



**SUBTYPING THE BEHAVIOURAL EFFECTS OF DECEIT AND THE
IMPLICATIONS FOR DETECTING DECEPTION**

by

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*Dedicated to my mother,
Ruta Dragunevicius*

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ABSTRACT

Identification of deception is crucial in legal, healthcare, social service, and airport security settings because it could be used to facilitate criminal or other harmful activity. However, people generally appear to be poor lie detectors, resulting in additionally serious consequences concerning false accusations of deceit. When judging truthfulness, observers may be limited to considering little more than the demeanour of individuals under question, but research indicates that most behaviours believed to be suggestive of lying have weak or no empirical relationships with deception. Nonetheless, it has been hypothesized that individuals do display signs of deceit, but that different individuals may exhibit different signs. This possibility might result in no signs emerging when analyses are focused on group differences, which is typical of deception research. Despite these propositions, there have been no attempts at subtyping the behavioural effects of deceit. The objective of this research was to determine whether people could be grouped in meaningful ways with regard to similar verbal and nonverbal behaviour changes when comparing lying to baseline truth-telling. Study 1 involved an extended analysis of behavioural cues to deception measured in a sample of undergraduate students ($n = 38$) and incarcerated offenders ($n = 26$) who provided both truthful and fabricated accounts of negative life events. Study 2 involved analysis of cues measured in another sample of undergraduates ($n = 64$) who provided truthful and deceptive accounts of exposure to the same moderately distressing images to better control the events that formed the basis of the accounts. “Fluid” and “laboured” liars were identified in both experiments when difference scores for cues were ipsatized and submitted to cluster analysis, reflecting distinctive changes in speech-related disturbances. Further, offenders in Study 1 were significantly more likely to be classified as fluid liars compared to students, and laboured liars in Study 2 held significantly more stereotypical beliefs about deception cues than fluid liars. Psychological factors that may underlie subtype expression are considered, such as attempted behavioural control and cognitive load. Implications for theory, research, and practice are discussed, including the potential usefulness of a profile-matching approach for detecting deceit.

LIST OF ABBREVIATIONS AND SYMBOLS USED

%	Percent
α	Cronbach's alpha
η_p^2	Partial eta squared
χ^2	Chi-square statistic
AIC	Akaike information criteria
ANOVA	Analysis of variance
APA	American Psychiatric Association
APD	Antisocial personality disorder
BADQ	Beliefs About Deception Questionnaire
BAI	Behaviour Analysis Interview
BIC	Bayesian information criteria
BIDR	Balanced Inventory of Desirable Responding
BFI	Big Five Inventory
CH	Calinski-Harabasz
d	Cohen's measure of effect size
DNA	Deoxyribonucleic acid
Ds	Dissimulation scale
DSM-5	Diagnostic and Statistical Manual of Mental Disorders-5th edition
EEG	Electroencephalogram
F	Fisher's F -ratio
fMRI	functional Magnetic Resonance Imaging
Fp	Infrequency-Psychopathology scale
IAPS	International Affective Picture System
IM	Impression Management
k	Number of clusters
LC	Latent class
LCA	Latent class analysis
LPA	Latent profile analysis
M	Mean
MMPI-2	Minnesota Multiphasic Personality Inventory-2
n	Sample size / number of participants
NIM	Negative Impression Management
OR	Odds ratio
p	p -value for determining statistical significance
PAI	Personality Assessment Inventory
PCL-R	Psychopathy Checklist-Revised
PTSD	Posttraumatic stress disorder
r	Pearson product-moment correlation coefficient
RM	Reality Monitoring
RS	Rare Symptoms
SCAN	Scientific Content Analysis
SD	Standard deviation
SDE	Self-Deceptive Enhancement
SDR	Socially Desirable Responding

SEM	Structural equation modeling
SIRS	Structured Interview of Reported Symptoms
SPSS	Statistical Package for the Social Sciences
SVA	Statement Validity Assessment
<i>t</i>	Student's <i>t</i> -test statistic
US	United States
VSA	Voice Stress Analysis

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CHAPTER 1. INTRODUCTION

Defining Deception and the Scope of the Dissertation

In psychological science, deception has been defined as a deliberate attempt to mislead others without giving any forewarning of the intention to do so (DePaulo et al., 2003; Ekman, 1985/1992; Vrij, 2008, 2011). Deception can occur in many forms. It may involve the presentation of false information as if it were true, which is sometimes described as falsification; it also may involve leaving out information that is known to be true, which is often referred to as concealment (Ekman, 1985/1992). Falsehoods communicated by individuals who are truly mistaken are not considered to be lies (DePaulo et al., 2003; Vrij, 2011). Of note, like most researchers (e.g., DePaulo et al., 2003), this author uses the terms *lying* and *deceiving* interchangeably. Further, according to the definition above, deception is an act that involves at least two subjects and excludes self-deception (Vrij, 2008), which is not the focus of this dissertation.

The objective of this dissertation research was to determine whether people could be grouped in meaningful ways with regard to similar verbal and nonverbal behaviour changes when comparing lying to a truth-telling baseline. As will be discussed later, identifying subtypes concerning the behavioural effects of deceit could enhance theoretical understanding on the topic. It also may inform future research on the phenomenon. Moreover, the identification of subtypes may have practical implications, and could lead to improvements in the practice of detecting deception.

Two experimental studies were conducted to meet this objective. The first study involved an extended exploratory analysis of behavioural cues to deceit measured in a sample of undergraduate students and incarcerated male criminal offenders who provided

both truthful and fabricated accounts of negative life events. The second study sought to address the methodological limitations of the first. It involved an analysis of the same behavioural cues measured in a sample of undergraduate students who provided truthful and deceptive accounts of exposure to the same moderately distressing visual images in order to better control the events that formed the basis of the accounts. Such efforts in deception research are sometimes referred to as establishing the “ground truth” (Hartwig, 2011, p. 138).

Before describing the methodology and results of these studies in more detail, however, the first chapter of this dissertation aims to place the aforementioned research into context by providing relevant background information on the phenomenon of deception. More specifically, an overview of the functions of deception and its prevalence is provided. The importance of detecting deceit in particular situations, such as in criminal justice, healthcare, and social service settings, is highlighted. Findings on the accuracy of judgments of veracity are summarized, and problems associated with inaccurate deception detection are covered. Some of the more popular methods for detecting deceit also are presented in this chapter, and a rationale for examining the verbal and nonverbal behaviour of suspected deceivers is offered to further place the current dissertation research into context.

The second chapter of this dissertation provides a detailed description of the methodology and results concerning the first study, after the major conceptual formulations on behavioural cues to deceit are summarized. The second chapter also includes a discussion that is specific to the findings of the first study. Similarly, the third chapter describes the methods and results of the second study, and includes a discussion

that is specific to the findings of this study. The fourth chapter addresses the general implications of the dissertation findings for theory and research on deception. This final chapter includes a discussion of the implications of the findings for the practice of deception detection.

The Functions of Deception

Why does deception exist? Deception is believed to be an evolutionary adaptation (Bond & Robinson, 1988). Adaptations reliably solved problems concerning survival and reproduction during the time period in which they evolved (Confer et al., 2010). More specifically, adaptations involved attributes that aided in survival and reproduction being passed on to future generations, from parents to offspring, at greater frequencies than other attributes because they conferred advantages to the organisms that possessed them (Darwin, 1859). These principles apply to adaptations for exploiting others, including deception, in order to expropriate scarce but reproductively relevant resources (Buss & Duntley, 2008).

On the points above, deception appears to serve two main functions and can be considered both a “selfish act” and a “social lubricant” (Vrij, 2008, p. 11). That is, lying may assist with the obtainment of desirable rewards, and with the avoidance of unwanted losses or punishments. Lying also may assist with protecting the feelings of the self, and with protecting the feelings of others. With regard to this latter function, Vrij (2008) asserted that people often lie to avoid embarrassment and having to disclose all of their faults, mistakes, and immoral or indecent thoughts to the rest of the world. Along these

lines, it also was pointed out that social interactions and conversations would likely become awkward and rude if people always told the truth to each other.¹

The Prevalence of Deception

Given the tenets above, it is not surprising that deceit appears to be rather common in social interactions. The available evidence suggests that children begin to develop the capacity for intentional deception between six and seven years of age (Salekin, Kubak, & Lee, 2008). In adults, a widely cited diary study involving community participants and college students indicated that these two groups told an average of one to two lies per day, respectively (DePaulo et al., 1996). Other research has indicated that people admit to using deception in 27% of face-to-face interactions, 37% of telephone conversations, and 14% of email communications (Hancock, 2007; but also see Serota, Levine, & Boster, 2010). Much of this deception may involve relatively harmless lying that often goes undetected. Indeed, DePaulo and colleagues (1996) qualified that most of the lies that participants reported in their study were not of major gravity. Even though most deception may not be serious, its identification is crucial in certain venues, such as in criminal justice, healthcare, social service, and airport security settings, because it could be used to carry out criminal or terrorist activity (Loftus, 2011; Porter & ten Brinke, 2010; Vrij, 2014; Vrij, Granhag, Mann, & Leal, 2011; Vrij, Granhag, & Porter, 2010; Vrij, Mann, & Leal, 2013). It also could be used to avoid the consequences for engaging in such activity, legal or otherwise (e.g., feigning mental disorder in an effort to obtain an insanity acquittal and avoid conviction) (Vitacco & Rogers, 2010).

¹ Lying to protect the feelings of the self or others could be argued to be related to the first function (i.e., to obtain rewards or avoid punishments/losses) because it may serve the deceiver in a similar manner by increasing one's likeability among others or by reducing unpleasant interpersonal conflict (Rogers, 2008a).

It is difficult to determine the exact prevalence or base rate of deception in the above-mentioned contexts through empirical investigations. This is partly due to the inherent difficulty in identifying deceit. First, it may be illogical in many instances to ask individuals to be honest about their dishonest behaviour (Hartwig, 2011; Rogers, 2008b). Second, the accuracy of many prevalence estimates is questionable because, generally, only unsuccessful deceivers (i.e., those who are detected) are included in the statistics (Resnick & Knoll, 2008). Third, estimates may vary as a function of other variables. For example, estimates may vary as a function of the setting in which the research took place, or as a function of the assessment/detection methods used to identify the deception (Rogers & Bender, 2012; Rogers & Gillard, 2013; Rogers, Salekin, Sewell, Goldstein, & Leonard, 1998). Even within the same setting, estimates may vary as a function of situational circumstances. As an example, some inmates in correctional facilities may exaggerate symptoms of mental disorders in order to obtain preferred living arrangements (e.g., single cells, placements on mental health units), but later may minimize any such difficulties in their efforts to appear well-adjusted when parole decisions are at hand (Rogers & Bender, 2012; Vitacco, 2008; Vitacco & Rogers, 2010; Walters, 1988).

Despite the difficulty, research suggests that deceit is not an uncommon problem in the aforementioned contexts. Deception within healthcare settings, such as feigning illness or malingering, is of considerable concern. The American Psychiatric Association's (APA) *Diagnostic and Statistical Manual of Mental Disorders* (5th edition; DSM-5) defines malingering as "the intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives" (APA, 2013, p. 726). External incentives could include, for example, avoidance of work

or military duty, evasion of criminal prosecution, or the obtainment of financial compensation or drugs. The definition of feigning, by contrast, makes no assumptions about the goals of such symptom fabrication or exaggeration because standardized measures of deceptive response styles have not been validated to determine the specific motivations of individuals (Rogers, 2008a; Rogers & Bender, 2003, 2012; Rogers & Gillard, 2013). Definitions aside, based on 33,531 American neuropsychological referrals, it was estimated that suspected malingering and symptom exaggeration occurred in 29% of personal injury cases, 30% of disability cases, 19% of criminal cases, and 8% of medical cases (Mittenberg, Patton, Canyock, & Condit, 2002).² With respect to general forensic practice, large-scale surveys of over 500 forensic experts have obtained malingering estimates of approximately 15% and 17%, respectively (see Rogers, Salekin et al., 1998; Rogers, Sewell, & Goldstein, 1994). Regarding general clinical practice, this survey data yielded malingering estimates between 5% and 7%; however, these could be overestimates given forensic experts often consult on high-stakes non-forensic issues that may still be consequential to clients (e.g., independent evaluations of insurance claims) (Rogers, 2008a, 2008c). In an archival study of 100 consecutive cases of United States (US) veterans seeking treatment for Vietnam combat-related posttraumatic stress disorder (PTSD), Frueh and colleagues (2005) found that 5% of treatment-seekers had either never served in Vietnam or had never served in the military.

Even though research on the prevalence of deception in non-forensic contexts may be lacking, those working in emergency rooms can often attest to not only malingering by voluntary patients seeking admission, but also to defensive response

² Rogers (2008c; Rogers & Bender, 2012) has pointed out that percentages are higher when a broadened category (i.e., the spectrum from symptom exaggeration to suspected malingering) is used. In other words, the prevalence of malingering is relatively lower when focused on definite cases.

styles by involuntary patients denying psychopathology or refusing to discuss the events that preceded their admission (Rogers, 2008c). Defensiveness is considered to be the polar opposite of malingering, and refers to the gross minimization or intentional denial of physical or psychological symptoms (Rogers, 1984, 2008a; Rogers & Bender, 2012). This may involve denial of symptomatology that is of very serious concern to mental health professionals, such as excessive substance use (Stein & Rogers, 2008; Wooley, Rogers, Fiduccia, & Kelsey, 2013), deviant sexual interests (Lanyon & Thomas, 2008), or suicidal ideation and intention (Ekman & Friesen, 1984). Defensiveness can be contrasted against other deceptive response styles pertaining to overly positive presentations, such as social desirability or impression management. King and Bruner (2000) defined social desirability as the tendency for some individuals to “present themselves in the most favourable manner relative to prevailing social norms and mores” (p. 80). More precisely, social desirability refers to the attribution of positive characteristics in addition to denial of negative qualities (Carsky, Selzer, Terkelson, & Hurt, 1991; Rogers, 2008a). Impression management, by contrast, involves intentional attempts to control others’ perceptions of a person and, sometimes, is conceived of as being more situational than social desirability (Rogers, 2008a).³ Both social desirability and impression management are a focus of attention in personnel selection (Jackson & Crawford, 2008; Rogers, 2008c). For example, psychologists involved in the assessment of law enforcement applicants are often faced with the task of having to distinguish between the typical efforts of candidates who are portraying themselves in a positive light, and those candidates who may be concealing psychopathology (Jackson &

³ Rogers (2008a) qualified that people may engage in impression management for reasons that are not necessarily prosocial in nature, such as “playing dumb” (p. 7).

Crawford, 2008). In other words, defensiveness differs from social desirability and impression management as it involves hiding of symptoms and simulation of adjustment (Rogers & Bender, 2012). Although base rates of defensiveness among mentally disordered individuals are unclear, Rogers (2008d) estimated that they could range from between 16% to 33% of clinical referrals. Similarly, in a meta-analytic review of child custody and job applicant referrals, Baer and Miller (2002) estimated the base rate of defensiveness to be approximately 30%.

Complicating matters further for both researchers and practitioners are individuals who engage in a combination of deceptive response styles within a given situation. In the context of clinical assessments, this type of response style is sometimes referred to as hybrid responding (Otto, 2008; Rogers, 2008a; Rogers & Bender, 2012). For example, under certain circumstances, some individuals might engage in both defensiveness and malingering. More specifically, Rogers (2008c) provided the example of some plaintiffs in personal-injury evaluations who may become defensive with regard to questions of their functioning prior to the injuries, but who also may mangle when queried about their functioning since the injuries. Collectively, these observations suggest that the beliefs that deception is both very rare, and that it has stable base rates, are misconceptions (Rogers, 2008a; Rogers & Bender, 2012; Rogers & Gillard, 2013).

The Importance of Detecting Deceit in Specific Contexts

Practitioners and policymakers employed by criminal justice, healthcare, social service, and airport security agencies are interested in identifying deception for additional reasons beyond preventing criminal, terrorist, or other forms of harmful behaviour. Craig and Badali (2004) summarized several of these additional reasons for those working

specifically in healthcare agencies. First, deception and malingering do not represent trivial problems given mandates emphasizing balance between the provision of quality service and responsible cost management. That is, the willingness to identify and manage deception and malingering is justified by the massive costs incurred when even a very small percentage of individuals are receiving care and monetary support by misrepresenting themselves (also see Rogers & Gillard, 2013). Second, the use of deceit in healthcare settings displaces the care of those who are genuinely suffering. Third, deception and malingering to avoid responsibilities or to obtain drugs violates expectations of fairness, and often elicits anger in those who value social justice.

As it relates to the work of mental health professionals who diagnose mental disorders, the first step in differential diagnosis is to determine whether the presenting symptoms are real or fabricated (First, 2014). Of note, this step precedes ruling out a substance etiology for symptoms, and ruling out a disorder due to a general medical condition. Although ruling out deception may be only the first step in the process of differential diagnosis, it also is described as one of the most difficult determinations to make (First, Francis, & Pincus, 2004). Mental health professionals have been advised to be neither excessively skeptical nor gullible in this regard (First, Frances, & Pincus, 2002).

As difficult as such determinations may be, the *Canadian Code of Ethics for Psychologists* dictates that psychologists should “not knowingly participate in, condone, or be associated with dishonesty, fraud, or misrepresentation” (Sinclair & Pettifor, 2001, p. 75). Turning a blind eye to the possibility of deception also is not an option. On this point, Rogers (2008a) opined that malingering should be systematically evaluated

whenever the outcome of an evaluation has significant consequences, and the code of ethics cited above also states that psychologists should “not suppress disconfirming evidence of their own and their colleagues’ findings and views, acknowledging alternative hypotheses and explanations” (Sinclair & Pettifor, 2001, p. 77). Rogers (2008a, 2008c) further stated bluntly that practitioners’ decisions to neglect such deception represent serious omissions and a likely reflection of professional naïveté.

More to these points, Taylor, Frueh, and Asmundson (2007) have detailed how provision of treatment for mental disorders to those who are likely to be malingering may not only be wasteful of clinicians’ time and resources, but also could be harmful. For example, they argued that treating fabricated PTSD symptoms for a fictitious event with repeated imaginal exposure could make things worse by increasing the risk of implanting false memories. It was stressed that some of the individuals under question could even develop genuine PTSD symptoms if they came to truly believe that they had been traumatized (also see Loftus, 2011). Taylor et al. (2007) described several reasons for why malingerers may present for such treatment. These included cases that they have encountered in which lawyers recommended to clients that they seek treatment in order to obtain an inexpensive or free diagnostic report from the treating clinician, rather than having to hire a psychiatrist or psychologist to conduct a more expensive medico-legal examination.

Whether generalists or forensic specialists, practitioners also must be mindful of the deception that is often associated with specific mental disorders and other clinically-relevant phenomena. Vitacco (2008) provided a useful overview of clinical disorders and syndromes in which deception may be either a peripheral or a central aspect. With regard

to the latter, it was noted that deceitfulness is a core symptom of conduct disorder, and that clinicians must assess the magnitude and type of deception when evaluating youth with this potential diagnosis. It also was highlighted that deceit is a central feature of both antisocial personality disorder (APD) and psychopathy. According to the DSM-5, deceitfulness in APD is indicated by repeated lying, use of aliases, or conning of others for pleasure or profit (APA, 2013). For psychopaths, deception may be observed in the form of superficial charm, pathological lying, and conning or manipulation of others (Babiak et al., 2012; Hare, 1991, 2003, 2006; Hare & Neumann, 2008, 2009). Vitacco (2008) further advised clinicians to be on the lookout for patients who present with atypical, varied, and dramatic symptom patterns, and alert to the possibility that some of these individuals might not be malingering but instead trying to meet deep-rooted psychological needs in the case of factitious disorders. On this point, he also addressed clinicians involved in the assessment of maladaptive parenting practices who often encounter evidence indicating that caretakers are responsible for the ailments of their children. In these scenarios, it was emphasized that a key distinction to be made is whether the actions of these parents represent neglect or intentional efforts to fabricate or induce disorders, as in the case of factitious disorder by proxy. In addition to the defensiveness often associated with substance misuse or paraphilias as they relate to sexual abuse, Vitacco (2008) drew attention to the role of defensiveness and deception in eating disorders. It was noted that deceit may occur in a variety of ways among individuals diagnosed with anorexia nervosa and bulimia nervosa. For example, some individuals may hide food to facilitate binge eating, and others may lie about weight gain or minimize any weight loss.

The above is not to state that mental health professionals should aim to identify every concealment or distortion made by their clients. Of note, the fabrication of an isolated symptom, or minor embellishments concerning the frequency or intensity of symptoms, does not qualify as malingering (Gillard & Rogers, 2010; Rogers & Granacher, 2011). Moreover, consistent with the research cited earlier, Rogers (2008a) also has pointed to persuasive evidence suggesting that some degree of deception is involved in most communications. For example, drawing on the research of Laurenceau, Barrett, and Rovine (2005) that involved an examination of the daily diary reports of married couples, Rogers (2008a) highlighted that the willingness for self-disclosure was multi-determined and variable within intimate relationships. Rogers (2008a) also highlighted that complete and accurate self-disclosure is rare even within the exceptionally supportive context of psychotherapy. Citing the work of Farber (2003), and Farber and Hall (2002), Rogers (2008a) pointed out that issues concerning sexuality, body image, and reproduction are seldom discussed fully in therapy. Thus, it has been argued that only “consequential” distortions and deceptions be considered, and that practitioners go about this work in a professional and ethical manner (Rogers, 2008a, p. 4).

A review conducted by Hill and Knox (2001) of the empirical literature on therapist self-disclosure indicated that it too occurs infrequently, and that therapists typically avoid disclosing personal and intimate details about themselves beyond their professional backgrounds. On this point, Rogers (2008a) has stated that a lack of self-disclosure does not imply dishonesty, but rather an unwillingness to share personal information. For therapists, this appears to be the case for a variety of reasons. For

example, some therapists may avoid self-disclosure to prevent shifting the focus of therapy from their clients to themselves, and others may avoid self-disclosure to maintain appropriate boundaries with clients (Hill & Knox, 2001). Psychologists, also, may not always be completely transparent in their assessment methods. For example, Rogers (2008a; Rogers & Bender, 2012) raised the issue of how providing clients with full descriptions of validity scales on psychological instruments may decrease their effectiveness at detecting malingering (e.g., Rogers, Bagby, & Chakraborty, 1993). It was further stated that such disclosures could be considered equivalent to coaching clients on how to thwart these detection strategies.

Although there may be legitimate reasons for healthcare providers to avoid disclosing specific information under certain circumstances, of particular concern are the problems addressed by Otto (2008) regarding the collateral records of some medical and mental health professionals. More specifically, Otto (2008) highlighted the survey results obtained by Wynia, Cummins, VanGeest, and Wilson (2000) involving 720 American physicians who were asked to anonymously report on their actions when seeking insurance coverage for patients. It was indicated that 28% of these physicians acknowledged exaggerating the severity of some patients' conditions, 23% admitted to changing billing diagnoses, and 10% had reported signs or symptoms in medical charts that their patients did not evidence. Otto (2008) further noted that these patterns of deceptive behaviour do not appear to be limited to physicians, despite the professional obligations of treatment providers. For example, citing another survey conducted by Tubbs and Pomerantz (2001) involving 92 psychologists in Illinois, Otto (2008) pointed to the finding that 18% of these psychologists reported "sometimes" altering a diagnosis

in order to meet insurance criteria. Practitioners, therefore, were cautioned about making erroneous assumptions regarding the validity of information obtained from collateral sources, especially when drawing on this information in other client matters (e.g., forensic examinations) (Otto, 2008).

Deception Detection Accuracy and Associated Problems

Despite the strong interest among practitioners and stakeholders in identifying deception, the majority of people appear to be poor lie detectors (Bond & DePaulo, 2006, 2008; Hartwig & Bond, 2011; Vrij, 2008). Of note, two of the most frequently cited meta-analyses on this topic found that people generally perform around chance levels on deception detection tasks (Bond & DePaulo, 2006, 2008). This finding appears to apply to many professionals who work in the aforementioned settings (see, e.g., Porter, Woodworth, & Birt, 2000; Porter, Juodis, ten Brinke, Klein, & Wilson, 2010; Shaw, Porter, & ten Brinke, 2013). Moreover, the finding does not seem to preclude those employed in law enforcement (see, e.g., Ekman & O'Sullivan, 1991; Hartwig, Granhag, Strömwall & Vrij, 2004; Mann, Vrij, & Bull, 2004; Vrij & Mann, 2001; Vrij et al., 2008).

Inaccurate lie detection poses two major problems. The first problem is obvious and involves failure to identify the potentially harmful acts that have been summarized in this chapter. With specific reference to clinical assessments, misclassifying a malingerer as a genuine patient may result in severe consequences for the criminal justice system, employers, or insurance companies (Rogers & Gillard, 2013). The second problem with flawed lie detection involves false accusations and wrongful convictions (Hartwig, 2011; Kassin, 2012; Kassin & Fong, 1999; Loftus, 2011; Mann et al., 2004; Meissner & Kassin, 2002; Vrij, Mann, & Fisher, 2006). In other words, some individuals may be mistakenly

labelled as behaving deceptively (i.e., false positives). These individuals, in turn, may be denied necessary services, financial well-being, their freedom, or perhaps even their lives in cases where capital punishment is at issue (Kassin et al., 2010; Rogers & Gillard, 2013). On these points, at the time of this writing, there have been 317 documented post-conviction DNA exonerations in the US alone (Innocence Project, 2014). The average length of time served by these exonerees was reported to be 13.5 years, and it was further indicated that 18 of these individuals had served time on death row for crimes that they did not commit. Thus, practitioners, including psychologists, bear a great deal of professional responsibility in their efforts to identify deception accurately and minimize these kinds of errors (Rogers & Gillard, 2013).

Rationale for Examining Verbal and Nonverbal Behaviour of Suspected Deceivers

Many specialized tools and procedures have been developed to assist various professional groups with detecting deceit. Vrij (2008, 2014; Vrij et al., 2010a, 2011, 2013) and his colleagues have already comprehensively reviewed the major strengths, weaknesses, and empirical support (or lack thereof) surrounding use of some of the more popular instruments and methods. These included polygraph techniques based on both the concern approach and the orienting reflex approach (also see Iacono & Patrick, 2008; National Research Council, 2003), the Behaviour Analysis Interview (BAI; Inbau, Reid, Buckley, & Jayne, 2001), Statement Validity Assessment (SVA; e.g., Köhnken & Steller, 1988; Raskin & Steller, 1989; Steller, 1989; Steller & Boychuk, 1992; Steller & Köhnken, 1989), Reality Monitoring (RM; e.g., Sporer, 1997), Scientific Content Analysis (SCAN; Sapir, 1987/2000), and Voice Stress Analysis (VSA; see www.polygraph.org/section/press-room/position-voice-stress). The use of thermal

imaging (e.g., Pavlidis, Eberhardt, & Levine, 2002), functional Magnetic Resonance Imaging (fMRI; e.g., Langleben et al., 2002, 2005), and electroencephalograms (EEG; see, e.g., Farwell & Smith, 2001) to detect deception also were reviewed. Despite the extensive promotion and commercial availability of many of these tools, it was concluded that no tool is infallible and that each suffers from considerable problems and limitations.

