DETECTING DECEIT FROM IDIOSYNCRATIC DECEPTION CLUES

By

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B.A. (Hons.), University of New Brunswick, 2009

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

Master of Arts

In the Graduate Academic Unit of Psychology

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This thesis is accepted by the
Dean of Graduate Studies

THE UNIVERSITY OF NEW BRUNSWICK

April, 2017

Abstract

Lie detection research is largely driven by the proposition that lying is experienced differently than truth-telling in terms of emotional discomfort, cognitive load, and behavioural control. These experiences are believed to moderate changes in expressive nonverbal behaviour that occur during deception. Many assumptions that underlie theories of lie detection have gone untested. In this study, 61 participants completed a personality packet and then lied and told the truth about their attitudes concerning contentious social issues. Following each interview, participants completed a questionnaire concerning their perceived level of discomfort, cognitive load, and behavioural control. Results indicated that participants experienced deception differently from truth telling. Furthermore, personality contributed to the experience of deception. Detailed analyses revealed idiosyncrasies in behavioural clues and multiple behaviours were more useful than any single behavioural clue. Taken together these results suggest that researchers should focus on constellations of behavioural clues, rather than focusing on individual behaviours.

Keywords: behavioural deception clues; lie detection; individual differences; nonverbal behaviour

Acknowledgement

There are several people for which I owe a debt of gratitude. First and foremost is to my supervisor, Dr. Lisa Best, who offered irreplaceable guidance in carrying out this research, as well as a hand in conducting it. I must also thank the members of my supervisory committee, Dr. Murray Goddard and Dr. Mary Ann Campbell, as well as the members of my examining committee, Dr. Lilly Both and Dr. Greg Marquis, for their significant contributions.

I am thankful for the number of hours that Kathryn Flood, Alex Macaulay, and Rory McPhee spent playing vital roles in this research. To the rest of the lab, I am thankful for the support they have provided and the times they listened to me ramble on about my research. They are my fellow graduate students and colleagues, but most importantly, my friends.

My family has supported me throughout my pursuit of higher education. For this I am grateful. Finally, my long-time love, Belenda, and her son Harven. They provide me with the drive I need to work hard and be successful at what I do.

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Detecting Deceit from Idiosyncratic Deception Clues

Everybody lies, and we learn to do so at a very early age (Evans & Lee, 2013). In fact, the average person admits to telling one or two lies per day (DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996), and if motivated to make a good impression, can tell anywhere from three to 12 lies during a 10-minute conversation (Feldman, Forrest, & Happ, 2002). We might lie to gain a reward, avoid a consequence, maintain relationships, or enhance and/or protect the impressions others form of us (Buller & Burgoon, 1996). We also might lie because, at times, it is simply easier than telling the truth (Levine, Kim, & Hamel, 2010). Fortunately, many of these everyday lies are of little consequence and act as a sort of social lubricant, told to avoid awkward and embarrassing situations (DePaulo et al., 1996; Vrij, 2008; Vrij, Ennis, Farman, & Mann, 2010). Some lies, on the other hand, have serious consequences, and being aware of when these serious lies occur can be extremely valuable in certain situations. For example, evaluating a suspect's credibility, deciding whether a politician is being honest with their campaign promises, or determining whether or not an individual is a security threat are situations in which being able to spot the lies matters most.

In 2006, the Global Deception Research Team (GDRT) asked individuals in 58 countries "how can you tell when others are lying?" The majority of respondents believed that when people lie, they behave in ways that make their deception detectable. Across cultures, people reported the belief that liars would avert their gaze, shift their posture, touch and scratch themselves more frequently, stutter, have more pauses in their speech, show more hand gestures, and tell longer stories. Research has also revealed that people maintain beliefs that lying is accompanied by feelings of discomfort and

increased cognitive load, and that people try harder to control their verbal and nonverbal behaviour while lying. It is likely that these latter beliefs are the driving force behind the opinions about which behaviours are most useful in detecting deception (Vrij, Akehurst, & Knight, 2006).

For more than four decades, researchers have examined whether or not lies can be detected through observation and analysis of nonverbal behaviour. Ingenious lie scenarios have been developed for use in the laboratory, necessitating that participants tell lies about attitudes and facts, the contents of video clips and photographs, whether or not they cheated on a particular task or participated in a mock-crime, about descriptions of liked and disliked people, during a simulated job interview, about past experiences, about responses on personality tests, and several other topics (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003). Contradicting popular belief, this research has resulted in two undeniable findings. First, at least in the laboratory, people fair little better than chance when asked to spot the lies. Average detection rates of truths and lies, regardless of whether an individual is a professional or layperson, fall around 54 % (Bond & DePaulo, 2006; 2008; Ekman & O'Sullivan, 1991; Ekman, O'Sullivan, & Frank, 1999). Second, none of the examined behaviours are exclusively and/or strongly related to deception (DePaulo et al., 2003; Sporer & Schwandt, 2006; 2007). Despite these meta-analytic findings, researchers argue about the ecological validity of the majority of lie-detection research. They insist that the majority of the experimental research has examined lie-detection through behavioural analysis using lies of such trivial nature that generalizing to real-world settings is all but impossible (Frank & Svetieva, 2012). In fact, some deception scholars have suggested that when lie scenarios

used in research more closely approximate real-world settings, the lies become more detectable (Buckley, 2012; Frank & Ekman, 1997). Others have corroborated this assertion, demonstrating that motivated liars are more detectable than unmotivated liars (DePaulo, Kirkendol, Tang, & O'Brien, 1988; DePaulo, Lanier, & Davis. 1983; DePaulo, Stone, & Lassiter, 1985; O'Sullivan, Frank, Hurley, & Tiwana, 2009). In other words, when the lie being told is more meaningful to the individual telling it, there is more of a chance that the individual will "choke under the pressure."

Behavioural deception clues

Ekman and Friesen (1969) were the first to formally theorize about behavioural deception clues. They proposed that our body movements and facial expressions could provide two types of information that are useful in spotting deception. They referred to such information as *nonverbal leakage* and *deception clues*. A deception clue is any information, verbal and nonverbal behaviour or otherwise, that suggests lying. In the current thesis, it is only the behavioural clues that are of interest. Nonverbal leakage occurs when our true emotional or psychological state affects our nonverbal behaviour, despite attempts to inhibit or misrepresent those states in our nonverbal expressions (i.e., a fleeting expression of fear; a clenched fist in anger). In this sense, all behavioural deception clues are forms of nonverbal leakage because they result from people failing to inhibit/control behavioural signals of their inner experiences of lie-telling. Although Ekman and Friesen suggested some expressive behavioural signals that might be useful in detecting deception, such as displays of emotion, their suggestions were dependent on the context surrounding the lie, rather than telling a lie in and of itself. They provided no strict rules about the specific behaviours that were to be considered deception clues;

rather, they suggested that when expressive behaviour is incongruent with the verbal message it is more likely to indicate that something is amiss. More concrete theorizing about which expressive behaviours are to be considered behavioural deception clues emerged with the development of three major lie detection approaches: the emotion approach, the cognitive approach, and the attempted control approach.

Lie detection approaches

Building on Ekman and Friesen's (1969) theory of behavioural deception clues, Zukerman, DePaulo, and Rosenthal (1981) suggested four ways that lying could cause changes in an individual's expressive behaviour. First, deception may be more arousing than truth telling. Second, telling a lie might cause certain emotions to occur. Both of these factors are closely related to one another and are often considered to represent the same aspect of lying, or at very least have similar effects on behaviours indicative of emotional or physical arousal (Caso, Gnisci, Vrij, & Mann, 2005). Third, telling a lie might require more mental effort than telling the truth, which might result in behavioural indicators of cognitive load. Fourth, when an individual lies they are less likely to take their credibility for granted and, thus, they may attempt to control their verbal and nonverbal behaviour to prevent signs of lying. Each of Zuckerman et al.'s (1981) factors represent a different behavioural based approach to spot a liar: one that favours differences in emotions, one that favours differences in cognitive load, and one that favours differences in attempts to control behaviour. Each of these approaches makes specific predictions about how experiences while lying affect expressive behaviour in such a way that the behaviour serves as a viable deception clue. For the purpose of this

thesis Eleven behaviours were chosen. Predictions made by each lie detection approach concerning the specific patterns of change in these behaviours are outlined in Table 1.

Table 1
Predictions about Behavioural Deception Clues

Behaviour	Emotion Approach	Cognitive Approach	Attempted Control Approach
Illustrators	<	<	<
Adaptors	>	--	<
Closed Posture	>	--	<
Postural shifts	>	<	<
Gaze aversion	>	>	<
Leg & foot movements	>	<	<
Response latency	--	>	--
Response length	<	>	>
Eye blinks	>	<	--
Lip press	--	--	>
Smiling	>	--	<

Note: > indicates that liars show more of the behaviour
< indicates that liars show less of the behaviour
-- indicates that there is no clear prediction made

Emotion-based approach. Emotion-based approaches rest on the assumption that when an individual lies they experience emotions differently than when they tell the truth. Further, these differences in emotions are assumed to result in changes in emotion relevant behaviours (Ekman, 1981; 1988; 1989; 2009; Ekman & Friesen, 1969; Frank & Ekman, 1997; Frank & Svetieva, 2012; Zuckerman et al., 1981). Ekman (1981) suggested five ways that emotions could become involved in deception, thus influencing behavioural affect displays. First, the lie could concern the misrepresentation or concealment of felt emotions, such as the concealment of anger or hatred towards a specific group of people, or disgust towards someone's beliefs and traditions. Second, emotions might be associated with the content of the lie itself; for example, an individual who is ashamed of something they did in the past might show signs of shame when they try to conceal what happened. Third, an individual might experience what is

called *detection apprehension* and feel fear or anxiety about the possibility of getting caught. Fourth, an individual might experience guilt. When that guilt is elicited by what a person is lying about, it is a more general form of guilt. When the guilt occurs because the individual is lying, it is termed *deception guilt*. The fifth and final way Ekman proposed that emotions intertwine with deception is known as *"duping delight."* Duping delight refers specifically to the experience of elation or satisfaction that is experienced in some forms of deception, and by some individuals when deceiving another person. Ekman (1981; 1989; 2009) maintained that the most commonly experienced emotions during deception are likely to be apprehension, guilt, and elation.

Behavioural clues of emotion. Several predictions about behavioural deception clues have been derived from an emotion-based framework; all of which result from the experience of deception relevant emotions. For example, because deception is predicted to be associated with the experience of negative emotions, or discomfort, (i. e., shame, guilt, apprehension), signs of negative emotion might give a lie away. Some of the indications of negative emotions and arousal include: an increase in *adaptors*, which are defined by self or object directed fidgeting (Ekman, 2009; Ekman & Friesen, 1969; Ekman & Friesen, 1972); *speech disfluencies* (Cook, 1969; Pope, Siegman, & Blass, 1970; Zuckerman et al.,1981); *eye blinks* (Koukounas & McCabe, 2001; Stern, Walrath, & Goldstein, 1984; Zuckerman et al., 1981); various forms of *psychomotor agitation* which refers to meaningless, frequent, body movements (Day, 1999; Katz et al., 1984); and *gaze aversion* (Helminen, Kaasinen, & Heitanen, 2011; Moukheiber et al., 2010; Schneier, Rodebaugh, Blanco, Lewin, & Liebowitz, 2011). If it is true that negative

emotional arousal is experienced during deception, then the frequency or intensity of any of these behaviours might increase as a result.

Another way in which negative emotions could signal deception is by the experience of negative emotions resulting from being deceptive, which might make the topic aversive and cause an individual to nonverbally disengage from the conversation (Zuckerman, DePaulo, & Rosenthal, 1981). Behavioural clues of disengagement from social interaction include, but are not limited to, shorter *response lengths*, a lack of *eye contact*, *a closed body posture* or *orienting the body away* from their conversation partner, and a decrease in the *illustrative arm movements* that generally accompany speech when a person is engaged in what they are saying (DePaulo et al., 2003; Ekman & Friesen, 1972; Friesen, Ekman, & Wallbott, 1979; Vrij, 2008). A summary concerning these predictions made by the emotion approach concerning behavioural deception clues appears in Table 1, which is based on Vrij (2008). The direction of change in Table 1 represents a theoretical change in behaviour while lying. Approaches may differ in whether they predict an increase or decrease of each behavioural during deception and Table1 allows for a quick comparison between approaches.

Cognitive-based approach. The cognitive approach assumes that being deceptive results in greater cognitive load. Changes in expressive behaviours that are relevant to mental exertion (Vrij, Fisher, Mann, & Leal, 2008; Vrij & Granhag, 2012a; Vrij, Granhag, Mann, & Leal, 2011; Zuckerman, DePaulo, & Rosenthal, 1981) might accompany this change in cognitive load. Similar to the emotion approach, there are several reasons that lying would necessitate the recruitment of more mental resource than truth-telling. First, creating a lie on the spot can be a mentally taxing endeavor,

especially when details are necessary and one word answers will not suffice. Second, deceptive individuals might be less likely to take their credibility for granted, and may monitor their behaviour closely to ensure that they are appearing credible. Third, liars may monitor and evaluate the reactions of their targets in order to ensure that these lies are believed. Fourth, liars might need to continuously remind themselves to lie as any "slip-up" could prevent success. Fifth, cognitive effort increases during lying because both the lie and the corresponding truthful information must be processed simultaneously, whereas truthful individuals simply have to process truthful information. Finally, it is thought that relaying information from memory occurs more easily than fabricating information during deception (Vrij, Fisher, Mann, & Leal, 2008).

Behavioural clues of cognitive load. Using a cognitive approach, behaviours indicative of thinking harder are considered signs of lying. Thinking hard is believed to result is less *blinking*, (Bagley & Manelis, 1979; Holland & Tarlow, 1972; 1975; Leal & Vrij, 2008; 2010; Stern et al., 1984), and therefore might be a clue that a person is being deceptive. An increase in filled pauses (i.e., "ums" and "ahhs") and other speech disturbances are also found to accompany increases in mental effort. These are believed to occur because having to think about answers carefully might result in disfluent speech (Corley & Stewart, 2008; Khawaja, Ruiz, & Chen, 2008; Vrij, 2008). Disfluent speech could, in turn, result in a longer *response length*. *Response latency* is another possible clue that deception is occurring. Lies are believed to necessitate more planning; as such, the spontaneous lie may be accompanied by longer response latencies to questioning (Walczyk, Roper, Seemann, & Humphrey, 2003; Walczyk, Schwartz, Clifton, Adams, Wei, & Zha, 2005). Along with signalling discomfort, *gaze aversion* can also signal

when an individual is exerting considerable cognitive load. Researchers using a cognitive-based approach also predict a decrease in eye-contact, but do so for different reasons than emotion-based approaches. The cognitive approach views eye contact as distracting, and breaking eye contact frees up mental resources. There is considerable evidence that people break eye contact while thinking during conversation for this very reason (Doherty-Sneedon & Phelps, 2005; Glenberg, Schroeder, & Robertson, 1998; Markson & Paterson, 2009; Vredeveldt, Hitch, & Baddeley, 2011; Vrij, Mann, Leal, & Fisher, 2010).

Along with signalling withdrawal from a conversation topic, a reduction of *illustrative arm movements*, as well as other *body movements*, might signal an increase in cognitive load. The cognitive load approach theorizes that this reduction in overall animation occurs for a slightly different reason than that proposed by the emotion approach. In this case, a reduction in illustrators and other body movements are believed to result from a general neglect of body language due to a depletion of cognitive resources (Ekman, 1981; Ekman & Friesen, 1972; Vrij, 2008; Zuckerman et al., 1981). In contrast, other research suggests that as tasks become more cognitively complex, gesture rates increase as a means to work through problems (Goldin-Meadow & Wagner, 2005; Hostetter, Alibali, & Kita, 2007; Melinger & Kita, 2007). Thus, research showing a decrease in illustrator use during deception (DePaulo et al., 2003; Ekman, Friesen, & Scherer, 1976) might result from the fact that deception appears to have different effects on various types of hand movements (Caso, Marricchiolo, Bonaiuto, Vrij, & Mann, 2006). The possibility that researchers differ in what they

consider to be an illustrator could account for contrasting findings in different experiments. Predictions for the cognitive approach are summarized in Table 1.

Attempted control approach. This approach suggests that individuals are less likely to take their credibility for granted when they lie; to avoid signalling their deception, they may attempt to control their behaviour (DePaulo et al, 1988; DePaulo et al., 2003; Vrij, 2008; Zuckerman et al., 1981). There are a couple of ways that controlling behaviour could produce behavioural deception clues. First, people might not have a good sense of their nonverbal habits and may over-control their expressive actions, leading to a rigid and unnatural demeanor. Another possibility is that attempting to control behaviour could result in nonverbal leakage and deception clues because attempting to convincingly control all verbal, para-verbal, and nonverbal channels simultaneously is an extremely demanding task. Paradoxically, attempting to control all channels of expressive behavior might mean that some of the behavioural deception clues leak through unchecked.

