, A.F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis. A Regression-Based Approach.* New York: Guildford Press.

Ireland, M. E., & Pennebaker, J. W. (2010). Language style matching in writing: Synchrony in essays, correspondence, and poetry. *Journal of Personality and Social Psychology, 99,* 549–571. doi:10.1037/a0020386

Kincaid, H. V., & Bright, M. (1957). The tandem interview: A trial of the two-interviewer team. *Public Opinion Quarterly, 21,* 304 –312. doi:10.1086/266716

LaFrance, M. (1990). The trouble with rapport. *Psychological Inquiry, 1,* 318–320. doi:10.1207/s15327965pli0104_11

Laughlin, P. R., Hatch, E. C., Silver, J. S., & Boh, L. (2006). Groups perform better than the best individuals on letters-to-numbers problems: Effects of group size. *Journal of Personality and Social Psychology,90,* 644 – 651. doi:10.1037/0022-3514.90.4.644

Meissner, C. A., Evans, J. R., Brandon, S. E., Russano, M. B., & Kleinman, S. M. (2010). Criminal versus HUMINT interrogations: The importance of psychological science to improving interrogative practice. *Journal of Psychiatry & Law, 38*, 215–249.

Milne, R, & Bull, R. (1999). *Investigative interviewing: Psychology and practice.* Chicester: Wiley.

Mullen, B., Bryant, B., & Driskell, J. E. (1997). The presence of others on arousal: An integration. *Group Dynamics: Theory, Research, and Practice, 1,* 52–64. doi:10.1037/1089-2699.1.1.52

Ord, B., Shaw, G. & Green, T. (2014). *Investigative Interviewing Explained*, Chatswood, Australia: LexisNexis Butterworths.

Preacher, K.J. & Hayes, A.F. (2004). SPSS and SAS Procedures for Estimating Indirect Effects in Simple Mediation Models. *Behavior Research Methods, Instruments, & Computers, 36(*4), 717-731.

Schollum, M. (2005). *Investigative interviewing: The literature*. Welling, New Zealand: New Zealand Office of the Commissioner of Police.

Shaw, M. E. (1981). *Group Dynamics: The psychology of small group behaviour*. New York, NY: McGraw-Hill.

Simmel, G. (1964). *The sociology of Georg Simmel* (K. H. Wolf, Ed. and Trans.). Glencoe, IL: Free Press.

Sip, K. E., Roepstorff, A., McGregor, W. & Frith, C. D. (2008). Detecting deceptions: The scope and limits. *Trends in Cognitive Sciences, 12*(2), 48-53. doi:10.1016/j.tics.2007.11.08

St-Yves, M. (2006). The psychology of rapport: Five basic rules. In *Investigative interviewing: Rights, research, regulation* (pp. 107–122). Devon, UK:Willan Publishing.

St. Yves, M. (2009). Police interrogation in Canada: From the quest for confession to the search for the truth. In T. Williamson, B. Milne, & S. P. Savage (Eds.), *International developments in investigative interviewing* (pp.92–110). Devon, UK: Willan Publishing.

Ströfer, S., Ufkes, E. G., Noorzij, M. L., & Giebels, E. (2016). Catching a Deceiver in the Act: Processes Underlying Deception in an Interactive Interview Setting. *Applied Psychophysiological Biofeedback*, doi:10.1007/s10484-01|6-9339-8

Tickle-Degnen, L., & Rosenthal, R. (1990). The nature of rapport and its nonverbal correlates. *Psychological Inquiry, 1,* 285–293. doi:10.1207/s15327965pli0104_1

Vallano, J. P. & Compo, N. S. (2011). A Comfortable Witness Is a Good Witness: Rapport-Building and Susceptibility to Misinformation in an Investigative Mock-Crime Interview. *Applied Cognitive Psychology, 25*, 960-970. doi:10.1002/acp.1789

Vrij, A. (2008). *Detecting lies and deceit: Pitfalls and opportunities.* Chichester, UK: John Wiley and Sons.

Vrij, A., Fisher, R., Mann, S. & Leal, S. (2006a) Detecting deception by manipulating cognitive load. *Trends in Cognitive Sciences, 10*(4), 141-142.

Vrij, A., Leal, S., Mann, S., & Fisher, R. (2012). Imposing cognitive load to elicit cues to deceit: Inducing the reverse order technique naturally. *Psychology, Crime & Law, 18*, 579–594. doi:10.1080/10683160902776843

Vrij, A., Mann, S. & Fisher, R. P. (2006b). Information-gathering vs accusatory interview style: Individual differences in respondents' experiences. *Personality and Individual Differences, 41*(4), 589-599.