More optimistic conclusions have been drawn, however, with regard to the detection of dissimulation as it pertains to mental disorders, cognitive impairment, and medical complaints. A variety of assessment methods for evaluating deceptive response styles were critically examined in the highly respected text *Clinical Assessment of Malingering and Deception* edited by Rogers (2008e). In both his earlier and subsequent reviews of current clinical methods, Rogers (2008c; Rogers & Bender, 2012; Rogers & Gillard, 2013; Rogers & Granacher, 2011; Vitacco & Rogers, 2010) and his colleagues concluded that the selective use of multiple detection strategies lends strength to the identification of specific response styles. In these reviews, the rare-symptoms strategy was characterized as the “workhorse” for the detection of feigned mental disorders (Rogers, 2008c, p. 392). This particular detection strategy takes advantage of symptoms that are infrequently endorsed by genuine patients, and feigners are often detected because they tend to report many of these rare difficulties (Rogers, 2008d; Rogers & Bender, 2012; Rogers & Granacher, 2011; Vitacco & Rogers, 2010). On this point, the rare-symptoms strategy has yielded very large effect sizes (i.e., Cohen’s $d \geq 1.50$) in both experimental research employing simulation designs, and in studies involving real-world known-groups comparisons (Rogers, 2008c, 2008d). It was suggested that practitioners use a multi-method approach incorporating both test- and interview-based measures when

conducting their assessments (Rogers, 2008c; Rogers & Bender, 2012; Rogers & Granacher, 2011; Vitacco & Rogers, 2010). Recommended scales on psychological tests and interviews that capitalize on the rare-symptoms strategy included: the infrequency-psychopathology scale (Fp; Arbisi & Ben-Porath, 1995) of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kraemmer, 1989; Butcher et al., 2001); the Negative Impression Management (NIM) scale of the Personality Assessment Inventory (PAI; Morey, 1991); and the Rare Symptoms (RS) scale of the Structured Interview of Reported Symptoms (SIRS; Rogers, Bagby, & Dickens, 1992).

For clinical practice, Rogers (2008c; Rogers & Bender, 2012; Rogers & Gillard, 2013; Rogers & Granacher, 2011) and others also recommended employing the “erroneous stereotypes” strategy on account of its effectiveness with relatively sophisticated feigners. This detection strategy draws on the finding that many individuals, even mental health professionals, hold common misconceptions regarding clinical features that are usually associated with mental disorders (Rogers, 2008d; Rogers & Bender, 2012). As with the rare-symptoms strategy, feigners are often identified via over-reporting of such stereotypes. Also, like the rare-symptoms strategy, very large effect sizes have been observed in both simulation and real-world studies that have used the erroneous stereotypes strategy to identify feigning (Rogers, 2008c, 2008d). Moreover, it was highlighted that this particular detection strategy seems to be resistant to coaching (Rogers, 2008d). Currently, the most favourable scale for tapping erroneous stereotypes appears to be the MMPI-2 Dissimulation scale (Ds) (Rogers, 2008c; Rogers & Bender,

2012; Rogers & Gillard, 2013; Rogers & Granacher, 2011), which was originally developed by Gough (1954).

Despite the widespread use of many of the aforementioned methods, Vrij et al. (2010a) maintained that observation of behaviour is still the most commonly used approach for detecting deceit. This is partly the case because certain technologies and equipment (e.g., fMRI) may be either unavailable or impractical to implement in most situations. On these points, many police officers the world over are trained to evaluate the verbal and nonverbal behaviour of criminal suspects during interviews to help them distinguish between those who are likely to be innocent, and those who are likely to be guilty and deliberately withholding crucial information (see Horvath, Blair, & Buckley, 2008). Porter and ten Brinke (2008) highlighted that many airport security staff also are trained to identify potential threats partly by watching for concealed emotions in the faces of passengers.

Although it may sound simple and ideal to use physical evidence to guide determinations on the veracity of matters, Porter and ten Brinke (2009) further highlighted that, in many legal cases, there may be little or no evidence other than the conflicting accounts of those involved. In countries with no statute of limitations, such as Canada, it also was pointed out that legal decision-makers may have to make determinations concerning allegations of events that occurred decades ago. Porter and ten Brinke (2009) emphasized that the testimony of witnesses in many of these cases may be the only evidence. In their review of relevant court cases, the opportunity for legal decision-makers to scrutinize the demeanour of witnesses was stressed. Citing a conclusion by the Supreme Court of Canada in *R. v. B. (K. G.) (1993)*, Porter and ten

Brinke (2009) underscored that judges and juries need to be able to view witnesses clearly in order to sufficiently evaluate body language, facial expressions, or other indicators of credibility that are not discernible from written transcripts.

But which behaviours should be attended to when evaluating those who are suspected of duplicity, and for what reasons? Are there any that are uniquely associated with deception? Do discernable behavioural differences between truth-tellers and liars even exist? If so, is there a single behavioural profile suggestive of deceit that observers should be mindful of? Or might there be many? These questions, and others, are addressed in the following chapters of this dissertation.

CHAPTER 2. STUDY 1:

SUBTYPING THE BEHAVIOURAL EFFECTS OF DECEIT

The first study in this dissertation involved an extended exploratory analysis of verbal and nonverbal behavioural cues to deception displayed by criminal offenders and non-offenders while they described both planned truthful and deceptive accounts of negative life events (Porter, Doucette, et al., 2008). The objective of the current study was to determine whether these individuals could be grouped in terms of similar behaviour changes when comparing lying to a truth-telling baseline. As detailed in the previous chapter, when forming judgments of the truthfulness of communications, in many instances observers may be limited to considering little more than the demeanour of the individuals under question. Behavioural cues to deceit, however, are not understandable without first having some conceptual understanding of why and when these behaviours may appear (Ekman, 1988). Therefore, the dominant conceptual formulations regarding behavioural cues to deception are summarized before a rationale for subtyping individuals with respect to cues is presented. The following formulations are those that have been featured most prominently in key reviews of the empirical literature (see, e.g., DePaulo et al., 2003; Vrij, 2008; Vrij et al., 2010a, 2013).

Verbal and Nonverbal Cues to Deception: Conceptual Background

Ekman and Friesen (1969). Some researchers have credited Ekman and Friesen (1969) with publishing “the first influential theoretical statement” on behavioural cues to deceit (DePaulo et al., 2003, p. 74). In their seminal article, a distinction was made between leakage cues and deception cues. Leakage cues were described as those cues that reveal what liars are attempting to hide, such as how they truly feel. Deception cues, by

contrast, suggest that deceit may be occurring, but do not reveal the nature of the concealed information.

Ekman and Friesen (1969) provided “micro expressions” as an example of possible leakage cues (p. 98). In contrast to macro facial expressions, which were characterized as often lasting for about half a second, micro facial expressions were described as being so short in duration that they are at the threshold of recognition and almost imperceptible to untrained observers. More specifically, Ekman and Friesen (1969) considered the face to be the primary site for displays of affect (e.g., happiness, anger, fear, sadness, surprise, disgust), and underscored that these displays can be intensified, weakened, neutralized, or masked by another emotion. Micro affect displays were thought to represent the fragments of squelched, neutralized, or masked displays. That is, some affect displays may begin to emerge before senders are completely conscious of them or able to suppress them, given the speed of the face as a sending system. Ekman and Friesen (1969) postulated that, if there is a brief but relatively complete display of affect, then such micro displays may represent leakage. It was further stated that such micro displays are often followed by, or are covered by, simulated and opposing macro displays of affect; however, untrained observers often miss these micro displays.

In contrast to leakage cues, Ekman and Friesen (1969) provided poorly performed simulations of affect as an example of deception cues. Excessively long and overly expressive performances were highlighted in this regard. Specific examples included smiles that are too long in duration, or frowns that are too severe. In their comprehensive meta-analytic review of 158 cues to deceit, DePaulo and colleagues (2003) highlighted

that nearly all of the cues reported in the literature are deception cues as opposed to leakage cues.

According to Ekman and Friesen (1969), the face is not the only source of potential leakage or deception cues. The hands also were said to be a source of these cues. On this note, the importance of adaptors was addressed. Ekman and Friesen (1969) described adaptors as having developed from movements that were first learned by individuals early in life as part of their efforts to meet bodily needs, perform actions, manage emotions, and learn instrumental tasks. It was dictated that, in adulthood, adaptors are emitted during social interactions in a fragmented form of the original behaviour. These fragments of previously learned adaptive acts are said to be maintained by habit. Ekman and Friesen (1969) conceived that, when first learned, these adaptive behaviours were associated with specific drives, felt emotions, expectancies, interpersonal interactions, or certain settings. In adulthood, these old habits are believed to be triggered by something in the current environment; however, the total activity is rarely carried out completely. It was further indicated that these behaviours may appear to be random to observers without knowledge of the origin of the activities. Given their habitual nature, adaptors also were characterized as occurring without awareness.

Self-adaptors, also referred to as self-manipulations (see, e.g., Granhag & Strömwall, 2002), are believed to be based on behaviours learned to manage various problems and needs (e.g., to groom or modify the attractiveness of the face or body). Other types of adaptors are thought to originate in early interpersonal contacts (e.g., movements necessary for defending or attacking). Ekman and Friesen (1969) suggested that individuals often will be uncomfortable when engaging in deception, and that these

adaptors may emerge as deception clues that betray the discomfort. For example, these individuals may scratch or pick at themselves. As an example of an adaptor as a leakage cue, Ekman and Friesen (1969) described individuals who, while smiling, may also be tearing at a fingernail. As another example, these researchers indicated that the formation of a fist may leak interest in an attack.

In contrast to adaptors, Ekman and Friesen (1969) defined illustrators as actions that are tied to verbal speech. More precisely, illustrators demonstrate what is being said through pointing, pictorial enactment, rhythmic movements, and kinetic actions. It was suggested that a lack of usual illustrative hand movements may indicate individuals who do not believe what they are saying. Ekman and Friesen (1969) characterized such presentations as unnatural.

Zuckerman, DePaulo, and Rosenthal (1981). Although it was premised that the communication of deception was unlikely to be associated with any single verbal or nonverbal behaviour, Zuckerman and colleagues (1981) asserted that deception involves various psychological states and processes that influence behaviour. It was argued, then, that the search should be for those states and processes that are either more or less likely to occur when individuals are lying compared to when they are telling the truth. It was further argued that this search also should focus on behavioural cues that may be suggestive of such states or processes. Zuckerman et al. (1981) described four constructs that could be used in such a manner. In the current deception literature, these constructs are generally referred to as: arousal, emotional reactions, cognitive effort, and attempted behavioural control (Vrij, 2008). Each construct will be discussed in further detail as it relates to the phenomenon of deception.

The Role of Arousal.

Based on the research available at the time on psychophysiological approaches to deception detection, Zuckerman and colleagues (1981) reasoned that liars might experience a greater degree of undifferentiated arousal compared to truth tellers, and that this arousal may be manifested in the form of greater pupil dilation, increased eye blinks, a greater frequency of speech disturbances (i.e., errors and hesitations), and a higher voice pitch (DePaulo et al., 2003). It was acknowledged, however, that this general autonomic responsivity to deception may be explained by the experience of particular emotions while lying (Zuckerman et al., 1981). In other words, the possibility was raised that cues to deception may be better accounted for by the specific affects that are involved, and that the concept of diffuse or general arousal may be unnecessary.

The Role of Emotional Reactions.

It was further proposed that, to the extent that deceivers experience guilt over lying or fear of getting caught, behaviours indicative of guilt and fear may be displayed more often by liars than by those telling the truth (DePaulo et al., 2003; Zuckerman et al., 1981). As it relates to the current dissertation research, Zuckerman et al. (1981) suggested that liars might fidget more than truth-tellers. There also may be an increase in direct expressions of negative affect. For example, facial expressions might become less pleasant. It was further suggested that deceivers may attempt to disassociate themselves from their deceptive messages in order to minimize the negative experiences. Zuckerman and colleagues (1981) referred to this strategy as indirectness or withdrawal based on the work of Knapp, Hart, and Dennis (1974) and others. More specifically, Zuckerman et al. (1981) postulated that this strategy might result in evasive responses, decreased eye

contact, and less direct body orientation toward targets. Some of these researchers also conceived of speaking in the third-person as a way of disassociating from one's responses (e.g., DePaulo, Rosenthal, Rosenkrantz, & Green, 1982).

The Role of Cognitive Effort.

Zuckerman and his colleagues (1981) claimed that lying is more difficult and cognitively complex than telling the truth. It was said to be more difficult because liars have to formulate communications that do not contain logical inconsistencies and do not contradict information that others may already know. Given these challenges, it was predicted that deception may result in increased speech pauses or hesitations, longer response latencies, and fewer illustrators. With regard to the latter cue, Zuckerman et al. (1982) highlighted an earlier suggestion made by Ekman and Friesen (1972) that high levels of concentration during speeches would lead to decreases in the frequency of illustrators.

The Role of Attempted Behavioural Control.

Some individuals may attempt to control their behaviour while lying in order to maintain their deception, and these very attempts may, paradoxically, serve as cues to deceit (DePaulo et al., 2003; Zuckerman et al., 1981). That is, controlled behaviours could come across as overly planned, rehearsed, and lacking in spontaneity. Zuckerman and colleagues (1981) also proposed that discrepancies in verbal and nonverbal behaviours may become apparent to observers (e.g., discrepancies between the face, body, and voice). This was deemed to be a possibility because it was conceived that some channels of behaviour may not be completely controllable, and people may not be able to

simultaneously control all aspects of their behaviour with equal effectiveness (DePaulo et al., 2003; Zuckerman et al., 1981).

Ekman (1985/1992). In his later work, Ekman (1985/1992) made a distinction between cues that are related to thinking, and cues that are related to feeling. With regard to the former, liars do not always have time to prepare, memorize, or rehearse their lines. In some cases, this might result in accounts that are either internally inconsistent, or accounts that are contrary to known facts. Ekman (1985/1992) elaborated that failure to prepare and remember one's lines may produce cues in how accounts are delivered, even when there are no discrepancies in what is being said. That is, the need to think carefully about each word before it is spoken could result in obvious speech pauses. Of note, Ekman (1985/1992) also recognized that some liars may over-prepare their lines, and that this could result in accounts that seem too smooth and rehearsed.

It has been suggested, however, that Ekman's (1985/1992) "more important contribution" on cues to deceit was his conceptualization of the role of emotions (DePaulo et al., 2003, p. 75). More specifically, DePaulo and colleagues (2003) highlighted Ekman's (1985/1992) argument that it is possible to predict behaviours that discriminate truth-tellers from liars by understanding the emotions experienced by liars. On this point, Ekman (1985/1992) asserted that the fear of being caught, guilt about lying, and delight in having duped someone are so often involved in deception that they deserve specific attention. More precisely, fear cues were said to be indicative of detection apprehension. Examples of fear cues included higher voice pitch, louder and faster speech, pauses, speech errors, and indirect speech (DePaulo et al., 2003). In relation to guilt, Ekman (1985/1992) postulated that cues might include those associated

with sadness. On this note, DePaulo et al. (2003) referenced lower voice pitch, slower and softer speech, and gazing downward as examples. With regard to “duping delight”, cues suggestive of excitement were addressed, which may include higher voice pitch, louder and faster speech, and an increased use of illustrators (DePaulo et al., 2003; Ekman, 1985/1992). Importantly, because Ekman (1985/1992) noted that emotions also are relevant to when liars are simulating emotions that they are not experiencing, and when they are experiencing emotions that they are trying to hide, DePaulo et al. (2003) pointed out that cues also are dependent on the specific emotions that are being simulated and experienced.

Buller and Burgoon (1996). Buller and Burgoon (1996) accepted many of the concepts and propositions put forth by Ekman and Friesen (1969), and Zuckerman et al. (1981). Buller and Burgoon’s (1996) formulation, however, is distinguished from those of others in its emphasis on interpersonal communication processes. That is, the active participation of both senders and receivers was said to be a hallmark of interpersonal communication. Moreover, it was stressed that interpersonal communication is a dynamic activity. Buller and Burgoon (1996) further highlighted that behavioural patterns fluctuate over time as communicators adjust to each other’s feedback, adapt to the communication context, or change topics. Given these premises, it was argued that a uniform deceptive profile would be unlikely. It also was conceived to be unlikely because patterns of behaviours were said to vary with the senders’ goals, expectations, relationship with the receivers, and the receivers’ suspiciousness of the senders (Buller & Burgoon, 1996; DePaulo et al., 2003).

Both DePaulo et al. (2003) and Vrij (2008) highlighted the relevance of Buller and Burgoon's (1996) notion that people are engaged in several important tasks when attempting to deceive others. More specifically, while attempting to convey their message, deceivers also have to monitor their targets for signs of suspicion and modify their behaviour accordingly. DePaulo et al. (2003) stated that such demands may be challenging at first; however, Buller and Burgoon (1996) postulated that these difficulties should lessen with time as the deceivers receive more feedback, make adjustments, and obtain more control over their performance. Buller and Burgoon (1996), therefore, expected that liars in interactive situations should become more involved, pleasant, composed, fluent, and smooth in turn-taking as the interactions progressed.

DePaulo et al. (2003). Before they presented the results of their comprehensive meta-analysis on behavioural differences between truth-tellers and liars (summarized in the next section of this chapter), DePaulo and colleagues (2003) outlined the implications of a self-presentational perspective for predicting cues to deceit. They argued that the many varieties of lies are united by a single identity claim of honesty. It was stipulated that claims to honesty do not distinguish truth-tellers from liars. Deceivers, however, were said to be successful in their lies only to the extent that they appear sincere.

DePaulo et al. (2003) asserted that cues to deceit can be predicted based on the discrepancy between liars' claims and their beliefs concerning the truth of the matters. They elaborated that deceitful self-presentations are often not as convincingly embraced as truthful self-presentations. This difficulty for liars was said to be partly related to moral qualms that are not experienced by those telling the truth, which may account for the slight feelings of discomfort experienced by those engaged in deception. It also was

stated that liars may lack personal investment in their claims, given they may not have the relevant knowledge or experiences to back them. Based on these premises, it was conceived that liars may appear tense, less pleasant and forthcoming, and that their accounts would not seem compelling. DePaulo and her colleagues (2003) further implied that people usually experience an increased sense of deliberateness when behaving deceptively. In contrast, when behaving honestly, people were said to be “just acting naturally” most of the time (DePaulo et al., 2003, p. 77).⁴ Drawing on the work of Baumeister (1998), DePaulo and colleagues (2003) suggested that managing impressions of credibility represent attempts at self-regulation, and that these attempts consume mental resources. A stated implication of this self-regulatory busyness was that it may compromise deceivers’ abilities to generate detailed responses.

Citing Ekman’s (1985/1992) contributions, DePaulo et al. (2003) also suggested that thoughts and feelings (e.g., guilt, anxiety) could burden liars. If preoccupied by such mental content, it was indicated that the performance of deceivers may suffer, and that they may seem less engaged in their interactions. Moreover, efforts to control such thoughts and feelings were said to be a likely response for liars. Trying not to think about one’s insincerity was provided as an example; however, DePaulo et al. (2003) also recognized the longstanding observation that attempts at thought suppression often lead to increased preoccupation with the thoughts.

Overt behaviours were further formulated to be a target of self-regulatory efforts. It was highlighted that some deceivers may try to avoid acting in ways that they believe liars behave, but a risk to this strategy is that some of their beliefs may be inaccurate. In

⁴ It was qualified that truthful individuals sometimes experience a sense of deliberateness (e.g., when thoughts and feelings are difficult to express, or when the stakes are high for a persuasive performance).

this regard, DePaulo et al. (2003) provided the example of the typical belief that liars cannot stay still, and that some liars may seem to be holding back or lacking in involvement and positive engagement when trying to avoid movements so as to appear credible. Based on these premises, it was conceived that liars' deliberate attempts to control their thoughts, feelings, and behaviours would be compromised, and that they would appear tense, less pleasant, less convincing, and less forthcoming.

It should be noted that the self-presentational perspective rejects the notion that lying is typically a complicated, stressful, and guilt-inducing behaviour that elicits strong cues. According to DePaulo et al. (2003), deceptive presentations are carried out so regularly that only faint behavioural cues may be evident. As it relates to appearing less forthcoming, it was conceived that liars may respond in less detail, and that they may seem to be holding back. More precisely, their response latencies may be longer, and their speech may be slower. In terms of providing accounts that are less compelling, it was contended that there would be more discrepancies in the accounts of liars, and that they would appear less engaged, more uncertain, less fluent, and less active than truth-tellers. The self-presentational perspective on cues to deception also predicts that liars may appear less pleasant and positive than truth-tellers. Lastly, DePaulo et al. (2003) asserted that only their model predicts that the accounts of liars will contain fewer ordinary imperfections or unusual contents, given their proposition that even the most informed deceivers may have misconceptions about the nature of truthful accounts (e.g., truthful accounts are highly structured and coherent with few digressions).

Rationale for Subtyping the Behavioural Effects of Deception and Hypotheses

As mentioned in the first chapter, people tend to be poor lie detectors. Detecting deceit appears to be a difficult task for many reasons. One reason for the difficulty is that there does not appear to be any behaviour that always occurs when people are lying, but never occurs at any other time (DePaulo et al., 2003). Put simply, there does not appear to be any behaviour akin to Pinocchio's nose that observers can use to identify deception (Hartwig, 2011; Vrij, 2008; Vrij et al., 2010a).

Of relevance to this dissertation are the results from DePaulo et al.'s (2003) widely cited meta-analysis that reported on the combined results of 1,338 estimates for 158 cues to deception. The results of this meta-analysis indicated that most behaviours believed to be suggestive of lying have weak or no empirical relationships with deception (also see meta-analyses conducted by Sporer & Schwandt, 2006, 2007). On this point, DePaulo and colleagues (2003) reported a median Cohen's *d* effect size of .10 for 88 cues, and further highlighted that only three cues had effect sizes greater than .40. Such findings have led some researchers (e.g., Vrij et al., 2010a) to conclude that deception detection is difficult partly because it is not easy to spot the subtle behavioural differences between truth-tellers and liars, a conclusion that has been supported by the findings of more recent meta-analyses (see Hartwig & Bond, 2011).

Also of relevance to this dissertation, however, are anecdotal observations that different individuals seem to display different behavioural cues to deceit (Vrij, 2008). On this note, Vrij (2008) addressed the possibility that each individual does show clear signs of deceit, but that different individuals show different signs. It was further postulated that this might result in no signs of deceit emerging when these individuals are analyzed at a

group level, which was said to be typical of studies on deception. Despite these observations and propositions, there do not appear to have been any previous attempts at subtyping the behavioural effects of deception.

With regard to identifying subtypes of individuals in terms of verbal and nonverbal cues to deceit, the data obtained by Porter, Doucette et al. (2008) are valuable for several reasons. First, their study examined cues to deception in a sample of both criminal offenders and undergraduate students. More specifically, the data are valuable because most research examining deceptive behaviour has involved university students as participants (DePaulo et al., 2003; Hartwig, 2011), and the inclusion of offenders was intended to increase the generalizability of the findings. Second, participants in Porter, Doucette et al.'s (2008) study provided *both* truthful *and* deceptive accounts of negative life events. That is, the employment of a within-subjects design was consistent with recommendations put forth by senior researchers on the topic of deception detection in regards to making comparisons against baseline truthful behaviour when evaluating the behavioural responses of individuals suspected of engaging in deception (Hartwig, 2011; Vrij, 2008; Vrij et al., 2010a). Such recommendations have been made on account of the large individual differences that have been observed in people's behaviour and speech (DePaulo & Friedman, 1998), which may place some groups at risk for being falsely accused of lying. These groups include people whose natural behaviour may appear suspicious to others (e.g., introverts and socially anxious individuals to name a few) (Vrij et al., 2010a). Third, the data obtained by Porter, Doucette and colleagues (2008) are valuable for subtyping because the cues investigated appear to be representative of those described in the major formulations on cues to deceit summarized earlier. When

attempting to identify subtypes of individuals via cluster analysis, which was the technique employed in the current study, Nunnally (1978) stressed the importance of sampling variables that are representative of a specified domain. As will become clearer from the description of the study methodology, Porter, Doucette et al. (2008) examined a reasonably ample number of variables that have been thought to be important in the domain of verbal and nonverbal cues to deceit.

The current study was conducted in an exploratory manner because there appear to have been no previous attempts at subtyping individuals in terms of behavioural cues to deception. The lack of previous research and theory in this realm made it difficult to generate specific hypotheses beyond that subtypes would be identified. Again, this hypothesis was based on anecdotal observations (see Vrij, 2008), and it was difficult to hypothesize further on the number of subtypes that would emerge, or on the form that they would take.

It also should be noted that the data were still analyzed in terms of mean differences for behaviours observed in the truthful condition versus behaviours observed in the deceptive condition. Doing so facilitated a comparison of the findings when the focus was on the group level versus subtypes. In this respect, it was reasonable to hypothesize that either small or no group differences would emerge, consistent with meta-analytic reviews on behavioural cues to deceit (DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007).

Lastly, interrelationships among cues to deceit were investigated in the current study. On this matter, Nunnally (1978) stated that if variables are part of a theoretical system, it is likely that at least moderate-sized correlations will be observed among them.

Given that the variables described in the next section of this chapter have been conceptualized as being important in the domain of verbal and nonverbal cues to deceit, it is reasonable to hypothesize that at least some of the cues will be moderately correlated with each other. Although such a hypothesis may seem obvious, this issue does not seem to have been a major focus of attention in either individual studies of deception or in meta-analytic reviews. If moderate or large-sized correlations are observed among some cues to deceit, then it could have implications for the application of these cues in the practice of detecting deception.

Method

Participants

The offenders in the sample were 26 adult males serving federal sentences at a medium-security correctional facility in eastern Canada. Their mean age was 31.7 years ($SD = 10.1$). The non-offenders in the sample were 38 undergraduate students attending a university, also in eastern Canada. Their mean age was 20.8 years ($SD = 5.7$). Twenty-six (68.4%) of the undergraduate student participants were female and 12 (31.6%) participants were male.

Procedure

Participants in this study related one honest and one fabricated (counterbalanced) negative life event on videotape. They were given 10 minutes to plan each account, followed by a break to plan the next account. All participants were asked to provide a “credible and believable” description of the event in no more than five minutes. They also were told that their stories would be viewed by various groups to assess their honesty. Both truthful and fabricated events were limited to the five years preceding

participation in the study. It should be noted that asking participants to tell the truth and lie about past criminal behaviour was not possible due to the potential ethical dilemmas that could arise.

The participants were asked to provide their complete recollection of the negative life event, including when it occurred, its location, people present at the time, and all other factual details that they could remember. Beforehand, participants were provided with a list of potential types of negative life events that they could discuss (e.g., a serious accident, a medical procedure, or the death of a loved one). The events chosen, however, were ultimately up to the participants in light of their unique past experiences. Interviewers did not interject or request elaboration of details while the participants provided their accounts on video.