Behavioural clues of attempted control. The behavioural control approach makes less specific predictions about behavioural deception clues. Instead, it suggests that when behaviour is likely to indicate deception, only behaviours that are difficult to control will betray a lie (Ekman & Friesen, 1974; Zuckerman et al., 1981). This occurs because easily controlled behaviours that might betray a lie are supressed before they manifest. For example, hand movements and gaze direction are easily managed and, therefore, may not reliably indicate when people experience specific emotions or cognitive load during deception due to deliberate manipulation of these behaviours. Under this paradigm, behaviours that people lack precise control over, or are less

cognizant of, are more likely to be reliable deception clues (Ekman & Friesen, 1974). Blink rates, for instance, could serve as a possible indicator of deception because (1) liars are unlikely to pay close attention to this behavior, and (2) controlling eye blinks is almost impossible.

Although the attempted control approach still relies on some signs of nonverbal leakage (i.e., signs of cognitive load or emotions), it also relies of signs of deliberate behavioral control. Such signs consist of an unusual rigidity in expressive behaviour that is lacking in spontaneity and may appear planned (Ekman & Friesen, 1972; Greene, O'Hair, Cody, & Yen, 1985). Zuckerman and his colleagues (1981) believed that liars have to be well practiced to prevent signs of lying and simultaneously manifest signs of credibility. If a deceptive individual does not have a good sense about their baseline nonverbal habits, then they may over-control certain behaviours. If this is the case, then it would be expected that liars may reduce *illustrative hand movements*, *leg and foot movements*, *adaptors* (self or object directed fidgeting), *postural shifts*, and *speech disfluencies*; maintain or make more *eye contact*; provide *shorter responses*; *smile* less as to maintain a "poker face" (Ekman & Friesen, 1969, 1974); and show more facial movements (*lip presses*) designed to hide emotional facial expressions (Ekman & Friesen, 1982). Predictions made by the control approach are summarized in Table 1.

Behavioural deception clues in the laboratory

For the last four and a half decades, researchers have put the predictions described above to the test. Not only have these behavioural clues been examined, but many others have been added to the long list of potential deception clues (DePaulo et al., 2003). For the purpose of the current study, I examined 11 behaviours: speech

illustrators, adaptors, closed posture, postural shifts, gaze aversion, leg and foot movements, response latency, response length, eye blinks, lip presses, and undifferentiated smiling. These behaviours were selected because they are some of the most common behaviours examined in the literature. Furthermore, at least one of the three approaches discussed above have made fairly clear predictions about the effect deception has on them when people lie.

Speech illustrators. These are hand and arm movements that accompany and illustrate speech. The arm and hand movements might emphasize what is said; sketch a direction of thought; point to an object, place or event; depict spatial relationships; portray the rhythm or pacing of an event; represent an action; involve drawing a picture in the air as a referent; or completely substitute for a word or phrase (Ekman & Friesen, 1972). Although the rationale may be different, all approaches predict a decrease in illustrator activity while lying. Research findings are mixed, with some researchers reporting an increase of illustrators during deception (Bond, Kahler, & Paolicelli, 1985; deTurck & Miller, 1985; Porter, Doucette, Woodworth, Earle, & MacNeil, 2008), some researchers reporting a decrease (Cody & O'Hair, 1983; Davis & Hadiks, 1995; Ekman, 1988; Ekman & Friesen, 1972; Vrij & Mann, 2001; Vrij, Semin, & Bull, 1996), and others reporting no change in illustrator activity whatsoever (Ebesu & Miller, 1994; Feeley & deTurck, 1998; Granhag & Stromwall, 2002; Vrij, 2006; Vrij & Winkel, 1991). DePaulo et al.'s (2003) meta-analysis determined that illustrators tended to decrease during deception, supporting predictions by all three approaches, albeit the reported effect size was small (d = - 0.14, $p < 0.05$).

Adaptors. These are emotion-relevant behaviours, believed to signal a state of stress. An adaptor is a behaviour consisting of self- or object-directed touching, scratching, squeezing, rubbing, picking, or grooming that is theorized to relieve tension (Ekman & Friesen, 1972). Adaptor activity has been shown to increase in stressful situations (Castaner, Camerino, Anguera, & Jonsson, 2013; Gregersen, 2005; Neff, Tothman, Bowman, Tree, & Walker, 2011). Two of the theoretical approaches make predictions about adaptor activity during lying. As with research examining illustrators, results are mixed (for a summary, see Vrij, 2008). DePaulo et al. (2003) found a tendency for adaptors to increase in their meta-analysis, but only when self- and object-directed adaptors were undifferentiated. Again, the reported effect size was small (d= 0.16, $p < 0.05$).

***Postural shifts and leg and foot movements*.** Postural shifts refer to postural adjustments, trunk movements, or repositioning of the body. Leg and foot movements might be related to deception insofar as they might represent a state of psychomotor agitation, which could result from emotional arousal (Day, 1999; Katz et al., 1984). The emotion approach predicts that when people are deceptive they will show an increase in overall body movements (except illustrators). The cognitive and attempted control approaches both predict that these movements will decrease during deception. Consistent with the other cues, research findings for postural shifts and hand and foot movements are mixed (see Vrij, 2008). DePaulo et al. (2003) found no effect for either postural shifts (d = 0.05, *ns*) or leg and foot movements (d = -0.09, *ns*) in their meta-analysis.

***Gaze-aversion*.** One of the most strongly held beliefs about behavioural deception clues is that liars avert their gaze (GDRT, 2006). Gaze aversion is characterized by a conscious or unconscious reduction in eye contact. Both the emotion and cognitive approaches predict an increase in gaze aversion and the attempted control approach predicts an increase in overall eye-contact and corresponding decrease in gaze aversion that is due to over-control. It is perhaps unsurprising to find that research findings vary from one study to the next (see Vrij, 2008). DePaulo et al. (2003) found no effect for gaze aversion (d = 0.03, *ns*) or eye contact (d = 0.01, *ns*) in their meta-analysis.

***Response length and response latency*.** These clues could be considered para-verbal clues because of their close association with speech. Response latency is defined as the time that passes from the end of the question asked to the beginning of the response (DePaulo et al., 2003). Only cognitive approaches make predictions about response latency, suggesting that deceptive answers result in longer response latencies. Response length refers to the time spent providing a response to the interviewer's question (DePaulo et al., 2003). The attempted control approach suggests that because a liar wishes to avoid giving away too much information, their answers are likely to be shorter (DePaulo et al., 2003). Additionally, the emotion approach suggests that response length decreases because the individual is attempting to disengage from an aversive topic. Finally, because lying is associated with an increase in mental effort, the cognitive load approach would predict longer response lengths, resulting from disfluent speech. As with the other cues, findings are mixed (Vrij, 2008) and DePaulo et al.

(2003) found no effect for response latency (d = 0.02, *ns*) or response length (d = -0.03, *ns*).

***Eye Blinks*.** Eye blinks are defined as the opening and closing of the eye lids. They are thought to be a valid measure of emotional arousal (Koukounas & McCabe, 2001; Stern et al., 1984) and cognitive processing (Holland & Tarlow, 1975; Siegle, Ichikawa, & Steinhauer, 2008). Emotion based approaches predict an increase in eye-blinks during deception that is due to increased emotional arousal. Cognitive approaches predict a decrease in eye-blinking due to increased cognitive effort. This clue appears to be a stronger indicator of deceit when rapid successions of eye blinks, which occur immediately following a decrease in mental load, are controlled for (Leal & Vrij, 2008; 2010). The attempted control approach makes no prediction about eye blinks. Findings on eye-blink rates are mixed (Vrij, 2008). Overall, DePaulo et al.'s (2003) meta-analysis concluded no association between eye blinks and being deceptive (d = 0.07, *ns*).

***Smiling*.** Undifferentiated smiling is broadly defined as the corners of the mouth pulled up (DePaulo et al., 2003). Emotion approaches might predict an increase of smiling when the individual experiences duping delight, but only in situations in which duping delight is likely. Making predictions about duping delight likely necessitate an understanding of the type of lie being told and the person telling it, as well as an ability to differentiate real smiles from posed ones. A clearer prediction about smiling behaviour can be derived from the attempted control approach's reasoning about deception clues. Some research has shown that people use smiling as a masking movement to conceal negative emotions (Ekman, Friesen, & O'Sullivan, 1988). If lying causes people to experience negative emotions, then they may smile more often while

lying to hide this fact. However, because emotional reactions are negatively correlated with perceived believability (Riggio, Tucker, & Widaman, 1987), individuals may attempt to decrease all signs of emotion, including smiling, while lying (Ekman & Friesen, 1969; 1974). This is commonly referred to as "putting on a poker face." These findings on smiling behaviour are mixed (Vrij, 2008), and DePaulo et al.'s (2003) meta-analysis found no effect ($d = 0.00$). Ekman (2009) suggests that smiling behavior is useful as a deception clue only when genuine smiles are differentiated from falsified smiles. This has been demonstrated in Ekman, Friesen and O'Sullivan's (1988), but DePaulo et al. (2003) were unable to test this idea in their meta-analysis due to a small number of effect sizes available.

***Lip presses*.** Lip presses involve the firm pressing of the upper and lower lips together. This behaviour may increase in order to inhibit facial expressions that an individual feels will give their lie away. It may, therefore, be a means to control a fleeting smile or negative emotions (Ekman & Friesen, 1982). This behavioral deception clue is, therefore, best explained by an attempted control approach in that an increase in lip presses would be experienced. Although larger than the rest, the effect size for lip pressing found by DePaulo et al. (2003) was small ($d = 0.16$, $p < 0.05$).

Idiosyncratic deception clues

Most people are well aware of Pinocchio's fabled nose that grew every time he fibbed. Unfortunately, real deception clues do not appear to be so clear. The most common theoretical approaches pertaining to lie detection through behavioural analysis have never suggested that any single behaviour would indicate lying in every situation, and with every person (Ekman, 2009; Ekman 1988; DePaulo et al., 2003; Vrij, 2008).

Zuckerman et al. (1981) summarized this point nicely in writing: “Deception is not an affect and, thus, is unlikely to be associated with any specific verbal or nonverbal expression. However, deception does involve various processes and factors that influence behaviour (p. 7).” Theoretically, the reason for behaviour to change during deception is not simply because an individual is telling a lie; rather, it is because lying is experienced differently than truth telling, and these differences in experience might manifest themselves in a liar’s expressive behaviour.

Zukerman and colleagues (1981) argument appears to have received support in the lie detection literature in that no behaviour has emerged as a strong indicator of deception (DePaulo et al., 2003; Sporer & Schwandt, 2006;2007; Vrij, 2008). There is an alternative way of examining behavioural indicators of deception. Rather than being conceived as universal signals, behavioural deception clues may very well be idiosyncratic (Vrij & Mann, 2001). That is, they are unique to the individual telling the lie, the circumstances surrounding the lie, or due to some combination of these factors. Behaviour may betray the lies of some people, but the specific behaviours that do so are likely to vary between cases.

As mentioned earlier, behavioural deception clues do not occur simply because someone lies, but because lying might make an individual experience a particular psychological state that is reflected in their expressive behaviour (Ekman, 1989; Zuckerman et al., 1981). If these states are not experienced uniformly across all instances of deception, and by all people, then there is little reason to expect that signs of lying are universal. In this regard, rather than assuming that a universal lie signal akin to the fabled *Pinocchio’s nose* exists, behavioural deception clues might be better

approached as idiosyncratic phenomena resulting from each individual's unique experience of telling a lie.

There are several lines of evidence that seem to support the idea of idiosyncratic deception clues. First, the literature examining individual differences in the experience of being deceptive has found that not all people experience telling the same lie in a universal way (Vrij, Edward, & Bull, 2001a; Vrij & Holland, 1998). If all individuals do not experience deception in the same way, then there is little reason to expect the behaviours that give their lies away to be universal. Secondly, people appear to differ in their ability to create an effective veil of credibility (Frank & Ekman, 2004; Levine et al., 2011; Riggio, Salinas, & Tucker, 1988; Riggio, Tucker, & Throckmorton, 1987), which suggests that some people are more skilled at controlling their behaviour when they lie. Finally, not all situations in which lies are told necessarily will be experienced differently than if the truth was told. When fabricating a lie is no more difficult than telling the truth, and there are no real consequences associated with lying, then there is little reason to expect lying and truth-telling to be experienced differently. If lying and deception are not experienced differently, then there is no reason to expect their behaviour to indicate otherwise. Understanding how specific factors contribute to individual differences in the unique ways people experience being deceptive, and how these experiences relate to the specific clues that could give their lies away, is an important step in defining behavioural deception clues.

Behaviours that signal experiences of emotional arousal, cognitive load, and attempted control are only useful as deception clues if telling lies invokes a different psychological experience than those that occur when telling comparable truths, and

those experiences manifest in the liar's behaviour. Perhaps surprisingly, few studies (Caso et al., 2005; Vrij et al., 1996), have attempted to verify whether the assumptions made by each of the three theoretical approaches are correct. If the experience of lying does not actually differ from the experience of telling the truth, then there is no logical reason to expect differences to emerge in an individual's expressive behaviour. Unfortunately, researchers never test whether participants do indeed experience lying differently than truth telling. It is quite possible that many of these critics are correct, and that lying in the laboratory does not produce significant differences in these underlying processes in such a way that drastically affects nonverbal behaviour.

A further limitation in the existing literature is that researchers never attempt to determine whether the clues that emerge in behaviour are related to the way participants experience lying. For instance, although gaze aversion has been associated with discomfort and cognitive load, in general the lie detection literature has not examined whether gaze aversion is associated with those emotional and cognitive states while telling lies. Given that not all people experience deception in the same way (Vrij & Holland, 1998; Vrij et al., 2001a), their deception clues might vary with their experiences. For example, participants might report experiencing significantly greater cognitive load during deception, but report no differences in the experience of emotions or in behavioural control. In this case, deception should be associated with the emergence of behavioural deception clues relevant to cognitive-based approached, but not necessarily to the other two approaches. This issue is essentially never addressed in the literature, perhaps with the exception of Vrij and colleagues (1996). Rather, these

approaches are employed *post hoc* to offer possible explanations as to why behaviour differed in a particular experiment.

For deception clues to be considered idiosyncratic, they must be shown to exist and relate to variation in how an individual experiences deception. Solely assessing variations in the behaviours is insufficient to conclude that behavioural clues are idiosyncratic, as variations in expressive behaviour could occur by chance. Three criteria might provide evidence that behavioural deception clues are idiosyncratic. First, an individual must experience deception differently than truth telling. Second, individuals should vary in how they experience deception. Third, there should be an association between individual experiences and behavioural clues while lying. Individual differences in deception clues have been examined in the past, but much of the existing research has focused primarily on how specific personality traits are related to the behaviours that emerge as deception clues and ignored the underlying psychological processes to which they relate (Klaver, Lee, & Hart, 2007; Knapp, Hart, & Dennis, 1974; Miller, deTurck, & Kabfleisch, 1983; O'Hair, Cody, & McLaughlin, 1981; Riggio & Friedman, 1983; Riggio at al., 1987; Siegman & Reynolds, 1983; Vrij, Akehurst, & Morris, 1997; Vrij et al., 2001a). As discussed previously, the underlying processes are almost exclusively used as post hoc explanations as to why behaviour varied in particular studies. This type of theorizing is problematic in so far that behaviour may not have varied for the reasons researchers expect, but rather, the participant's behaviour may have simply varied by chance, which explains the mixed results across studies. To better understand idiosyncrasies in deception clues, it is necessary to examine associations between all three components (i.e., differences in the

individuals, differences in experiences while lying, and differences in the actual behavioural deception clues).

Experiences while lying and telling the truth. All three approaches to deception make very specific predictions about the emotional and mental states experienced by liars. Confirming that these assumptions are correct it is paramount to explaining differences in behaviours between truth-tellers and liars. To date, few studies have attempted to provide evidence that individuals do indeed experience greater discomfort and cognitive load when they lie, or that they try harder to control their behavior to create a credible impression. These few studies include two experimental studies, one by Caso and colleagues (2005) and the other by Vrij et al. (1996), as well as a diary study by Vrij et al. (2010).

Vrij et al. (1996) were the first to examine whether liars experienced greater nervousness and cognitive load, as well as whether they tried harder to control their behaviour. In their deception scenario, they asked participants to deny the possession of a small set of headphones during two interviews. Participants had the headphones in their pocket during the deceptive interview, whereas they did not during the truthful interview. After participants had completed both interviews, they were required to indicate on a seven-point Likert scale the extent to which they experienced specific emotions, cognitive load, and attempts to control behaviour during both the truthful and deceptive interviews. Their findings supported the prediction that deception is accompanied by greater levels of tension (M = 4.24 vs. M = 2.76; respectfully), cognitive load (M = 3.74 vs. M = 2.47; respectfully), and attempts to control behaviour (M = 5.37 vs. M = 4.24; respectfully).

The study by Caso and colleagues (2005), for all intents and purposes was a replication of Vrij et al. (1996). Similar to the above experiment, headphones were placed in the bag by the participant in the deceptive interview, whereas they were not in the truthful interview. These participants were instructed to deny possession in both interviews. These researchers also added an additional variable. They were interested in whether the stakes involved in lying would affect these underlying processes, and provided half of their participants with an incentive to succeed in deceiving the interviewer. A similar questionnaire as described above followed the completion of both interviews. Their findings supported theoretical assumptions about deception. Participants were more nervous (M = 4.12 vs. M = 2.35), needed to think more (M = 5.13 vs. M = 2.93), and tried harder to control their behaviour (M = 4.90 vs. M = 2.24) in the deceptive condition relative to the truthful condition. In addition, they found that when participants were motivated to be believed, they reported feeling greater tension than those who received no such motivation, irrespective of veracity condition. However, motivation had no such effect on the underlying processes of cognitive load or attempted control.