Walsh, D., & Bull, R. (2012). Examining rapport in investigative interviews with suspects: Does its building and maintenance work? *Journal of Police and Criminal Psychology, 27,* 73–84. doi:10.1007/s11896-011-9087-x

Williamson, T. (1993). From interrogation to investigative interviewing: strategic trends in police questioning. *Journal of Community and Applied Social Psychology, 3,* 89–99.

Supplemental data – Explorative Data Analysis

Explorative data analysis design

For explorative data analysis purposes, the experiment consisted of a 4 (veracity condition: truth, lie, intention to lie, false accusation) x 2 (1 interviewer or 2 interviewers) mixed design. Veracity condition was a between subject-factor to which participants were randomly assigned, and number of interviewers a between subject-factor to which participants were randomly assigned. Self-reported stress, cognitive load and self-reported rapport were assessed as independent variables.

Explorative data analysis results

Rapport

First, significant differences in self-reported rapport levels were found between the four veracity conditions ($F(3,79)= 3.627$, p= .017) (supplemental table 1). Specifically, rapport was significantly higher in the truth condition (M= 4.14, SE= .14) when compared to the lie condition (M= 3.21, SE= .20, p= .012).

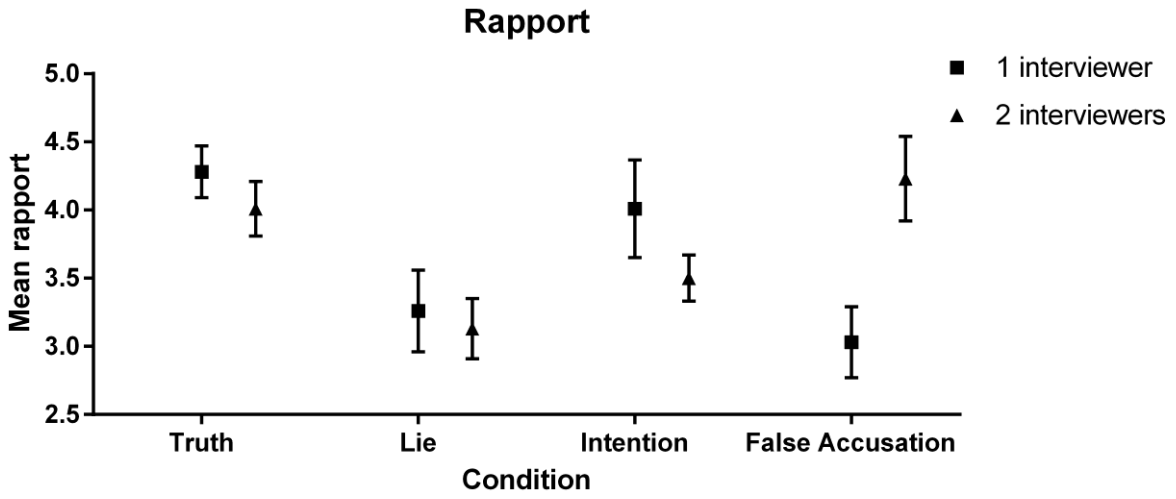
Condition	Mean	SE	F	df	p
Truth	4.14[a]	.14	3.63	3,79	.017
Lie	3.21	.20			
Intention to lie	3.73	.19			
False accusation	3.85	.26			

Supplemental table 1. Mean self-reported rapport by veracity condition.
[a] Truth versus lie, $p = .012$.

Furthermore, there were also significant differences in rapport among the veracity conditions with either one or two interviewers present ($F(8,77)=2.815$, p= .009)(supplemental table 2, supplemental figure 1). However, after Bonferroni correction for multiple comparisons, it was not possible to pinpoint any significant differences between the groups.

Condition	Number of interviewers	Mean	SE	F	df	p
Truth	One	4.28	.19	2.82	8,77	.009
	Two	4.01	.20			
Lie	One	3.26	.30			
	Two	3.13	.22			
Intention to lie	One	4.01	.36			
	Two	3.50	.17			
False accusation	One	3.03	.26			
	Two	4.23	.31			

Supplemental table 2. Mean self-reported rapport by veracity condition and number of interviewers present.



Supplemental figure 1. Self-reported rapport by veracity condition and number of interviewers present.

Cognitive load

Next, cognitive load was examined among the four veracity conditions (Table 2). Overall there were significant differences in cognitive load between the conditions ($F(3,79)=5.853$, p = .001). Cognitive load was highest in the lie condition (M= 3.64, SE= .18) and significantly higher than the three other veracity conditions: intention to lie (M= 2.88, SE= .18, p= .009), false accusation (M= 2.73, SE= .16, p= .002), truth (M= 2.91, SE= .13, p= .020).