Each video was coded for four nonverbal cues. These cues included: frequency of illustrators (finger, hand, or arm movements); frequency of self-manipulations (touching/scratching of hands, head, or other body parts); frequency of clear head movements (nods, shakes); and frequency of smiles or laughs. The videos also were transcribed verbatim to facilitate the coding of verbal behaviour. Each account was coded for length in terms of the number of words and response length in seconds. Speech rate was calculated by coding the number of words spoken per minute. Additionally, the stories were coded for the frequency of filled pauses/speech hesitations (“umm”, “ahh”, “well”, etc.), frequency of unfilled speech pauses (greater than two seconds in duration), and frequency of self-references (“I”, “me”, “my”, “we”).

A second rater coded 20% of the videos, so that the interrater reliability of the cues could be determined. Correlational analyses indicated that coding of the behaviours

was reliable. More specifically, the Pearson product-moment correlations for behaviours observed in the truthful accounts were as follows: smiles = .82; head movements = .68; illustrators = .98; self-manipulations = .93; filled pauses = .98; speech pauses = .95; and self-references = .99. Similarly, the correlations for behaviours observed in the deceptive accounts were: smiles = .88; head movements = .75; illustrators = .95; self-manipulations = .91; filled pauses = .69; speech pauses = .62; and self-references = .99.

Results

Searching for Outliers

The raw data concerning the 10 coded behaviours were examined for both univariate and multivariate outliers prior to performing any statistical analyses, as per standard recommendations (e.g., Tabachnick & Fidell, 2007). In searching for univariate outliers, the raw data were first converted to *z*-scores and then inspected for extreme standardized values. Mahalanobis distance was used to identify potential multivariate outliers. These evaluations were conducted separately for data obtained from participation in both the truthful and deceptive conditions. No outliers were identified.

Tests of Significance and Error Rates

Given the exploratory nature of this research, all statistical analyses performed involved two-tailed tests of significance. As in other exploratory research (e.g., Baumeister, Wotman, & Stillwell, 1993; Juodis, Woodworth, Porter, & ten Brinke, 2009), the Type I error rate was set at .05 for each statistical test conducted and Bonferroni corrections to this error rate were not made. The rationale for this decision was to prevent neglect of any potentially novel and important findings. Although there is a possibility for spurious findings to emerge by chance by proceeding in this manner,

there are no statistical corrections for missing important discoveries due to insufficient attentiveness to the data (Bem, 2004). Conducting research in this fashion simply underscores the importance of cautious interpretation and replication of results.

Comparing Truthful and Deceptive Accounts: Students versus Offenders

A series of 2 (participant group: student vs. offender) x 2 (veracity of account: truthful vs. deceptive) repeated measures factorial analysis of variance (ANOVA) were conducted to determine whether the truthful and deceptive accounts from students differed from those of offenders. The 10 coded behaviours were entered as the dependent variables. The results of these analyses, presented in Tables 1 and 2, showed a significant main effect for participant group with regard to smiles only. More specifically, on average and across the experimental conditions, students smiled significantly more often ($M = 4.41$; $SD = 3.54$) than offenders ($M = 1.21$; $SD = 1.68$). No significant interaction with the veracity of the account qualified this result.

The results in Table 1 and Table 2 also show that the ANOVAs revealed main effects for the veracity of the accounts with regard to time and number of words. More specifically, deceptive accounts took a significantly shorter amount of time to deliver and contained significantly fewer words than truthful accounts. Tables 1 and 2 further show a main effect for veracity of the accounts for head movements. That is, deceptive accounts involved significantly fewer head movements than truthful accounts. The main effects with respect to account veracity for the other coded behaviours failed to reach significance. No significant interactions qualified these results.⁵

⁵ Because the distributions of many coded behaviours were found to be positively skewed, nonparametric statistical analyses also were performed to determine whether significant differences existed between the truthful and deceptive accounts at the overall group level. A series of Wilcoxon's matched-pairs signed ranks tests yielded results that were generally consistent with the results of the ANOVAs.

Lastly, in considering the results of the ANOVAs, Tables 1, 2, and 3 indicate that there was a significant interaction between participant group and veracity of the account for speech pauses only. Specifically, as shown in the tables, the truthful and deceptive accounts of students did not differ significantly in terms of the number of speech pauses. The tables show a different result for offenders, however. That is, there were significantly fewer speech pauses by offenders during the delivery of the deceptive accounts compared to the delivery of the truthful accounts. This result represented a medium effect size when considering Cohen's (1992) standards for small ($d = .20$), medium ($d = .50$), and large ($d = .80$) effect sizes for independent means.

Table 1

Coded Behaviour Cell Means (and Standard Deviations) for Students' and Offenders' Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	Students (<i>n</i> = 38)			Offenders (<i>n</i> = 26)			Overall (<i>n</i> = 64)		
	Truthful	Deceptive	Mean Difference	Truthful	Deceptive	Mean Difference	Truthful	Deceptive	Mean Difference
Smiles	4.39 (4.28)	4.42 (3.78)	.03 (3.89)	1.73 (2.59)	.69 (1.12)	-1.04 (2.14)	3.31 (3.89)	2.91 (3.51)	-.41 (3.32)
Head movements	15.18 (14.97)	13.92 (11.87)	-1.26 (10.47)	15.00 (19.18)	10.77 (14.24)	-4.23 (11.09)	15.12 (16.66)	12.64 (12.87)	-2.47 (10.74)
Illustrators	13.29 (18.39)	13.61 (14.73)	.32 (13.28)	9.27 (13.59)	7.96 (10.66)	-1.31 (9.35)	11.66 (16.61)	11.31 (13.43)	-.34 (11.78)
Self-manipulations	15.11 (17.23)	14.79 (13.39)	-.32 (14.87)	10.08 (12.87)	11.04 (13.43)	.96 (7.88)	13.06 (15.69)	13.27 (13.43)	.20 (12.44)
Time (seconds)	113.21 (71.38)	98.92 (49.72)	-14.29 (44.77)	120.92 (103.84)	91.96 (66.91)	-28.96 (77.68)	116.34 (85.36)	96.09 (56.93)	-20.25 (60.21)
Words	341.61 (217.15)	298.92 (164.30)	-42.68 (137.95)	352.00 (322.44)	271.58 (195.28)	-80.42 (250.54)	345.83 (262.63)	287.81 (176.55)	-58.02 (190.88)
Speech rate	183.88 (31.04)	182.65 (31.15)	-1.24 (22.96)	171.68 (25.30)	177.80 (26.06)	6.11 (27.09)	178.93 (29.27)	180.68 (29.07)	1.75 (24.78)
Filled pauses	10.97 (9.92)	11.05 (9.67)	.08 (7.51)	12.58 (14.57)	8.38 (8.74)	-4.19 (12.71)	11.63 (11.94)	9.97 (9.33)	-1.66 (10.08)
Speech pauses	2.13 (2.59)	2.29 (2.18)	.16 (2.37)	3.46 (3.18)	2.23 (1.92)	-1.23 (2.64)	2.67 (2.90)	2.27 (2.06)	-.41 (2.56)
Self-references	24.29 (20.08)	22.13 (15.38)	-2.16 (20.60)	24.54 (30.15)	15.92 (12.64)	-8.62 (29.80)	24.39 (24.44)	19.61 (14.55)	-4.78 (24.73)

Table 2

Results of 2 x 2 Repeated Measures Univariate ANOVAs on Coded Behaviours.

Behaviour	Group			Veracity			Group x veracity		
	$F(1, 62)$	p	η_p^2	$F(1, 62)$	p	η_p^2	$F(1, 62)$	p	η_p^2
Smiles	18.33	<.001	.23	1.45	.233	.02	1.61	.210	.03
Head movements	.22	.641	.00	4.05	.048	.06	1.18	.281	.02
Illustrators	1.89	.174	.03	.11	.743	.00	.29	.592	.01
Self-manipulations	1.72	.194	.03	.04	.840	.00	.16	.690	.00
Time (seconds)	.00	.982	.00	7.96	.006	.11	.92	.342	.02
Words	.03	.871	.00	6.38	.014	.09	.60	.442	.01
Speech rate	1.63	.207	.03	.60	.441	.01	1.37	.247	.02
Filled pauses	.05	.827	.00	2.64	.109	.04	2.85	.096	.04
Speech pauses	1.34	.252	.02	2.89	.094	.04	4.84	.032	.07
Self-references	.54	.465	.01	2.93	.092	.05	1.05	.309	.02

Table 3

Results of t-Tests Comparing Behaviours Coded in Students' and Offenders' Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	Students ($n = 38$)			Offenders ($n = 26$)		
	$t(37)$	p	d	$t(25)$	p	d
Smiles	-.04	.967	.00	2.47	.021	.48
Head movements	.74	.462	.12	1.95	.063	.38
Illustrators	-.15	.884	-.02	.71	.482	.14
Self-manipulations	.13	.897	.02	-.62	.539	-.12
Time (seconds)	1.97	.057	.32	1.90	.069	.37
Words	1.91	.064	.31	1.64	.114	.32
Speech rate	.33	.741	.05	-1.15	.261	-.23
Filled pauses	-.07	.949	-.01	1.68	.105	.33
Speech pauses	-.41	.683	-.07	2.38	.026	.47
Self-references	.65	.522	.10	1.47	.153	.29

Note. Values under the fourth and seventh columns are effect sizes for independent samples.

Calculating and Correlating Difference Scores

Difference scores were computed for the 10 coded behaviours to capture changes when lying compared to a truth-telling baseline. These computations yielded 10 difference scores for each participant. Specifically, the truthful values of the coded behaviours were subtracted from the deceptive values. For example, the difference score for number of words for each person equalled the number of words spoken in the deceptive condition minus the number of words spoken in the truthful condition. In this manner, a negative difference score indicated a decrease in behaviour when lying compared to a truth-telling baseline. Conversely, a positive difference score indicated an increase in behaviour when lying compared to a truth-telling baseline.

The 10 difference scores for all 64 participants were submitted to correlational analyses. These analyses were performed to determine the nature and strength of the relationships among difference scores. Specifically, Pearson product-moment correlations were calculated. The results of these analyses are presented in Table 4.

Table 4

Pearson Product-Moment Correlations among Difference Scores of Coded Behaviours for Participants (n = 64) Relating Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Smiles	-	.49***	.38**	.01	.20	.21	.20	.17	-.16	.15
2. Head movements		-	.61***	.47***	.54***	.57***	.43***	.31*	-.05	.46***
3. Illustrators			-	.28*	.45***	.52***	.35**	.39**	-.15	.40**
4. Self-manipulations				-	.41**	.37**	.06	.20	.19	.38**
5. Time (seconds)					-	.98***	.22	.79***	.32*	.79**
6. Words						-	.39**	.79**	.21	.79***
7. Speech rate							-	.19	-.40**	.23
8. Filled pauses								-	.18	.65***
9. Speech pauses									-	.33**
10. Self-references										-

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

As can be seen in Table 4, results indicated that some pairs of difference scores were not significantly related, and other pairs were significantly correlated but to varying degrees. In considering Cohen's (1992) standards for small ($r = .10$), medium ($r = .30$), and large ($r = .50$) effect sizes, some significantly correlated pairs of difference scores evidenced medium-sized relationships, and others evidenced large-sized relationships. Almost all of the statistically significant relationships were positive relationships. This finding indicated that changes from truth-telling to lying for these pairs of behaviours, whether increases or decreases, were generally in the same direction. The exception was the relationship between difference scores for speech rate and difference scores for speech pauses. As speech rate tended to increase from truth-telling to lying, speech pauses tended to decrease from truth-telling to lying, and vice versa.

When examining the relationships among difference scores for coded behaviours that were found to be significantly different for truthful and deceptive accounts, Table 4 shows that the correlations for these pairs of difference scores varied. Difference scores for head movements were not significantly related to difference scores for speech pauses. There was a statistically significant, medium-sized relationship between difference scores for the amount of time taken to deliver the accounts and the difference scores for speech pauses. The relationship between difference scores for the time taken to deliver the accounts and difference scores for the number of head movements was statistically significant and in the large-sized range. The same was observed for the relationship between difference scores for the number of words spoken and differences scores for the number of head movements. The relationship between difference scores for the time

taken to deliver the accounts and the difference scores for the number of words spoken was statistically significant and these scores were almost perfectly correlated.

Subtyping Procedures

Defining Key Terms. Cluster analysis is an unsupervised technique that is used to unveil natural groupings of people that may exist within a sample. When more than one variable is used to determine how groups may “hang together”, cluster analysis is sometimes also referred to as profile analysis (Nunnally, 1978). The term *profile* initially came from the practice of plotting test battery scores on graphs in applied settings (Nunnally, 1978).

According to Nunnally (1978), the three major types of information that can be gleaned from the profile of scores for any person were the level, dispersion, and shape. The level was defined as the mean score of the person over the variables in the profile. Dispersion, also referred to as scatter, was described as how widely the scores in a profile diverge from the level. The standard deviation of scores for each person was said to be a measure of dispersion. The shape was characterized as the high and low points of scores in a profile. It was noted by Nunnally (1978) that even though two people may have the same profile level and dispersion, the high and low points of scores in their profiles could be very different. Shape, therefore, was defined by the rank-order of scores in the profile for each person.

Regarding tests of abilities, Nunnally (1978) highlighted that the shape of a profile denoted particular strengths and weaknesses for a person. In a controlled experiment, as in the current study, it was stated the profile shape captured the dependent variables that were most sensitive to the effects of an experimental manipulation for a

particular person. The objective of the current study was to conduct a cluster analysis to determine whether people fall into different groups, or subtypes, regarding behaviour changes when lying compared to a truth-telling baseline.

Between-Subjects Transformation of Variables. Prior to clustering profiles, the difference scores for the 10 coded behaviours were standardized by transforming them to z-scores. This transformation was made to place the 10 variables on the same scale. Scaling of variables is important because variables measured on different scales may have very different units and standard deviations (e.g., number of words versus frequency of smiles). If differences of this sort are permitted to remain, some variables may more strongly influence the clustering of profiles than other variables (Nunnally, 1978).

Within-Subjects Transformation of Variables: Compensating for Responsivity. Vrij (2008; Vrij, Granhag, & Mann, 2010) has pointed out that some people are better actors than others, and more skilled at regulating their verbal and nonverbal behaviour. The ability to conceal true feelings, for example, by maintaining a calm demeanour even when upset, was described as such a skill. These skills were argued to be of benefit when lying, and imply that some individuals may be less responsive than others in their verbal and nonverbal behaviour when engaged in deception tasks. Given that individuals may vary in their overall responsivity to deception tasks, a transformation to remove such differences was deemed necessary. Thus, a transformation of the intraindividual distribution of profile scores was undertaken prior to clustering profiles (Nunnally, 1978).

More specifically, the z-scores of difference scores were standardized again, but over each profile using the same z-score formula. A mean z-score for each participant's

10 original z-scores was computed, along with a standard deviation of the 10 original z-scores for each participant. Next, each participant's mean z-score was subtracted from the 10 original z-scores and divided by the corresponding standard deviation of the 10 original z-scores for the individual. These computations yielded 10 "ipsative" z-scores of difference scores for each participant, with the mean score of each participant over the variables in the profile being 0.0 and the standard deviation being 1.0. In other words, the transformation equated the level and dispersion in all profiles and compensated for individual differences in overall responsivity to the deception task. Such ipsative transformations of data have been used successfully in the past by forensic psychologists; specifically in the context of assessing sexual offenders, where denial of deviant sexual interests is a primary concern (see Appendix A). It should be noted, however, that ipsative z-scores are *relative* scores, and that the magnitude of these scores should not be confused with the magnitude of *absolute* measures for the same set of attributes (Clemens, 1966).

Using K-Means Cluster Analysis to Identify Subtypes. Following both transformations of data, a *k*-means cluster analysis (MacQueen, 1967) was conducted on the 10 ipsative z-scores of difference scores for all participants using SPSS version 15.0. The distance measure used in the current study, also referred to as the measure of profile similarity or profile dissimilarity (Nunnally, 1978), was Euclidean distance (SPSS, 2006). *K*-means cluster analysis attempts to identify groups of individuals that are similar to each other on selected characteristics, but that are different from individuals in other groups on the selected characteristics (Norusis, 2011). In other words, such a technique is

used for dividing a larger heterogeneous group into smaller homogenous groups (DiStefano & Kamphaus 2006).

K-means cluster analysis splits cases into a specified number of groups by maximizing between cluster variation relative to within cluster variation on the selected characteristics in a manner similar to conducting a one-way ANOVA where the groups are unknown and the largest pseudo-*F* value is obtained by reassigning members to each group (Systat Software, 2007). Although the pseudo-*F* statistics provided by *k*-means cluster analysis are considered opportunistic in nature, given the technique attempts to form groups that differ, the relative size of the statistics may be used for descriptive purposes (SPSS, 2006). More specifically, these statistics provide information about each variable's contribution to the separation of groups. The final cluster centres (means) obtained by the analysis also may be used to describe and name the clusters (Norusis, 2011). Clusters are often named by comparing this information and other demographic characteristics to theoretical perspectives and previous research (DiStefano & Kamphaus, 2006). Good cluster solutions are determined, in part, by a reasonable number of homogenous clusters and their interpretability (Norusis, 2011). A more detailed rationale for selecting *k*-means cluster analysis, and Euclidean distance as the distance measure, can be found in the Appendix B.

Identifying the Number of Subtypes. Conducting a *k*-means cluster analysis requires specification of the number of clusters to be formed. Two- to five-cluster solutions were inspected in the current study because the number of clusters believed to exist was not hypothesized in advance. Following inspection of these solutions, a two-cluster solution was deemed to be the best on both empirical and rational grounds.

Empirically, the CH Index was used to determine the optimal number of clusters in the data (Calinski & Harabasz, 1974). This Index is a measure of between-cluster dissimilarity over within-cluster dissimilarity, and involves computation of the pairwise sum of squared errors (distances) between clusters compared to the internal sum of squared errors for each cluster (Yuan, Li, & Wilson, 2008). The CH Indices for two-, three-, four-, and five-cluster solutions were: 17.63, 14.09, 12.27, and 11.14, respectively. Thus, the two-cluster solution evidenced the optimal clustering outcome because it maximized the CH Index.

As stated previously, a two-cluster solution also was deemed to be superior on rational grounds. Firstly, the two-cluster solution was the most parsimonious solution. Secondly, the two-cluster solution was interpreted more easily, signifying superior interpretability. Table 5 shows the final cluster means obtained by the *k*-means cluster analysis when it was constrained to produce a two-cluster solution.

Table 5

Comparison of Fluid and Laboured Liars' Mean Ipsative Z-Scores of Difference Scores for Behaviours Coded from Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 34)	Laboured liars (<i>n</i> = 30)			
Smiles	.36 (.96)	-.56 (1.09)	3.60	.001	.90
Head movements	.19 (.62)	-.12 (.89)	1.63	.109	.40
Illustrators	-.12 (.90)	-.00 (.81)	-.56	.579	-.14
Self-manipulations	-.26 (.93)	.16 (.75)	-1.99	.051	-.50
Time (seconds)	-.20 (.63)	.47 (.46)	-4.84	.000	-1.22
Words	-.04 (.60)	.30 (.48)	-2.45	.017	-.62
Speech rate	.95 (.97)	-1.11 (1.02)	8.30	.000	2.08
Filled pauses	-.01 (.91)	.22 (.73)	-1.11	.271	-.28
Speech pauses	-.73 (1.14)	.66 (.90)	-5.38	.000	-1.36
Self-references	-.12 (.83)	-.00 (.91)	-.54	.591	-.14

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for independent samples.

Describing the Subtypes: Fluid Liars and Laboured Liars.

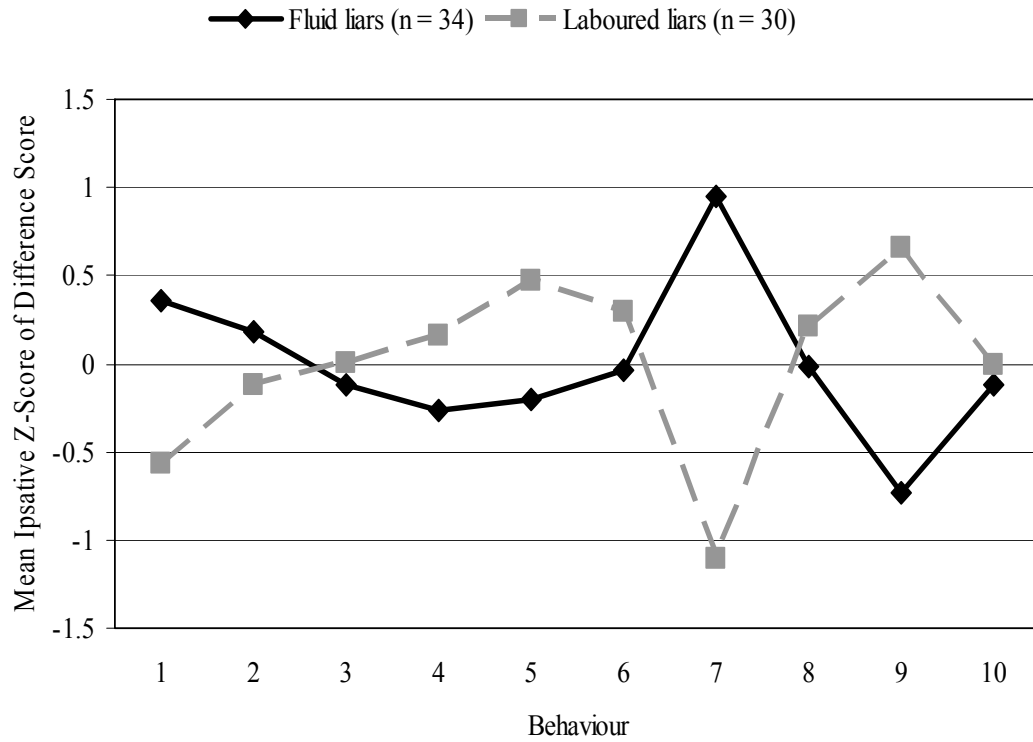
It should be noted that the term *relative* is used when describing the defining features of the subtypes because the data clustered were ipsative data. Table 5 shows that the first cluster, named “fluid liars”, comprised 53.1% of the sample. Fluid liars were characterized by a relative increase in speech rate as well as a relative decrease in speech pauses when lying in comparison to baseline truth-telling. For fluid liars, there was a relative decrease in the amount of time taken to deliver the accounts when lying in comparison to baseline truth-telling. For fluid liars, there also was a relative increase in smiles when lying in comparison to baseline truth-telling.

Table 5 shows that the second cluster, named “laboured liars”, comprised 46.9% of the sample. In contrast, laboured liars were characterized by a relative decrease in speech rate, as well as a relative increase in speech pauses when lying in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken when lying in comparison to baseline truth-telling. For laboured liars, there also was a relative decrease in smiles when lying in comparison to baseline truth-telling.

It is worth highlighting that a sizable number of cases were assigned to each cluster. This finding indicated that no group was characterized by only one or two outliers. This finding is of importance because *k*-means cluster analysis has been found to be sensitive to the presence of outliers (Hair, Black, Babin, & Anderson, 2009; Norusis, 2011). The profiles of the final cluster means for fluid liars and laboured liars are presented graphically in Figure 1.

Figure 1

Profiles of the Relative Behavioural Effects of Deception among Participants Relating Negative Life Events.



Note. 1 = smiles; 2 = head movements; 3 = illustrators; 4 = self-manipulations; 5 = time (seconds); 6 = words; 7 = speech rate; 8 = filled pauses; 9 = speech pauses; 10 = self-references.

Figure 1 illustrates that the profiles of fluid liars and laboured liars have different shapes. That is, the high and low points (or rank order) of scores in the profiles are different. This finding indicated that the differences between fluid liars and laboured liars are not only *quantitative* differences. Such differences would be depicted by parallel profiles. Parallel profiles would indicate that the two groups differ only in the degree of their behavioural responses to the deception task. The saw-tooth pattern observed among the profiles indicates *qualitative* differences between the two groups concerning the relative behavioural effects of deception.

Are the Subtypes Meaningful? Cluster analysis is a potentially useful method for explicating subtypes in complex datasets. Unfortunately, no single definitive rule exists for determining how many clusters to retain. Statistically, an analyst can retain as many clusters as there are variables. Theoretically, however, researchers are interested in finding the most parsimonious cluster solution that best describes the dataset. A similar problem arises in principle components analysis in terms of the number of components or factors to retain before factor rotation. Traditionally, most statistical software programs use an eigenvalue > 1.0 method for factor extraction. Monte Carlo studies, however, have shown that this technique may not be optimal (Costello & Osborne, 2005). An alternative technique, known as parallel analysis, provides a more robust method for determining the number of factors to retain. In parallel analysis a random dataset is created that mimics the number of variables contained in the existing dataset. A principle components analysis is then performed on the random dataset. The eigenvalues from the random dataset are compared to the eigenvalues from the existing dataset. Those components extracted from the extant dataset with eigenvalues greater than what was found in the

random dataset are then retained. Parallel analysis not only assists with determining how many factors to retain, but also helps ensure that factor solutions are more meaningful than what one would expect among random data.

In the current study, the logic of parallel analysis was extended to the cluster solutions that were obtained by following a procedure used by McKillop and Nielson (2011) (J. M. McKillop, personal communication, April 23, 2013). First, a randomly generated dataset was created with properties similar to the data obtained in the current study. This randomly generated dataset was comprised of 10 variables for 64 cases. The means and standard deviations of these variables were set to 0.0 and 1.0, respectively. Next, a *k*-means cluster analysis was conducted on the randomly generated data and constrained to produce two- to five-cluster solutions. For each solution, the pseudo-*F* statistics obtained for each variable were summed and then divided by 10. The resulting average or “global” pseudo-*F* values for two-, three-, four-, and five-cluster solutions were: 10.02, 7.88, 5.67, and 6.44, respectively. Similarly, global pseudo-*F* values for two- to five-cluster solutions were calculated using the data obtained from the present study. Using this data, the global pseudo-*F* values for two-, three-, four-, and five-cluster solutions were: 14.86, 16.53, 11.77, and 11.28, respectively. Finally, the global pseudo-*F* values for data obtained from the present study were divided by the global pseudo-*F* values obtained from the randomly generated data. Thus, the resulting ratios for two-, three-, four-, and five-cluster solutions were: 1.48, 2.10, 2.08, and 1.75, respectively. The finding that these ratios were all greater than 1.0 indicated that the cluster solutions obtained using data from the current study were greater than the cluster solutions obtained using randomly generated data. In other words, the cluster solutions obtained

using data from the current study outperformed those that were obtained using random data. This finding countered the argument that the solutions obtained using data from the current study were entirely random, including the obtained two-cluster solution characterizing fluid liars and laboured liars.

Validation of Subtypes: Identifying Correlates.