Finally, Vrij et al. (2010) were interested in whether feelings of tension, cognitive load, and attempts to appear convincing differed in real life lying and truth-telling. They had participants keep a journal of all the lies and truths they told over a one week period. Along with this task, participants were required to rate all of their interactions in terms of the degree they felt tense, exerted more cognitive load, and deliberately attempted to make an honest impression on a Likert scale ranging from 1 (*certainly not*) to 7 (*definitely*). Vrij et al. found that participants generally reported

being more tense (M = 3.33 vs. M = 2.43; respectfully), having to think harder (M = 3.48 vs. M = 2.40; respectfully), and exerting greater effort into appearing convincing (M = 3.65 vs. M = 2.86; respectfully) while lying, which seems to offer support for each of the assumptions made about lying. Thus, Vrij et al., Caso et al. (2005), and Vrij et al. (1996) all lend some support for the hypothesized experiences while lying relative to truth telling.

Limitations. Although each of these three studies discussed above offers preliminary evidence supportive of the assumptions made about differences in experiences while lying and telling the truth, they do not adequately answer the question as to whether these differences in experiences account for the display of behaviours that might give an individual's lies away. To date, only Vrij et al. (1996) have examined this association to any degree. They found that a decrease of behaviours, termed "subtle movements" (e.g., finger movements), emerged as valid indicators of deceit and were associated with an increase in cognitive effort and attempted control, but were not associated with tension. As mentioned above, when describing behavioural deception clues and predictions made by each theoretical approach, both cognitive and attempted control processes predict this effect on behaviour. Establishing a link between each of these assumptions and actual behaviours (e.g., if an individual experiences more discomfort, then it is related to signs of discomfort in their demeanor) is critical to establishing validity to lie detection approaches employing behavioural analysis strategies.

Since only subtle movements emerged as valid indicators of deceit, Vrij et al. (1996) were not able to test other associations between behavioural deception clues and

processes that predict them. The lack of valid indicators could be due to the most glaring problem in their experiment. The actual length of the messages was an average of 26 seconds (*SD* = 4 seconds) for truthful conditions and 27 seconds (*SD* = 5 seconds) for deceptive conditions. Given that participants were required to respond to six questions in each interview, each question and answer would have taken an average of approximately four seconds. If the interviewer had articulated each question clearly, then it would have only left, at most, two seconds per response. This suggests that participants provided mostly single word answers (i.e., "yes" or "no"). Ekman (2009) suggested that behavioural clues are more likely to emerge when a liar needs to maintain their deception over a greater period of time, and respond with more detail. This hypothesis was somewhat supported in DePaulo et al.'s (2003) meta-analysis, which indicated that some clues become clearer when lies are maintained over a greater length of time (it is unfortunate that only 30% of the studies they examined provided information about message duration).

There are other problems that could result from short interviews. Short interviews could mean that participants are not given adequate time to experience and introspect about emotions and cognitive effort. In fact, in the experimental research discussed above (Caso et al., 2005; Vrij et al., 1996) participants were not even aware that they would need to be cognizant of their emotions and degree of cognitive load until after the interviews were completed. Instead, participants were required to rely on their memory of each interview when making their judgements about their emotions, cognitive load, and attempts to control behavior. If the interviews were too short for participants to self-assess their emotional and cognitive states, then their responses

might have been derived from the fact that many people hold beliefs consistent with the theoretical assumptions about experiences while lying (Vrij, Mann, & Fisher, 2006). Given that "while truthful" and "while deceptive" items were clearly designated as such on the questionnaire, the wording of these questions might have primed participant's beliefs about deceptive behaviour and resulted in findings supportive of the assumptions. This might not be as significant an issue if the participants were required to report on their experiences while lying/truth-telling immediately after each interview, and leading words such as "while lying" were not present in the questionnaire.

A further problem with short interviews concerns memory. There is little doubt that memory is malleable (Garry, Loftus, & Brown, 1994; Loftus, 2005). It is not beyond reason that the particular experiences during one of these interviews might have affected how participants recalled their experience of the other, especially if those experiences were more potent. Ekman et al. (1988) noted a similar issue to this one when examining facial expressions while lying and telling the truth. In their experiment, they had to forgo counterbalancing truthful and deceptive conditions, because when participants needed to deceive first, negative emotions (as defined by the display of negative facial expressions) elicited by gory medical images persisted into the truthful condition. Such an issue may either mask actual differences between conditions or cause participants to recall the more salient emotions and mental states. Either way, it may be difficult for participants to accurately separate experiences associated being truthful and being deceptive from memory. Replication of these results using scenarios in which participants need to maintain their lies over a greater period of time, report on their

experiences immediately after both lying and telling the truth, and by using questionnaires that eliminate the potential priming issue, is therefore necessary.

The interview styles used in these two laboratory studies (Caso et al., 2005; Vrij et al., 1996) might have also introduced some problems. There are two commonly used styles for interviewing individuals suspected of lying. Accusatory styles involve an interview that includes accusations that the suspect is being deceptive, whether or not they actually are lying. Research has shown that such strategies lead to short denials and make people uncomfortable (Vrij, Mann, & Fisher, 2006). Both of these studies described above (Caso et al., 2005; Vrij et al., 1996) used accusatory styles. Caso et al. (2005) actually went so far as to accuse every participant of lying several times during the interviews. Given that being called a liar, in and of itself, can arouse negative emotions, accusatory interviews might not be the best way to evaluate differences in the experience of discomfort between truth-tellers and liars. Instead, information gathering strategies, in which only questions are asked and no accusations are made, are likely to be more useful in examining these underlying processes as well as potential behavioural indicators of deception (Vrij, 2006).

With respect to both laboratory studies (Caso et al., 2005; Vrij et al., 1996), it could be argued that the consequences associated with being detected were not sufficient to meaningfully motivate participants to want to avoid detection. This is an important issue because, paradoxically, motivation to succeed in deception appears to make clues to deception more transparent (DePaulo et al., 2003; DePaulo et al., 1988; DePaulo et al., 1983). In many deception studies, researchers attempted to motivate their participants in order to create approximations of real world high stakes lies. Among the

more common methods is the use of either instrumental motivation techniques, such as offering a monetary prize for successful deception, and identity relevant techniques, which involve informing participants that being skilled in deception is related to a flourishing career. DePaulo et al.'s (2003) meta-analysis determined that both methods were equally effective at motivating participants. Vrij and colleagues (1996) used identity relevant techniques to motivate their participants to avoid detection, but Caso et al. (2005) simply informed their participants in the high stakes condition that police officers would be scrutinizing their tapes at a later date. It is unclear why either of these techniques would necessarily create a situation in which people are motivated to avoid detection in their experiments, and these researchers never actually offered a rationale for their particular choices. A lack of motivation in these two experimental studies (Caso et al., 2005; Vrij et al., 1996) is evident in the fact that participants did not report experiencing high degrees of arousal or cognitive load, and did not try hard to control their behaviour. This finding suggests that the lies told in those studies may not have been meaningful to their participants.

Individual differences in experiences while lying. In addition to the evidence supporting the assumption that people experience lie-telling differently than truth-telling, there is evidence that the same lie can be experienced differently by different people. Some research has shown that personality traits are related to the particular way an individual experiences the act of lying (Vrij et al., 2001a; Vrij & Holland, 1998). Given that behavioural deception clues are representative of the underlying states hypothesized to accompany deception, it is reasonable to predict that the specific behavioral clues that signal deception vary with the specific experiences that accompany

lie-telling. A clearer understanding of how people differ in their experiences while lying, and whether or not these individual differences correspond to unique variation in behavioural deception clues could lead to more informed theorizing about behavioural deception clues. Several personality traits have been proposed to be associated with how an individual experiences deception, as well as how commonly deception is employed as socialization strategy. Traits relevant to impression management and sociability have been found to be relevant in accounting for differences in the frequency of lying as well as the particular experiences that accompany lying.

Sociability. Kashy and DePaulo (1996) reasoned that highly sociable individuals would be more likely to tell lies because they either want to enhance a positive impression on others or make others feel better about themselves. They suggested that highly sociable individuals might become more skillful liars because they are more comfortable in social interactions than less sociable people, they are more practiced in deception, and as lying becomes more habitual. Kashy and DePaulo found evidence that the rate of lying among highly sociable individuals is significantly higher than in their less sociable counterparts. Extraverts, who are more likely to be sociable than introverts, told more lies on a daily basis than did introverts, even after controlling for the number of social interactions. Vrij and Holland (1998) found that people with high levels of extraversion are less likely to experience high degrees of discomfort and cognitive load while lying, which suggests that extraverts might be less likely to show the stereotypical signs of lying (i.e., nervous behaviour, nonverbal indices of thinking). Given that extraverts are less likely to experience discomfort and significant cognitive load while lying, it is unlikely that they would feel the need to control their behaviour. Therefore, it

was predicted, that extraversion would be negatively correlated with the experience of discomfort and cognitive load, as well as attempts to control behaviour in the present study.

Schlenker and Leary (1982) defined social anxiety as anxiety resulting from the prospect or presence of personal evaluation in real or imagined social situations. Given that individuals are aware of when they are lying, and know that others may be evaluating the veracity of their statements, socially anxious individuals are likely to find deception an extremely uncomfortable task. Vrij and Holland (1998) found that socially anxious individuals had a greater tendency to report feeling awkward while lying. They did not, however, find an association between social anxiety and the experience of deception as being a difficult task. Given this nuanced finding, it was predicted that social anxiety would be positively correlated with feelings of discomfort while lying in the present research, but not necessarily with the experience of cognitive load. No study has examined whether or not social anxiety is related to attempts to control behaviour, but individuals who are low in social anxiety are more likely to evaluate their interpersonal skills favourably (Leary, 1983). In line with this finding, Kashy and DePaulo (1996) found that those low in social anxiety were more likely to think of themselves as successful liars. By comparison, if socially anxious individuals already believe they are horrible liars, then there is little reason for them to attempt to control their behaviour while lying. Furthermore, Vrij and Holland (1998) found that social anxious individuals were more likely to report that they felt there were deception clues in their demeanor. Given these results, it was hypothesized that social anxiety would be negatively correlated with attempts to control behaviour while lying.

Impression Management. Traits relevant to impression management are also important for predicting how an individual experiences lying. Individuals who are high in public self-conscious and other-directed are often concerned with how others view them and may use deception to meet the expectations of others (Vrij & Holland, 1998). Kashy and DePaulo (1996) found that individuals high in either of these traits tended to engage in deception more frequently. This finding may mean that people high in public self-consciousness and other-directedness become more accustomed to deception over time. Although both these traits appear to be related to the frequency of deception's usage, Vrij and Holland (1998) were only able to establish an association between other-directedness and experiences while lying. Those high in other-directedness reported feeling less awkward while lying and found deception a relatively easy task. Given this reality, there would be little reason for them to feel as though they need to control their behaviour while being deceptive. Therefore, it was expected that other-directedness would be negatively correlated with reported discomfort, cognitive load, and attempts to control behaviour in the present research.

Vrij et al. (2001a) also failed to find associations between the construct of public self-consciousness and underlying experiences of nervousness and cognitive load, but found a positive association between public self-consciousness and attempting to control behaviour (not examined in Vrij & Holland, 1998). It would appear that, although other-directed and public self-conscious individuals tend to lie more often to make a good impression on others, they may experience deception differently. Whereas other directed individuals may not feel awkward while lying or find lying a difficult task, public self-conscious individuals may not necessarily follow this pattern. To date, only public self-

consciousness and the personality construct of acting has been examined in relation to deliberate attempts to control behaviour while lying. Vrij et al. (2001a) demonstrated that individuals high in public self-consciousness reported attempting to control their behavior. Given the existing literature, it was expected that public self-consciousness would be positively correlated with attempts to control behaviour while lying, but not necessarily with discomfort or cognitive load.

Ability to regulate expressive behaviour. The construct of Acting, as measured by the Self-Monitoring Scale, is thought to reflect an ability to regulate verbal and nonverbal behaviour (Briggs, Cheek, & Buss, 1980). Vrij and Holland (1998) found impressive negative correlations between the trait of Acting and experiencing discomfort or cognitive load while lying. In other words, individuals scoring high in acting had a tendency to report that they did not feel awkward lying nor did they find lying a difficult task. Vrij et al. (2001a) further corroborated some of these results in their own research, finding negative correlations between acting and both feeling nervous and thinking hard while lying. Given that acting is negatively correlated with experiences of discomfort and cognitive load, there is little reason for individuals high in acting to feel as though they need to control their behaviour while lying. Taken together, this suggest that people who score high in acting may be skilled liars because they do not experience the underlying psychological processes believed to be necessary for producing viable deception clues. One study by Johnson et al. (2005) corroborated this notion, demonstrating that high self-monitors are more effective deceivers. In the present study, it was also expected that acting would be negatively correlated with discomfort, cognitive load, and attempted control while lying.

***Limitations*.** Neither Vrij and Holland (1998) nor Vrij et al. (2001a) had their participants report on experiences of discomfort, cognitive load, or attempts to control behaviour while giving truthful statements. In fact, Vrij and Holland's (1998) participants only told lies in their experiment. This constraint is problematic as it is unclear whether these findings are indeed unique to *experiences while lying*, or simply reflect variations in how individuals react when having their credibility assessed, regardless of the actual veracity of their statement. It is suspected that the discussed associations between personality variable and experiences of discomfort, cognitive load, and attempted control are not completely unique to experiences while lying, and that many of these associations between personality and each experience would have been similar if individuals had been asked to report on those experiences after giving truthful statements. For example, it is possible that socially anxious people experience discomfort while lying, but they also might be uncomfortable when attempting to convince someone that they are telling the truth. This dynamic might lead to signs of nervousness, regardless of the messages' legitimacy. In the present research, this possibility was examined by assessing the associations between the discussed personality variables and experiences while lying as well as while telling the truth.

Present Study

To date, the current body of literature is lacking in several ways. The literature that has examined differences in the experiences while lying and telling the truth is limited to three studies, and each of them examined relatively unengaging lies (Caso et al., 2005; Vrij et al., 1996; Vrij et al., 2010). It is unknown whether those findings generalize to situations in which the lies told are more meaningful to participants. In the

current study, participants were asked to lie and tell the truth about their attitudes and opinions on one of several contentious social issues. This is known as the false-opinion paradigm (Frank & Ekman, 1997). This particular methodology was chosen because the truths and lies told were likely to be more engaging and meaningful than those told in the previously described research (Caso et al., 2005; Vrij et al., 1996). Rather than using lies about whether or not participants are in possession of a small set of headphones, that they neither stole nor can keep, the lies told in the present research involved contentious issues. Some of these issues, such as abortion, are known to arouse passionate debate among individuals and it could be reasoned that, at least for some individuals, arguing convincingly for the opposite point of view is neither commonly done by them nor easy to do. If people are strongly committed to their position, then the content of the lie might involve emotional material, which is one way that Ekman (1981) proposed that emotions become involved in lies. It also may be cognitively demanding for participants to argue in favor of the opposite opinion if they have never seriously considered that view.

Following their participation in two video recorded interviews, one deceptive and the other truthful, participants were asked to report on experiences of emotions, cognitive load, and attempted control immediately following each interview. The current research used a within-subjects design. A within-subjects design is more suitable to address the questions *does human behaviour change when we lie?* and *do people experience telling lies differently than telling the truth?* This design allows individuals to serve as their own controls, telling comparable lies and truths in comparable situations which reduces any noise caused by individual differences factors.

The present study also aimed to examine individual differences in experiences while lying and telling the truth. To address the issue of individual differences, a packet of personality measures containing the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1997), the Briggs, Cheek and Buss version of the Self-Monitoring Scale (Briggs, Cheek, & Buss, 1980), and the Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975) was administered prior to the honest and deceptive interviews. These personality measures were used to determine whether specific traits were associated with experiences of discomfort, cognitive load, and attempts to control behaviour while lying, as well as whether similar patterns emerge in the truthful condition. Additionally, associations between each personality measure and behaviours relevant to each experience were examined to determine whether those associations could be corroborated behaviourally.