Subsequently it was investigated whether cognitive load differed within the conditions and number of interviewers present (supplemental table 3, supplemental figure 2). Overall the cognitive load did indeed differ ($F(7,75)=3.426$, p= .003). Again, cognitive load was highest in the lie condition, both for the subjects with one (M=3.75, SE= .23) and two interviewers (M=3.45, SE= .28). When compared to the other conditions, cognitive load was significantly higher in the lie with one interviewer versus intention to lie with one interviewer (M=2.56, SE= .33, p= .007), versus false accusation with two interviewers (M= 2.66, SE= .22, p= .012), and versus truth with two interviewers (M= 2.72, SE= .17, p= .049). Post-hoc analysis revealed no significant differences in the lie condition with two interviewers present versus any of the other conditions.

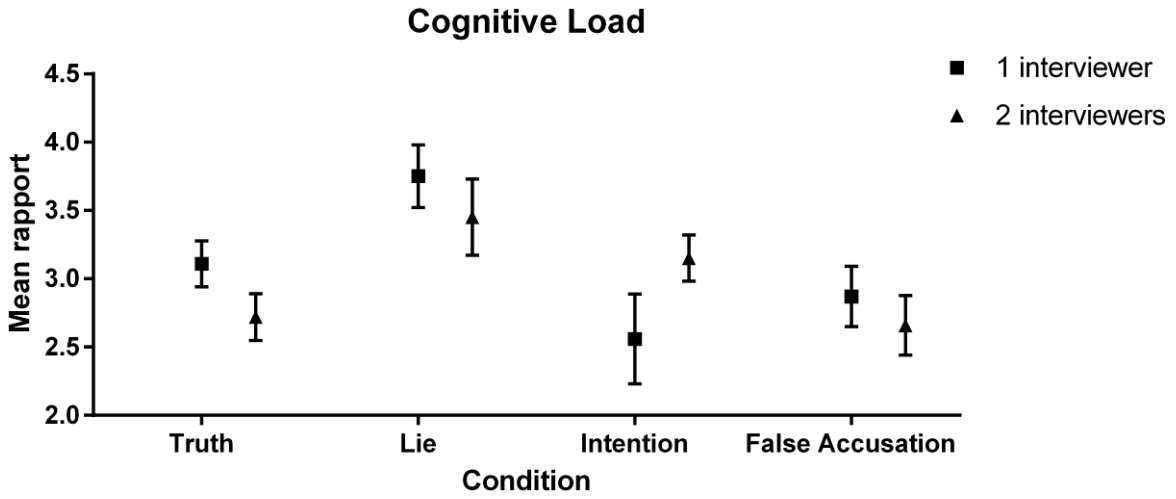
Condition	Number of interviewers	Mean	SE	F	df	p
Truth	One	3.11	.17	3.42	7,75	.003
	Two	2.72	.17			
Lie	One	3.75[a,b,c]	.23			
	Two	3.45	.28			
Intention to lie	One	2.56	.33			
	Two	3.15	.17			
False accusation	One	2.87	.22			
	Two	2.66	.22			

Supplemental table 3. Mean self-reported cognitive load by condition and number of interviewers present.

[a] Lie with one interviewer vs intention to lie with one interviewer, $p = .007$.

[b] Lie with one interviewer vs false accusation with two interviewers, $p = .012$.

[c] Lie with one interviewer vs truth with two interviewers, $p = .049$.



Supplemental figure 2. Self-reported cognitive load by veracity condition and number of interviewers present.

Stress

Additionally, stress levels were examined among the four veracity conditions (supplemental table 4). Overall, there were significant differences in stress between the veracity conditions ($F(3,78)=6.493$, p= .001). Stress was highest in the lie condition (M= 4.31, SE= .25), and significantly higher than the false accusation (M= 2.97, SE= .25, p= .005) and truth condition (M= 2.78, SE= .29, p= .001). There was no significant difference in stress between the lie condition and the intention to lie condition (M= 3.61, SE= .27, p= .361).

Condition	Mean	SE	F	df	p
Truth	2.78	.30	6.49	3,78	.001
Lie	4.31[a, b]	.25			
Intention to lie	3.61	.27			
False accusation	2.97	.25			

Supplemental table 4. Mean self-reported stress by veracity condition.
[a] Lie versus false accusation, $p = .005$.
[b] Lie versus truth, $p = .001$.