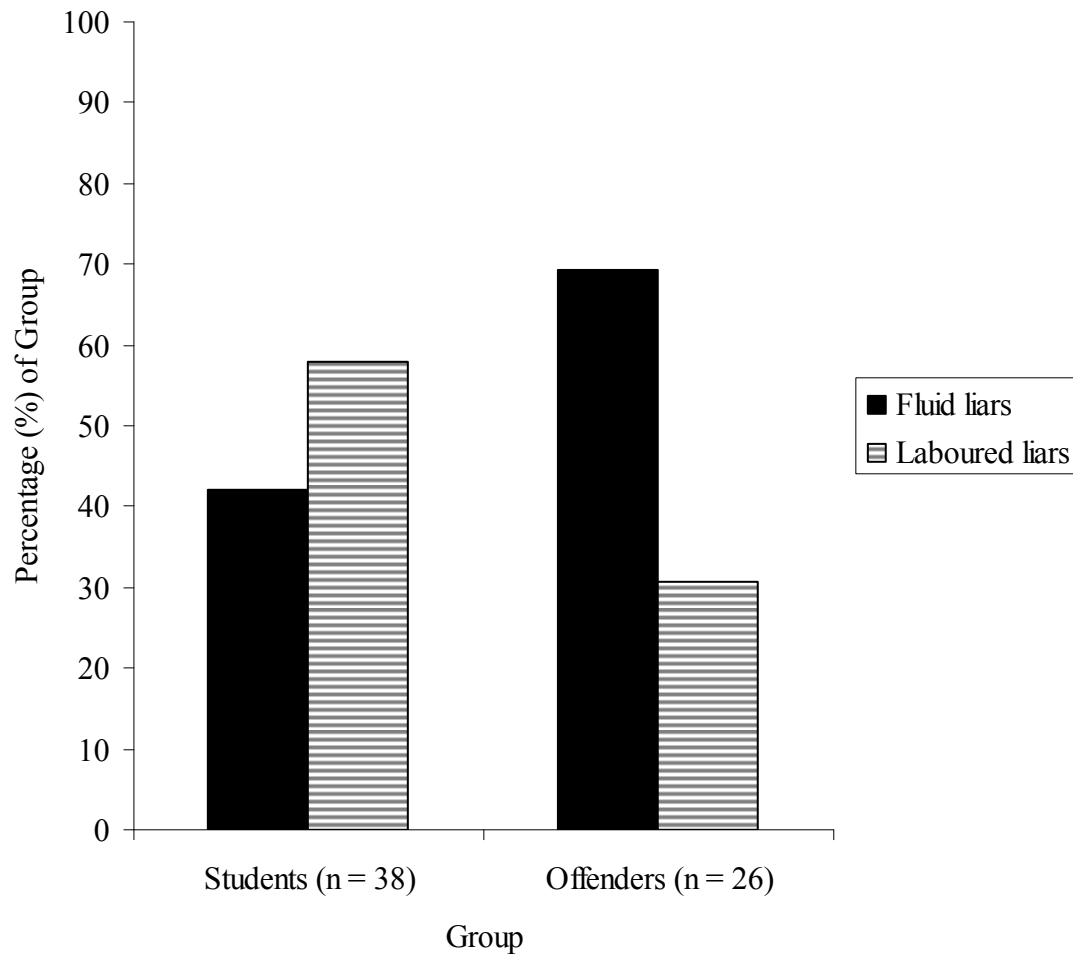
Searching for Potential Demographic Correlates.

One method of validating subtypes is to establish relationships between them and other variables of theoretical and practical importance that were not used to form the clusters (Hair et al., 2009). An effort, therefore, was made to determine whether fluid liars and laboured liars differed on any demographic characteristics. An independent samples *t*-test indicated no significant difference in age between fluid liars ($M = 24.1$; $SD = 8.1$) and laboured liars ($M = 25.8$; $SD = 10.6$), $t(60) = -.69$, $p = .493$, $d = -.17$.⁶ Cross-tabulation also indicated no significant association between the subtypes and the sex of the participants, $\chi^2(1, n = 64) = 2.06$, $p = .151$. Specifically, 42.3% of women were classified as fluid liars, and 57.7% were classified as laboured liars. Along these lines, 60.5% of men were classified as fluid liars, and 39.5% were classified as laboured liars. Of note, this latter finding held even when the offenders (all men) were excluded from the analysis. Interestingly, cross-tabulation revealed a significant association between the subtypes and criminal status, $\chi^2(1, n = 64) = 4.56$, $p = .033$. Specifically, 42.1% of students were classified as fluid liars, and 57.9% were classified as laboured liars. In contrast, 69.2% of offenders were classified as fluid liars, and 30.8% were classified as laboured liars. Figure 2 illustrates this association.

⁶ The ages of two offenders were unknown.

Figure 2

Assignment of Fluid and Laboured Liars as a Function of Criminal Status.



Examining the Importance of Criminal Status. Given the observed association between the subtypes and criminal status, it may have been the case that the obtained two-cluster solution was simply the result of performing the cluster analysis on a combined sample of students and offenders. That is, it may have been the case that the two subtypes solely reflected differences between students and offenders concerning the relative behavioural effects of deception. If, however, the two-cluster solution were to be obtained for student and offender groups when analyzed separately, then fluid liars and laboured liars would not be specific to either group. Such a finding would indicate that obtainment of the two subtypes was not solely attributable to differences between students and offenders concerning the relative behavioural effects of deception. It also would address the generalizability of the two-cluster solution. A *k*-means cluster analysis was performed on student and offender data separately to address these issues. Table 6 shows the final cluster means that were obtained when the analysis was conducted on student data only and constrained to produce a two-cluster solution.

Table 6

Comparison of Student Fluid and Laboured Liars' Mean Ipsative Z-Scores of Difference Scores for Behaviours Coded from Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	Group		<i>t</i> (36)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 17)	Laboured liars (<i>n</i> = 21)			
Smiles	-.16 (1.08)	.07 (1.02)	-.68	.502	-.22
Head movements	-.02 (.46)	-.04 (.91)	.08	.936	.03
Illustrators	-.00 (.77)	-.06 (.79)	.21	.833	.07
Self-manipulations	-.05 (.76)	.19 (.71)	-1.03	.312	-.33
Time (seconds)	-.14 (.68)	.31 (.77)	-1.86	.071	-.61
Words	.17 (.68)	.06 (.67)	.48	.631	.16
Speech rate	1.06 (.87)	-.98 (1.06)	6.38	.000	2.10
Filled pauses	.35 (1.11)	-.14 (.75)	-1.61	.116	.52
Speech pauses	-1.12 (.88)	.69 (.93)	-6.11	.000	-2.00
Self-references	-.08 (.77)	-.11 (1.09)	.09	.931	.03

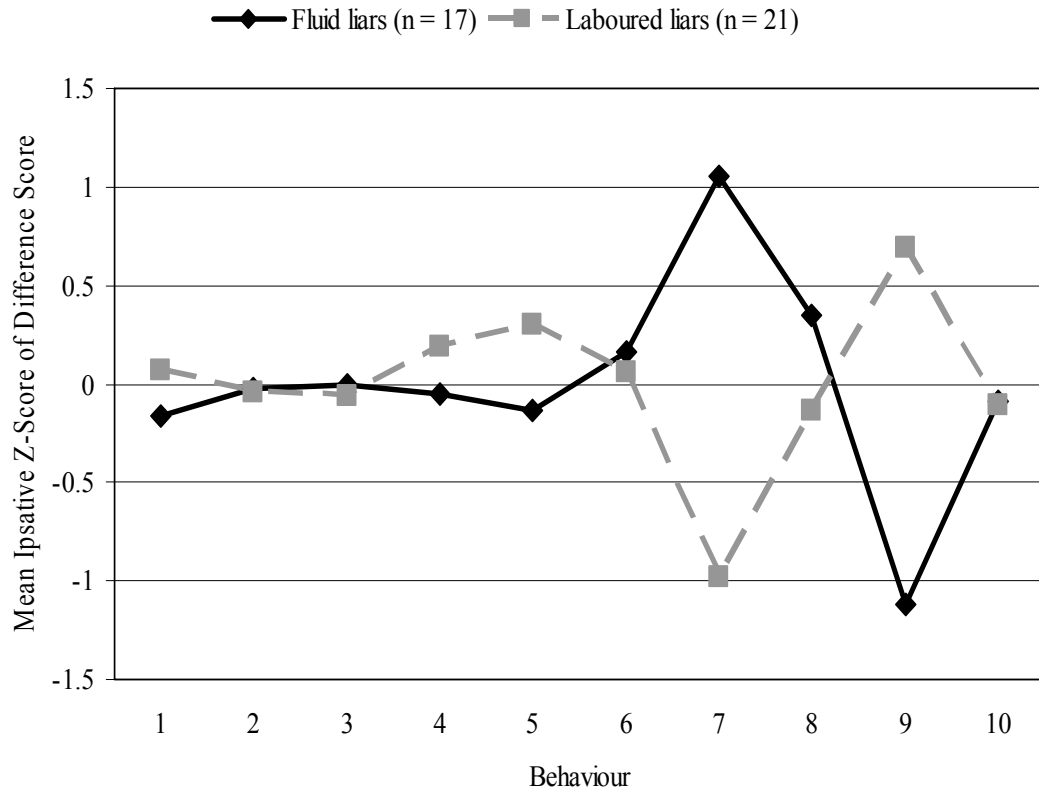
Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for independent samples.

Table 6 shows fluid liars comprised 44.7% of the student sample. Fluid liars again were characterized by a relative increase in speech rate when lying in comparison to baseline truth-telling. They again were characterized by a relative decrease in speech pauses when lying in comparison to baseline truth-telling. The table also shows laboured liars comprised 55.3% of the student sample. Laboured liars again were characterized by a relative decrease in speech rate when lying in comparison to baseline truth-telling. They again were characterized by a relative increase in speech pauses when lying in comparison to baseline truth-telling. The sizable number of cases assigned to each cluster again indicated that no group was characterized by only one or two outliers. Profiles of the final cluster means for student fluid liars and student laboured liars are presented in Figure 3.

Figure 3

Profiles of the Relative Behavioural Effects of Deception among Students Relating Negative Life Events.



Note. 1 = smiles; 2 = head movements; 3 = illustrators; 4 = self-manipulations; 5 = time (seconds); 6 = words; 7 = speech rate; 8 = filled pauses; 9 = speech pauses; 10 = self-references.

Figure 3 illustrates that the subtype profiles for students have different shapes. The saw-tooth pattern observed among the profiles again indicated qualitative differences between the two groups concerning the relative behavioural effects of deception, even when only student data were analyzed. These results indicated that obtainment of a two-cluster solution characterizing fluid liars and laboured liars is not solely the result of including data from offenders with data from students. Similarly, Table 7 shows the final cluster means that were obtained when the *k*-means cluster analysis was conducted on offender data only and constrained to produce a two-cluster solution.

Table 7

Comparison of Offender Fluid and Laboured Liars' Mean Ipsative Z-Scores of Difference Scores for Behaviours Coded from Truthful and Deceptive Accounts of Negative Life Events.

Behaviour	Group		<i>t</i> (24)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 15)	Laboured liars (<i>n</i> = 11)			
Smiles	.49 (.94)	-.62 (1.35)	2.48	.021	.96
Head movements	.38 (.67)	-.18 (.88)	1.85	.077	.72
Illustrators	-.11 (1.03)	.03 (.91)	-.38	.711	-.15
Self-manipulations	-.49 (1.26)	-.18 (1.13)	-.65	.521	-.26
Time (seconds)	-.11 (.62)	.40 (.25)	-2.57	.017	-1.08
Words	-.03 (.60)	.31 (.30)	-1.68	.11	-.70
Speech rate	.53 (1.06)	-.55 (1.28)	2.35	.027	.92
Filled pauses	.24 (.78)	-.19 (.68)	1.47	.155	.59
Speech pauses	-.66 (1.06)	.84 (.54)	-4.31	.000	-1.79
Self-references	-.23 (.69)	.15 (.84)	-1.27	.217	-.50

Note. Values under the second and third columns are means (and standard deviations).

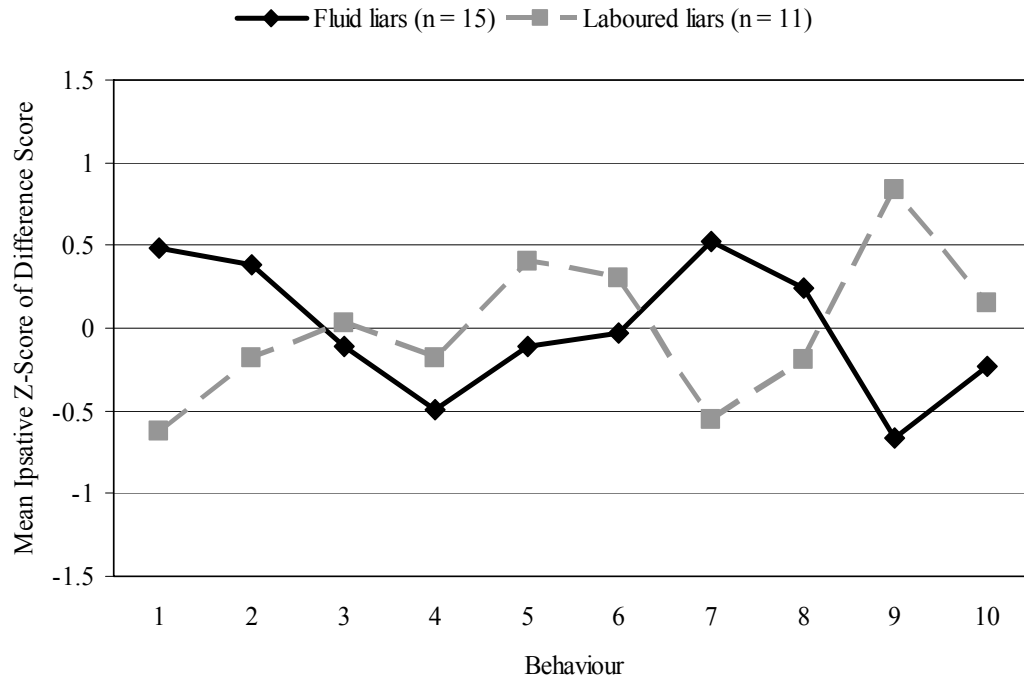
Values under the sixth column are effect sizes for independent samples.

Table 7 shows fluid liars comprised 57.7% of the offender sample. Fluid liars again were characterized by a relative increase in speech rate when lying in comparison to baseline truth-telling. They again were characterized by a relative decrease in speech pauses when lying in comparison to baseline truth-telling. For fluid liars, there was a relative decrease in the amount of time taken to deliver the account when lying in comparison to baseline truth-telling. For fluid liars, there also was a relative increase in smiles when lying in comparison to baseline truth-telling.

The table further shows laboured liars comprised 42.3% of the offender sample. Laboured liars again were characterized by a relative decrease in speech rate when lying in comparison to baseline truth-telling. They again were characterized by a relative increase in speech pauses when lying in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account when lying in comparison to baseline truth-telling. For laboured liars, there also was a relative decrease in smiles when lying in comparison to baseline truth-telling. The number of cases assigned to each cluster again indicated that no group was characterized by only one or two outliers. Profiles of the final cluster means for offender fluid liars and offender laboured liars are presented in Figure 4.

Figure 4

Profiles of the Relative Behavioural Effects of Deception among Offenders Relating Negative Life Events.



Note. 1 = smiles; 2 = head movements; 3 = illustrators; 4 = self-manipulations; 5 = time (seconds); 6 = words; 7 = speech rate; 8 = filled pauses; 9 = speech pauses; 10 = self-references.

The offender profiles depicted in Figure 4 have different shapes. The saw-tooth pattern observed among the profiles again indicated qualitative differences between the two subtypes concerning the relative behavioural effects of deception, even when only offender data were analyzed. These results indicated that obtainment of a two-cluster solution characterizing fluid liars and laboured liars is not solely the result of including data from students with data from offenders. Collectively, these findings indicated that fluid liars and laboured liars are not specific to students or offenders.

Examining the Importance of Speech Rate. The results presented above indicated that speech rate made a relatively large contribution to the separation of groups. Thus, the aforementioned cluster analytic procedures were repeated with speech rate omitted from the analyses.⁷ This action was taken to determine whether the obtained two-cluster solution characterizing fluid liars and laboured liars was solely the result of the contribution of speech rate. Table 8 shows the final cluster means obtained when the *k*-means cluster analysis was constrained to produce a two-cluster solution and speech rate was omitted from the analysis.

⁷ The reanalysis required a new within-subjects transformation of data involving nine variables instead of 10 variables.

Table 8

Comparison of Fluid and Laboured Liars' Mean Ipsative Z-Scores of Difference Scores for Behaviours Coded from Truthful and Deceptive Accounts of Negative Life Events with Speech Rate Excluded from Analysis.

Behaviour	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 35)	Laboured liars (<i>n</i> = 29)			
Smiles	.54 (.86)	-.86 (1.01)	5.98	.000	1.49
Head movements	.38 (.63)	-.31 (.96)	3.49	.001	.86
Illustrators	.03 (.87)	-.20 (.89)	1.04	.304	.26
Self-manipulations	-.27 (1.03)	.14 (.80)	-1.73	.089	-.44
Time (seconds)	-.05 (.66)	.41 (.60)	-2.90	.005	-.73
Words	.07 (.71)	.26 (.60)	-1.16	.251	-.29
Filled pauses	.17 (1.03)	-.06 (.72)	1.00	.324	.25
Speech pauses	-.86 (1.07)	.80 (.83)	-6.80	.000	-1.73
Self-references	-.00 (.92)	-.17 (1.05)	.69	.490	.17

Note. Values under the second and third columns are means (and standard deviations).

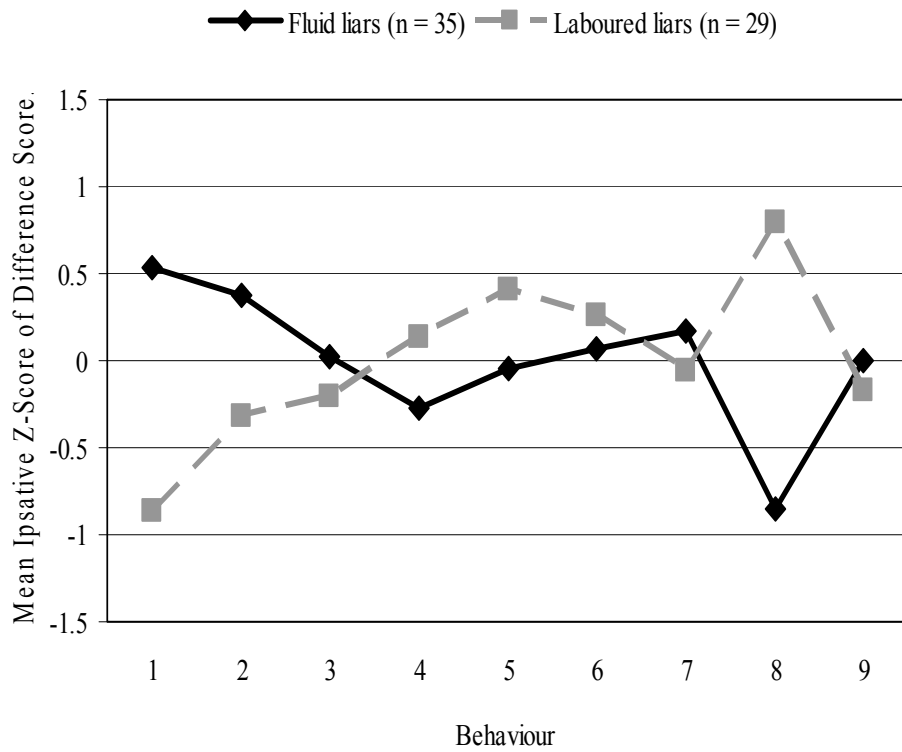
Values under the sixth column are effect sizes for independent samples.

The results presented in Table 8 demonstrated that a two-cluster solution characterizing fluid liars and laboured liars was obtained even when speech rate was omitted from the analysis. The table reveals that the first cluster, again named fluid liars, comprised 54.7% of the sample and was characterized by a relative decrease in speech pauses when lying in comparison to baseline truth-telling. For fluid liars, there was a relative decrease in the amount of time taken to deliver the accounts when lying in comparison to baseline truth-telling. For fluid liars, there also was a relative increase in smiles when lying in comparison to baseline truth-telling.

In contrast, Table 8 shows that the second cluster, again named laboured liars, comprised 45.3% of the sample and was characterized by a relative increase in speech pauses when lying in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account when lying in comparison to baseline truth-telling. For laboured liars, there also was a relative decrease in smiles when lying in comparison to baseline truth-telling. A sizable number of cases again were assigned to each cluster, indicating that no group was characterized by only one or two outliers. The profiles of the final cluster means for fluid liars and laboured liars, when speech rate was omitted from the analysis, are presented in Figure 5.

Figure 5

Profiles of the Relative Behavioural Effects of Deception among Participants Relating Negative Life Events with Speech Rate Excluded from the Analysis.



Note. 1 = smiles; 2 = head movements; 3 = illustrators; 4 = self-manipulations; 5 = time (seconds); 6 = words; 7 = filled pauses; 8 = speech pauses; 9 = self-references.

Figure 5 illustrates that the profiles again have different shapes (i.e., high and low points of scores). This finding again indicated that the differences between the two subtypes are not only quantitative differences. The saw-tooth pattern observed among the profiles indicated qualitative differences between the two groups concerning the relative behavioural effects of deception. Collectively, these results indicated that obtainment of a two-cluster solution characterizing fluid liars and laboured liars is not solely the result of the contribution of speech rate.

Discussion

General Behavioural Differences between Students and Offenders

On average, and across the truthful and deceptive accounts, it was observed that only smiles occurred significantly more often for students than for offenders. This finding is not surprising, and there are many different plausible explanations for the result beyond the possibility that it was obtained simply by chance. Even though both groups were describing negative life events, given that the offenders were incarcerated, it seems very likely that they had fewer reasons than students to be happy and show such displays. The finding may not have been entirely the result of situational circumstances, however. On this point, a substantial number of offenders are known to experience serious mental disorders; more so than the general population (e.g., psychotic disorders, mood disorders, and personality disorders) (Fazel & Danesh, 2002; Steadman, Osher, Robbins, Case, & Samuels, 2009). Because the correctional files of offenders in the present study were not available for review, however, it was not possible to obtain this kind of diagnostic information. It, therefore, cannot be ruled out that such conditions may have influenced some of the offenders' displays of affect. It also is possible that another third variable may account for the finding highlighted above, in whole or in part. On this note, perhaps some of the more basic dimensions of personality (e.g., neuroticism vs. emotional stability, antagonism vs. agreeableness) had a bearing upon some offenders' affective expressions, and not necessarily mental disorders or personality disorders per se.

Although the focus of this dissertation was not on general verbal and nonverbal behaviour differences between forensic and community populations, such potential differences should probably be the focus of further research and warrant the consideration

of those who are routinely involved in detecting deceit. Earlier in this chapter it was highlighted that large individual differences have been observed in people's behaviour and speech (DePaulo & Friedman, 1998), and that this may place some groups at greater risk for being falsely accused of lying. This was said to be a concern for those whose natural behaviour may appear suspicious to others, such as introverts, socially anxious persons, and individuals of some ethnicities (e.g., some Aboriginal people in Canada, some Turkish and Moroccan individuals living in the Netherlands) (see Vrij et al., 2010a). If it is established through further research that offenders generally smile less often than non-offenders, and if it is commonly believed that liars typically appear less pleasant than those telling the truth (see, e.g., DePaulo et al., 2003; Zuckerman et al., 1981), then offenders may represent another group at increased risk for being falsely accused of deception. Until confirmed by additional studies, however, those who consider and interview known offenders in investigations of unsolved crimes would still do well to be mindful of such a possibility. For example, it may be of some relevance to police who draw on information from sex offender registries during the course of their work, which were developed to assist officers with identifying possible suspects to investigate for unsolved sexual assaults (Murphy, Fedoroff, Martineau, 2009).

The extent to which offender and non-offender populations differ with regard to other displays of affect is not clear, as they were not examined in the present study. Nor is it clear whether the difference described above is specific to the processing and communication of negative emotional material. Studies that investigate these issues further would shed some light on the generalizability of the aforementioned finding. If nothing else, these points underscore the importance of making comparisons against

similar baseline truthful behaviour, wherever possible, when evaluating the behavioural responses of individuals suspected of engaging in deception (Hartwig, 2011; Vrij, 2008; Vrij et al., 2010a).

Differences between Truthful and Deceptive Accounts of Negative Life Events

It was found that, on average, deceptive accounts took a significantly shorter amount of time to deliver and contained significantly fewer words than truthful accounts. It also was observed that fabricated accounts involved significantly fewer head movements than genuine accounts. The first two findings provide some support for DePaulo and colleagues' (2003) self-presentational perspective on cues to deceit, which specifically predicts that liars are less forthcoming than truth-tellers in this manner. Consistent with the results of meta-analytic reviews (DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007), and in line with the hypothesis of the present study, were the relatively small effect sizes that were obtained for these cues.

The remaining coded behaviours (i.e., illustrators, self-manipulations, speech rate, filled pauses, and self-references) did not differ significantly between the genuine and fabricated accounts, and these findings run counter to the formulations on cues to deceit that were summarized earlier (see Buller & Burgoon, 1996; DePaulo et al., 2003; Ekman, 1985/1992; Ekman & Friesen, 1969; Zuckerman et al., 1981).⁸ No significant interactions concerning criminal status qualified these particular results, with one exception – Whereas the deceptive and truthful accounts of students did not differ significantly with regard to the number of speech pauses, there were significantly fewer speech pauses by offenders during the delivery of deceptive accounts compared to the delivery of truthful

⁸ These results, however, may not be entirely relevant to Buller and Burgoon's (1996) conceptualization because it emphasized interpersonal communication processes, and the present study did not involve ongoing communication between the participants and the experimenter during the experimental tasks.

accounts. This finding appears to be consistent with formulations that emphasize the role of attempted behavioural control (see DePaulo et al., 2003; Zuckerman et al., 1981); however, it is not known whether offenders specifically believed that speech pauses represented a cue to deceit and, therefore, consciously tried to minimize them to the point of overdoing it. For this reason, future research should examine individuals' beliefs about cues to deception. On that note, if offenders did hold this particular belief, why wouldn't the students? This question will be addressed in the discussion on subtypes, after the relationships among the aforementioned cues are discussed.

Relationships among Cues to Deceit for Negative Life Events

As hypothesized, substantial correlations were observed among the cues that were found to differ significantly between the truthful and deceptive accounts. More specifically, difference scores for the time taken to deliver the accounts and the difference scores for the number of words spoken were almost perfectly correlated, indicating that they were measuring the same attribute (i.e., the length of the narratives). The correlation between difference scores for the time taken to deliver the accounts and difference scores for the number of head movements was in the large-sized range. The same could be said for the correlation between difference scores for the number of words spoken and differences scores for the number of head movements. Additionally, a significant and medium-sized correlation was observed between difference scores for the amount of time taken to deliver the accounts and the difference scores for speech pauses. It should be noted that changes in these behaviours from truth-telling to lying were generally in the same direction, whether they were increases or decreases. It was only in the case of

difference scores for head movements and difference scores for speech pauses that a statistically significant correlation was not obtained.