Multiple versus single behavioural clue lie detection. Ekman (2009) suggested that decisions concerning credibility should be based on the occurrence of multiple, rather than single, behavioural deception clues. Rather than representing discomfort, cognitive load, or attempted control, a change in a single behaviour could be a chance occurrence, especially when many behavioural clues are under consideration. For instance, when an individual scratches their cheek (i.e., adaptor), it is difficult to conclude that they are feeling uncomfortable; they could simply be itchy. If that same individual shows an increase in adaptors, lip presses, speech hesitations, response latency, as well as a reduction in illustrators as compared to their usual behaviour, then it becomes more likely that they are experiencing discomfort. Deception is then deduced from discomfort when it is incongruent with what would be expected if they

were being truthful. As with anything, the more evidence there is in support of a claim, the more likely it is that the claim is correct. In line with Ekman's suggestion, Vrij and Mann (2004) have concluded that it would be more beneficial to examine behavioural deception clues in clusters rather than as individual behaviors. Some research has demonstrated that using the occurrence of multiple clues as the criteria to classify truthful and deceptive messages is substantially more accurate than using any single behaviour. The clear majority of this research exceeds accuracy rates of 80% in classifying truthful and deceptive messages (Ekman, O'Sullivan, Friesen, & Scherer, 1991; Frank & Ekman, 1997; Vrij, Edward, Roberts, & Bull, 2000), with at least one reporting a correct classification rate as high as 90.4% (ten Brinke & Porter, 2012). In the current study, this status was examined by first determining the number of people who would have been caught lying using each clue, under each approach (i.e., emotion, cognitive load, attempted control), separately. Then by examining the number of individuals who would have been classified correctly using at least two behavioural deception clues.

Given the provided information, the following hypotheses were derived:

H1: Nonverbal behaviour will differ as a function of veracity condition.

H2: Participants will report experiencing more discomfort and cognitive load, and feel that they tried harder to control their behaviour while lying then when telling the truth.

H3: The frequency/duration of individual behaviours indicative of discomfort, cognitive load, and attempts to control behaviour will be related to self-reported experiences of those states (e.g., if the cognitive approach predicts a decrease in blinking, then blinking should negatively correlate with the self-reported experience of cognitive load).

H4: Personality will be associated both with experiences while lying and telling the truth in similar ways.

- *Extraversion will be negatively correlated with all three experiences while lying and telling the truth (i.e., discomfort, cognitive load, attempts to control behaviour).*
- *Social anxiety will be positively correlated with reported discomfort and negatively correlated with attempts to control behaviour while lying and telling the truth.*
- *Other-directedness will be negatively correlated with all three experiences (i.e., discomfort, cognitive load, attempts to control behaviour) while lying and telling the truth.*
- *Public self-consciousness will be positively correlated with attempts to control behaviour while lying and telling the truth.*
- *Acting will be negatively correlated with all three experiences (i.e., discomfort, cognitive load, attempts to control behaviour) while lying and telling the truth.*

H5: Self-reported discomfort, cognitive load, and attempted control while lying will be positively correlated with the total number of behavioural indicators of discomfort, cognitive load, and attempted control that emerge in behaviour while lying and telling the truth.

H6: The number of behaviours indicative of discomfort, cognitive load, and attempted control will correlate with personality factors when lying and telling the truth.

H7: A lie detection approach that incorporates multiple behavioural clues will identify more individuals as deceptive than each individual behaviour on its own.

Method

Participants

Sixty-four undergraduate students were recruited for the present study. Three participants were excluded from the analyses: one did not complete both interviews; one did not follow the instructions and tried to appear deceptive when telling the truth; and one was removed due to a low level of English comprehension. Thus, the final sample consisted of 61 participants (68.9% female), ranging from 17 to 37 years of age, having an average age of 20.9 (*SD* = 4.2) years. Eighty-two percent of the sample identified as having been born in Canada, and 88.5% indicated that they spoke English as their primary language at home. All participants received 2 bonus marks towards their Introduction to Psychology course in return for their participation and were entered into a draw for a $50 gift card of their choice to either the campus book store or the local shopping mall.

Materials

Demographics. Participants were asked to report their age, sex, nationality, language spoken at home, and country of birth. This demographics survey was provided with the Contentious Issues Opinion Survey (CIOS).

Contentious Issues Opinion Survey (CIOS) (Appendix A). The CIOS was designed for the current experiment following the procedure described by Frank and Ekman (1997). Participants reported their beliefs on several contentious issues (i.e., "*The death penalty should be legal.," "Abortion should be legal.," "Marijuana should be legalized."*) by responding to a list of statements concerning contentious issues. Frank and Ekman's (1997) version of this survey assessed the magnitude and direction

of their participants' opinions using a single 1 (*definitely agree*) to 7 (*definitely disagree*) point Likert scale. In the present research, a second scale, assessing the relative importance of each opinion, was also included.

Twenty-one contentious issues were used on the current version of the CIOS. Participants responded on a 7 point Likert scale, indicating the extent to which they *completely agreed* (1) or *completely disagreed* (7) with each statement. They were then asked to indicate on a second 7 point Likert scale whether the issue was *very important* (1) or *completely unimportant* (7) to them. Items that were rated closest to "*very important*" and which showed the most polarization in opinion (response is closest to 1 or 7 on the scale), were used as the topic of discussion. This strategy ensured that the lies told in the study were personally relevant. If a participant was uncomfortable discussing the chosen topic, then an alternate personally meaningful topic was substituted.

Experiences while Deceptive/Truthful Questionnaire. To assess how participants felt when they lied and told the truth, a questionnaire was adapted from previous research (Caso et al., 2005; Vrij et al., 2001a; Vrij et al., 2010; Vrij & Holland, 1998; Vrij et al., 1996; see Appendix B). This questionnaire consisted of 18 items measuring the degree of discomfort (items: 4, 5, 7, 9, 10, 11, 15, 16; e.g., *"How tense did you feel during the interview?"*, *"How guilty did you feel during the interview?"*); *duping delight* (items: 2, 6, 8; e.g. , *"To what extent did you find answering the questions enjoyable?",* "*To what extent did you find answering the questions fun*?"); cognitive load (items: 1, 3, 14; e.g., *"How difficult was it to answer the interviewer's questions?", "How much did you have to concentrate while answering the interviewer's*

questions?"); and attempts to control behavior (items: 12, 13, 17; *"To what extent did you think about your behavior during the interview?", "To what extent did you try to control your behavior during the interview?"*). This questionnaire was completed following each interview condition (true opinion, false opinion). Questionnaire items were derived from those used in previous research examining experiences while lying/truth-telling (Caso et al., 2005; Vrij et al., 2001a; Vrij et al., 2010; Vrij & Holland, 1998; Vrij et al., 1996). Although all items originated from previous research, they were reworded to an open, rather than closed, question format. Given that participants were asked to rate the degree of discomfort, cognitive load, and attempts to control behaviour during true and false opinion conditions, an open-question format was more appropriate. Each item required participants to provide a response on a 7 point Likert-scale ranging from 1 (*not at all*) to 7 (*extremely*). An additional item asked participants to rate how confident they were that the interviewer believed that they were truthful on a scale ranging from 1 (*not very confident*) to 7 (*very confident*).

For each participant, scores on discomfort items were averaged together to obtain an overall "discomfort" score, cognitive load items were averaged together to obtain an overall "cognitive load" score; attempted control items were averaged together to obtain an overall "attempted control" score; and questions 15-17 were averaged together to form a "duping delight" score. Items appeared in a randomized order on the actual questionnaire. Cronbach's alpha of the discomfort scale, cognitive load scale, and attempted control scale were calculated for truth and lie conditions separately and are reported in Table 2. All scales demonstrated robust internal reliability, apart from the Attempted Control Scale in the truthful condition, which had more moderate reliability.

Although there appears to be a pattern of slightly higher Cronbach's alphas in the lie condition, the items were not worded to be specific to experiences while lying. These reliabilities are summarized in Table 2.

Table 2
Internal reliabilities for Experiences while Deceptive/Truthful Questionnaire by veracity condition

Scale	Truth α	Lie α
Discomfort	.89	.92
Cognitive Load	.72	.76
Attempted Control	.63	.76
Excitement	.92	.95

Eysenck Personality Questionnaire-Revised Shortened Version (EPQ-RS). The EPQ-RS is a shortened version of the Eysenck Personality Questionnaire Revised (see Appendix C). It consists of 48 items (e.g. *"Would you call yourself a nervous person?"*, *"Do you like mixing with people?"*) requiring a yes/no response, and is designed to measure three personality factors: Extraversion (12 items), Neuroticism (12 items), and Psychoticism (12 items). The EPQ-RS also contains a lie validity scale (12 items). For each scale, higher scores indicate greater levels of that personality attribute measured by the factor. Some items are reverse scored. Alpha coefficients for the EPQ-RS have been found to range between .73 and .82 and other psychometric properties have been found to be fair (Aluja, Garcia, & Garcia, 2002; Eyesnck & Eyesnck, 1997). In the present study, adequate reliability was obtained for the Extraversion (a = .83) and Neuroticism (a = .82) scales. The psychoticism and lie scales did not perform well, with reliabilities under .60; therefore, they were not used in the current study.

Self-Monitoring Scale (SMS). Briggs and colleagues (1980) self-monitoring scale (see Appendix D) consist of 20 items (e.g. *"I am not particularly good at making people like me."*, *"I can look anyone in the eye and tell a lie with a straight face (if for a*

right end).”) which represent three subscales: Extraversion (6 items), Other-directedness (11 items), and Acting (5 items). Each item required a response on a 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*) point Likert scale. Responses are totalled, with higher scores on each subscale representing greater levels of that factor. Briggs et al.’s (1980) three factor Self-Monitoring scale was used in the present research to determine whether the associations reported by Vrij and Holland (1998) replicated. Associations between each of the factors and any behavioral deception clues that emerged were also examined. Despite the scale performing well in previous research, reliabilities were quite low in the present study (Extraversion, α = .69; Other-Directedness, α = .65; Acting, α = .67). For this reason, poor performing items were dropped. One item was dropped from the extraversion scale, one item was dropped from the other-directedness scale, and one item was dropped from the acting scale, yielding acceptable reliabilities for each scale (a = .72, a = .76, a = .71, respectively).

Self-Consciousness Scale (SCS). Fenigstein, Scheirer, and Buss’s (1975) self-consciousness scale (see Appendix E) includes 23 items (i.e. *“Generally, I am not very aware of myself”* and *“I am concerned about the way I present myself”*) that are rated on a scale from 1 (*extremely uncharacteristic*) to 4 (*extremely characteristic*). The scale is comprised of three subscales: Private self-consciousness (10 items), Public self-consciousness (seven items), and Social Anxiety (six items), with reported alpha reliability coefficients of .79, .84, and .73 respectively. The internal reliability of the total Self-consciousness scale score has been found to be .80 and has good discriminant validity (Carver & Glass, 1976). Scores are calculated in the direction higher levels of

each factor, with items three, nine, and 12 requiring reverse-scoring. In the present study, the Public Self-consciousness scale (a = .78) and Social Anxiety scale (a = .78) performed adequately, but the internal reliability of the Private Self-consciousness Scale was insufficient (α = .55) and required two poorly performing items to be removed before adequate reliability was attained (a = .69).

Interview space and video capture. The interview space consisted of two chairs facing each other, placed roughly two and a half meters apart. There were no obstructions placed between the interviewer and the participant. Two video cameras, placed in plain sight of the participant, were used for video and audio capture. One camera, placed directly above the interviewer, was focused on the participant's entire body, capturing an image from the floor to just above the participant's head. This video was used during the scoring of most of the examined behavioural deception clues. The second camera, placed on a small table to the right of the interviewer, was focused on the participant's upper body, and captured an image from approximately mid-upper body to just above the top of their head. This video was used for scoring facial behaviours (i.e., smiles, lip presses, gaze aversion, blinks). All video recordings were stored on an encrypted external hard drive.

Procedure

Questionnaire phase. When participants arrived at the laboratory they were told that they would be completing several short questionnaires, and then would be asked to participate in two brief interviews. They were told that they would lie in one interview and tell the truth in the other and that the order in which this occurred would be provided to them prior to the interview phase of the experiment. After providing

consent, participants completed a brief demographics questionnaire and the CIOS. To ensure that an issue important to them could be chosen for an interview topic, participants were asked to consider their views on each issue carefully and respond to the questionnaire as truthfully as possible. After the participant completed the survey, it was collected by the experimenter who then provided the participant with a packet of personality measures containing the EPQ-RS, the SMS the SCS, and the BIDR. The order of these measures was counterbalanced to control for order effects. The personality packet was given separately to allow the researcher sufficient time to determine the topic that was discussed during the interviews.

Interview phase. Following the completion of the personality measure packets, participants were provided with further instructions concerning these interviews. They were told that they would be discussing one of the topics that appeared on the contentious social issues survey during these interviews. Participants were told that in one interview (true opinion/honest condition) they needed to answer the interviewer's questions honestly, and that their goal was to convince the interviewer that they were telling the truth about their opinion. For the other interview (false opinion/deceptive condition) participants were told that they needed to lie to the interviewer when answering each question and convince the interviewer that they were telling the truth, even though they were lying. The order of the honest and the deceptive opinion conditions were counterbalanced to account for possible order effects.

To motivate each participant to try hard, they were told by a research assistant that the interviewer would be trying to determine whether or not they were describing their opinion truthfully. The participant also was informed prior to each interview that

being believed was *important to the experiment* and that *they must avoid detection when lying* (emphasis intended). Additionally, participants were told that if both interviewers believed the participant, their name would be entered into a draw for a chance to win one of four $50 gift cards.

Prior to the interviews, each participant was informed of the topic chosen for discussion, and was asked if they have any reservations about discussing that topic during these interviews. If participants were distressed about discussing the chosen topic (truthfully, deceptively, or both), then the next best suitable topic was chosen. After this phase of the experiment was explained, participants were given a second consent form. That consent form provided consent for their interviews to be recorded and allowed the participant to indicate whether they consented to their videos being used in future research and/or for demonstration purposes.

In an attempt to acclimate participants to the cameras and interview setting, each interview began with a standardized irrelevant questions that resembled "small-talk" (i.e., questions concerning participants' degree programs, how long they have lived in Saint John, and whether or not they are enjoying university life). This set of questions appeared prior to each interview. The interviewer signaled the beginning of the actual interview by stating "*I'm now going to shift the focus of the interview to the topic of (chosen topic). At this point I am going to be trying to determine whether you are being truthful about your opinion*", at which point participants needed to respond to several scripted questions (Interview questions appear in Appendix F).

Following the completion of the first interview, each participant was asked to wait in their seat for the next interviewer. While they waited, they were asked to provide

feedback concerning how they felt during the interview by filling out the Experiences while Deceptive/Truthful Questionnaire. They were asked to answer the questionnaire as accurately as possible. Participants were given approximately five minutes to complete the questionnaire, and it was collected by a research assistant prior to the second interview. In the second interview, participants were asked to respond to the questions in the opposite fashion (i.e. , deceptively or honestly) that they had done in the previous interview. Following the second interview, participants were again asked to fill out a questionnaire concerning how they felt during the interview. After participants completed the questionnaire, they were debriefed about the nature of the experiment and offered a means to acquire the results of the study if interested.

Behaviour coding procedure. To examine differences in nonverbal behavior, operational definitions for each of the 11 behaviours were created along with a coding guide. No consistent coding method for nonverbal deception clues could be found after reviewing the lie-detection literature. Although some of the definitions in the literature, such as those for blinking, gaze aversion, and response length and latency were clearly described, others were less clear. Specifically, an exact description as to how a single behavioural unit for each of these behavioural clues was identified during coding often was not described in the existing literature. Instead, definitions of each behaviour were at times ambiguous and open to interpretation. To develop clear operational definitions for use in coding in the current study, two coders watched a random selection of videos and decided on what constituted a single behavioural unit, which consisted of a start and end point, for each of the examined behaviours. When possible, definitions were taken from past research examining the behavioural clues in questions, but only if those

definitions were clear. The final definitions used for the coding of each behaviour are included in Appendix G.

Each of the 11 behavioural clues were coded by an individual who was blind to the experimental conditions. For many of the behaviours, the sound remained muted to avoid the coder from forming judgments based on what the individual was saying. Gaze aversion, response length, and response latency required the audio to remain on as a means to identify the correct portions of the interview to be coded.

Adobe Premiere Professional, a video editing software, was used to create visual representations of the audio files in the form of an audio waveform. These audio waveforms were used to code response latency and length, which allowed accuracy to be within a thousandth of a second. To code nonverbal behaviours, the Behavioural Observation Research Initiative Software (BORIS) was used. This software is capable of coding behaviour both in terms of their frequency and duration.

To control for interview length and/or response length, some behavioural deception clues were converted to scores representing either a rate per minute (i.e., adaptors, illustrators, blink-rate, posture shift), or the proportion of interview time/response time spent engaging in the specific behaviour (i.e., gaze aversion, foot and leg movements, closed posture). For all behaviours, coding began at the beginning of the experimental questions and ended after the response of the last relevant question. Absolute frequency of adaptors, posture shifts, and blinks were coded and total frequency of each was divided by the total interview length (minutes) to provide a measure of frequency per minute. The duration of time spent in a closed posture and engaging in leg and foot movements were recorded and then converted into a value

representing the proportion of the interview spent engaging in those behaviours. This was done by dividing the number of seconds engaging in those behaviours by the duration of the interview (expressed in seconds).

In previous research, illustrators were defined as occurring only when an individual is speaking (Ekman & Friesen, 1972; Friesen, Ekman, & Wallbott, 1979), and individuals tend to direct their gaze towards the speaker while listening (Ellsworth & Ludwig, 1972; McCarthy, Lee, Itakura, Muir, 2006; Vertegaal, Slagter, Van der Veer, & Nijholt, 2001). Thus, these behaviours were only coded during the response periods of the interview and rate per minute was calculated using response length rather than interview length.