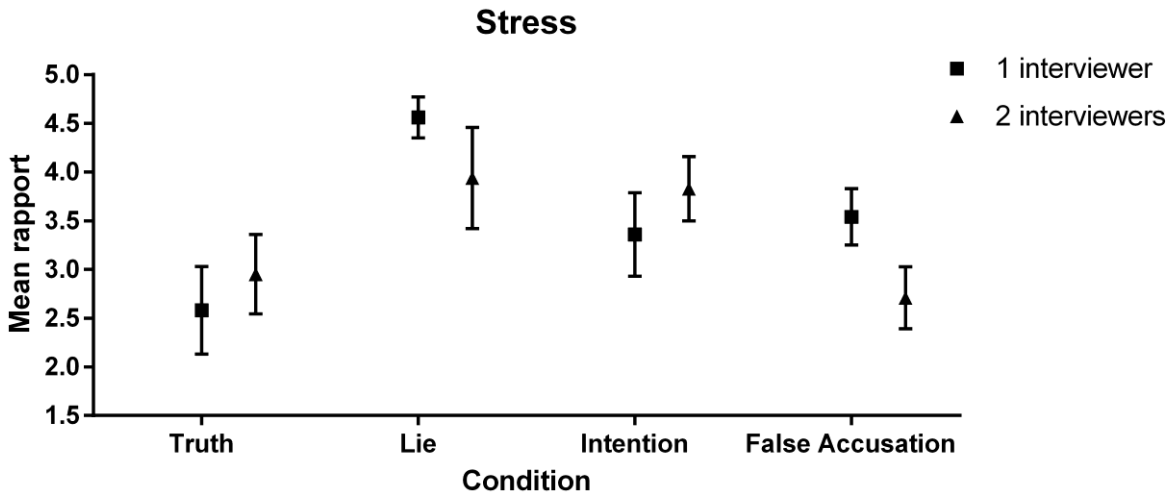
Next, the differences in stress among the veracity conditions and number of interviewers present were examined (supplemental table 5, supplemental figure 3). There were significant differences in overall stress levels post-interview ($F(7,74)=3.455$, p= .003). The self-reported stress was highest in the lie condition with either one (M= 4.56, SE= .21) or two interviewers (M= 3.94, SE= .52). Self-reported stress was significantly higher when the lie condition with one interviewer was compared to false accusation condition with two interviewers present (M= 2.71, SE= .32, p= .007) and the truth condition with one interviewer present (M= 2.58, SE= .45, p= .011). There was no significant difference in stress when the lie condition with two interviewers was compared to the other conditions and number of interviewers.

Condition	Number of interviewers	Mean	SE	F	df	p
Truth	One	2.58	.45	3.46	7,74	.003
	Two	2.95	.41			
Lie	One	4.56[a, b]	.21			
	Two	3.94	.52			
Intention to lie	One	3.36	.43			
	Two	3.83	.33			
False accusation	One	3.54	.29			
	Two	2.71	.32			

Supplemental table 5. Mean self-reported stress by veracity condition and number of interviewers present.

[a] Lie with one interviewer versus false accusation with two interviewers, *p* = .007.

[b] Lie with one interviewer versus truth with one interviewer, *p* = .011.



Supplemental figure 3. Self-reported stress by veracity condition and number of interviewers present.

Intelligence gathered

The median of intelligence gathered during the interview (median word count) was 192.00, IQR 133.00-270.00. There was no significant difference in intelligence gathered between men (Median 227, IQR 176-299) and women (Median 173, IQR 127-247, p= .052 *Mann-Whitney*). For the veracity conditions, there was a significant difference in total word count (df 3, chi-square 9.957, p= .019 *Kruskal-Wallis*)(supplemental table 6). For subjects in the truth condition the amount of intelligence gathered was highest (Median = 220, IQR 177-312), and for the lie condition the lowest (Median = 138, IQR 111-237) (Table 8). The median of intelligence gathered during interviews with either one or two interviewers present did not differ (df 1, chi-square 1.551, p= .213).

Condition	Median word count	IQR	Chi-square	df	p
Truth	220	177-312	9.957	3	.019
Lie	138	111-237			
Intention to lie	192	157-281			
False accusation	193	129-254			

Supplemental table 6. Median intelligence gathered by veracity condition.

The median amount of intelligence gathered for each veracity condition with either one or two interviewer present is listed in supplemental table 7. There were significant differences in the amount of intelligence gathered among the conditions and number of interviewers present (df 7, chi-square 22.261, p= .002). Specifically, the least intelligence was gathered from subjects in the lie condition with two interviewers (Median 110, IQR 81-132), the most intelligence was gathered from subjects in the truth condition with one interviewer (Median 299, IQR 231-379).

Condition	Number of interviewers	Median word count	IQR	Chi-square	df	p
Truth	One	299	231-379	22.261	7	.002
	Two	200	166-213			
Lie	One	146	122-268			
	Two	110	81-132			
Intention to lie	One	231	161-543			
	Two	190	151-247			
False accusation	One	120	93-131			
	Two	209	171-256			

Supplemental table 7. Median intelligence gathered by veracity condition and number of interviewers present.