These findings also are not particularly surprising given that the behaviours have been conceptualized as important in the domain of verbal and nonverbal cues to deception. On this note, it is likely that at least moderately-sized correlations will be observed among variables if they are part of a theoretical system (Nunnally, 1978). Even though these results may seem obvious, they are still reported here because the issue of correlated cues appears to have received very little attention in the literature. As mentioned in the introduction of this chapter, if moderate and large-sized correlations are observed among cues, then it could have implications for their practical application.

Problems associated with correlated variables, as they pertain to applied decision-making, have been raised in other forensic contexts. For example, in relation to the assessment of risk for future violence, Quinsey, Harris, Rice, and Cormier (2006) drew attention to the difficulty that some people seem to have with adjusting their predictions according to interrelationships among various predictor variables. From a practical standpoint, it was stated that people often assume they are using more information as the basis for their decisions than is actually the case. Quinsey and colleagues (2006) went on to state that individuals, therefore, may be willing to make more extreme judgements than are warranted, and also may have more confidence than is justified.

Otto (2008) made very similar points with regard to evaluations of malingering and other relevant response styles (also see Rogers & Bender, 2012). More specifically, it was indicated that, in some assessment contexts, forensic examiners may have numerous response style measures to select from for use. It was further highlighted that, in some of

these circumstances, many instruments are highly related and may yield very similar results. Otto (2008) emphasized that the preferred approach in such cases is almost always to use and interpret the results from the single most valid measure instead of using a number of highly correlated scales or instruments. This was suggested because, with very few exceptions, use of highly correlated measures of response styles tends to do little to improve the accuracy of evaluators' conclusions. On this point, Otto (2008) stressed that it may even inappropriately increase evaluators' confidence in these conclusions. It was qualified, however, that examiners could administer the two best measures of a given response style *if* scores on these measures are not highly correlated.

Based on the discussion of these results so far, it may be tempting to conclude that either decreases in the number of words or decreases in the amount of time taken to deliver an account should be used as a primary behavioural cue to deception, but not both variables given the near-perfect correlation observed among them. It also might be argued that the time taken to provide the account may be the more ideal cue for use given its relatively larger effect size and the ease with which this variable is measured (i.e., transcription of audio/video recordings and counting of words is not required; only a watch is needed). Additionally, even though decreases in head movements was only moderately correlated with each of these two variables, one still might argue that this change does not tap a unique aspect of deception. That is, perhaps the shorter duration of the deceptive accounts merely led to fewer opportunities for the participants to shake or nod their heads.

These conclusions and guidelines seem somewhat premature at the present time, however, given the current state of the knowledge on interrelationships among

behavioural cues to deceit. Again, the literature on correlations among cues is relatively scant. Neither quantitative reviews (DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007) nor qualitative reviews (e.g., Vrij, 2008) have addressed interrelationships. From a glance at individual studies, this is likely because researchers generally do not report on interrelationships. Such a practice is unfortunate because large-scale reviews of studies that report on correlations among cues would inform the field as to which of them provide unique or redundant information when attempting to discriminate between truth-tellers and liars. It, therefore, is recommended that researchers begin to systematically examine and report on these issues. This proposal seems particularly important to follow because it has been recommended that practitioners rely on multiple cues in their efforts to detect deception (see, e.g., Vrij, 2008; Vrij et al., 2010a), and the results of a recent meta-analysis suggested that indicators of deception are manifested in constellations as opposed to single cues (Hartwig & Bond, 2014). Although it was indicated in this meta-analysis that deception can be better detected from multiple cues than a single cue, it was qualified that the strongest cue contributes the most, and interrelationships among cues were not reported. Until this research is conducted, practitioners ought to be judicious in their inferences based on multiple cues, especially if they are unaware of the relationships among them.

Identification of Subtypes: Fluid and Laboured Liars

Are there alternative interpretations for why many of the coded cues did not differ significantly between the truthful and deceptive accounts, beyond that the formulations on which they are based are flawed in some way? Do the dominant formulations on cues to deceit require substantial revisions? Would it be proper to conclude that these

formulations lack adequate empirical support and, therefore, should be abandoned completely? To base such strong conclusions on the results of a single study seems inappropriate. This appears especially the case in light of the results of several meta-analyses that have pointed to a number of potentially relevant variables that may moderate the relationship between the coded behaviours and the veracity of communications, such as whether the lies were about transgressions or other experiences (DePaulo et al., 2003; Sporer & Schwandt, 2006, 2007).

More to the comments above, DePaulo and colleagues' (2003) self-presentational perspective specifically states that cues to deceit should be faint. This was argued on account of the observation that people routinely engage in deception in their everyday lives. On these points, DePaulo et al. (2003) considered many of the nonsignificant results in their meta-analysis as support for their formulation because they were still in the expected direction predicted by the self-presentational perspective. These researchers added that Bond, Kahler, and Paolicelli (1985) made similar arguments from an evolutionary point of view, suggesting that blatant cues to deceit would have been recognized by humans long ago and that this would have led evolution to favour more flexible and less obvious liars.

In a related vein, Ekman (1985/1992) wrote that some lies are executed beautifully, and that nothing in the deceiver's behaviour or speech may betray the deception. He went on to describe a group that he called "natural liars", individuals who are able to lie easily and with a great amount of success (Ekman, 1985/1992, p. 57). It was said that natural liars are aware of their ability, and that they have been getting away with things, like fooling parents, teachers, and friends, since childhood when they desired

to do so. Ekman (1985/1992) elaborated that natural liars feel no detection apprehension and are confident in their ability to deceive, but stipulated that they are not psychopaths according to his research. In terms of the ability to control expression, such as facial signs of feelings, Ekman (1985/1992) asserted that natural liars do so perfectly. Some of them were described as: likeable, charming, clever and inventive in fabricating, and smooth talkers with convincing mannerisms.

A number of Ekman's (1985/1992) views are similar to those of Vrij (2008; Vrij et al., 2010b) mentioned earlier in this chapter, who indicated that some individuals are better actors than others and more skilled at regulating their verbal and nonverbal behaviour. These skills were argued to be of benefit when lying, and imply that individuals may vary in their overall responsivity to deception tasks. Vrij (2008) also addressed the possibility that different individuals show different signs of deceit, and that this would result in no signs of deceit emerging when these individuals are analyzed at a group level. Consistent with the original hypothesis of the present study, two seemingly meaningful profiles concerning the behavioural effects of deception were observed when the difference scores for cues were transformed to *z*-scores, ipsatized, and submitted to cluster analysis. A two-cluster solution was retained over solutions of other sizes on account of both its parsimony and interpretability. Additionally, the two-cluster solution was empirically superior to solutions of other sizes and outperformed a two-cluster solution that was obtained using random data, suggesting that the two observed subtypes were more meaningful than what one would expect among random data.

Fluid liars were characterized by a relative increase in speech rate as well as a relative decrease in speech pauses when lying in comparison to baseline truth-telling. For

fluid liars, there was a relative decrease in the amount of time taken to deliver the accounts when lying. For fluid liars, there also was a relative increase in smiles when lying. In contrast, laboured liars were characterized by a relative decrease in speech rate, as well as a relative increase in speech pauses when lying in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken when lying. For laboured liars, there also was a relative decrease in smiles when lying. The results of this study indicated that speech rate made a relatively large contribution to the separation of these two groups; however, a two-cluster solution characterizing fluid and laboured liars was obtained even when speech rate was omitted from the analysis. The latter finding suggested that the obtainment of this two-cluster solution was not solely the result of the contribution of speech rate.

Association between Subtypes and Criminal Status

What factors account for the manifestation of these two different subtypes? In the hope of finding some clues to the answer to this question, demographic variables were examined to ascertain whether any of them may be correlates. There was no significant difference in age between the subtypes, and no significant association with the sex of the participants. There was, however, a significant association between the subtypes and criminal status, with almost 70% of offenders having been classified as fluid liars and the rest classified as laboured liars. By contrast, about 42% of students were classified as fluid liars, and approximately 58% were classified as laboured liars. Based on this finding alone, one might hypothesize that some other correlate of criminality, such as psychopathy for example, may be responsible for the result. In addition to being

pathological liars, psychopaths also have been described as tending to be smooth, slick, and verbally facile (Hare, 1991). Maybe this construct accounts for the fluid style of lying that was observed in the present study? Without access to the offenders' correctional files, it was not possible to determine whether there was any relationship between the subtypes and psychopathy.

While it may be reasonable to hypothesize that psychopaths are more likely to be characterized as fluid liars than laboured liars, it seems hasty to discount the possibility that many of them still could be classified as laboured liars. This is because the identification of subtypes described here relied on comparisons against baseline truthful behaviour. If psychopaths tend to be smooth, slick, and verbally facile even when they are telling the truth, then it is still within the realm of possibility that many of them may display a laboured style of lying if the deceptive task is cognitively challenging enough and the psychological mechanism underlying the behavioural responses of laboured liars is predominantly increased cognitive load. On this point, the final chapter of this dissertation will address the reasons for naming the two subtypes according to the fluid and laboured behavioural descriptors rather than according to the psychological constructs that may mediate them (e.g., "attempted behavioural controllers" versus "cognitively loaded liars"). As will be discussed in the last chapter, even though the constructs of attempted behavioural control and cognitive load may appear to map well onto the fluid and laboured subtypes, respectively, there are reasons for withholding the conclusion that these states/processes are in fact those that primarily govern the manifestation of the two subtypes.

Even if future research were to confirm that psychopaths are more likely to display a fluid style of lying as opposed to a laboured style, which would be an interesting finding in and of itself, this would still probably not be the whole story in terms of accounting for the expression of the two subtypes. It seems unlikely because the results of the present study indicated that neither fluid liars nor laboured liars were exclusive to either students or offenders, and the estimated prevalence of psychopathy in the general population appears too low for it to be the chief factor in explaining whether students displayed either a fluid or a laboured style of lying. Neumann and Hare (2008) reported that only 1-2% of individuals in a large and representative North American community sample evidenced clinically significant levels of psychopathy. Similarly, Coid, Yang, Ullrich, Roberts, and Hare (2009) estimated that psychopathy affected less than 1% of the household population in Britain. Thus, other factors are likely to be at play. For example, again, perhaps some of the more basic and common dimensions of personality have a role in the manifestation of the two subtypes that were observed here.

Similar arguments could be made for the role of cognitive abilities (e.g., intelligence, working memory, or verbal skills) in explaining whether individuals evidenced either a fluid or a laboured style of lying. At first, one might hypothesize that perhaps laboured liars had more limited cognitive abilities than fluid liars, which resulted in their more choppy verbal performance. This hypothesis, however, also would suggest then that the offenders' cognitive abilities were superior to those of the students because they were proportionally more likely to be classified as fluid liars. Although no data were collected that could speak directly to this issue, it seems unlikely to be the case. This is not to state that individual differences in cognitive abilities do not have any role in

accounting for whether an individual is likely to be classified as either a fluid or laboured liar when engaging in deception. Rather, like psychopathy, it appears more probable that cognitive abilities would not fully account for the differences observed among fluid and laboured liars, but maybe partially so.

On the face of it, it seems that simpler and more general factors are likely to be responsible for the observed differences between the fluid and laboured liar subtypes, given that both students and offenders evidenced these styles. For example, perhaps laboured liars were less confident in their deception skills than fluid liars, which caused them to struggle more in communicating their deceptive accounts. Or perhaps fluid liars were more practiced at deception than laboured liars, and that is why their verbal performance appeared to be somewhat smoother in delivery. Such a hypothesis would seem to be consistent with the higher likelihood of more extensive and noteworthy histories of deception among some offenders (e.g., deceitful acts used to carry out crimes or to avoid culpability for them). Moreover, the offenders also may have had more experiences than students in dealing with individuals who scrutinized their demeanour in high-stakes situations, such as police officers, judges and jurors, or parole board members. These kinds of experiences may have indirectly taught them to avoid some of the more stereotypic behaviours that liars are believed to exhibit (see DePaulo et al., 2003; Zuckerman et al., 1981), but did not protect them from overcompensating and providing accounts that came across as overly smooth and rehearsed. Thus, future research should examine individuals' confidence in their deception skills, their emotional experiences when lying, and potential strategies that they may have employed in addition to their beliefs concerning cues to deceit.

Limitations of the First Study

The general limitations of the research that comprises this dissertation are discussed more fully in the final chapter. In setting the stage for the second study described in the next chapter, however, it is worth mentioning that there were some notable limitations of this first study with respect to its internal validity. That is, even though efforts were made to exert some control over the types of negative life events that participants chose to describe, there was a lack of complete control over the event that was ultimately chosen given the participants' unique past experiences. Additionally, a lack of access to collateral sources meant that it was not possible to obtain information that could verify the veracity of the negative life events that were described. With respect to generalizability, the findings that were discussed in this chapter may be limited to the communication of truthful and fabricated accounts of negative life events. Thus, it is worth establishing whether these results, particularly those pertaining to the subtypes, can be replicated in studies that employ different methodologies. These, and other issues, are addressed in the next chapter.

CHAPTER 3. STUDY 2:

REPLICATING THE SUBTYPES

The first study in this dissertation involved an examination of uncorroborated accounts of negative life events. It, therefore, could not be guaranteed that every participant in the first study was in fact acting truthfully or deceptively when instructed to do so. It also could be argued that the findings from the first study were an artifact of the different kinds of negative life events that were described (e.g., medical procedures, serious accidents, the deaths of loved ones). That is, participants in the first study ultimately chose the events they wished to discuss, even though they were provided with some direction in this regard.

The second study in this dissertation sought to replicate the findings from the first by using a similar within-subjects design; however, participants in this study based their truthful and deceptive accounts on exposure to the same moderately distressing stimuli in order to better control the emotional events that formed the basis of their accounts. By following this procedure, it could be more easily assured that participants were in fact acting truthfully or deceptively in each respective condition. Such efforts in deception research are sometimes referred to as establishing the *ground truth* (Hartwig, 2011; Vrij, 2008). Moreover, because this study represents an even more highly controlled experiment than the first, a replication of the findings would counter the explanation that the results of the first study were likely due to different types of negative life events that were described.

This second study also expanded on the first by having participants complete several measures of psychological constructs and a manipulation check following their

participation in the experiment. With regard to subtyping the behavioural effects of deceit, having participants complete such measures could assist with elucidating possible psychological correlates of the subtypes if they were to be observed again. Importantly, identifying correlates for an outcome is an early but essential step in identifying possible causes (Kraemer et al., 1997). Following from the discussion of the first study, it was decided that beliefs about deception, confidence in deception skills, emotional reactions and strategies employed when lying, and basic dimensions of personality would be investigated in this second study. Moreover, in addition to ensuring that the experiment and elements of its design had the intended effects, including a manipulation check could provide a means for ruling out potential confounding methodological variables that may be responsible for results.

It should be mentioned that the original hypotheses for the first study were carried forward to the present study. More specifically, it was hypothesized that: (1) Either small or no group differences would be observed for the majority of cues investigated; (2) Most cues would be moderately correlated with one another; and (3) Subtypes would emerge when difference scores for cues are standardized to *z*-scores, ipsatized, and submitted to cluster analysis. With regard to the latter hypothesis, this study specifically sought to establish whether the fluid liar and laboured liar subtypes could be replicated. Replication was attempted using a different experimental methodology to examine the generalizability of the subtypes, and to rule out the possibility that they were a peculiar artifact of some element of the first experiment.

Of note, the conceptual work of Rogers, Boals, and Drogin (2011) appeared relevant for generating hypotheses concerning the possible relationship between the

subtypes and beliefs about cues to deceit. On this point, the previous chapter highlighted the potential connection between fluid lying and attempted behavioural control. More specifically, it was indicated that it was not clear whether fluid liars held common misconceptions about deceptive presentations, and that their avoidance of exhibiting stereotypic cues to deceit led them to overcompensating and providing accounts that came across as overly smooth and rehearsed. Rogers and colleagues (2011) argued that researchers should investigate whether deceivers are aware of common but mistaken beliefs regarding honesty, and whether deceivers attempt to apply them to their own situations. If they do, researchers and practitioners might be able to capitalize on this phenomenon by developing an “erroneous stereotypes” detection strategy similar to the one highlighted in the first chapter. Unfortunately, in examining a third of the peer-reviewed articles included in Sporer and Schwandt’s (2007) meta-analysis, Rogers et al. (2011) observed that none reported the use of manipulation checks to evaluate participants’ beliefs or efforts concerning attempted behavioural control. They further argued that a comprehensive examination of participants’ efforts to control believed cues would facilitate a greater understanding of mechanisms responsible for empirical results. Thus, the present study investigated individuals’ beliefs about cues to deception. It was hypothesized that fluid liars would hold a substantial number of stereotypes concerning cues, perhaps even more so than laboured liars. Such stereotypic beliefs may have led fluid liars to manifesting excessive efforts to appear honest, which ultimately became their own indicators of deceit (i.e., overly smooth accounts). This hypothesis seems plausible as Rogers and colleagues (2011) have pointed out that beliefs, whether accurate

or not, may strongly influence self-presentations and impression management (also see Barrick, Shaffer, & DeGrassi, 2009).

To account for the behavioural differences between fluid and laboured liars, it is possible to generate alternative hypotheses to the one presented above. For example, as discussed in the previous chapter, perhaps fluid liars are more practiced at deception than laboured liars. That is, maybe their additional practice with deception leads to more polished deceptive communications, but is not protective against erroneous stereotypes regarding honesty. Or perhaps fluid liars enjoy engaging in deception more than laboured liars. The former hypothesis may imply more use of deception that goes undetected by fluid liars, and the latter may be indicated by more self-reported enjoyment for behaving deceptively. It also is possible that general strategies, such as trying to maintain a calm and cool demeanour when lying, may account for some of the observed differences between the subtypes, and not necessarily a conscious focus on the avoidance of specific behaviours per se. These possibilities were considered in the current study.

Alternatively, maybe the differences observed between fluid and laboured liars are a function of confidence in deception skills. That is, maybe laboured liars are less confident than fluid liars in their abilities to deceive others. Or maybe they experience greater emotional arousal when lying and, perhaps, greater arousal causes their choppy verbal performance. It should be noted, however, that this latter explanation seems less compelling given that anxious arousal is predicted to be associated with faster speech rate, at least according to Ekman (1985/1992). It seems more reasonable to hypothesize differences in the degree of perceived difficulty of the deception task, which would

reflect differences between the subtypes in cognitive load. Nonetheless, each of these possible explanations was considered in the present study.

Lastly, in the previous chapter, a possible link between the subtypes and personality traits was discussed. On this point, Vrij (2008) noted in his comprehensive review of the deception literature that extraverts appear to lie more frequently than introverts, even when controlling for the greater number of social interactions that extraverts engage in. Vrij (2008) also noted that there is some research demonstrating that extraverts and introverts show different behavioural patterns when lying. For example, he highlighted that introverts seem to display more speech disturbances than extraverts (see Siegman & Reynolds, 1983). Given these observations, it was hypothesized that perhaps introverts are more likely than extraverts to display a laboured style of lying. Having stated this, each of the basic dimensions of personality was still assessed in the current study, and not simply extraversion versus introversion alone. That is, all of the “Big Five” personality traits were examined, which include: extraversion (vs. introversion), neuroticism (vs. emotional stability), openness to experience (vs. closedness to experience), agreeableness (vs. antagonism), and conscientiousness (vs. negligence). It is possible to imagine how each of these dimensions of personality could be related to the subtypes. For example, perhaps neurotic individuals are more likely to experience fear and anxiety during the deception task and, thus, are more likely to exhibit a laboured style of lying than emotionally stable individuals. Maybe negligent and antagonistic individuals are less likely to be engaged in the experimental tasks and, therefore, are more likely to display a laboured style of lying on account of poorer preparation. These possibilities also were explored in the present study.

Method

Participants

The sample consisted of another 64 undergraduate students attending a university in eastern Canada. Their mean age was 21.4 years ($SD = 4.0$). Forty-six (71.9%) participants were female. Eighteen (28.1%) participants were male.

Materials

International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1999). The moderately distressing stimuli on which participants based their truthful accounts were images taken from the IAPS. These pictures were designed to elicit emotional arousal in experimental settings. IAPS images were chosen because viewing them represented a safe, laboratory-based analogue of the procedure used in the first study. The pictures selected for use in the current study, and the respective labels created for them by this author, were: (a) A riot in progress (IAPS image #2691); (b) The face of a battered woman (IAPS image #3180); (c) A child running away from a soldier (IAPS image #6212); (d) The aftermath of a plane crash (IAPS image #9050); (e) A man pointing a gun at another man (IAPS image #3530); and (f) Two police officers arresting people (IAPS image #6834).

Participants based their truthful accounts on exposure to only three of the aforementioned pictures, which were presented to them in a predetermined but randomized and counterbalanced order. As such, individuals based their deceptive accounts on exposure to only the labels of the three images that were not presented to them (also in a predetermined but randomized and counterbalanced order). These pictures were selected because they have been found to elicit suitable levels of negative emotional

arousal and valence according to normative data. These particular images also were selected because they differed from each other in their pictorial content and labels, reducing the chance of participants basing their fabricated accounts on an IAPS image they may have already seen in the truthful condition if they happened to be assigned to the truthful condition first.

On the point above, it may have been possible for some individuals to rely on pictures they have seen in the past (e.g., on television, the internet, or in newspapers) to provide a fabricated account that was coincidentally consistent with the label they viewed in the experiment. There is no known technology that could prevent such an occurrence from happening. These occurrences would not jeopardize the validity of any findings, however. The individuals technically would still be behaving deceptively because the actual IAPS images were not viewed. Moreover, these scenarios are still a reflection of some deceptive behaviour in naturalistic settings. That is, in real-world contexts, people occasionally tell lies that are embedded within partial truths (Vrij et al., 2010a).

Manipulation Check. This brief self-report questionnaire was used to assess whether elements of the experimental design had the intended effects. For example, participants rated the pleasantness of the IAPS images they had viewed on a nine-point Likert scale. They also rated the level of emotional arousal they had experienced when viewing these pictures or only their labels. Individuals rated the perceived difficulty of the truthful and deception tasks, as well as the emotional arousal they experienced when engaged in each task. Two additional questions tapped whether they believed it was important to maintain a calm demeanour when engaged in the deception task or whether

they believed it was important to be animated, energized, or excited, so as not to attract suspicion. The manipulation check was created by this author.

Demographic Measure. This author-constructed, self-report questionnaire captured a variety of demographic information. Demographic characteristics that were assessed included age, sex of the participant, etc. The information was used to characterize the sample in order to facilitate possible future comparisons of the results with other studies that may attempt to replicate the findings.

Beliefs About Deception Questionnaire (BADQ; The Global Deception Research Team, 2006). The BADQ is a 10-item survey that assesses pan-cultural stereotypes about how liars behave (e.g., liars avoid eye contact). Its items are based on the results of two worldwide studies involving respondents from 75 different countries who spoke a total of 43 different languages. The psychometric characteristics of the measure are unknown; however, it was stated that respondents from 58 countries showed very strong agreement in the generation of their beliefs about the behaviour of liars, and the authors reported a Cronbach's alpha (α) of .98. The survey also included seven questions pertaining to respondents' beliefs about their deception abilities, the frequency of deception, and the demography of deception.

This author developed five additional items that were appended to the end of the BADQ to assess participants' self-reported deception abilities, their perception of the gullibility of others, and whether they enjoyed engaging in deception. More specifically, participants rated the following items on a nine-point Likert scale, ranging from 1 (Not true) to 9 (Very true): (i) I could fool a professional lie-catcher (e.g., a police officer); (ii) Most people are easily deceived; (iii) Most people cannot tell when I am lying; (iv)

Everybody lies on occasion; and (v) I enjoy telling lies. These questions were added to the end of the BADQ to prevent possible contamination of the original measure.

Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). The BFI is a 44-item self-report measure that taps the “Big Five” personality dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness. Each item is responded to on a five-point Likert scale, ranging from 1 (Disagree strongly) to 5 (Agree strongly). The measure is shorter than others that examine the Big Five personality traits, reducing the possibility of participant fatigue. Although shorter, the questionnaire still examines the core traits of the Big Five personality dimensions and has demonstrated good reliability and validity. In the current study, the internal consistency of these personality scales was found to be generally acceptable. Specifically, Cronbach’s alphas (α) for the extraversion, agreeableness, conscientiousness, neuroticism, and openness scales were: .89, .81, .79, .80, and .83, respectively.

Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1991). The BIDR is a 40-item self-report measure that assesses two forms of socially desirable responding. More specifically, the instrument contains two 20-item subscales that tap self-deceptive enhancement (SDE) and impression management (IM). The former scale assesses individuals’ *unconscious* tendencies to exaggerate their positive attributes, whereas the latter scale assesses *conscious* tendencies to exaggerate positive attributes. Respondents rate their degree of agreement to each item statement (e.g., I always pick up my litter) on a 7-point Likert scale. Points are added for each extreme response (6 or 7), following reversal of negatively keyed items. The instrument also yields an overall measure of socially desirable responding (SDR) by summing the scores of the SDE and

IM scales. The BIDR is a popular instrument for assessing response styles in both research and clinical/forensic settings, and has evidenced good reliability and validity. In the current study, the internal consistency of the BIDR scales was found to be generally on par with previous research. Specifically, Cronbach's alphas (α) for the SDE, IM, and SDR scales were .65, .80, and .79, respectively.

Procedure

In the truthful condition, participants viewed three different pictures from the IAPS as well as their respective labels. They were then asked to provide a single account concerning a description of the details of these pictures. In contrast, in the deception condition, participants viewed only the labels for three different pictures from the IAPS. They were then similarly asked to provide a single account concerning a description of the details of the pictures that they did not actually view. In this condition, participants were only able to rely upon brief labels of the images (e.g., "a riot in progress") to guide them in their description of the details. The rationale for having individuals describe the details of three separate images in each account was to prevent the possibility of floor effects. That is, if each account focused on the details of only a single picture, then the accounts may have been too short in duration and provided too little opportunity for observing certain behaviours (e.g., a leaked smile).

The elicitation of truthful and fabricated accounts was counterbalanced across all participants in an effort to manage order effects. The six images and respective labels described above also were counterbalanced across all participants to minimize the potential for obtaining behavioural differences due to the pictorial content that was described. All stimuli were presented on a computer screen. Each image and its

respective label (truthful condition), or each blank screen with only a label (deceptive condition), was viewed for 60 seconds. Individuals were provided with 60-second breaks between stimulus viewings in both conditions to rest their eyes.

Prior to viewing the pictures and labels in the truthful condition, participants were instructed to try to remember as many details as possible about the images presented to them. They were told that they were being asked to do this because they would later be instructed to provide a “credible and believable” description of these pictures in as much detail as possible while being recorded on video. Similarly, prior to viewing only labels for images in the deception condition, participants were instructed to try to remember each label. In this instance, however, they were instructed to consider as many pictorial details as possible that they may lie about having seen that are consistent with the labels. They were similarly told that they were being asked to do this because they would later be instructed to provide a credible and believable description of the images that were not actually shown to them in as much detail as possible. Participants were informed that this task also would be recorded on video.