Smiles and lip presses required a slightly different approach. During the early stages of coding these behaviours, it was noticed that there were differences in opinions regarding whether a small cluster of smiles counted as a single long smile, or several short smiles. Similarly, a long smile was sometimes perceived as several fleeting smiles. Coding of lip presses was similarly difficult. To resolve these issue, a media player that allowed the coder to advance frame by frame was used to code these behaviours. A single still frame was sampled for every second of the interview by advancing the video in one second increments. One second increments were chosen as it was quite likely that some stage of any smile or lip press would be captured in those still frames. The presence of a smile or lip press for each frame was recorded. The total number of frames containing a smile or lip press was divided by the number of seconds (i.e., number of sampled frames) in the interview. The resulting value can be interpreted as the

proportion of video frames that contained a smile or lip press during the interview phase of the experiment.

Response length was defined as the amount of time that a participant spoke and was coded by using a professional media editor in which the audio waves were visible. The points at which participants started and stopped speaking was identified for each question. These sections were clipped, and the sum of the total duration of these audio clips was recorded for each participant in each condition. Coding of response latency was similar; the point at which the interviewer was done asking the question, and the participant started speaking was identified by visual inspection of the audio wave and by listening to the interview. The nine response latencies were averaged for each condition to identify average response latency. This method provided very precise measurement of both response length and latency.

To evaluate the reliability of the various coding methods used, 10 percent of the videos were recoded by a second observer, blind to the experimental conditions. Intraclass correlation coefficients indicated that the coding procedures for illustrators ($ICC = .922$, $p < .001$), adaptors ($ICC = .914$, $p < .001$), closed-posture ($ICC = .880$, $p < .001$), postural shifts ($ICC = .918$, $p < .001$), gaze aversion ($ICC = .903$, $p < .001$), leg and foot movements ($ICC = .989$, $p < .001$), response latency ($ICC = .996$, $p < .001$), response length ($ICC = .999$, $p < .001$), blinks($ICC = .739$, $p < .001$), lip press ($ICC = .884$, $p < .001$), and smiling ($ICC = .986$, $p < .001$) were reliable.

Results

Behaviour while lying and telling the truth

To determine whether veracity condition influenced participant behaviour, a 2 (gender: male, female) x 2 (condition order: truth first, lie first) x 2 (veracity condition: truth, lie) mixed measures MANOVA was conducted with the 11 measured behaviours serving as the dependent variables. The result of the analysis did not support the hypothesis that behaviour would differ as a function of veracity condition, F (11, 35) = .908, p = .543, partial η^2 = .222. Neither interaction effect of gender, F (11, 35) = .534, p = .866, partial η^2 = .144, nor condition order, F (11, 35) = .610, p = .808, partial η^2 = .161, were statistically significant. The three-way interaction was also not statistically significant, F (11, 35) = .640, p = .782, partial η^2 = .167.

Self-reported experiences while lying and truth telling

To standardize the scores on the measures of self-reported Discomfort, Cognitive Load, Attempted Control, and Excitement, total scores were divided by the number of items in the corresponding scale. This procedure resulted in scores for Discomfort, Cognitive Load, Attempts to Control Behaviour, and Excitement scale scores that ranged from one (low levels) to seven (high levels). To determine whether self-reported Discomfort, Cognitive Load, Attempts to Control Behaviour, and Excitement differed between veracity conditions, a 2 (gender: male, female) x 2 (condition order) x 2 (veracity condition: truth, lie) mixed measures MANOVA was conducted with Discomfort, Cognitive Load, Attempts to Control Behaviour, and Excitement scales from experiences while lying/telling the truth post interview questionnaires serving as

dependent variables. Gender and condition order were entered into the analysis as between-subject factors.

Results of the MANOVA indicated that there were no statistically significant interactions between veracity condition and gender, F (4,53), p = .129, partial η^2 = .124, or veracity condition and veracity condition order, F (4,53), p = .082, partial η^2 = .142, on the combined self-reported experience measures. Further, no three-way interaction among those variables occurred, F (4,53), p =.763, partial η^2 = .034. There was a statistically significant main effect of veracity condition, F (4,53), p < .001, partial η^2 = .331. Tests of within-subjects contrasts revealed statistically significant differences between veracity conditions in self-reported Discomfort (p < .0001, partial η^2 = .252), Cognitive Load (p < .006, partial η^2 = .128) and Attempts to Control Behaviour (p < .001, partial η^2 = .236), but not Excitement (p = .075, partial η^2 = .055). When lying, participants reported experiencing greater Discomfort, Cognitive Load and Attempts to Control Behaviour as compared to when they were truthful (see Table 3).

Table 3
Differences between veracity conditions in Experiences while Deceptive/Truthful Questionnaire scores

Measure	Truth	Lie	Difference	*p*-value	Effect size
Discomfort	3.718	4.876	-1.158	.00001	.252
Cognitive Load	3.926	4.723	-0.797	.0059	.128
Attempted Control	3.826	4.870	-1.044	.0001	.236
Excitement	4.046	3.680	0.366	.0751	.055

To examine associations between Discomfort, Cognitive Load, Attempts to Control Behaviour, and Excitement while telling the truth and lying, Pearson's correlations were conducted between these variables. Several statistically significant associations were found, which can be found in Table 4. Experiencing discomfort while

lying was positively correlated with experiencing cognitive load while lying (r = .766, p < .001) and attempting to control behaviour (r = .691, p < .001), and was negatively correlated with feelings of excitement (r = -.426, p < .01). Additionally, experiencing cognitive load while lying was positively correlated with attempting to control behaviour while lying (r = .577, p < .001).

An almost identical pattern emerged for experiences of anxiety, cognitive effort, and attempts to control behaviour while telling the truth (see Table 4). Feeling anxious while telling the truth was positively correlated with experiencing cognitive effort (r = .744, p < .001) and attempting to control behaviour (r = .492, p < .001), and was negatively correlated with feelings of excitement (r = -.528, p < .001). Again, experiencing cognitive effort was found to be positively correlated with attempting to control behaviour (r = .440, p < .001). In addition, experiencing cognitive effort while telling the truth was found to be negatively correlated with feelings of excitement (r = -.381, p < .01).

To determine whether cognitive and emotional experiences, as well as attempts to control behaviour, in the one situation were related to those experienced during the other situation, (e.g., whether discomfort while lying was related to discomfort while telling the truth) correlations were conducted between truth/lie counterparts. Only two statistically significant correlations emerged. First, attempting to control behaviour while lying was positively correlated with attempting to control behaviour while telling the truth (r = .393, p < .01). Second, feeling excitement while lying was positively correlated with feeling excitement while telling the truth (r = .630, p < .001). See Table 4.

Table 4

Correlations among experiences while lying and telling the truth

	Lie Discomfort	Lie Cognitive Effort	Lie Attempted Control	Lie Excitement	Truth Discomfort	Truth Cognitive Effort	Truth Attempted Control	Truth Excitement
Lie Discomfort	-	**.766*** **	**.691*** **	**-.426** **	*ns*	*ns*	*ns*	*ns*
Lie Cognitive Effort	**.766*** **	-	**.577*** **	*ns*	*ns*	*ns*	*ns*	*ns*
Lie Attempted Control	**.691*** **	**.577*** **	-	*ns*	*ns*	*ns*	**.393** **	*ns*
Lie Excitement	**-.426** **	*ns*	*ns*	-	*ns*	*ns*	*ns*	**.630*** **
Truth Discomfort	*ns*	*ns*	*ns*	*ns*	-	**.744*** **	**.492*** **	**-.528*** **
Truth Cognitive Effort	*ns*	*ns*	*ns*	*ns*	**.744***	-	**.440*** **	**-.381** **
Truth Attempted Control	*ns*	*ns*	**.393** **	*ns*	**.492*** **	**.492*** **	-	*ns*
Truth Excitement	*ns*	*ns*	*ns*	**.630*** **	**-.528** **	**-.381** **	*ns*	-

Note: * $p<.05$ ** $p<.01$ *** $p<.001$

Self-Reported Experiences and Behavioural Clues

To determine whether or not the behavioural clues displayed while lying were related to self-reported experiences while lying, three sets of Pearson's correlations were conducted. To assess role of emotion, behavioural clues theorized to be related to emotion (Illustrators adaptors, posture shifts, leg and foot movements, gaze aversion, response length, blinks, and closed posture) were correlated with scores on the Discomfort scale. Behavioural clues believed to be related to cognitive load (illustrators, adaptors, posture shifts, gaze aversion, leg and foot movements, response latency, and blinks) were correlated with the Cognitive load scale. Finally, behavioural clues believed to be related to attempted control (Illustrators, adaptors, posture shifts, gaze aversion, leg and foot movements, response length, lip presses, and smiling) were correlated with scores on the Attempts to Control Behaviour scale. Identical analyses was conducted to determine whether any of these behaviours displayed in the truth condition were related to experiences while telling the truth.

Significant associations were found between behaviours and the experiences they are theorized to represent. Additionally, correlations were in the direction that would be expected by each of the theories. In the lie condition, illustrators (r = -.321, p < .05) and response length (r = -.281, p < .05) were negatively correlated with experiencing discomfort while lying. Gaze aversion (r = .287, p < .05) and blink rate (r = .267, p < .05) positively correlated with experiencing discomfort while lying. Illustrators (r = -.271, p < .05) were also negatively correlated with experiencing cognitive load. Leg and foot movements (r = -.248, p = .058) were just above the statistical cut-off for significance, but in the direction predicted by the cognitive load

approach. Gaze aversion ($r = .397$, $p < .01$) and response latency ($r = .312$, $p < .05$) were both positively correlated with experiencing cognitive load while lying. Engaging in leg and foot movements negatively correlated with attempting to control behaviour while lying ($r = -.333$, $p < .05$), whereas lip pressing was positively correlated with attempting to control behaviour while lying. Response length was, again, just above the cut-off for statistical significance, but the direction of the correlation was consistent with what is predicted by the attempted control approach about response length. No other behaviours were significantly related to emotions, cognitive effort, or attempts to control behaviour.

Only two significant correlations emerged from the truth condition. Again, response latency was positively correlated with experiencing cognitive load while telling the truth ($r = .267$, $p < .05$) and lip pressing was found to be positively correlated to attempting to control behaviour while telling the truth ($r = .267$, $p < .05$). These results are summarized in Table 5.

Table 5

Correlations between self-reported experiences and behaviour in deceptive and truthful conditions

	Lie			Truth		
Behavioural Clue	Discomfort	Cognitive Load	Attempted Control	Discomfort	Cognitive Load	Attempted Control
Illustrators	**-.321 ***	**- .271 ***	ns	ns	ns	ns
Adaptors	ns	ns	ns	ns	ns	ns
Closed-Posture	ns	--	ns	ns	--	ns
Postural Shifts	ns	ns	ns	ns	ns	ns
Gaze Aversion	**.287 ***	**.397 ****	ns	ns	ns	ns
Leg & Foot Movements	ns	**-.248** $^{+}$	**-.333 ***	ns	ns	ns
Response Latency	--	**.312 ***	--	--	**.267 ***	--
Response Length	**-.281 ***	ns	**-.220** $^{+}$	ns	--	ns
Blinks	**.267 ***	ns	--	ns	ns	--
Lip Press	--	--	**.280 ***	--	--	**.267***
Smiling	--	--	ns	--	--	ns

Note: -- Indicates no prediction by the theoretical approach
+ Indicates that the p value approached significance
* $p < .05$ ** $p < .01$

Personality Correlates of Experiences while Lying and Telling the Truth

To determine whether personality was related to Discomfort, Cognitive Load, or Attempting to Control Behaviour while lying, correlational analyses were conducted between these variables and the personality variables outlined above. Feeling discomfort while lying was positively correlated with Neuroticism (r =.345, p<.01), Public self-consciousness (r =.260, p<.05), Social Anxiety (r =.345, p<.01), and Other-directedness (r =.309, p<.05). Attempted behavioural control was associated with Public Self-consciousness (r =.272, p<.05), and Other-directedness (r =.261, p<.05). Social anxiety was negatively correlated with feelings of excitement (r =.280, p<.05). No statistically significant correlations emerged between self-reported experiences while telling the truth and the personality measures examined in this study. These results are summarized in Table 6.

Table 6

Correlations among personality measures and feelings while lying and telling the truth

	Lie Discomfort	Lie Cognitive Effort	Lie Attempted Control	Lie Excitement	Truth Discomfort	Truth Cognitive Effort	Truth Attempted Control	Truth Excitement
Extraversion	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Neuroticism	**.271***	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Public Self-Consciousness	**.260***	*ns*	**.272***	*ns*	*ns*	*ns*	*ns*	*ns*
Private Self-Consciousness	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Social Anxiety	**.345****	*ns*	*ns*	**-.280***	*ns*	*ns*	*ns*	*ns*
Other-directedness	**.362****	*ns*	**.320***	*ns*	*ns*	*ns*	*ns*	*ns*
Acting	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*

Note: * $p < .05$ ** $p < .01$

Emotional, Cognitive, and Attempted Control patterns of deception clues

To address hypotheses five and six, behavioural deception clue profile scores were created. The strategy was a modified version of the approach used by Vrij et al. (2001a). Whereas Vrij et al. examined stereotypical deceptive behaviour, the current study examined behavioural deception clues specific to each of the emotion, cognitive, and attempted control approaches to detect deception. This coding procedure resulted in separate scores for each approach. Additionally, a decision rule was adopted in which an attempt was made to ignore small differences. This rule required the difference score to be greater than or equal to the average increase or decrease, whichever applied to the behaviour under a given detection approach. The decision rules appear in Table 7. For each behaviour, difference scores between truth and lie conditions were created by subtracting the truthful behaviour from the deceptive behaviour. A positive score indicated that the behaviour increased while lying, a negative indicated that it decreased. Each behaviour was assessed once for each approach. A value of 1 was assigned to the behaviour when the change was in the direction predicted by the approach and greater than the average increase or decrease (whichever applied), and a 0 when there was no difference or the difference was in the opposite direction.

Table 7

Deception detection decision rules used

Behaviour	Increase (≥)	Decrease (≥)	Truth Baseline
Illustrators	N/A	1.76/minute	3.67/minute
Adaptors	1.02/minute	.78/minute	.68/minute
Closed Posture	41%	N/A	21%
Postural shifts	.25/minute	.24/minute	.06/minute
Gaze aversion	13%	17%	54%
Leg & foot movements	9%	11%	20%
Response latency	1.00 seconds	N/A	2.04 Seconds
Response length	40.65 seconds	61.13 seconds	178.38 Seconds
Eye blinks	5.15/per minute	3.69/minute	24.8/minute
Lip press	3%	N/A	6%
Smiling	3%	3%	4%

Note: The change was required to be equal to or greater than the values above to be considered a deception clue. Truth baseline values represent the average of the behaviour in the truth condition.

Classification of Deception Clues

Emotional deception clue scores were created for each participant by adding the number of behavioural deception clues that could be identified in their behaviour. An emotional deception clue pattern of behaviour included an individual showing fewer illustrators, and greater use of adaptors, closed posture, posture shifts, gaze aversion, foot and leg movements, shorter response lengths, and a higher blink rate. The total score could range from “0” to “8” and represented the extent to which the changes in the individual’s behaviour agreed with those outlined for the emotion approach. Higher scores indicated a better fit with the approach’s predictions about behaviour.

Cognitive deception clue scores were constructed the same way, using fewer illustrators, postural shifts, leg and foot movements, blinks per minute, and longer response latencies, and greater gaze aversion as the criteria. Scores could range from “0”

to “6.” Again, higher scores indicated more agreement with the cognitive approach’s prediction about the examined behavioural deception clues.

Attempted control behavioural clue scores were constructed by using fewer illustrators, adaptors, posture shifts, leg and foot movements, less gaze aversion, fewer smiles, a shorter response length, and more lip presses as the criteria. Scores ranged from “0” to “8,” where higher scores signaled more agreement with an attempted control demeanor pattern of deception clues.

A mixed theory approach score was calculated by summing the number of examined behaviours that showed a change related to at least one of the theoretical perspectives large enough to be considered a deception clue. Scores could range from 0 to 11, and the total score represented the total number of examined behaviours identified as deception clues in each of the participant’s behaviour.

Experiences while Lying and Behavioural Deception Clue Patterns

To determine if the number of emotion based, cognitive based, and attempted control based behavioural clues shown by an individual were related to self-reported experiences while lying, behavioural clue pattern scores were correlated with the difference scores of Discomfort, Cognitive load, and Attempted Control scales of the Experiences while Lying/Telling the Truth Questionnaire. Only two statistically significant correlations were found. Difference scores in Attempted Control were negatively correlated with showing Emotion-based deception clues ($r = -.262$, $p < .05$). This correlation indicates that larger differences between conditions in attempted control was associated with showing fewer emotion-based behavioural deception clues. Furthermore, self-reported Attempted Control difference scores were negatively

correlated with the overall number of behavioural deception clues shown by an individual, as determined by the mixed approach (r = -.277, p < .05).