Before providing an account, participants were given five minutes alone in an interviewing room to mentally plan their descriptions. They were informed that they would not be interrupted or asked questions during the video recording. Participants were told, however, that the truthfulness of the videos would be evaluated by a registered forensic psychologist who would be blinded to the conditions from whence the videos were derived. They were further informed that the psychologist had expertise in detecting deception. To ensure that all individuals fully understood the requests of them under each condition, demonstration stimuli for the truthful and deception conditions were presented

to each participant prior to their undertaking of the experimental tasks.⁹ Exposure to demonstration stimuli was deemed to be particularly important for providing a frame of reference regarding IAPS images to those participants who were assigned to the deception condition first.

Participants were administered the paper-and-pencil measures following the completion of the experimental tasks. Although it could be argued that participation in the experiment and completion of the questionnaires should have been counterbalanced across participants, it was still decided to have them complete the measures following their participation in the experiment. This action was taken to provide the best possible chance of replicating the results of the first study. More specifically, it was believed that replication would be best achieved by following a procedure that was highly similar to that of the first study, which did not involve administration of psychological measures to participants. It was further believed that the behaviour of some individuals may have been influenced considerably, particularly during the deception task, if they had completed certain questionnaires (e.g., BADQ) prior to partaking in the experiment. On this point, however, it also should be mentioned that participation in the experiment may have influenced some participants' responses to the measures. Thus, the results concerning the questionnaires should be interpreted cautiously with this possibility in mind.

⁹ The truthful condition demonstration pictures and labels were: (1) A vicious dog (IAPS image #1300); (2) A Ku Klux Klan rally (IAPS image #9810); and (3) A sinking ship (IAPS image #9600). The deception condition demonstration labels were: (1) A homeless man drinking alcohol; (2) A man and a woman visiting a cemetery; and (3) An addict injecting drugs. These labels corresponded to IAPS image #2750, IAPS image #9220, and IAPS image #2710, respectively. Again, these pictures have been found to elicit negative emotional arousal in research settings according to normative data reported by the IAPS authors. These particular stimuli were used for demonstration purposes because they differed in content from the stimuli used in the actual experiment, reducing the possibility of participants drawing on demonstration stimuli for their deceptive accounts.

Each participant was debriefed following completion of the paper-and-pencil questionnaires. The 10 behaviours reported on in the first study were similarly examined in this study via the coding of transcripts and videos. To facilitate this, a specific coding procedure was developed (see Appendix C). As with the first study, a second coder viewed 20% of the videos to determine the interrater reliability of the observed behaviours. Correlational analyses indicated that the behavioural measurements were reliable. Specifically, the Pearson product-moment correlations among raters for the coded behaviours were as follows: smiles = .92; head movements = .90; illustrators = .98; self-manipulations = .93; filled pauses = .99; speech pauses = .99; and self-references = .98.

Results

Manipulation Check Results

During the videotaping, nine participants could not remember one or more of the six stimuli they were asked to describe. These participants were excluded from the analysis due to the possibility of them forming a “forgetting” cluster, which could have obscured the results when attempting to replicate the subtypes observed in the first study. An additional nine participants were recruited in their place. Each of these participants was able to complete the experiment without issue.

The experiment appeared to have the intended effects according to participants’ retrospective self-reports on the manipulation check questionnaire. A paired-samples *t*-test indicated that participants’ difficulty ratings for the deception task ($M = 6.30$; $SD = 1.73$) were significantly higher than their difficulty ratings for the truth-telling task ($M = 3.28$; $SD = 1.89$), $t(63) = -10.28$, $p < .001$, $d = -1.28$. A paired-samples *t*-test also showed

that participants' ratings of the arousal they reportedly experienced during the deception task ($M = 6.23$; $SD = 1.91$) were significantly greater than the ratings of arousal reportedly experienced during the truth-telling task ($M = 4.72$; $SD = 1.96$), $t(63) = -7.43$, $p < .001$, $d = -.93$. Table 9 indicates that participants' ratings of the pleasantness of stimuli viewed in the truthful condition (IAPS images and labels) were lower than the pleasantness ratings for the stimuli viewed in the deception condition (only labels for IAPS images). The table also indicates that their arousal ratings for stimuli viewed in the truthful condition were significantly higher than for stimuli viewed in the deception condition.

Table 9

Comparison of Participants' (n = 64) Pleasantness and Arousal Ratings for Stimuli

Viewed in the Truthful and Deception Conditions of the Second Experiment.

Order of stimulus presentation and quality rated	Truthful condition (IAPS images)	Deception condition (Image labels only)	<i>t</i> (63)	<i>p</i>	<i>d</i>
Stimulus #1					
Pleasantness	3.17 (1.38)	3.84 (1.32)	-3.20	.002	-.40
Arousal	4.98 (2.04)	4.13 (2.17)	2.77	.007	.35
Stimulus #2					
Pleasantness	3.22 (1.21)	3.80 (1.37)	-2.60	.012	-.32
Arousal	5.02 (1.69)	4.00 (2.12)	3.90	<.001	.49
Stimulus #3					
Pleasantness	3.50 (1.52)	3.81 (1.39)	-1.13	.262	-.14
Arousal	5.12 (2.19)	4.16 (2.39)	2.92	.005	.36

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for dependent samples.

Search for Outliers

Prior to performing any statistical analyses, the raw data concerning the 10 coded behaviours were examined for both univariate and multivariate outliers. The same approach described in the first study for identifying outliers was followed. Again, data obtained from participation in both conditions were inspected. As with the first study, no outliers were identified.

Comparing Truthful and Deceptive Accounts of Having Viewed Distressing Images

Paired-samples *t*-tests were conducted to determine which of the 10 coded behaviours differed significantly among the truthful and deceptive accounts at the group level. The results of these *t*-tests are presented in Table 10. The table shows that there were significantly more speech pauses in the deceptive accounts than in the truthful accounts. Differences among the other coded behaviours failed to reach significance according to the *t*-tests.¹⁰

¹⁰ Nonparametric statistical analyses also were conducted to determine whether significant differences existed between the truthful and deceptive accounts. A series of Wilcoxon's matched-pairs signed ranks tests yielded results consistent with the *t*-tests.

Table 10

Results of t-Tests Comparing Behaviours Coded in Participants' (n = 64) Truthful and Deceptive Accounts of Exposure to Moderately Distressing Images.

Behaviour	Veracity of account			<i>t</i> (63)	<i>p</i>	<i>d</i>
	Truthful	Deceptive	Difference			
Smiles	4.50 (4.63)	4.56 (5.14)	.06 (3.72)	-.14	.893	-.02
Head movements	203.45 (164.46)	208.11 (183.17)	4.66 (78.11)	-.48	.635	-.06
Illustrators	27.52 (32.74)	27.94 (36.70)	.42 (16.40)	-.21	.838	-.03
Self-manipulation	26.88 (38.44)	27.19 (36.74)	.31 (18.59)	-.13	.893	-.02
Time (seconds)	134.58 (76.04)	133.22 (81.42)	-1.36 (32.26)	.34	.737	.04
Words	347.52 (203.54)	341.45 (214.29)	-6.06 (100.90)	.48	.632	.06
Speech rate	155.09 (21.33)	154.82 (24.49)	-.27 (16.38)	.13	.897	.02
Filled pauses	16.19 (13.05)	16.45 (13.32)	.27 (6.35)	-.34	.739	-.04
Speech pauses	.20 (.74)	.67 (1.82)	.47 (1.27)	-2.95	.004	-.37
Self-references	5.02 (6.22)	5.25 (4.88)	.23 (3.47)	-.54	.591	-.07

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for dependent samples.

Calculating and Correlating Difference Scores

Difference scores were computed for the 10 coded behaviours to again capture changes when lying compared to a truth-telling baseline. As with the first study, negative difference scores indicated decreases in behaviours when lying compared to a truth-telling baseline, whereas positive difference scores indicated increases in behaviours when lying compared to a truth-telling baseline. The 10 difference scores for all 64 participants were submitted to correlational analyses to determine the nature and strength of the relationships among them. The Pearson product-moment correlations obtained from these analyses are presented in Table 11.

Table 11

Pearson Product-Moment Correlations among Difference Scores of Coded Behaviours for Participants (n = 64) Relating Truthful and Deceptive Accounts of Exposure to Moderately Distressing Images.

Behaviour	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Smiles	-	.16	.19	.29*	.40**	.41**	-.08	.26*	.00	.23
2. Head movements		-	.45***	.38**	.73***	.78***	.20	.48***	.04	.09
3. Illustrators			-	.45***	.51***	.57***	.24	.37**	.16	.05
4. Self-manipulations				-	.28*	.42**	.19	.23	-.06	.14
5. Time (seconds)					-	.91***	.01	.64***	.07	.01
6. Words						-	.36**	.57***	-.06	.19
7. Speech rate							-	-.10	-.18	.30*
8. Filled pauses								-	.03	.01
9. Speech pauses									-	-.37**
10. Self-references										-

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

Table 11 shows that some pairs of difference scores were not significantly correlated, whereas other pairs were significantly correlated to varying degrees. According to Cohen's (1992) standards, as summarized in the first study, some significantly correlated pairs of difference scores evidenced medium-sized relationships. Other correlated pairs evidenced large-sized relationships. On this point, difference scores for the time taken to deliver the accounts and the difference scores for the number of words spoken were almost perfectly correlated.

Almost all of the statistically significant relationships were positive relationships, indicating that changes from truth-telling to lying for these pairs of behaviours were generally in the same direction. The exception was the relationship between difference scores for speech pauses and difference scores for self-references, which evidenced an inverse relationship. An examination of the relationships among difference scores for coded behaviours that were found to be significantly different for truthful and deceptive accounts was not possible because only speech pauses were found to be significantly different in this regard. On this note, only difference scores for self-references were found to be significantly correlated with difference scores for speech pauses.

Subtyping Procedures

Cluster analysis was conducted to determine whether individuals again would fall into different groups, or subtypes, regarding behaviour changes when lying compared to a truth-telling baseline. The same between-subjects and within-subjects data transformations that were described in the first study were carried out prior to clustering profiles in the current study. The former transformation was made to place the raw difference scores of the coded behaviours on the same scale, and the latter transformation

was undertaken to compensate for individual differences in overall responsivity to the deception task. These computations yielded 10 ipsative z-scores of difference scores for each participant, with the mean score of each participant over the variables in the profile being 0.0 and the standard deviation being 1.0.

Identifying the Number of Subtypes. As in the first study, a *k*-means cluster analysis was conducted on the 10 ipsative z-scores of difference scores for all participants with Euclidean distance selected as the distance measure. Two- to five-cluster solutions were inspected. A two-cluster solution again appeared to be the best on both empirical and rational grounds. More specifically, the CH Indices for two-, three-, four-, and five-cluster solutions were: 15.93, 12.98, 10.72, and 10.10, respectively. In other words, a two-cluster solution evidenced the optimal clustering outcome, as it maximized the CH Index. The two-cluster solution also was the most parsimonious solution and demonstrated superior interpretability. Table 12 shows the final cluster means obtained by the *k*-means cluster analysis when it was constrained to produce a two-cluster solution.

Table 12

Comparison of Fluid and Laboured Liars' Mean Ipsative Z-scores of Difference Scores for Behaviours Coded from Truthful and Deceptive Accounts of Exposure to Distressing Images.

Behaviour	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Smiles	-.19 (.10)	.31 (.91)	-1.95	.056	-.49
Head movements	-.11 (.60)	-.02 (.87)	-.46	.648	-.11
Illustrators	-.08 (.87)	.04 (.78)	-.57	.574	-.14
Self-manipulations	.27 (.86)	-.25 (.91)	2.36	.022	.59
Time (seconds)	-.48 (.58)	.40 (.57)	-6.03	.000	-1.51
Words	-.13 (.57)	.08 (.52)	-1.51	.137	-.38
Speech rate	1.09 (.94)	-.90 (.83)	8.99	.000	2.25
Filled pauses	-.61 (.73)	.61 (1.04)	-5.47	.000	-1.36
Speech pauses	-.26 (1.03)	-.06 (1.21)	-.71	.482	-.18
Self-references	.48 (.89)	-.20 (.91)	3.00	.004	.75

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for independent samples.

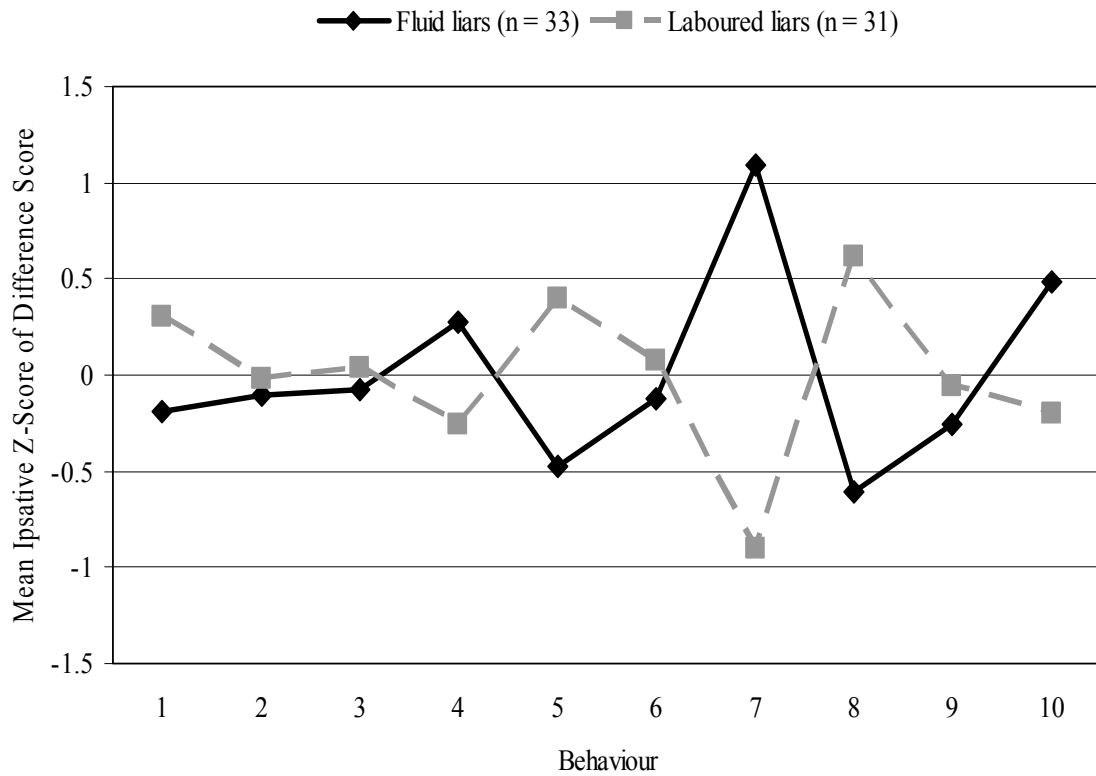
Describing the Subtypes: Fluid Liars and Laboured Liars.

Table 12 shows that the first cluster, again named “fluid liars”, comprised 51.6% of the sample. Fluid liars were characterized by a relative increase in speech rate as well as a relative decrease in filled pauses when lying in comparison to baseline truth-telling. For fluid liars, there was a relative decrease in the amount of time taken to deliver the accounts when lying in comparison to baseline truth-telling. For fluid liars, there also was a relative increase in self-references and self-manipulations when lying in comparison to baseline truth-telling.

Table 12 further shows that the second cluster, again named “laboured liars”, comprised 48.4% of the sample. In contrast, laboured liars were characterized by a relative decrease in speech rate as well as a relative increase in filled pauses when lying in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken when lying in comparison to baseline truth-telling. For laboured liars, there also was a relative decrease in self-references and self-manipulations when lying in comparison to baseline truth-telling. As with the first study, a sizable number of cases were assigned to each cluster, indicating that neither group was characterized by only one or two outliers. The profiles of the final cluster means for fluid liars and laboured liars are presented in Figure 6.

Figure 6

Profiles of the Relative Behavioural Effects of Deception among Participants Describing Moderately Distressing Images.



Note. 1 = smiles; 2 = head movements; 3 = illustrators; 4 = self-manipulations; 5 = time (seconds); 6 = words; 7 = speech rate; 8 = filled pauses; 9 = speech pauses; 10 = self-references.

Figure 6 illustrates that the profiles of fluid liars and laboured liars again have different shapes, indicating qualitative differences between the two groups concerning the relative behavioural effects of deception.

Are the Subtypes Still Meaningful? To determine whether the cluster analysis obtained solutions that were meaningful, the procedure used by McKillop and Nielson (2011) that was summarized in the first study was followed again. Global pseudo- F values for two- to five-cluster solutions were calculated using the data obtained in the current study. Using this data, the global pseudo- F values for two-, three-, four-, and five-cluster solutions were: 14.86, 16.53, 11.77, and 11.28, respectively. These global pseudo- F values were divided by the global pseudo- F values obtained from the randomly-generated data described in the first study. The resulting ratios for two-, three-, four-, and five-cluster solutions were: 1.69, 1.74, 2.17, and 1.53, respectively. The finding that these ratios were all greater than 1.0 indicated that the cluster solutions obtained using data from the current study were greater than the cluster solutions obtained using randomly generated data. That is, the cluster solutions obtained using data from this second study outperformed those that were obtained using random data. This finding indicates that the solutions obtained using data from the current study were not entirely random, including the two-cluster solution characterizing fluid liars and laboured liars.

Subtype Validation: Identifying Correlates.

Searching for Potential Demographic Correlates.

An effort was first made to determine whether fluid liars and laboured liars differed on any demographic characteristics.¹¹ As can be seen in Table 13, a significant

¹¹ For the ethnicity, country of origin, and major area of study variables, some of the categories within these variables had to be combined into an “other” category due to the small numbers of cases in them. This

association was found between the subtypes and the sex of the participants. Specifically, males were significantly less likely to be classified as laboured liars. The results presented in the table further indicate that the subtypes did not differ on any other demographic characteristics.

amalgamation allowed for comparisons between fluid liars and laboured liars that did not violate statistical assumptions.

Table 13

Comparison of Fluid and Laboured Liars' Demographic Characteristics.

Variable	Group		$t(62)$	p	d
	Fluid liars ($n = 33$)	Laboured liars ($n = 31$)	or $\chi^2(64)$		or odds ratio
Age	21.70 (5.03)	21.11 (2.62)	.59	.559	.15
Sex (%)			4.28	.039	
Male	39.4	16.1			3.39
Female	60.6	83.9			.30
Ethnicity (%)			.22	.636	
Caucasian	75.8	80.6			.75
Other	24.2	19.4			1.32
Country of origin (%)			1.35	.245	
Canada	75.8	87.1			.46
Other	24.2	12.9			2.16
Years in university	2.12 (.92)	2.53 (1.20)	-1.54	.130	-.38
Major (%)			1.67	.196	
Psychology	48.5	64.5			.52
Other	51.5	35.5			1.93

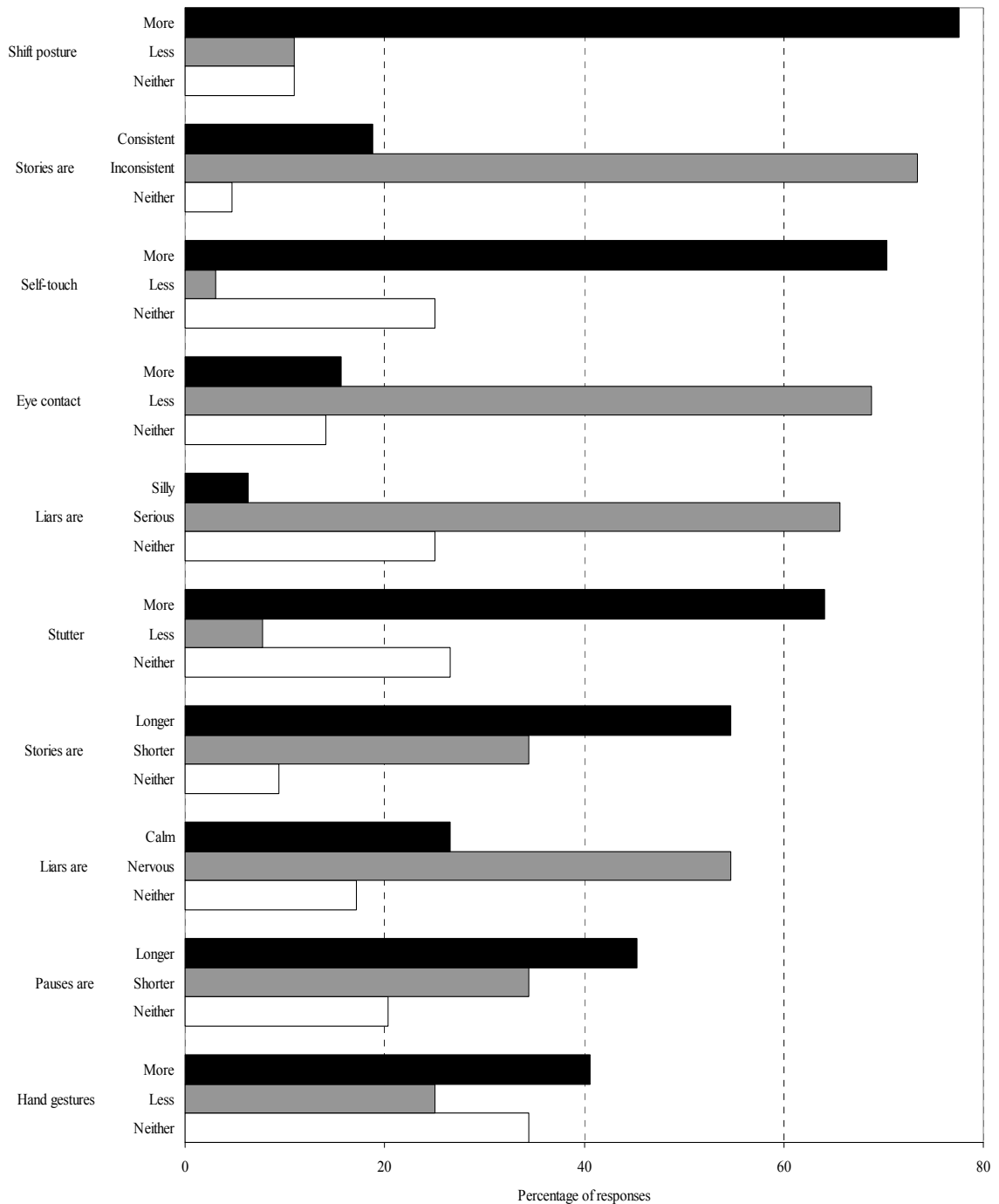
Note. Values under the second and third columns are means (and standard deviations) for continuous variables or percentages for categorical variables. For continuous variables, values under the sixth column are effect sizes for independent samples.

Searching for Potential Attitudinal Correlates.

Figure 7 provides a breakdown of participants' beliefs about how liars typically behave. These results were based on responses to the first 10 items of the BADQ, and are presented in the same format used by The Global Deception Research Team (2006). It is worth pointing out that the most commonly held worldwide beliefs about deceptive behaviour correspond to the modal responses for items observed in Figure 7. Although the Global Deception Research Team (2006) obtained a somewhat different rank order of these 10 items in comparison with the current study, the modal responses to the individual items were the same across both studies.

Figure 7

Participants' ($n = 64$) Beliefs About the Behaviour of Liars.



Note: Percentages may not sum to 100% because two participants gave more than one response to some items and their responses to these items were excluded.

Table 14 displays the subtypes' endorsement of each stereotypical cue to deceit. As can be seen in the table, a sizable percentage of individuals in each group believed that these particular behaviours represent cues to deceit. Although there were no statistically significant differences between the subtypes with respect to endorsement of the individual cues, the table shows a non-significant pattern of greater endorsement of these cues by laboured liars. The only exception to this pattern was that more fluid liars than laboured liars believed that deceivers are nervous. Again, however, this difference was a non-significant difference.

Table 14

Comparison of the Subtypes' Endorsement of Stereotypical Beliefs About the Behaviour of Liars.

Stereotypical belief	Group		$\chi^2(64)$	<i>p</i>	Odds ratio
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Shift posture more	69.7	83.3	1.79	.181	.46
Stories are inconsistent	66.7	80.6	1.60	.206	.48
Self-touch more	60.6	80.6	3.08	.080	.37
Make less eye contact	60.6	77.4	2.10	.147	.45
Are serious	57.6	74.2	1.96	.162	.47
Stutter more	60.6	67.7	.35	.552	.73
Stories are longer	51.5	58.1	.28	.599	.76
Are nervous	57.6	51.5	.23	.632	1.28
Pause longer	42.4	48.4	.23	.632	.79
Make more hand gestures	30.3	51.6	3.01	.083	.40

Note. Values under the second and third columns are percentages.

The current study also sought to examine whether fluid and laboured liars differed with respect to the degree to which they held pan-cultural stereotypes about how liars behave. This involved tallying for each participant the number of beliefs held that matched the most commonly held worldwide beliefs reported by the Global Deception Research Team (2006). By following this approach, each participant received a score between zero and 10. Interestingly, an independent-samples *t*-test indicated that laboured liars held a significantly greater number of stereotypical beliefs about deceptive behaviour ($M = 6.74$; $SD = 1.88$) than did fluid liars ($M = 5.58$; $SD = 2.48$), $t(62) = 2.11$, $p = .039$, $d = -.53$. Of note, this difference represented a moderate effect size according to Cohen's (1992) criteria. The results presented in Table 15 indicated that there were no significant differences between fluid and laboured liars for beliefs concerning the frequency of deception, their deception-related abilities, the gullibility of others, and whether they enjoyed engaging in deception. Beliefs concerning the demography of deception were not examined in the current study given their peripheral relationship to the research objectives.

Table 15

Fluid and Laboured Liars' Beliefs About the Frequency of Deception, their Deception-Related Abilities, and the Gullibility of Others.

Variable	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Number of times per week a typical person lies ^a	10.14 (10.71)	22.32 (70.93)	-.96	.341	-.24
Number of other peoples' lies detected (out of 10) ^a	4.06 (2.29)	4.24 (2.00)	-.34	.737	-.08
Number of own lies caught by others (out of 10) ^a	5.39 (2.83)	5.27 (2.89)	.17	.867	.04
I could fool a professional lie-catcher (e.g., a police officer) ^b	2.85 (2.03)	3.13 (2.01)	-.55	.581	-.14
Most people are easily deceived ^b	5.48 (1.86)	5.32 (1.35)	.40	.692	.10
Most people cannot tell when I am lying ^b	4.33 (2.38)	4.32 (1.76)	.02	.984	.00
Everybody lies on occasion ^b	7.70 (2.20)	7.97 (1.17)	-.61	.545	-.15
I enjoy telling lies ^b	2.06 (1.56)	2.71 (2.07)	-1.42	.160	-.35

Note. a. Original BADQ item. b. Ancillary item developed by this author (rated on a 9-point Likert scale, ranging from 1 = 'Not True' to 9 = 'Very True'). Values under the sixth column are effect sizes for independent samples.

Searching for Potential Personality Correlates.

The results presented in Table 16 show that there were no significant differences between the two subtypes in terms of their personality traits as captured by the BFI. It should be noted that these results held even when taking acquiescent-related response styles into account. These response styles included “yea-saying” and “nay-saying”. This was achieved by ipsatizing BFI items through a procedure described by John, Naumann, and Soto (2008).

Table 16

Comparison of Fluid and Laboured Liars' Personality Traits.

BFI scale / trait	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Extraversion	3.38 (.89)	3.57 (.78)	-.87	.390	-.22
Agreeableness	3.98 (.58)	3.77 (.68)	1.33	.187	.33
Conscientiousness	3.59 (.66)	3.70 (.59)	-.68	.501	-.17
Neuroticism	2.92 (.74)	2.95 (.68)	-.13	.896	-.03
Openness	3.66 (.73)	3.79 (.56)	-.76	.453	-.19

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for independent samples.

Table 17 summarizes the results of comparisons of BIDR scores for fluid and laboured liars. As can be seen in the table, there were no significant differences between the two subtypes concerning the various forms of socially desirable responding. More specifically, fluid liars and laboured liars did not differ in terms of their tendencies to engage in self-deceptive enhancement or impression management. These findings counter the argument that responses on some of the other aforementioned measures (e.g., BFI) may have been differentially influenced by increased amounts of socially desirable responding for one of the subtypes.

Table 17

Socially Desirable Responding among Fluid and Laboured Liars.

BIDR scale	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Self-deceptive enhancement	5.64 (3.05)	5.81 (3.34)	-.21	.832	-.05
Impression management	6.09 (3.57)	5.77 (3.47)	.36	.721	.09
Socially desirable responding	11.73 (5.24)	11.58 (5.76)	.11	.915	.03

Note. Values under the second and third columns are means (and standard deviations).

Values under the sixth column are effect sizes for independent samples.

Searching for Methodological Correlates: Ruling Out Confounding Variables.

An attempt was made to determine whether specific methodological variables were associated with the manifestation of the two different subtypes. The results of this analysis failed to indicate a significant effect of the order in which the truthful and deceptive accounts were obtained, $\chi^2(1, n = 64) = 3.06, p = .080$. Of the fluid liars, 39.4% provided their truthful accounts first and their deceptive accounts second, whereas 60.6% gave their deceptive accounts first and their truthful accounts second. Similarly, of the laboured liars, 61.3% provided their truthful accounts first and their deceptive accounts second, whereas 38.7% delivered their deceptive accounts first and their truthful accounts second. Table 18 shows that there were no significant associations between the subtypes and the particular stimuli that were described. These findings counter the argument that the behavioural differences observed among fluid and laboured liars were likely due to systematic differences in the pictorial content that was discussed.

Table 18

Nature of the Stimuli Described by Fluid and Laboured Liars.

Stimulus and veracity	Group		$\chi^2(64)$	<i>p</i>	OR
	Fluid liars	Laboured liars			
	(<i>n</i> = 33)	(<i>n</i> = 31)			
A riot in progress			.06	.802	
Truthful	51.5	48.4			1.13
Deceptive	48.5	51.6			.88
The face of a battered woman			.56	.453	
Truthful	54.5	45.2			1.45
Deceptive	45.5	54.8			.69
A child running away from a soldier			.06	.802	
Truthful	48.5	51.6			.88
Deceptive	51.5	48.4			1.13
The aftermath of a plane crash			.56	.453	
Truthful	45.5	54.8			.69
Deceptive	54.5	45.2			1.45
A man pointing a gun at another man			.06	.802	
Truthful	48.5	51.6			.88
Deceptive	51.5	48.4			1.13
Two police officers arresting people			.06	.802	
Truthful	51.5	48.4			1.13
Deceptive	48.5	51.6			.88

Note. OR = odds ratio.

The results presented in Table 19 show that there were no significant differences between the two subtypes with regard to the perceived difficulty of the truthful and deception tasks. The same finding was obtained for retrospective ratings of the perceived emotional arousal experienced during these tasks. Fluid and laboured liars did not differ significantly in their beliefs concerning self-presentation during the deception task. Specifically, there was no significant difference between the subtypes in the belief that it was best to maintain a calm or cool demeanour during the deception task, so as not to attract suspicion. Moreover, there was no significant difference between the groups in the belief that it was best to act animated, energized or excited during the deception task.

Table 19

Fluid and Laboured Liars' Ratings of the Perceived Difficulty of the Experimental Tasks, Emotional Arousal Experienced During the Experimental Tasks, and Beliefs Concerning Self-Presentation During the Deception Task.

Variable	Group		<i>t</i> (62)	<i>p</i>	<i>d</i>
	Fluid liars (<i>n</i> = 33)	Laboured liars (<i>n</i> = 31)			
Difficulty ratings for the truth-telling task ^a	3.45 (1.91)	3.10 (1.89)	.75	.453	.18
Emotional arousal ratings for the truth-telling task ^b	4.67 (2.27)	4.77 (1.61)	-.22	.829	-.05
Difficulty ratings for the deception task ^a	6.30 (1.83)	6.29 (1.66)	.03	.977	.01
Emotional arousal ratings for the deception task ^b	6.33 (2.04)	6.13 (1.78)	.43	.672	.10
Thought it was best to keep a calm or cool demeanour to not attract suspicion ^c	6.12 (2.13)	6.19 (1.74)	-.15	.883	-.04
Thought it was best to be animated, energized or excited to not attract suspicion ^c	3.21 (1.88)	3.61 (1.91)	-.85	.401	-.21

Note. a. Rated on a 9-point Likert scale, ranging from 1 = 'Easy' to 9 = 'Difficult'. b. Rated on a 9-point Likert scale, ranging from 1 = 'Calm' to 9 = 'Aroused'. c. Rated on a 9-point Likert scale, ranging from 1 = 'Not True' to 9 = 'Very True'. Values under the second and third columns are means (and standard deviations). Values under the sixth column are effect sizes for independent samples.

Discussion

Before discussing the main findings of the second study, it is worth highlighting again that the experiment appeared to have the intended effects according to participants' responses on the manipulation check. Student participants perceived fabricating accounts of having viewed moderately distressing images to be significantly more difficult than truthfully describing moderately distressing pictures that they were actually shown. This finding is in line with both past and current views that deception can be more taxing cognitively than telling the truth, given the increased demands on the deceiver (e.g., formulating the lie, considering its plausibility, controlling one's demeanour, monitoring the reactions of observers for signs of doubt, etc.) (Vrij, 2014; Vrij et al., 2013; Zuckerman et al., 1981). The students also reported experiencing significantly more emotional arousal during the deception task, which was consistent with several of the perspectives summarized previously (e.g., Ekman, 1985/1992, Ekman & Friesen, 1969; Zuckerman et al., 1981). With respect to the validity of the stimuli employed, participants rated the negatively-charged pictures, on which their truthful accounts were based, as less pleasant than the stimuli that were viewed in the deception condition (i.e., blank screens with image labels only). Additionally, their ratings of arousal concerning these pictures were significantly higher than ratings of arousal for the stimuli that were viewed in the deception condition. These findings provide some empirical support for the internal validity of the second experiment, at least according to participants' responses on the manipulation check. It should be noted, however, that these responses were retrospective in nature, and some retrospective assessments may be vulnerable to bias.

Differences between Truthful and Deceptive Accounts of Distressing Images

The results of the second study indicated that, on average, deceptive accounts involved significantly more speech pauses than truthful accounts. Consistent with the first hypothesis was the small effect size that was obtained for this difference. This finding also is consistent with several of the formulations on cues to deceit that were summarized in the second chapter, but most notably with the formulations of Zuckerman et al. (1981) and Ekman (1985/1992). More specifically, these conceptualizations described the utility of cognitive effort/thinking cues for detecting deception.

There were no significant differences between the truthful and deceptive accounts for the nine other coded behaviours. These findings also are consistent with the first hypothesis that small or no group differences would emerge for the cues investigated, and are generally consistent with the results of the meta-analytic investigations that have been highlighted throughout this manuscript (DePaulo et al., 2003; Sporer, & Schwandt, 2006, 2007). Notably, these particular results again run counter to the major conceptualizations on cues to deceit. Several possible explanations for such findings have been put forth by leading researchers in the field. The previous chapter already summarized some reasons for why behavioural cues to deceit may be faint according to evolutionary and the self-presentational perspectives (Bond et al., 1985; DePaulo et al., 2003). Additionally, it has been pointed out that many lies are executed flawlessly (Ekman, 1985/1992). But how does one reconcile the discrepancy between the results of the first study and the results of the second study? For example, why would significant differences between truthful and deceptive accounts emerge in the first experiment but not in the second for the amount of

time taken to deliver the accounts, the number of words spoken, and the number of head movements? This matter will be addressed in the final chapter of the dissertation.

Relationships among Cues to Deceit for Having Viewed Distressing Images

Consistent with the second hypothesis, and in line with the results of the first study, were the substantial correlations observed among many of the difference scores for the coded behaviours. Considering the relationships among difference scores for cues that were found to differ significantly between the truthful and deceptive accounts in the current study was not possible because only speech pauses were found to differ significantly in this regard. Although difference scores for self-references were found to correlate significantly with difference scores for speech pauses, self-references did not emerge as a cue to deceit at the group level in this experiment. How might researchers and practitioners cope with inconsistencies in the results of studies that examine correlations among cues to deceit? This issue also will be discussed in the final chapter.

Replication of Subtypes: Fluid and Laboured Liars

A two-cluster solution characterizing fluid and laboured liars was observed again when difference scores for cues were standardized to z -scores, ipsatized, and submitted to cluster analysis. This finding was consistent with the third hypothesis of the present study and the results of the previous experiment. Fluid liars exhibited a relative increase in speech rate as well as a relative decrease in filled pauses when lying in comparison to baseline truth-telling. For fluid liars, there was a relative decrease in the amount of time taken to deliver the accounts when lying. For fluid liars, there also was a relative increase in self-references and self-manipulations when lying. In contrast, laboured liars displayed a relative decrease in speech rate as well as a relative increase in filled pauses when lying

in comparison to baseline truth-telling. For laboured liars, there was a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken when lying. For laboured liars, there also was a relative decrease in self-references and self-manipulations when lying. As with the first study, this two-cluster solution appeared to be the best on both empirical and rational grounds. Also consistent with the first study was the finding that the obtained solutions were more meaningful than what one would expect among random data, including the two-cluster solution characterizing fluid and laboured liars.

Although fluid and laboured lying profiles emerged in both experiments, the keen observer may have noticed that the profiles for each subtype were not exactly the same across both experiments. For example, some cues that differentiated the subtypes in the first experiment did not do so in the second experiment, and vice versa. How does one make sense of these differences? Again, discussion of discrepancies between the results of the two studies will be saved for the final chapter of this dissertation.

Subtype Correlates: Sex Differences and Beliefs about Cues to Deception

A significant association was found between the subtypes and the sex of the participants, with men being less likely to be classified as laboured liars. This was the only demographic variable on which the subtypes differed significantly. It may be tempting to begin generating explanations for why men tended to display a fluid style of lying over a laboured style. For example, given that there is some evidence suggesting that adolescent boys appear to be more likely than girls to use deception in order to obtain dates (Eyre, Read, & Millstein, 1997), one might hypothesize from an evolutionary perspective that a smooth style of lying may have some advantages with regard to

reproduction goals. Alternative explanations also might be generated from the perspective of gender roles and socialization. It should be remembered, however, that a significant association between the subtypes and the sex of the participants was not found in the first experiment. In other words, the association observed here could have been spurious, so future attempts at replicating the finding seem warranted. Additionally, whether fluid and laboured lying represent state- or trait-like characteristics should be first established.

The present study also examined the relationship between the subtypes and the degree to which they held pan-cultural stereotypes about how liars behave (e.g., liars make less eye contact, stutter more, pause longer, etc.). Of note, the most commonly held worldwide beliefs about deceptive behaviour corresponded to the modal responses given by the students in the current study (see Global Deception Research Team, 2006). As hypothesized, fluid liars held an appreciable number of supposedly stereotypical beliefs concerning cues. More specifically, as a group, they held an average of more than five of the 10 beliefs reported by the Global Deception Research Team (2006). This finding provides some support for Zuckerman and colleagues' (1981) formulation of deceptive behaviour emphasizing attempted behavioural control. Indeed, if fluid liars held no stereotypic beliefs about deceit, then attempted behavioural control would seem to be a less likely candidate for the mechanism underlying their overly polished accounts. This is because the formulation specifically predicts that those engaged in attempted behavioural control hold erroneous stereotypes about honesty and how liars behave.

Contrary to expectations, it was found that laboured liars held a significantly greater number of stereotypical beliefs regarding deceptive behaviour compared to fluid

liars. More precisely, laboured liars, as a group, held an average of almost seven of the 10 stereotypical beliefs documented by the Global Deception Research Team (2006). Again, this difference between subtypes represented a moderately large effect size. There are several different conceivable explanations for the result. For example, in holding a greater number of stereotypical beliefs, perhaps laboured liars were more vulnerable to self-fulfilling prophecies consistent with how liars are believed to behave. Indeed, both accurate and inaccurate beliefs may strongly influence self-presentations (Barrick, Shaffer, & DeGrassi, 2009; Rogers et al., 2011). Or, in holding fewer stereotypical beliefs, perhaps fluid liars were less prone to demand characteristics of how they thought the experimenter may have wanted them to behave. Probably the simplest explanation, however, has to do with the ordering of participation in the experiment and the completion of self-report measures. That is, in view of their deceptive performance, which seemed to be consistent with the apparent stereotypical belief that liars tend to struggle with delivering their accounts (also see Hartwig & Bond, 2011), laboured liars may have endorsed a greater number of such beliefs. This explanation is concordant with Bem's (1972) self-perception theory, which states that individuals come to know their beliefs partially through inferring them from observations of their own behaviours or situations in which the behaviours occur. For this reason, future research should examine the relationship between beliefs and deceptive behaviours longitudinally. For example, it would be interesting to know whether a similar or a different relationship emerges between the subtypes and stereotypical beliefs when the beliefs are measured in the week or month prior to participating in a comparable experiment. Having stated this, researchers could still measure these beliefs after participation in an experiment to gauge

whether and how they change. Moreover, future research also should examine whether participants endorse making a conscious effort to control specific cues, as this data was not collected in the present study and the pattern observed between the subtypes and specific stereotypical beliefs about cues was non-significant. Such data might facilitate a greater understanding of the mechanisms underlying the manifestation of the subtypes, particularly those of fluid liars.

There did not appear to be convincing data to support the hypothesis that fluid liars were more practiced at deception than laboured liars. There was no significant difference between the two subtypes with respect to the number of times they were reportedly detected when behaving deceptively. It should be noted though that the frequency with which these two groups lied was not assessed. The same could be said for confidence in the ability to deceive others, as no significant differences were observed in terms of self-reported deception skills. The subtypes also did not differ significantly in their views on the gullibility of others, or whether they enjoyed engaging in deception. Further, the differences between subtypes did not appear to be attributable to more global strategies concerning the management of self-presentations, such as trying to maintain a calm and cool demeanour while lying or acting animated, energized, or excited so as not to attract suspicion. It should be mentioned, however, that the present study was somewhat limited in measuring these particular constructs. That is, most of them were assessed via responses to only one or two questions, and individual items may be prone to error. Thus, further development of psychometrically sound measures of these constructs could be useful and may yield different results.

The perceived difficulty of the experimental tasks was not significantly different for fluid and laboured liars. Nor was the self-reported emotional arousal experienced during these tasks. Although these findings seem to undermine the supposition that the mechanisms underlying laboured lying are cognitive load and/or emotional arousal, it may have been that fluid liars coped with these states/processes in a different way. For example, even though all participants were given time to mentally plan and rehearse their accounts, perhaps fluid liars did so to a greater degree than laboured liars, and this is what led to their overly smooth accounts. Greater effort, in turn, may have been a function of more engagement or interest in the experimental tasks. Because these variables were not assessed in the present study, future research should examine them via manipulation checks. That is, investigators could ask participants whether they actually used the allotted time to mentally plan and rehearse their accounts or whether they gave them “off-the-cuff”. Similarly, experimenters could query whether individuals did not try hard, tried a little bit, gave a good effort, or really tried to do their best during each task. Likert scales also could be developed to tap subjects’ interest in the experimental tasks, as well as their levels of motivation in each condition.

With regard to the possible role of personality traits, the study results failed to indicate any significant differences between the subtypes and the “Big Five” dimensions of personality. Importantly, these results held even when compensating for acquiescent-related response styles (i.e., “yea-saying” or “nay-saying”). Moreover, there were no significant differences between the subtypes concerning various forms of socially desirable responding, countering the argument that responses on the other aforementioned measures may have been differentially influenced by increased amounts

of socially desirable responding for one of the subtypes.¹² Given that a relatively short instrument was used to assess these broad personality dimensions, future studies could examine whether differences emerge when more comprehensive measures are used. For example, those instruments that simultaneously tap the more narrow facets of the “Big Five” personality traits could be employed. Researchers also may wish to focus on other individual differences that could play a role in the manifestation of the subtypes. For example, while it was argued in the second chapter that psychopathy, diagnosed categorically, would be unlikely to fully account for the differences observed between the subtypes, subclinical psychopathy may play a more prominent role when measured continuously, such as by instruments that tap the “Dark Triad” of personality (Paulhus & Williams, 2002).

Lastly, an effort was made to determine whether the subtypes may have been a product of confounding methodological variables. Interestingly, the results failed to indicate a significant effect of the order in which the truthful and deceptive accounts were obtained. Similarly, there were no significant associations between the subtypes and the particular stimuli that were described. This latter finding suggests that the behavioural differences observed between the subtypes were not specifically due to systematic differences in the pictorial content that was discussed. Collectively, these findings also

¹² It is recognized, however, that the ideal scenario would have been for each instrument to have its own embedded measures of relevant response-styles because individuals may distort their answers on one instrument but not on another (Otto, 2008). Moreover, it is acknowledged that irrelevant (e.g., random) responding and exaggeration of difficulties, such as those related to neuroticism, were not directly assessed in the present study. Incidence of the latter response style is likely to have been low in the current research context, however, because there would have been very little to gain from exaggerating difficulties. With regard to the former response style, some steps were taken to screen for random responding. For example, the experimenter made an effort to identify whether the self-report measures were completed in an unusually short amount of time. Of note, there were no instances of this occurring.

counter the argument that the results of the first study concerning the subtypes were likely due to confounding methodological variables.

Limitations of the Second Study

Probably one of the greatest limitations of the current study was its correlational design regarding examination of the relationships between the subtypes and the constructs that were assessed via self-report measures. The reader should remember, however, that the primary objective of this study was to establish whether the subtypes in the first study could be replicated in the context of a more highly controlled experiment. Discovering correlates of the subtypes in order to identify clues as to the causal mechanisms that may be underlying them was more of an ancillary objective. It was for this reason that participation in the experiment and completion of the measures was not counterbalanced across participants, as some of these measures could have unduly influenced the behaviour of individuals who completed them prior to participating in the experiment. Having stated this, now that the subtypes appear to have been replicated after having followed similar procedures to those employed in the first study, counterbalancing participation in experiments with completion of measures in studies that investigate these matters further seems more permissible. That is, so long as investigators still attempt to gauge the impact of this methodological variable.

The correlational aspect of the present study identified some clues as to possible factors underlying the subtypes. Like all correlational findings, they must be interpreted with caution. Indeed, other factors that may be responsible for the results were highlighted in the previous section, as well as in the discussion section of the second chapter. Recommendations were made concerning other variables that should be assessed

via manipulation checks, which could be responsible for the results. But researchers need to not stop there. In some cases, it may be possible to manipulate variables directly in order to determine whether they have a causal role in the manifestation of the subtypes. For example, in the previous section it was hypothesized that perhaps fluid liars made more use of their allotted time to mentally plan and rehearse their accounts. In a follow-up study, a researcher could test this hypothesis directly by not only having participants tell the truth and lie but also randomly assign half of all participants to a condition in which they practice their accounts with a confederate and the other half of participants to a condition in which they are left to their own devices. If the above hypothesis is correct, a greater proportion of fluid liars would be expected to emerge when participants are encouraged to practice their accounts with a confederate than when they are not. As another related example, a researcher could provide half of all participants with a list of the stereotypical beliefs regarding deception cues, and inform them that observers will be likely to use them in judging the truthfulness of their accounts (“coaching” condition). The remaining half of participants could receive no such information (control condition). If attempted behavioural control plays a causal role in fluid lying then a greater proportion of fluid liars would be expected in the coaching condition.

Like the discussion that followed the first experiment, this discussion section highlighted some of the limitations that were specific to the current study. Again, many recommendations for future research were made. These recommendations, however, were tailored to testing and clarifying the ideas that were reported here. Limitations that apply to both of the studies that comprise this dissertation research (e.g., issues pertaining to external validity) will be discussed in the next and final chapter. The last chapter also will

outline general recommendations for future research on the topic of subtyping the behavioural effects of deceit.

CHAPTER 4. GENERAL DISCUSSION

The purpose of this dissertation was to determine whether people could be grouped in meaningful ways with regard to similar verbal and nonverbal behaviour changes when comparing lying to a truth-telling baseline. Two experimental studies were conducted to meet this objective. The first study involved an analysis of behavioural cues to deceit measured in a sample of undergraduate students and incarcerated male criminal offenders who provided both truthful and fabricated accounts of negative life events. The second study addressed the methodological limitations of the first. It involved an analysis of the same behavioural cues measured in a sample of undergraduate students who provided truthful and deceptive accounts of exposure to the same moderately distressing images. This second study was conducted to better control the events that formed the basis of the accounts and establish the *ground truth* of the matters discussed (Hartwig, 2011; Vrij, 2008). The behaviours examined in both studies were considered to be a representative sampling of those that are believed to be relevant in the domain of deception cues (Buller & Burgoon, 1996; DePaulo et al., 2003; Ekman, 1985/1992, Ekman & Friesen, 1969; Zuckerman et al., 1981). These cues included: the number of smiles; number of head movements; number of illustrators; number of self-manipulations; number of words spoken; the length of the response in seconds; speech rate; the number of filled pauses; number of silent pauses; and the number of self-references in the accounts. In addition to providing a summary of the general findings from these studies, this final chapter addresses the possible broader implications of the results for theory and research concerning deception. It also addresses the potential implications of the findings for the practice of deception detection. Limitations applicable

to both studies are discussed, and recommendations for future research are provided throughout.

Summary of General Findings

Results Consistent Across Both Studies.

Small or No Group Differences for Cues to Deception.

Based on the results of meta-analytic reviews (DePaulo et al., 2003; Sporer, & Schwandt, 2006, 2007), it was hypothesized that either small or no group differences would be observed for the cues investigated. This indeed was the case in both studies. In the first study, deceptive accounts of negative life events, on average, involved fewer spoken words, were shorter in duration, and were associated with fewer head movements than truthful accounts. These findings provided some support for DePaulo and colleagues' (2003) self-presentational perspective on cues to deceit, which specifically predicts that liars are less forthcoming and tell less compelling tales than truth-tellers. The other coded behaviours did not differ significantly between the genuine and fabricated accounts when the student and offender samples were examined together; however, a significant interaction concerning criminal status was found for speech pauses, which will be discussed in a later section.

In the second study, deceptive accounts of having viewed moderately distressing images involved significantly more speech pauses than truthful accounts. As with the first study, a small effect size was obtained for this difference. The finding provided some support for Zuckerman et al.'s (1981) and Ekman's (1985/1992) conceptualizations, which originally described the utility of cognitive effort and thinking cues for detecting

deceit. Again, there were no significant differences between the truthful and deceptive accounts for the remaining coded behaviours.

Some researchers have provided possible explanations for why significant differences are unlikely to be obtained for cues, or why they may be small differences at best. For example, some theorists have suggested that individuals are so practiced at deception as a result of having engaged in it so regularly in their day-to-day lives that only faint cues are likely to be observed (DePaulo et al., 2003; Hartwig, 2011). Others have suggested that evolution would not have favoured blatant cues to deceit (Bond et al., 1985). And still others have pointed out that many lies are executed flawlessly, choosing to emphasize the talents of natural performers instead (Ekman, 1985/1992). Might there be alternative explanations to these ones?

Although interpreting null results may be difficult, they may be informative when obtained in the context of rigorous investigations. It would seem inaccurate to conclude that null results were obtained here because the studies conducted did not measure up with regard to quality or purpose. Indeed, having individuals tell the truth and lie about personal attitudes or facts (e.g., negative life events) are popular paradigms used by deception researchers, as is having individuals lie and tell the truth about images that they may or may not have seen. Of note, these paradigms were the top two paradigms used by deception researchers according to the most extensive meta-analysis of cues conducted to date (DePaulo et al., 2003). Moreover, the studies conducted were exceptional with respect to the number of participants that were recruited. On this point, DePaulo and her colleagues (2003) reported an average sample size of approximately 42 participants for the studies that were included in their large-scale review. In other words, the experiments

that comprised this dissertation research involved one-and-a-half times as many participants found in the average deception study. Moreover, they both employed the more powerful within-subjects design, with careful attention to counterbalancing of conditions and stimuli.

Given the high levels of interrater reliability that were attained for independent coders, it also seems unlikely that null results were obtained on account of measurement issues regarding the dependent variables. Of note, some of these coders were kept blind to the study purposes, conditions, and hypotheses. However, it could be argued that examining interrater reliability via use of more conservative statistics, such as kappa, may lead to further improvement in the measurement of behavioural cues to deceit and thereby enhance the validity of empirical investigations. Although it is possible that some of the results of the first study may have been partially attributable to confounding variables, and corroborating data were lacking to verify the veracity of the accounts provided, the first study was stronger than the second with respect to external validity. Conversely, even though the second study may have been relatively weaker with regard to external validity, it addressed methodological issues relating to the internal validity of the first experiment (e.g., establishing the ground truth of the matters). Additionally, the second study also made use of demonstration conditions and manipulation checks to ensure that participants understood instructions, and to show that the experiment indeed had the intended effects (e.g., the deception task was more difficult than the truthful task and caused more emotional arousal, stimuli used in the truthful condition were less pleasant and caused more arousal than stimuli used in the deception condition). What is more, the second study required participants to describe multiple images in each

condition to combat the potential of being hampered by floor effects for the dependent variables. Thus, the adequacy of the manipulations does not seem to be a compelling reason for the null results. Lastly, to criticize these studies via attacks on the field of deception research in general for imprecisely conceived formulations or slipshod experimental methods would definitely not be criticisms shared by all. Notably, senior researchers and experts who have achieved a great deal of success in the related field of detecting deceptive response styles in clinical/forensic settings have commended general deception researchers for the experimental rigor with which many of their investigations have been conducted, and for the links that they have drawn between theoretical formulations, research, and practice (see, e.g., Rogers, 2008f). Prominent memory researchers also have expressed such positive views (see, e.g., Loftus, 2011).

Fluid and Laboured Liar Subtypes and the Robustness of Speech Rate.