Personality and behavioural deception clue patterns

Hypothesis six stated that the pattern of correlations between behavioural deception clue profile scores and personality would be similar to those found between self-reported experiences while lying and scores on the personality tests. Although this was not the case, some statistically significant correlations emerged between personality and the total number and type of clues shown by individuals. Although SMS Extraversion was not related to how an individual felt while lying, it was negatively correlated with the number of attempted control behavioural deception clues (r = -.292, p < .05), and the combined number of clues when considering all approaches (r = -.261, p < .05). Additionally, Public self-consciousness was negatively correlated with the number of cognitive behavioural deception clues shown by an individual (r = -.261, p < .05).

Single and multiple Behavioural Deception Clues

Single Behaviours. Hypothesis seven involved an exploratory investigation of the usefulness of single and multi-clue approaches of deception detection. Using the decision rule described above (i.e., changes in behaviour that were equal to or greater than the average increase of decrease in that behaviour), the total number of people showing each individual behavioural deception clue was calculated. As shown in Table 8, regardless of the approach and direction of change, relatively few individuals would be identified as liars using any single behavioural clue. In fact, using a single approach would not exceed correct classification of 30% of the sample. Even if both increases and

decreases (when applicable) were taken into account, single behaviours did not surpass the 50% detection mark. Indeed, the best performing behaviour is gaze aversion, at 47.5% of the sample being detected when lying, followed by blinks at 42.6%.

Table 8

Proportion of participants showing each behavioural clue

Behaviour	Emotion	Cognitive	Attempted Control	Combined
Illustrators	23%	23%	23%	23%
Adaptors	8.2%	14.8%	14.8%	23%
Closed Posture	15.3%	N/A	N/A	15.3%
Postural shifts	5.1%	5.1%	5.1%	10.2%
Gaze aversion	27.9%	27.9%	19.7%	47.5%
Leg & Foot	16.9%	20.3%	20.3%	37.3%
Response latency	N/A	18%	N/A	18%
Response length	14.8%	N/A	16.4%	31.3%
Eye blinks	23%	19.7%	N/A	42.6%
Lip press	N/A	N/A	12.5%	12.5%
Smiling	10.7%	N/A	16.1%	26.8%

Note: Percentages represent the number of individuals identified as lying based on the using each approaches prediction about behaviour.

Multi-clue Approaches. A multi-clue approach considers multiple possible indicators of emotion, cognitive load, and attempted control, rather than relying on a single behaviour. Additionally, this approach allows for the consideration of the co-occurrence of these indicators. Considering all 11 behaviours simultaneously as potential indicators lead to slightly better classification rates using the decision rule outline above.

The results of these analyses indicated that 80% of participants showed a change in at least one of the behaviours that was large enough to be considered a deception clue related to emotional discomfort (see Table 9). Only 44% of the sample showed a large enough change in two or more behaviours that could be considered emotion based clues to deception. The most emotion-based clues showed by any participant was five.

In terms of cognitive load, 69% showed a change in at least one behaviour consistent with cognitive load base framework to deception clues. Furthermore, 31% showed a change in at least two behaviours related to cognitive load large enough to be considered deception clues. The most cognitive-load based deception clues shown by any single individual was four.

Finally, 69% of the sample showed a change on at least one behaviour large enough to be considered a deception clue related to attempted control and 34% showed a change in two or more behaviours large enough to be considered attempted-control based behavioural deception clues. The most behavioural deception clues related to attempted control shown by any participant was three.

When considering a combination of all the clues and predictions by the approaches, 96% of participants showed a change in at least one behaviour that was large enough to be considered a deception clue. Eighty-two percent showed a large enough change in at least 2 behaviours that could be considered deception clues related to any of the three approaches. The most deception clues shown by a single person was seven. These results seem to suggest that considering all possible behavioural clues and both increases and decreases would lead to better, albeit not perfect, detection rates. These results are summarized in Table 9.

Table 9

Proportion of sample showing multiple behavioural deception clues

	Number of Deception Clues		
Approach	At least one	Two or more	More than three
Emotion	80%	44%	13%
Cognitive	69%	31%	3%
Attempted Control	69%	34%	15%
Combination of approaches	96%	82%	62%

Discussion

Although the individual behavioural clues did not appear to differentiate between lying and truth telling, several expected and unexpected findings in the current study contribute to the body of literature on behavioural deception clues. Previous research has indicated that individuals experience greater discomfort and cognitive load, and make greater attempts to control their behaviour, while lying; this finding was corroborated. Furthermore, self-reported experiences while lying were not related to how individuals felt when they told a comparable truth. Although behaviour was not found to differ between lie and truth conditions, some of the nonverbal behaviours in the lie condition were related to those self-reported experiences they have been proposed to represent.

Individual differences in the experience of being deceptive were also found. Individual feelings and the degree to which individuals tried to control their behaviour when they lied were related to some aspects of their personality. Interestingly, none of these personality measures were related to how they felt when they told the truth. Finally, a descriptive analysis of behavioural deception clue patterns suggested that the best approach to lie detection resulted from the use of a combination of all approaches, and the consideration of multiple deception clues.

Experiences while Lying

In the current study, participants reported experiencing greater discomfort and cognitive load when they lied. In addition, they tried harder to control their behaviour when they lied. These findings provide theoretical support for explanations as to why deception clues might emerge in our behaviour (Ekman, 1981; Ekman & Friesen, 1969; Hocking & Leathers, 1980; Vrij et al., 2008; Zukerman et al., 1981). Although

theorizing about behavioural deception clues relies heavily on the assumption that people experience lie-telling differently than truth-telling, 50 years of research has almost never tested those assumptions (Caso et al., 2005; Vrij et al., 1996). The current study had several goals, but perhaps the largest contribution of this research was to add to the extremely limited body of research examining how people experience the act of lying, as well as determining whether they try harder to make a credible impression by controlling their behaviour.

Although prior studies have supported the assumptions made by the three primary behaviour based deception detection approaches, accusatory type interviews were used in the previous work; these interview styles are known to amplify signs of discomfort in both truth-tellers and liars, produce brief verbal denials, and result in fewer clues to deception (Vrij & Granhag, 2012; Vrij et al., 2006; Vrij, Mann, Kristen, & Fisher, 2007). Furthermore, the lies used in previous research were relatively unengaging, and to a certain degree, participants were coached on how to lie. In the present study, participants were never accused of lying by the interviewers, and the content of the truthful and deceptive messages was personally relevant. Demonstrating that these findings are consistent across different lie scenarios adds to the evidence that the very act of lying, at least to some degree, seems to have some effect on emotions and cognitive load, and causes an individual to try harder to appear convincing by controlling their behaviour.

In the real world, professional lie-catchers do not have access to an individual's internal emotional and mental states. Even when an individual is suspected of deception and their behaviour suggests increased discomfort, cognitive load, or behavioural

control, an interviewer can never be completely confident as to whether the change in behaviour is due to deception or the circumstances in which the lie is told. Signs of discomfort or cognitive load could simply reflect a stressful or mentally taxing situation. In the present study, this issue was controlled by asking participants to lie and tell the truth about the same topic and subsequently answering the same questions in both situations. There was a possibility, however, that those who experience discomfort, cognitive load, and attempted behavioural control while lying, might have also experience these things when telling a comparable truth.

In the current study, efforts were made to ensure the equivalency of the two veracity conditions, and interviewers were counterbalanced across veracity conditions. If individuals were prone to feel certain emotions and cognitive load due to the interview setting and specific interview questions, then a positive correlation between how individuals felt when they lied and how they felt when they told the truth would be expected. On the contrary, correlational analyses revealed that lie discomfort and lie cognitive load were not related to truth discomfort and truth cognitive load. This result suggests that how an individual felt when they lied, as compared to when they told the truth, likely had more to do with veracity condition than with situational variables.

When considering the attempted control approach, the association is more complex; attempted control while lying was positively correlated with attempted control while telling the truth. This pattern, however, makes a certain amount of sense. The attempted control approach assumes that lying causes an individual to become tense. In response, a liar would attempt to control behavioural indicators of that tension (Buller & Burgoon,1996). In situations when veracity is important, however, people are equally

likely to feel some level of tension; if the questions are difficult, then they might also experience increased cognitive load. These underlying processes only differ in terms of their source. For instance, the source of the liar's tension could either be detection apprehension or detection guilt, whereas the source of the truth-tellers tension is a fear of being disbelieved (Ekman, 1989). Those who are adequately motivated to make a credible impression, regardless of whether they are lying, likely make a similar conscious effort to appear credible, by stifling behaviours that could be interpreted as deception clues. In the present study, participants were instructed to try to convince both interviewers that they were telling the truth and offered an incentive if they succeeded. Furthermore, the interviewers started the relevant portion of the interview by indicating to the participant that each interviewer would be trying to figure out whether they were telling me the truth. Each of these factors would have likely affected the attempted control aspect of lying and truth-telling in similar ways, as individuals who are motivated to be perceived as honest are more likely to employ a strategy to succeed in that goal.

There also appears to be an important interplay between the three underlying detection approach processes, both while lying and telling the truth, that warrants some attention. Cognitive load, discomfort, and attempts to control behaviour were each positively correlated with one another in the lie and truth conditions (see Table 4); these findings support some aspects of the theoretical frameworks of these three approaches to lie detection. It has been suggested that signs of attempted control are a response to an increase in tension (Buller & Burgoon,1996). Attempted control was positively correlated with levels of discomfort and cognitive load. Given that attempted control is a

strategy employed to stifle signs of discomfort and cognitive load, those who do not experience discomfort or cognitive load while lying or telling the truth would have little reason to control their behaviour to appear credible.

There was a positive correlation between discomfort and cognitive load. Although causation cannot be implied, research has shown that tasks involving high mental effort can increase aspects of the physiological stress response, such as heart rate, blood pressure, and levels of the catecholamine norepinephrine (Peters et al., 1999; Peters et al., 1998). Additionally, cognitively challenging tasks have been shown to increase negative mood states and anxiety (Al'Absi, Bongard, Buchanan, Pincomb, Licinio, & Lovallo, 1997; Allen, Jones, McCarthy, Sheehan-Mansfield, & Sheffield, 2013). Although a common argument as to why individuals feel more discomfort when telling lies is that they are experiencing detection apprehension or deception guilt (Ekman, 1989), another possibility is that cognitive load contributed to the discomfort experienced by participants while lying. It may very well be that detection apprehension, deception guilt, and cognitive load all lend a part in making deception a more unpleasant task than telling the truth.

Individual differences in experiences while lying

Individual differences in experiences while lying were found in the present study. This result is of importance because predictions about the behavioural clues that people show while lying are based on how they feel when lying. Only four of the measured personality factors were related to how participants felt when telling lies, and only the correlation between social anxiety and discomfort was consistent with previous findings (see Vrij et al., 2001a; Vrij & Holland, 1998). In the current study, public self-

consciousness and other-directedness were both positively correlated with the experience of discomfort while telling lies. These findings are the exact opposite to both the predictions and findings of past research. Although, Vrij and Holland (1998) argued that high levels of other-directedness and public self-consciousness should be associated less discomfort while lying, intuitively, these traits may make people feel more uncomfortable while lying. As well as being less confident in social situations, other-directed people are guided by external standards (Briggs et al., 1980). Publicly self-conscious individuals are deeply concerned with how others feel about them (Fenigstein et al.,1975). Given that lying is usually frowned upon by society, high levels of other-directedness and public self-consciousness should be associated with finding deception an uncomfortable task.

One novel association between neuroticism and feelings of discomfort while lying emerged. High levels of neuroticism are believed to result in an increased reactivity to stressors (Bolger & Schilling, 1991). One possible explanation for the association between lie-discomfort and neuroticism is that deception is a unique stressor; the discomfort experienced during deception might have differed qualitatively from any discomfort experienced while telling the truth. In fact, it is possible that the positive correlation found between discomfort and neuroticism in the lie condition represents an association between neuroticism and deception guilt, detection apprehension, or a mix of both, rather than an association between neuroticism and general discomfort. This possibility would explain why a similar correlation was not observed between these variables in the truth condition.

In the current study, attempted control while lying was positively correlated with public self-consciousness, which is consistent with Vrij et al. (2001a). Given that 1) high levels of other-directedness and public self-consciousness were associated with higher levels of discomfort while lying, and 2) higher levels of discomfort while lying were associated with greater attempts to control behaviour, it makes theoretical sense that other-directedness also would be positively correlated with attempted control. Publicly Self-Conscious and Other-Directed people are both highly motivated to make a good impression on others (Briggs et al., 1980; Feinstein et al., 1975) and, while lying, may attempt to control behavioural signs of discomfort in order to avoid being caught.

The lack of consistent individual differences in experiences while lying is likely due to methodological differences. Both the lies and interview strategy used in the present study differed from those used in past research. In the current study and following Vrij et al. (2001a), an information gathering style interview technique was used, whereby questions were asked as a means to gather as much information as possible. Vrij and Holland (1998), on the other hand, used an accusatory interrogation technique in which participants were accused of lying and placed under considerable pressure. Accusatory styles are more likely to arouse negative emotions, lead to short denials, and produce fewer cues to deception than information gathering techniques (Vrij et al., 2006; Vrij et al., 2007). Given this effect, the discomfort variable in previous studies could have been contaminated by the interview strategy and may not truly represented the experience of discomfort brought on by deception. Furthermore, the participant responses in Vrij and Holland (1998) were extremely short (less than four seconds each), suggesting a short denial strategy which would require far fewer

cognitive resources than confabulating information. The current study differed from that of previous research in one other important way. The lies told in the present study focused on strongly held opinions, whereas those told in previous research pertained to what a participant witnessed in a video (Vrij et al., 2001a) or required participants to lie about taking a psychology course (Vrij & Holland, 1998). When considering these factors, the fact that the findings in this study differed from those in Vrij and Holland (1998) is less surprising.

Deception is a complicated process, and how individuals feel when they lie, likely depends on the situation surrounding the lie and what they are lying about. These differences likely played a role in mediating the correlations between personality and experiences while lying. Rather than it being a simple matter of "X" trait being related to "X" experience while lying, it is possible that those associations depend on the interview technique, the type of lie, and the interaction of numerous other variables. Personality might be only related to experiences while lying in certain ways, under certain conditions. The literature on individual differences in experiences while lying is so lacking, that only speculations can be made at this point. Nevertheless, results of the current study collaborate past research (Vrij et al., 2001a; Vrij & Holland, 1998) in that they suggest that at least some aspects of personality might account for some of the variability in how people experience deception. Those variations are likely to play a strong role in which behaviours become relevant in detecting deception in any individual and their baseline behaviour, and attempts should be made to better understand those differences.

In the present study, personality traits were exclusively related to experiences while lying. No personality trait was associated with experiences while telling the truth. The exclusivity of this finding to the lie condition is extremely interesting. The literature, thus far, has only focused on experiences while telling lies. Participants in the earlier studies conducted by Vrij and Holland (1998) and Vrij et al. (2001a) were questioned using accusatory style interview techniques. It is possible to argued that previous findings represent the how personality relates to experiences while being interrogated/questioned, rather than how personality relates to experiences while lying. If similar associations emerged between personality and experiences while telling the truth, then the later interpretation would be likely. The exclusiveness of findings to the lie condition in the present study suggests that something about lying was driving the associations between experiences while lying and personality variables. As this was the first study to compare individual differences in experiences while lying and while telling comparable truths, only conjectures can be made at this point.

Theoretically, individuals might experience cognitive load, discomfort, and attempts to control behaviour both while lying and while telling the truth. These three underlying processes, however, likely arise from different sources. Whereas detection apprehension and deception guilt are believed to be a primary source of discomfort while lying, they do not account for experienced discomfort while telling the truth. Similarly, the reasons that an individual experiences cognitive load when they lie differ from why they experience cognitive load when they tell the truth. For example, in the present study, participants had to fabricate reasons to add the appearance of credibility to their deceptive messages. When telling the truth, they may have experienced

increased cognitive load when trying to recall or develop, and articulate, reasons for their beliefs. Additionally, the underlying motivation that causes an individual to try to control their behaviour while lying, could also differ from what motivates them to control their behaviour when they tell the truth. The liar attempts to control behaviour in order to stifle deception clues and nonverbal leakage that could give their lie away, whereas the honest individual attempts to control behaviours they believe will leave an impression of dishonesty. Given that discomfort, cognitive load, and attempted control while lying likely arise from different sources then when telling the truth, the findings on individual differences in experiences while lying might not generalize to experiences of telling comparable truths. They could, at some level, represent, distinct emotional and cognitive processes. Whereas discomfort, for example, represents detection apprehension while lying, it could represent fear of being disbelieved while telling the truth, or simply, an uncomfortable environment.

Behavioural clues of deception

The 11 behaviours that were examined in the current study were chosen because they are commonly proposed to be indicators of discomfort, cognitive load, and attempts to control behaviour in the deception field. At the group level, there were no behavioural differences between the truth and lie conditions. At first glance, these findings would suggest that behaviour cannot discriminate between veracity conditions. There are, however, alternative explanations as to why the deceptive and honest conditions failed to produce differences at the group level. First, it is possible that the examined behaviours were not related to the experiences they have been proposed to represent. Second, some personality factors were associated with experiences while

lying and attempted control of behaviour. These factors could have also caused variations in the specific pattern and types of clues shown by any single individual. Third, some behaviours have been proposed to either increase or decrease during deception. In those cases, a change from baseline might be more important than the entire group showing the same change. If, in fact, half the group showed an increase in a certain behavioural clue to deception and the other half showed a roughly equal decrease, then mean differences could appear to be roughly zero. Careful consideration of these findings provides support for some of these possibilities.

Behavioural deception clues and experiences while lying. As mentioned, one potential reason that behaviours did not differ between conditions is that the specific behaviours believed to represent certain emotions, mental states, and detection avoidance strategies are not actually associated with those variables. The fact that differences were found in self-reported experiences of those internal experiences, but not in the behaviours that are believed to represent those experiences is problematic for theories on behavioural deception clues. In the lie-detection literature, each theory about why behaviours change during deception is usually applied as a post-hoc explanation for those changes. For instance, if liars show fewer eye blinks, then it is inferred that they must have been experiencing an increase in cognitive load. In real-life scenarios, the same logic is used, as the interrogator would not be privy to the state of mind of the potential liar. Indeed, having evidence that a behaviour is related to the experience it is believed to represent should be an important step in theorizing about potential behaviours that might serve as deception clues. Despite the fact that laboratory studies have the advantage of being able to measure these internal mental states via techniques

such as self-report surveys, no study on behavioural deception clues, to my knowledge, has directly assessed the association between behaviours and the experiences they are believed to represent. In fact, researchers have failed to assess this dynamic with the same study, despite the fact that both are critical components to behavioural deception clue research.

In the present study both the physical behaviours and self-reported experiences while lying were measured, making it possible to assess whether specific behaviours were indicators of discomfort, cognitive load, or attempted control. Some, but not all, of these examined behaviours were related to self-reported experiences in ways that were consistent with the literature (see Table 1; Vrij, 2008). These findings provide empirical evidence that behaviours can be used, to some degree, to determine whether someone is experiencing discomfort or cognitive load while lying, and whether they might be trying to control their behaviour. For instance, higher levels of cognitive load in the lie condition were associated with greater gaze-aversion, fewer illustrators, and a longer response latency. Higher levels of discomfort in the lie condition were associated with a shorter overall response lengths, an increase in blink-rate, greater gaze aversion, and fewer illustrators. Finally, higher levels of attempted control were associated with more frequent lip pressing and fewer leg and foot movements.

Regardless of whether or not the occurrence of behaviours can differentiate truth from lies at the group level, this information may still prove useful to an individual attempting to assess credibility as it could lead the conversation in useful directions by identifying instances of cognitive load, discomfort, or attempts to control behaviour. Ekman (2009) referred to nonverbal behaviour used in this way as “hot spots.” These

are behaviours that indicate that something is amiss, or that the topic being discussed might be of significance. When behaviour suggests that unexpected internal changes have occurred, the interviewer could explore those areas of the conversation that coincide with the occurrence of these behaviours more closely, even if it does not immediately imply deception.

Behavioural deception clues and personality. A second potential reason for the lack of behavioural deception clues could be that individual differences in experiences while lying could affect the types of clues that appear in behaviour. Some personality variables seemed to predispose individuals to experiencing discomfort and attempts to control their behaviour while lying. This finding suggests that some people may not have shown behavioural clues because they simply did not experience the necessary discomfort, cognitive load, or attempts to control behaviour. Despite this notion, few correlations emerged between the types of behavioural clues shown while lying and personality measures. Specifically, only Self-Monitoring "Extraversion" was negatively correlated with the number of deception clues that emerged related to attempted control as well as the emergence of deception clues altogether. Public Self-Consciousness, on the other hand, was negatively correlated with the number of behavioural deception clues related to cognitive load.

Although few personality variables seemed related to the number and types of behavioural clues displayed, these findings are suggestive of individual differences that could affect the types of behavioural clues displayed by an individual. Additionally, it is highly likely that individuals vary in their nonverbal communication of discomfort, cognitive load, and attempts to control behaviour. For example, despite feelings of

nervousness, not everyone will communicate discomfort with gaze aversion or adaptors. Even if a single behaviour is not found to differentiate truth from lies at the group level, it is possible that the overall display of discomfort, cognitive load, or attempts to control behaviour would fare better. In fact, asking individuals to identify when discomfort or cognitive load is occurring, rather than asking whether deception is occurring, results in higher accuracy in deception detection (Vrij, Edward, & Bull, 2001b). This finding might be because people consider overall behavioural display, when making assessments about emotions and cognitive states, but use only single behaviours when judging deception.

Changes from baseline. Unreliable changes from baseline could also affect whether differences between truth and lie conditions are found. In some cases, the theoretical approaches have made opposing predictions about whether certain behaviours should increase or decrease when lying. For example, emotion and cognitive load based approaches have predicted an increase in gaze aversion while lying, whereas the attempted control approach predicted a decrease. If both occurred in equally large proportions of the sample, then a reliable difference would not be found. A closer examination of the individual difference scores in each behaviour suggested that this may have occurred. Although difference scores of many of the behaviours were normally distributed around values very close to zero, the ranges of many of these scores were quite large. In some cases, large negative difference scores indicated that the behaviour occurred less when lying and in other cases large positive difference scores indicated that the behaviour occurred more while lying. To further illustrate, at the group level, the average difference in blink rate was .95 blinks per minute, but

differences in the lie condition ranged from -12.77 blinks per minute to 21.06 blinks per minute. A closer inspection showed that 47.5 % of this sample showed a blink rate decrease from baseline (a response to cognitive load) and 52.5% showed an increase from baseline (a response to discomfort). Although these differences are in the opposite direction, both types of changes have been predicted to occur in response to deception by the literature. Thus, examining only the mean frequency or duration of the group would likely conceal actual differences at the individual level from a person's unique baseline of behaviour.

Multiple behavioural clues versus single clues

In the current study, a decision rule was adopted to classify a change in behaviour as a deception clue under the guidelines of each approach laid out in Table 7. Results indicated that no single behaviour could be classified as a deception clue in more than 30% of the sample when considering the three deception detection approaches in isolation. When behaviours were considered separately using a combination of all three approaches, the number of individuals who showed each of the 11 examined behavioural deception clues had a tendency to increase. These results suggest that all three approaches should be considered when looking for deception clues, as it would account for multiple patterns of behavioural change, which could very well improve detection rates.

Ekman (2009) has argued that no single behaviour reliably betrays deception, a point that is supported by DePaulo et al.'s meta-analysis (2003). According to Ekman, the lie detector should base their decision about credibility on the appearance of multiple clues in behaviour. The problem with using a single behavioural deception clue can be

best highlighted using an example. If an individual breaks eye-contact, then it is possible that they are nervous. It is also possible that the break is simply due to chance. If they break eye-contact and show several adaptors, then the combination of behaviours might have occurred by chance but a pattern has started to emerge in their behaviours that makes chance less likely. In the present study, I described the proportion of individuals showing single and multiple behavioural deception clues. When considering these approaches separately, the proportion of individuals showing at least one behavioural deception clue ranged from 69% to 80%. Between 31% and 44% of participants showed two or more clues related to each of these approaches, and fewer than 15% showed three or more behavioural clues related to each of these approaches. Using a model that accounts for all three theories drastically increased the number of individuals showing multiple clues. Almost the entire sample (96%) showed at least one behavioural deception clue that could be explained by at least one of the approaches, whereas 82% showed two or more. Sixty-two percent of the sample showed three or more behavioural deception clues in their demeanor, which is still significantly better than what would be expected by chance.

Implications and future directions

Admittedly, at first glance, it is difficult to tie together the numerous findings in the present study. The purpose of examining so many variables within a single study was to allow a clearer understanding of the interplay between experiences, behavioural deception clues, and personality. Past researchers have focused on each of these aspects individually, but no single study has included all aspects within the same research paradigm. Lie scenarios and interview techniques vary across studies, which could mean

that findings from one study are not applicable to another. Although theorizing about how each aspect could interact with one another is possible across different studies, empirical comparisons within the same study allow for stronger conclusion to be drawn.

The lie-detection literature is replete with unreliable findings for many of the individual behavioural clues. In some studies, deception is indicated by an increase in a behaviour yet, in other studies, a decrease suggests deception. These results do not necessarily mean that the behaviour is useless as a deception clue, but does suggest that both changes are valid because deception clues are idiosyncratic and dependent upon both the specific individual and on how they feel when they are lying. Because many researchers do not measure these underlying experiences (discomfort, cognitive load, attempted control), it is not possible to understand the discrepancies in the literature.

Based on the results of the current study, I would argue that the term behavioural deception clues is misleading; rather, these behaviours are behavioural clues of discomfort, cognitive load, and attempts to control behaviour and, as such, are only a clue to deception if people experience these factors more strongly when they lie. For behavioural deception clues to be idiosyncratic, people would need to vary in how they experience deception and the types of deception clues that present in their behaviour. Again, as found here, personality appears to be associated with how individuals experience the act of telling lies as well as which deception clues are shown. Furthermore, participants showed vastly different behavioural clues from one another. Inspection of these data revealed that the largest proportion of the sample showing a specific pattern of behavioural change (i.e., increase or decrease) in a single behaviour was 30% (gaze aversion; emotion or cognitive load approach) and 96% of the sample

showed at least one behavioural change considered a deception clue by one of the approaches. In addition, a combination of all three frameworks identified 82% of the sample as showing two or more behavioural clues, which was almost double the identification of the most successful individual approaches. Taken together, these results strongly indicated that the patterns of clues varied among individuals and that the use of a combination of approaches would most likely lead to the highest identification rates.

Individuals seem to express discomfort, cognitive load, and attempts to control behaviour in vastly different ways; because of this fact, considering a larger number of behavioural indicators of these emotional and cognitive states will increase the odds of detection. Future research would benefit if researchers placed less importance on the specific behaviours as though they are the fabled Pinocchio's nose, and instead focus on various constellations of behaviour related to discomfort, cognitive load, and attempts to control behaviour (Hartwig & Bond, 2014).

Perhaps the most important direction for the future of behavioural deception clue research is the development of tested and validated methods for the scoring of nonverbal clues to deceit. As no standardized procedure exists, it is difficult to know whether researchers have used comparable coding methodologies, which might be part of the reason for inconsistencies in the research. Ekman and Friesen (1978) developed the facial action coding system which allows for a highly detailed and standardized coding method of facial activity. I would suggest that a method for coding other nonverbal behaviours be developed. Researchers of behavioural deception clues could then come to a consensus as to what constitutes a behavioural unit for each of the behaviours

examined, as well as ensure similar procedures for coding nonverbal behaviours are being applied across studies. Some coding guides for nonverbal behaviour have been proposed in the body language literature (Dael, Mortillaro, & Scherer, 2012), but none have been adopted within the lie detection literature, perhaps because they do not focus on the particular behaviours often included in lie-detection studies.

Limitations of the current study

Several limitations to the present research are worth noting. First, several of the personality measures had issues with internal reliability and required slight modifications. Although these instruments appeared to function well in past research, they did not perform flawlessly here, and low Cronbach's alphas required that a few items be dropped. The lower reliability could be at least one reason that more factors affecting individual differences in experiences while lying and behavioural deception clues were not found. Furthermore, some of these instruments are quite dated, but were used here as a means to replicate previous findings that have been largely ignored in the literature.

Although attempts were made to have individuals tell meaningful lies, one of the standard limitations to laboratory research on lie detection apply to the current study. In both the current and past research, there were no serious consequences associated with getting caught while lying. Moreover, the Contentious Issues Survey was used to ensure that participants would feel strongly about at least one issue. A potential downside, however, was that the issues might have varied in degree of seriousness. Although the instrument asks about opinions on a variety of social issues, it could be argued that an individual who identifies as having a homosexual orientation being asked to argue that

same sex marriage should be illegal, when they believe it shouldn't be, may be a more serious lie than a participant arguing that the drinking age should be raised. In spite of controlling the reported importance of each issue, the varying subject matter might elicit very different emotional and cognitive reactions.

Another limitation might have to do with the interview environment used in the current study. ten Brinke, Khambatta, and Carney (2015) demonstrated that the specific environment that the interview takes place in can affect an individual's nonverbal behaviour. They theorized that unenriched, empty, interview environments, such as those that are typically portrayed in television police dramas and movies, would increase the occurrence of behavioural deception clues because such environments place more pressure on the suspected liar. Although they found that various nonverbal deception clues appeared to be more common in unenriched versus enriched environments, Verschuere, Meijer, & Vrij (2016) correctly pointed out that ten Brinke et al.'s (2015) had misinterpreted their findings. tenBrinke's research indicated that unenriched environments increased behavioural indicators of discomfort in both truth tellers and liars alike. In effect, unenriched environments appear to make truth-tellers look more like liars, making it more difficult to distinguish liars and truth-tellers from one another. The present study was conducted in a relatively unenriched environment, making the environment a potential confound. Participants sat in a chair across from the interviewer in a large undecorated interview space. It is completely possible that this setup increased signs of discomfort in participants both when they lied as well as when they told the truth.

Finally, the analysis of differences in nonverbal deception clues was likely underpowered, which makes drawing conclusions about differences in nonverbal deception clues problematic. Although the analysis may have been underpowered, the sample size was still larger than the average sample size of studies examining deception clues described in the existing literature (*M* = 41.73, *SD* = 31.93; Depaulo et al. 2003). Additionally, the difference scores of all 11 behaviours between lie and truth conditions were essentially zero. Such small differences are useless in terms of practicality and it is unlikely that increasing the sample size would have substantially affected those differences.

General conclusions

After 50 years of research no single behaviour has been identified as a reliable indicator of deception. This reliability is because the behaviours themselves are not indicators of deception; but rather, they serve as behavioural markers of discomfort, cognitive load, and attempts to control behaviour. In the current study, people experienced deception differently from truth telling, which appears to be the one consistent finding in the existing literature on behavioural deception clues. Participants also varied from one another in how they experienced deception, and displayed different behavioural deception clues from one another. The future of behavioural deception clue research would benefit greatly from a better understanding how individuals experience the act of being deceptive under different conditions, as well as individual differences in those experiences. It is quite possible that personality factors, beyond those examined here, play a role in how individuals experience deception under certain conditions. Rather than focusing on specific behaviours, methods to identify nonverbal increases in

discomfort, cognitive load, and attempts to control behaviour using overall patterns of behavioural change could be developed.

Idiosyncratic patterns of behaviour appeared to be more useful as deception clues than each individual behaviour on its own. As demonstrated here, less than 30% of the sample showed a change in a single, specific, behaviour that would be indicative of a change in one of the three measured experiences. However, the proportion of individuals that could be identified as showing an increase in one of the three experiences drastically increased when all possible patterns were considered. Eighty-Two percent of the sample showed two or more behavioural deception clues when all possible clues were considered.

The overall results of the current study suggest that it is not the behaviours themselves, but rather, the experiences these behaviours are proposed to represent that are the real clues of deceit. Therefore, it is likely more useful to examine idiosyncratic clusters of discomfort-related behaviour, cognitive-load related behaviour, and attempted control related behaviour, rather than individual behaviours when attempting to detect deception. The specific means by which an investigator deduces increases in discomfort, cognitive load, or attempted control is likely to vary from one individual to the next.

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Appendix A

Demographics and Contentious Issues Opinion Survey

Instructions: On the following pages you will first be asked to provide demographic information concerning your age, gender, race/ethnicity, your primary language spoken, and country of birth. You will then find several statements about current or recent social issues (i.e. , abortion, capital punishment, gay marriage) that can sometimes cause heated debates. For each statement you will be asked to indicate how much you agree or disagree with the statement on a seven point scale. In addition to this you will be asked how important the belief is to you. For a belief to be considered important to you it should be one you feel strongly about, have thought extensively about, and have strong reasons as to why you feel that way about the issue. It is possible that you might completely agree or disagree with a statement, but not consider that issue of great importance to you. Be sure that you think carefully about your true feelings on each topic and respond as honestly as possible.

*****If there is a specific issue that is very sensitive for you, and you are uncomfortable providing your truthful opinion on that issue, please do not respond in a socially desirable way. Leave the item blank.**

Demographics

Instructions: Please provide the following demographic information.

1. **What is your age in years?**

   _____

2. **What is your sex? (circle one)**

   Male Female

3. **What is your ethnicity?**

   Canadian ☐ American ☐ Chinese ☐ Arabic ☐ Other ☐ _____

4. **What language do you primarily speak at home?**

   English ☐ French ☐ Chinese ☐ Other ☐ _____

5. **What is your country of birth?**

   Canada ☐ United States ☐ Other ☐_____

Contentious Issues Opinion Survey

Instructions: Please rate the degree to which you agree with each statement and how important that belief is to you.

1. **Abortion should be legal.**

   Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

   How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

2. **Marijuana should be legalized.**

   Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

   How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

3. **Assisted Suicide (Euthanasia) should be legalized.**

   Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

4. Prostitution should be legal in Canada.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

5. Global warming (climate change) is scientific fact.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

6. Gay couples should be allowed to marry.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

7. Creationism (i.e. , that people were created by a higher power) should be taught in high school science classes as an alternative to evolution.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

8. Evolution should be taught in high school science class.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

9. Addiction is not a real disease.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

10. The death penalty should be legal.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

11. Human and Animal cloning is unethical.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

12. Using animal for the testing of drugs is unethical.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

13. The Anti-vaccination movement is a danger to public health.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

14. The grading system and honour role should be eliminated from the education system.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

15. Unionized employees should have the right to strike even when doing so negatively affects the lives of others (e.g. , Paramedics, Nurses, Professors, School Teachers, Police).

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

16. All firearms should be outlawed to anyone except those requiring them for work or hunting (e.g. licensed hunters, police, or military).

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

17. The minimum drinking age in Canada should be changed to 21.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

18. Using human embryos in stem cell research is unethical.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

19. Attention Deficit Hyperactivity Disorder is over-diagnosed in young children.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

20. Canada's temporary foreign worker program should be eliminated.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

21. Religious studies should be taught in public schools.

Do you agree or disagree with this statement?

Strongly Agree			Neither agree nor disagree			Strongly Disagree
1	2	3	4	5	6	7

How important is this belief to you?

Very Important			Neither important nor unimportant			Very Unimportant
1	2	3	4	5	6	7

Overall, how honest were you while completing this survey?

Completely dishonest						Completely honest
1	2	3	4	5	6	7

Appendix B

Post Interview Questionnaire

Instructions: The following questions refer to how you felt during the interview. For each question, circle the number on the seven point scale that best answers the question. Please answer as honestly and accurately as possible.

1. **How difficult was it to answer the interviewer's questions?**

Not at all						Extremely
1	2	3	4	5	6	7

2. **To what extent did you find answering the questions fun?**

Not at all						Extremely
1	2	3	4	5	6	7

3. **How much did you need to concentrate while answering the interviewer's questions?**

Not at all						Extremely
1	2	3	4	5	6	7

4. **How guilty did you feel during the interview?**

Not at all						Extremely
1	2	3	4	5	6	7

5. **How much did you feel like you were under pressure during the interview?**

Not at all						Extremely
1	2	3	4	5	6	7

6. **To what extent did you find answering the questions exciting?**

Not at all						Extremely
1	2	3	4	5	6	7

7. **How awkward did you feel during the interview?**

Not at all						Extremely
1	2	3	4	5	6	7

8. **To what extent did you find answering the questions enjoyable?**

Not at all						Extremely
1	2	3	4	5	6	7

9. How physically aroused did you feel during the interview (e.g. felt like your heart was beating faster)?

Not at all						Extremely
1	2	3	4	5	6	7

10. How tense did you feel during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

11. How relieved were you that the interview was over?

Not at all						Extremely
1	2	3	4	5	6	7

12. To what extent did you think about your behaviour during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

13. To what extent did you try to control your behaviour during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

14. To what degree did you put a lot of thought and effort into answering the interviewer's questions?

Not at all						Extremely
1	2	3	4	5	6	7

15. How nervous did you feel during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

16. How uncomfortable did you feel during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

17. To what extent did you attempt to behave in a way that would appear honest during the interview?

Not at all						Extremely
1	2	3	4	5	6	7

18. How confident are you that the interviewer believed that you were being truthful?

Not at all Confident						Extremely Confident
1	2	3	4	5	6	7

Appendix C

Eysenck Personality Questionnaire- Revised Short Version

Instructions: Please answer each of the 48 questions by putting a circle around "Yes" or "No." There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the questions.

1. Does your mood often go up and down?.....Yes / No
2. Do you take much notice of what people think?.....Yes / No
3. Are you a talkative person?.....Yes / No
4. If you say you will do something, do you always keep your promise no matter how inconvenient it might be?.....Yes / No
5. Do you ever feel just miserable for no reason?.....Yes / No
6. Would being in debt worry you?.....Yes / No
7. Are you rather lively?.....Yes / No
8. Were you ever greedy by helping yourself to more than your share of anything?.....Yes / No
9. Are you an irritable person?.....Yes / No
10. Would you take drugs which may have strange or dangerous effects?.....Yes / No
11. Do you enjoy meeting new people?.....Yes / No
12. Have you ever blamed someone for doing something you knew was really your fault?.....Yes / No
13. Are your feelings easily hurt?.....Yes / No
14. Do you prefer to go your own way rather than act by the rules?.....Yes / No
15. Can you usually let yourself go and enjoy yourself at a lively party?.....Yes / No
16. Are all your habits good and desirable ones?.....Yes / No
17. Do you often feel "fed up"?.....Yes / No

18. Do good manners and cleanliness matter much to you?.....Yes / No
19. Do you usually take the initiative of making new friends?.....Yes / No
20. Have you ever taken anything (even a pin or button) that belongs to someone else?.....Yes / No
21. Would you call yourself a nervous person?.....Yes / No
22. Do you think marriage is old-fashioned and should be done away with?.....Yes / No
23. Can you easily get some life into a rather dull party?.....Yes / No
24. Have you ever broken or lost something belonging to someone else?.....Yes / No
25. Are you a worrier?.....Yes / No
26. Do you enjoy cooperating with others?.....Yes / No
27. Do you tend to keep in the background on social occasions?.....Yes / No
28. Does it worry you if you know there are mistakes in your work? .....Yes / No
29. Have you ever said anything bad or nasty about anyone? .....Yes / No
30. Would you call yourself tense or “highly-strung”?.....Yes / No
31. Do you think people spend too much time safeguarding their future with savings and insurances? .....Yes / No
32. Do you like mixing with people?.....Yes / No
33. As a child were you ever cheeky to your parents? .....Yes / No
34. Do you worry too long after an embarrassing experience? .....Yes / No
35. Do you try not to be rude to people? .....Yes / No
36. Do you like plenty of bustle and excitement around you? .....Yes / No
37. Have you ever cheated at a game? .....Yes / No

38. Do you suffer from “nerves”? .....Yes / No

39. Would you like other people to be afraid of you? .....Yes / No

40. Have you ever taken advantage of someone?.....Yes / No

41. Are you mostly quiet when you are with other people? .....Yes / No

42. Do you often feel lonely? .....Yes / No

43. Is it better to follow society’s rules than to go your own way? .....Yes / No

44. Do other people think of you as being rather lively? .....Yes / No

45. Do you always practice what you preach? .....Yes / No

46. Are you often troubled about feelings of guilt? .....Yes / No

47. Do you sometimes put off until tomorrow what you ought to do today?.....Yes / No

48. Can you get a party going? .....Yes / No

Appendix D

Briggs, Cheek, & Buss (1980) Self-Monitoring Scale

Instructions: This questionnaire contains 20 statements that could apply to you. For each question, indicate on the 5 point Likert scale the extent to which the statement in ***extremely uncharacteristic*** (1) of you or ***extremely characteristic*** (5) of you. Each statement should be responded to quickly without overthinking. The entire questionnaire should take only a few minutes to complete.

1. I feel a bit awkward in company and do not show up quite as well as I should.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

2. At a party I let others keep the jokes and stories going.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

3. In a group of people I am rarely the center of attention.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

4. I am not particularly good at making other people like me.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

5. I have never been good at games like charades or improvised acting.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

6. I have trouble changing my behavior to suit different people and different situations.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

7. In different situations and with different people I often act like another person.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

8. In order to get along and be liked, I tend to be what people expect me to be rather than anything else.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

9. I’m not always the person I appear to be.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

10. I guess I put on a show to impress or entertain people.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

11. Even if I am not enjoying myself, I often pretend to be having a good time.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

12. I may deceive people by being friendly when I really dislike them.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

13. I would not change my opinions (or the way I do things) in order to please someone else or win their favor.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

14. When I am uncertain how to act in social situations, I look to the behavior of others for cues.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

15. My behavior is usually an expression of my true inner feelings, attitudes, and beliefs.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

16. At parties and social gatherings, I do not attempt to do or say things that others will like.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

17. I would probably make a good actor.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

18. I have considered being an entertainer.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

19. I can make impromptu speeches on topics about which I have almost no information.

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

20. I can look anyone in the eye and tell a lie with a straight face (if for a right end).

extremely uncharacteristic				**extremely characteristic**
1	**2**	**3**	**4**	**5**

Appendix E

Self-Consciousness Scale

Instructions: Please respond to the following 23 statements by indicating in a 4 point Likert scale the degree to which each statement is ***extremely uncharacteristic*** (1) of you or ***extremely characteristic*** (4) of you. Circle the number that best describes how characteristic the statement is of you. Each statement should be responded to quickly without overthinking. The entire questionnaire should take only a few minutes to complete.

1. I'm always trying to figure myself out.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

2. I'm concerned about my style of doing things.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

3. Generally, I'm not very aware of myself.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

4. It takes me time to overcome my shyness in new situations.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

5. I reflect about myself a lot.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

6. I'm concerned about the way I present myself.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

7. I'm often the subject of my own fantasies.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

8. I have trouble working when someone is watching me.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

9. I never scrutinize myself.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

10. I get embarrassed very easily.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

11. I'm self-conscious about the way I look.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

12. I don't find it hard to talk to strangers.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

13. I'm generally attentive to my inner feelings.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

14. I usually worry about making a food impression.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

15. I'm constantly examining my motives.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

16. I feel anxious when I speak in front of a group.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

17. One of the last things I do when I leave my house is look in a mirror.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

18. I sometimes have the feeling that I'm off somewhere watching myself.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

19. I'm concerned about what other people think about me.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

20. I'm alert to changes in my mood.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

21. I'm usually aware of my appearance.

extremely uncharacteristic			**extremely characteristic**
1	2	3	4

22. I'm aware of the way my mind works when I work through a problem.

Extremely uncharacteristic			**Extremely characteristic**
1	2	3	4

23. Large groups make me nervous.

Extremely uncharacteristic			**Extremely characteristic**
1	2	3	4

Appendix F

Interview Questions

Acclimation questions phase

Interviewer: “Hello, my name is _____. In a minute, I’ll be asking you questions about one of the topics that appeared on the opinion survey you filled out earlier. But before we get started…”

1. How long have you lived in Saint John?
2. What do you think about living here?
3. A) Where are you originally from? (If participant has indicated that they’ve recently move to Saint John)

   B) In what part of Saint John did you spend most of your life? (If from Saint John)
4. So what degree-program are you taking here at UNB?
5. How are you enjoying University life so far?

Relevant questions phase

Interviewer: “O.k. I’m now going to ask you some questions about your attitudes towards (state topic). Are you ready to begin?”

1. Could you tell me about you opinion concerning (issue)?
2. Approximately how long would you say you have you felt this way about (issue)?
3. Tell me about the reasons that you have this opinion.
4. Of the reasons you’ve provided, which do you consider the most important and why?

5. What do you think is ultimately wrong with the counter-position to this issue?
6. How do you think your views on this issue will change overtime?
7. Do your parents know you feel this way about (issue) and how do they feel about your views on this topic?
8. Describe how it would make you feel if someone told your opinion was wrong and disagreed with you.
9. What, if any, merit do you see in the other position on this issue?

Appendix G

Operational Definitions of Behavioural Clues

Speech Illustrators. Any hand and arm movement that accents or emphasizes a word or phrase, movements that appear to sketch a path or direction of thought, pointing, movements depicting spatial relationships, movements depicting rhythm or pacing of speech, movements drawing pictures in the air, and movements that depict bodily action were all coded as a speech illustrator. For hand and arm movements to be considered illustrators they had to: a) occur during the time the participant is speaking, and b) must not have a precise or direct verbal meaning (Ekman & Friesen, 1972). For example, movements such as the "O.K." hand gesture or "thumbs up" hand gesture are not classified as speech illustrators under these criteria.

The frequency of illustrators was coded by identifying start and endpoints of an illustrative hand movement. The point at which the participant began gesturing to the time the participant ceased gesturing was recorded as a single illustrator. To account for potential variation in message length, frequency of illustrators was converted to a rate per minute by dividing the total number of illustrators by the response length.

Adaptors. In the current study, Ekman and Friesen's (1969) original definition of adaptors was used. Movements that involved rubbing, squeezing, scratching, picking, holding, covering, grooming, massaging or touching of the face, body, or some object were scored as adaptors. Given DePaulo et al.'s (2003) finding that the effect size for adaptors is greater when they are undifferentiated, all categories of adaptors were scored as a single overall frequency rather than differentiating between types. Frequency of

adaptors was then converted to a rate per minute by dividing total number of adaptors by interview length.

Postural shifts. Any re-positioning in of the trunk of the body forward, backward, or sideward was considered a posture shift (Vrij & Winkel, 1991). A total number of posture shifts was converted to a per minute rate by dividing total number of posture shifts by interview length.

Closed posture. The proportion of time each participant spent in a closed off posture while being interviewed was recorded. An individual was considered to be in closed posture when both the upper and lower body engaged in an action that made the individual appear smaller. These included crossed arms and legs, knees close together and elbows in close to the body, the individual leaning away from the interviewer while crossing the legs with an arm across the chest in such a way that the view of the torso was obstructed, and leaning forward in such a way that the size of the individual and view of the torso area appeared to be reduced. The proportion of the interview in which the participant was engaged in this behaviour was recorded.

Gaze aversion. Gaze aversion was coded anytime the participant looked away from the general direction of the interviewer's face (Mann, Vrij, & Bull, 2002; Vrij & Winkel, 1991). Gaze aversion involved either orienting the eyes away from the interviewer or orienting both the head and eyes away from the interviewer. Duration of gaze aversion as recorded as the proportion of the interview spent avoiding eye contact.

Leg and foot movements. Duration of leg and foot movements was scored by starting a timer when the participant started a movement of the leg or foot and stopped

when the participant ceased the activity. Both leg and foot movements were collapsed into one category of behavior (Vrij et al., 2001a).

Response latency. Response latency was scored as the duration of time in seconds that passes between the time the question was asked and the time a response was given by the participant (Vrij et al., 2001a; Walczyk et al., 2003).

Response Length. Response lengths were scored as the duration (in seconds) of the participant's message (DePaulo et al., 2003). Message duration consisted of the time from which the participant began to speak to the time they finished their answer.

Eye Blinks. The frequency of eye blinks were recorded and converted to a number per minute.

Lip press. Lip presses were recorded each time the bottom and top lip was pressed together firmly, narrowing the natural lip thickness (Ekman & Friesen, 1982; DePaulo et al., 2003). The number of still frames sampled at every second of the interview video containing a lip press was counted.

Smiling. The number of still frames sampled at every second of the interview video was recorded. Smiling was defined as the corners of the mouth pulled upwards (DePaulo et al., 2003). Frequency of smiling was recorded on a per minute basis.

CURRICULUMN VITAE or *CV*

Candidate's full name: Derek John Gaudet

Universities Attended: University of New Brunswick, B.A. (hons), 2009

Publications:

Everitt, J., Best, L. A., & Gaudet, D. (2016). Candidate gender, behavioral style, and willingness to vote: Support for female candidates depends on conformity to gender norms. *American Behavioral Scientist*, *60*(14), 1737-1755.

Gaudet, D., Flood, K. & Best, L. (2016, April). Personality and political ideology in Canada. In Pracana, C. & Wang, M. *International Psychological Applications Conference and Trends Proceedings*. Lisbon, Portugal. 55- 59. Lisbon, Portugal: World Institute for Advanced research and Science. ISBN: 978-989-99389-6-0 © 2016.

Conference Presentations:

Best, L. A**.,** MacLaren, V. V., Rouse, C., Shannon, A., Ciszewski, S., & Gaudet, D. (2013). *Alcohol use and personality: A comparison of high and low risk drinkers.* Paper presented at the Annual Meeting of the Canadian Psychological Association.

Ciszewski, S., Gaudet, D.J., & Best, L.A. (2013, April). Alcohol Abuse and Dependence: Personality Correlates. Poster session presented at the Graduate Research Convention, University of New Brunswick, Fredericton, New Brunswick.

Everitt, J., Best, L., & Gaudet, D. (2013). Exploring viewer reactions to media coverage of female politicians. Paper presented at the European Consortium on Political Research Annual Conference. Bordeaux, France.

Everitt, J., Best, L., & Gaudet, D. (2013). Exploring viewer reactions to media coverage of female politicians. Paper presented at the Harvard Kennedy School Women and Public Policy School Seminar Series. Cambridge, Massachusetts, U.S.A.

Everitt, J., Best, L., & Gaudet, D. (2014). Gender's Impact on Viewers' Reactions to Politicians' Non-verbal Cues. Paper presented at Maritime Interdisciplinary Arts Seminar. Saint John, New Brunswick.

Everitt, J., Best, L., & Gaudet, D. (2014). *Gender's Impact on Viewers' Reactions to Politicians' Non-verbal Cues*. Paper presented at the Multidisciplinary Opinion and Democracy Group at the University of Gothenburg.

Gaudet, D., Flood, K., & Best, L. (May, 2016). *Personality and Political Ideology in Canada.* Oral presentation presented at International Psychological Applications Conference and Trends, Lisbon, Portugal.

Gaudet, D., Flood, K., & Best, L. (September, 2016). *Personality and Political Ideology in Canada.* Poster presentation presented at University of New Brunswick Research Showcase, Fredericton, N.B.

Shannon, A., Ciszewski, S., Gaudet, D., Rousse, C., Best, L., & MacLaren, V. (2013, March). Personality correlates of alcohol abuse and dependence. Poster session presented at the Inter-professional Health Research Day. Saint John, New Brunswick.