So if small differences and null results are not entirely the product of the frequency with which people engage in deception, evolutionary processes, natural performers, or poorly designed studies, then what other contributing factors might there be? Vrij (2008) addressed the possibility that each individual does show clear signs of deceit, but that different individuals may show different signs. It was said that this might result in no signs of deceit emerging when these individuals are analyzed at a group level. There was some evidence obtained from both studies to support these ideas. As hypothesized on the basis of anecdotal observations, two seemingly meaningful profiles concerning the behavioural effects of deception were observed in each study when the difference scores for cues (deceptive minus truthful) were transformed to *z*-scores, ipsatized, and submitted to cluster analysis. A two-cluster solution appeared to reflect

qualitative differences between the subtypes and was retained over solutions of other sizes in both studies on account of its parsimony and interpretability. Further, in each study, the two-cluster solution was empirically superior to solutions of other sizes and outperformed a two-cluster solution that was obtained using randomly generated data, suggesting that the two observed subtypes were more meaningful than what one would expect among random data. These findings were of relevance because good cluster solutions are determined, in part, by a reasonable number of homogenous clusters and their interpretability (Norusis, 2011).

More specifically, fluid liars and laboured liars were observed across both studies, and were named as such to reflect their salient differences in speech disturbances. Most prominent were the robust differences and relative changes in speech rate that were observed in both studies. Fluid liars exhibited a relative increase in speech rate when comparing lying to a truth-telling baseline. By contrast, laboured liars showed a relative decrease in speech rate. Of note, this particular cue appeared to be the most sensitive to the experimental manipulations according to the rank order of scores and profile shapes of the subtypes (Nunnally, 1978).

Psychological Factors Underlying Subtype Expression?

Given that the constructs of attempted behavioural control and cognitive effort (Zuckerman et al., 1981) appear to map fairly well onto the fluid and laboured liar subtypes respectively, one might rightfully ask why the subtypes were not named according to these constructs. For example, why not call them “attempted behavioural controllers” and “cognitively-loaded liars”? A decision was made to name them according to concrete behavioural descriptors because neither study yielded unequivocal

evidence that the aforementioned constructs were in fact those that govern the manifestation of the subtypes, even though some indirect evidence was obtained. More specifically, further research is required to demonstrate that these states/processes have a causal role in subtype expression beyond inferring them from the correlates that will be summarized later. On these points, the previous chapter provided some suggestions for how investigators may demonstrate causal status. For example, in a similar experiment, a researcher could include additional conditions in which some participants are “coached” on stereotypical cues to deceit that may be used to detect their lies, while other participants receive no such coaching. An observed association between coaching and fluid lying would provide some causal evidence for the role of attempted behavioural control in fluid lying. Similarly, researchers could add additional conditions in which some participants are required to provide their accounts in reverse chronological order with respect to the events that are discussed, while others are not (see, Vrij, 2014; Vrij & Granhag, 2012; Vrij, Leal, Mann, & Fisher, 2012; Vrij et al., 2008, 2010a; 2011, 2013). An observed association between laboured lying and recalling events in reverse chronological order would provide some support for the causal role of cognitive effort in laboured lying.

It should be mentioned, however, that other factors may be responsible for the differences observed among the subtypes, which also is why they were not named according to the constructs highlighted above. For example, in the previous chapter, it was hypothesized that perhaps fluid liars and laboured liars made different use of their time in mentally planning and rehearsing their accounts, with fluid liars over-preparing and laboured liars under-preparing. In other words, differences in preparation may

account for the differences observed between the subtypes, and not necessarily the conscious control of behaviours per se. Differences in preparation also may reflect other variables, such as interest in the tasks or motivation to succeed at them. To address this possibility, future studies could involve some participants sharing their planned accounts with a confederate before providing them, while others are left to their own devices. An observed association between fluid lying and greater planning and preparation via the assistance of a confederate would provide some causal evidence for this factor. Because the manipulation check that was used in the second study did not assess the self-reported motivation of participants in each condition or their interest in the experimental tasks, no data are available to speak to these issues and they should be queried via manipulation checks in future investigations. Another relevant factor that researchers should consider investigating is whether the fluid style of lying reflects a “get it over with” approach to deception, which also may account for the observed differences between the subtypes. In sum, additional experimental and correlational evidence is needed to elucidate the causal mechanisms involved in subtype expression before they are renamed to reflect more abstract psychological constructs.

The Need for Better Measures of Constructs Related to Deception.

Collectively, these findings raise the question of how deception researchers can be sure that they are actually measuring the constructs that they purport to be measuring (e.g., arousal, emotional reactions, cognitive effort, or attempted behavioural control). For example, it could be argued very easily that changes in speech disturbances, such as hesitations, silent pauses, and speech rate, are not specific to any particular explanatory construct. They may be associated with changes in arousal, fear, cognitive effort, or

attempted behavioural control in various ways. Complicating matters further is the recognition that these states/processes may operate in concert, and some researchers may disagree with specific predictions for the cues that are derived from the formulations (Sporer, & Schwandt, 2006, 2007).

Even though the overall pattern of changes among certain cues may be more or less suggestive of some constructs rather than others, Nunnally (1978) pointed out long ago that very few constructs can be fully operationalized by a single variable or item, as in the case of reaction time for example. To cope with this problem, investigators in other fields of psychology have had to develop multi-item composite measures of constructs, recognizing that the vast majority of observable variables are not completely specific to the attributes that they intend to assess. Yet, for some reason, most deception researchers often examine and statistically report on individual cues in isolation, as if they were both specific to, and a complete representation of such abstract constructs as “cognitive effort” or “attempted behavioural control”.

Although it has often been said that a cue comparable to Pinocchio’s nose does not exist for diagnosing deception, this also is likely to be the case for the states/processes associated with it. For example, speech hesitations could represent arousal or cognitive load. Moreover, increasing cognitive load may very well result in increased anxiety (Vrij & Granhag, 2012). Such problems are not unique to the field of deception research, however. Again, most psychological attributes are best represented by composite scores, based on multiple items (Nunnally, 1978). Indeed, most clinicians would frown upon a hypothetical practitioner who diagnosed depression solely on the basis of changes in sleep. As another example, would any psychologist be justified in characterizing an

individual's global intelligence solely on the basis of his or her response to a single item on an intelligence test?

Given that individual cues do not seem to be specific to the constructs that deception researchers wish to assess, and that different individuals may exhibit different styles of lying that also could be associated with different causal mechanisms, it appears that multi-item composite scales of these constructs are needed. Without a doubt, such scales seem long overdue. Although the development of behavioural rating scales for these constructs (that are not dependent on coding of specific verbal content) is a topic for another paper, interested researchers could look to seminal readings on psychometric theory for guidance (see, e.g., Nunnally, 1978). It is worth mentioning, however, that such endeavours are likely to be costly in terms of both time and resources. This is because the development of reliable and valid composite measures of constructs often requires the generation of large numbers of items and the use of large samples of participants. Such an investment may be worthwhile in the long run though, as the greatest advances in psychological science often involve advances in measurement (Nunnally, 1978). Indeed, one need only look at the impact that sound measures of constructs have had in other areas, such as the usefulness of the Psychopathy Checklist-Revised (PCL-R; Hare, 1991, 2003) for assisting decision-makers with offender classification and management, or the utility of numerous tests of cognitive abilities for characterizing strengths and deficits that may have a bearing on various domains of functioning.

Deception researchers could collaborate with other specialists (e.g., cognitive scientists, emotion researchers) in the pursuit of developing internally consistent and

relatively homogenous multi-item behaviour ratings scales of constructs such as fear, cognitive effort, guilt, duping delight, etc. To the extent that rigorous and well-planned efforts fail to yield reliable and valid measures of the phenomena of interest, researchers may have to abandon these constructs and search for others (Nunnally, 1978). If the efforts are successful, however, the measures developed could have applications beyond those that deception researchers may have anticipated. For example, a behaviour rating scale for fear that does not require the scoring of specific verbal content could be potentially useful in assessments of individuals with more limited verbal abilities. General applications aside, it would be interesting to know whether distinctive profiles emerge when difference scores of composite measures of the constructs summarized in this dissertation (deceptive minus truthful) are standardized, ipsatized, and submitted to cluster analysis. Such efforts could paint an even clearer picture of the behavioural effects of deceit. Further, it would be useful to know whether faint changes from truth-telling to lying across a number of cues that comprise a construct translate to more noticeable differences on global measures of the constructs that are represented by these cues.

One could criticize the aforementioned ideas on the grounds of practicality. For example, even though the sophistication of general deception research has been praised, Rogers (2008f) noted the limited clinical utility of the findings on account of the time-intensive coding that is involved for specific behaviours. Given the time and resources required, it was said that this methodology is impractical for clinical assessments and other professional applications. So how could one justify the development and use of composite measures of constructs that may involve the coding of even larger numbers of cues? Similar to the arguments made earlier, this author believes that the payoff would be

in the long run. That is, if reliable and valid composite measures of the relevant constructs are developed successfully, and based on the lowest level of coding (e.g., frequency and/or duration of cues), then researchers may eventually be able to move to the development of briefer and less time-intensive “screening” measures that could be used for practical purposes. For example, perhaps researchers could test whether shorter composite measures can be developed based on a smaller number cues that load most heavily on the constructs. Making ratings of these behaviours on Likert scales also could be tested for their accuracy in an effort to develop more rapid methods for the coding of cues. Of course, any detection strategies based on new composite measures would still have to demonstrate incremental validity over those that have already been established as effective.

Appreciable Correlations among Cues to Deceit: Practical Implications.

With regard to interrelationships among cues, substantial correlations were observed across both studies. This was hypothesized on the grounds that at least moderate correlations are to be expected when variables are part of an overall theoretical system (Nunnally, 1978). Specifically, these variables are all conceived to be important in the domain of behavioural cues to deception (Buller & Burgoon, 1996; DePaulo et al., 2003; Ekman, 1985/1992, Ekman & Friesen, 1969; Zuckerman et al., 1981). Given these findings, it was recommended in the second chapter that practitioners be cautious when using multiple cues to assist them with making judgments concerning the veracity of matters, especially when they are unaware of the nature of the relationships among them. This recommendation was made because some cues may provide only redundant information and could lead to over-confidence in judgements, a problem that has been

reported in other forensic contexts (see, e.g., Otto, 2008; Quinsey et al., 2006; Rogers & Bender, 2012).

Such findings further underscore the need for composite measures of constructs, where some redundancy among items/variables may actually be beneficial to the measurement of abstract psychological attributes. Of course, some of these hypothetical measures could still very well be correlated with each other, but some test construction procedures could be employed to reduce inter-correlations (see Nunnally, 1978).

Moreover, being aware of correlations among a smaller number of global measures of constructs is more manageable than having to keep track of correlations among the large number of possible cues that have been documented to date. Until such measures have been developed, this author argued that researchers should start to systematically report on interrelationships among cues, so that users of these cues can gain a sense of the ones that may provide unique information for differentiating truth-tellers from liars.

Additionally, deception researchers could begin to factor analyse cues to gain an understanding of how they may hang together, as well as an understanding of the more abstract variables that underlie them. On this point, the studies described here did not involve enough participants to permit factor analysis. Use of larger samples is advisable if this is the focus of inquiry.

Results Unique to Each Study.

Differences between Students and Offenders: Value in Baseline Comparisons.

In the first study, across the truthful and deceptive accounts, it was observed that only smiles occurred significantly more often for students than for offenders. Although the focus of this dissertation was not on general behaviour differences between forensic

and community populations, it was argued in the second chapter that such potential differences should probably be the focus of future research and warrant the consideration of practitioners who are routinely involved in detecting deceit. This argument was made on the basis that if it is established through further research that offenders generally smile less often than non-offenders, and if it is commonly believed that liars typically appear less pleasant than those telling the truth (see, e.g., DePaulo et al., 2003; Zuckerman et al., 1981), then offenders may represent another group at increased risk for being falsely accused of deception. The extent to which offender and non-offender populations differ with regard to other displays of affect is not clear, as they were not examined in the first study, so this also should be a focus of future investigations. Moreover, the smiles that were coded in this dissertation research were relatively undifferentiated from the many different kinds that have been documented (see, e.g., Ekman, 1985/1992); thus, it may be possible for a different pattern to emerge if specific kinds of smiles were measured. From a practical standpoint, it is reiterated that these issues underscore the importance of making comparisons against similar baseline truthful behaviour, wherever possible, when evaluating the behavioural responses of individuals suspected of engaging in deception (Hartwig, 2011; Vrij, 2008; Vrij et al., 2010a).

Decreases in Silent Pauses among Offenders while Lying: Attempted Control?

As mentioned earlier in this chapter, in the first study, a significant interaction concerning criminal status was found for speech pauses. Whereas the deceptive and truthful accounts of students did not differ significantly with regard to the number of speech pauses, there were significantly fewer speech pauses by offenders during the delivery of deceptive accounts compared to the delivery of truthful accounts. This

difference for offenders represented a moderate effect size, and appeared to be consistent with formulations that emphasize the role of attempted behavioural control in deceptive communications (DePaulo et al., 2003; Zuckerman et al., 1981). It was qualified in the second chapter, however, that it was not known whether offenders specifically believed that speech pauses were a cue to deceit and, thus, consciously tried to minimize them to the extent of overdoing it. In line with the suggestions of others (e.g., Rogers et al., 2011), it was recommended that future studies examine individuals' beliefs about cues to deceit, as was done in the second study (summarized later).

Speech Rate and the Robustness of the Subtypes.

When comparing lying to baseline truth-telling, in addition to a relative increase in speech rate, fluid liars in the first study were characterized by a relative decrease in speech pauses. When lying, they also exhibited a relative decrease in the amount of time taken to deliver the accounts, and showed a relative increase in smiles. By contrast, laboured liars were characterized not only by a relative decrease in speech rate when lying, but also by a relative increase in speech pauses. When lying, they showed a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken. Laboured liars also evidenced a relative decrease in smiles when lying. Even though the results of the first study indicated that speech rate made a comparatively large contribution to the separation of these two groups, a two-cluster solution characterizing fluid and laboured liars was still obtained when speech rate was excluded from analysis. This latter finding suggested that the obtainment of the two-cluster solution was not solely the result of the contribution of speech rate.

Criminal Status as a Subtype Correlate.

As mentioned in the second chapter, one method of validating subtypes is to establish relationships between them and other variables of theoretical and practical importance that were not used to form the clusters (Hair et al., 2009). Moreover, identifying correlates for an outcome is an early but essential step in identifying possible causes (Kraemer et al., 1997). Interestingly, a significant association between the subtypes and criminal status was found in the first study. More precisely, almost 70% of offenders were classified as fluid liars and the rest were classified as laboured liars. By contrast, about 42% of students were classified as fluid liars, and approximately 58% were classified as laboured liars. The results of the first study also indicated that neither fluid liars nor laboured liars were exclusive to either students or offenders, as both subtypes were observed when the two groups were analyzed separately. This finding suggested that obtainment of the two subtypes was not solely attributable to differences between students and offenders concerning the relative behavioural effects of deception. It also demonstrated the generalizability of the two-cluster solution across both forensic and community samples.

Based on these findings, it was argued that it was unlikely that clinical psychopathy would fully account for the different subtypes, given its estimated low prevalence in the general population (Coid et al., 2009; Hare & Neumann, 2008). More specifically, it seemed too rare to be the chief factor in explaining whether students exhibited a fluid style versus a laboured style of lying. A similar argument was made for the role of cognitive abilities. That is, the hypothesis that laboured liars had more limited cognitive abilities than fluid liars would inaccurately suggest that offenders' cognitive

abilities were superior to those of students because offenders were proportionally more likely to be classified as fluid liars. As with psychopathy, it appeared more probable that cognitive abilities would not fully account for the differences observed among fluid and laboured liars, but maybe partially so in some cases. Instead, it was postulated that more common and general factors were likely to have a role, such as basic dimensions of personality, confidence in deception skills, greater practice at deception, certain emotional reactions when lying, or broad strategies employed while lying.

Replication of Subtypes Using a Different Methodology.

In the second study, in addition to a relative increase in speech rate when lying, fluid liars exhibited a relative decrease in filled pauses. They also showed a relative decrease in the amount of time taken to deliver the accounts as well as a relative increase in self-references and self-manipulations when lying. In contrast, laboured liars displayed not only a relative decrease in speech rate when lying, but also a relative increase in filled pauses. They demonstrated a relative increase in the amount of time taken to deliver the account in addition to a relative increase in the number of words spoken when lying. For laboured liars, there also was a relative decrease in self-references and self-manipulations when lying. The replication of the subtypes using a different methodology provided further evidence of their generalizability. This replication also suggested that they were not a peculiar artifact of some element of the first experiment, nor were observations of the subtypes deemed to be limited to communications concerning truthful and fabricated accounts of negative life events.

Stereotypical Beliefs about Cues to Deception as a Subtype Correlate.

The second study sought to examine the relationship between the subtypes and the extent to which they held pan-cultural stereotypes about how liars behave (e.g., liars make less eye contact, stutter more, pause longer, etc.), given that both accurate and inaccurate beliefs may influence self-presentations (Barrick, Shaffer, & DeGrassi, 2009; Rogers et al., 2011). As hypothesized, fluid liars held an appreciable number of stereotypical beliefs concerning cues. More specifically, as a group, they held an average of more than five of the 10 beliefs reported by the Global Deception Research Team (2006). This finding provided some additional support for Zuckerman and colleagues' (1981) formulation emphasizing attempted behavioural control, as it specifically predicts that those engaged in attempted behavioural control hold erroneous stereotypes about honesty and how liars behave. Such stereotypic beliefs may have led fluid liars to excessive efforts to appear honest, which ultimately became their own indicators of deceit (i.e., overly smooth accounts).

Contrary to expectations, it was found that laboured liars held a significantly greater number of these stereotypical beliefs. As a group, they held an average of almost seven of the 10 stereotypical beliefs documented by the Global Deception Research Team (2006), and this difference between subtypes represented a moderate effect size. The previous chapter outlined several conceivable explanations for this result. For example, in holding a greater number of stereotypical beliefs, maybe laboured liars were more vulnerable to self-fulfilling prophecies consistent with how liars are believed to behave. Alternatively, in holding fewer stereotypical beliefs, perhaps fluid liars were less prone to demand characteristics of how they thought the experimenter may have wanted them to

behave. It was argued, however, that the simplest explanation likely involved the ordering of participation in the experiment and the completion of self-report measures. More specifically, in light of their deceptive performance, which appeared to be consistent with the apparent stereotypical belief that liars tend to struggle with delivering their accounts (also see Hartwig & Bond, 2011), laboured liars may have endorsed a greater number of such beliefs.

It was noted in the previous chapter that the latter explanation is concordant with Bem's (1972) self-perception theory, which states that individuals come to know their beliefs partially through inferring them from observations of their own behaviours or situations in which the behaviours occur. Such an explanation may be a viable alternative to others for how stereotypes of lying arise. For example, the Global Deception Research Team (2006) proposed that stereotypes about lying are designed to discourage lies. They went on to state that these stereotypes are not intended to be descriptive, but rather to reflect worldwide norms (e.g., children should feel ashamed when lying to parents, liars should feel bad, liars should get caught, and lying should not pay). It was elaborated that stereotypes of liars promote such views, and are transmitted through generations via socialization as mechanisms for social control.

But maybe some stereotypic beliefs about cues persist because some individuals actually display them? On this point, laboured liars exhibited some cues concerning speech disturbances that were consistent with the pan-cultural stereotype. Maybe the liars who are caught by these cues reinforce the stereotypic beliefs among those who detected them? Similarly, maybe the liars who exhibit these cues assume that they also apply to all others? The findings from the second study raise the additional question of whether some

of these cues can even be considered stereotypes if a substantial proportion of individuals display them while lying. Interestingly, another study conducted since publication of The Global Deception Research Team's (2006) findings also has indicated that some children exhibit behaviour while lying that is consistent with the pan-cultural stereotype (i.e., gaze aversion) (McCarthy & Lee, 2009). The findings from the present research raise the additional question of whether it is possible that some individuals are accurate at detecting one type of liar but not another. For example, maybe many individuals can accurately detect laboured liars but not fluid liars given their greater similarity to the global stereotype? Such a possibility may partially account for the overall poor levels of performance that are commonly reported in studies that focus on the accuracy of deception judgements.

Based on these findings and their potential implications, future research should examine the relationship between beliefs and deceptive behaviours longitudinally. It was mentioned in the third chapter that it would be interesting to know whether a similar or a different relationship emerges between the subtypes and stereotypical beliefs when the beliefs are measured in the week or month prior to participating in a comparable experiment. Of course, researchers could still measure the beliefs after participation in an experiment to gauge whether and how they change. Moreover, future research also should examine whether participants endorse making a conscious effort to control specific cues, as this data also was not collected in the second study. Such data might lead to a greater understanding of the mechanisms responsible for empirical results (Rogers et al., 2011).

Variables Not Identified as Subtype Correlates.

Of note, the second study did not yield convincing data to support the hypothesis that fluid liars were more practiced at deception than laboured liars. That is, there was no significant difference between the subtypes with respect to the number of times they were reportedly detected when behaving deceptively. It should be noted, however, that the frequency with which these two groups lied was not assessed. The same was said for confidence in the ability to deceive others, as no significant differences were observed in terms of self-reported deception skills. The subtypes also did not differ significantly in the degree to which they reportedly enjoyed engaging in deception. Furthermore, the differences between subtypes did not appear to be attributable to more global strategies for managing self-presentations (e.g., trying to maintain a calm and cool demeanour while lying, or acting animated, energized, or excited so as not to attract suspicion). It should be repeated, though, that the second study was somewhat limited in measuring these particular constructs, as most of them were evaluated via responses to only one or two questions that could be prone to error.

It is worth repeating that the perceived difficulty of the experimental tasks was not significantly different for fluid and laboured liars in the second study. Nor was the self-reported emotional arousal experienced during these tasks. Although these findings appear to undermine the possibility that the mechanisms underlying laboured lying were cognitive load and/or emotional arousal, it was postulated in the previous chapter that perhaps fluid liars coped with these states/processes in a different way. Again, maybe fluid liars put forth greater effort when mentally planning and rehearsing their accounts? The third chapter provided several recommendations on how researchers could examine

this possibility further via the use of manipulation checks. Additionally, querying participants on the extent to which they experienced guilt and duping delight also would be informative, as they were not assessed through the manipulation check used in the second study.

With regard to the possible role of personality traits, the results of the second study failed to indicate any significant differences between the subtypes and the “Big Five” dimensions of personality. Notably, these results held even when compensating for acquiescent-related response styles. Further, there were no significant differences between the subtypes concerning various forms of socially desirable responding, countering the argument that responses on the other aforementioned measures may have been differentially influenced by increased amounts of socially desirable responding for one of the subtypes. Given that a relatively brief instrument was used to assess these broad personality dimensions, it was recommended that future studies examine whether differences emerge when more comprehensive measures are used that simultaneously tap the more narrow facets of the “Big Five” personality traits. Researchers also may wish to focus on other individual differences that could play a role in subtype expression (for a review of other individual difference variables that may be of relevance, see Vrij, 2008). On a related note, DePaulo et al. (2003), Sporer and Schwandt (2006, 2007), and Hartwig and Bond (2011, 2014) have reported on a host of moderator variables in their meta-analyses that may have a bearing on the manifestation of the subtypes.

Lastly, an effort was made in the second study to determine whether the subtypes may have been a product of methodological variables. Importantly, the results failed to indicate a significant effect of the order in which the truthful and deceptive accounts were

obtained. Similarly, there were no significant associations between the subtypes and the particular stimuli that were described. This latter finding suggested that the behavioural differences observed between the subtypes were not specifically due to systematic differences in the pictorial content that was discussed. Collectively, the findings from the second study counter the argument that the results of the first study concerning the subtypes were likely due to confounding methodological variables (e.g., differences in the types of negative life events that were described).

Discrepancies between the Results of the Two Studies. As summarized earlier in this chapter, small group differences were obtained for some of the cues investigated in the first study (i.e., head movements, number of words spoken, duration of the accounts in seconds), which supported DePaulo et al.'s (2003) self-presentational perspective. In the second study, however, a small group difference was observed only for speech pauses, which supported Zuckerman et al.'s (1981) and Ekman's (1985/1992) formulations. With regard to correlations among cues, the first study revealed a number of substantial correlations among the cues that were found to be significantly different for the truthful and deceptive accounts. By contrast, in the second study, only difference scores for self-references correlated significantly with difference scores for speech pauses, and self-references did not emerge as a cue to deceit at the group level in the second experiment. Even though fluid and laboured lying profiles emerged in both studies, the keen observer may have noticed that the profiles for each subtype were not exactly the same across both experiments. Some cues that differentiated the subtypes in the first experiment did not do so in the second experiment, and vice versa, even though cues reflecting speech disturbances represented the largest differences between the

subtypes in both studies. Moreover, with regard to subtype correlates, the results of the first study did not indicate a significant association between the subtypes and the sex of the participants. In the second study, however, a significant association was observed between these two variables, with men being less likely to be classified as laboured liars.

How is one to make sense of these apparent discrepancies? The previous chapter already discussed the possibility that the observed association between the subtypes and the sex of the participants may have been spurious or random. On this point, given the exploratory nature of the research, the Type I error rate was set at .05 for each statistical test conducted, and Bonferroni corrections to this error rate were not made. The rationale for this decision was to prevent neglect of any potentially novel and important findings, and there was a possibility for spurious findings to emerge by chance by proceeding in this manner. It also was argued, however, that there are no statistical corrections for missing important discoveries due to insufficient attentiveness to the data (Bem, 2004), and that conducting research in this fashion underscored the importance of cautious interpretation of results. Like Cohen (1994), this author believes that psychologists must rely on replication for generalization. Thus, it was argued in the previous chapter that future attempts at replicating the findings seemed warranted. It also was argued that researchers should first establish whether fluid and laboured lying represent state- or trait-like characteristics, before attempting to explain any possible associations between the subtypes and the sexes. Having stated this, Vrij (2008) indicated that gender differences in cues are unlikely because, in many situations, men and women do not differ with respect to the emotions felt, cognitive effort experienced, or in their attempts to give convincing impressions while lying. Vrij (2008) also stated that there do not appear to be

any theoretical reasons for why men and women would differ in terms of behavioural manifestations of emotions, cognitive load, or attempted behavioural control while lying. The lack of a theoretical rationale, however, does not necessarily mean that such differences do not exist. Thus, more empirical data on the issue of whether men and women deceive differently with respect to subtypes would be valuable. In the previous chapter, this author alluded to the possible use of evolutionary or socialization perspectives for generating hypotheses on the matter.

Are there other explanations for the discrepancies? There were some differences between the two studies concerning methodology. The nature of the accounts provided were different (i.e., negative life events experienced vs. exposure to negative images), and there were slight differences in the coding procedures for some cues for example. It is not immediately apparent, however, why these specific methodological differences would result in the discrepancies noted above. Perhaps the simplest explanation has to do with the nature of the cues themselves. If some of the behavioural differences between truth-tellers and liars are indeed subtle and faint (Bond et al., 1985; DePaulo et al., 2003; Hartwig & Bond, 2011; Vrij, 2008; Vrij et al., 2010a), then some of the cues may be highly sensitive to sampling effects. Future research, therefore, should seek to identify the most robust cues. The current dissertation research indicated that speech rate may be a critical variable in this regard, at least with respect to the identified subtypes.

Further Implications of the Findings for Detecting Deception

For whom are these findings relevant? Given the intensive examination of behaviour that was involved, it would appear that the findings may be most relevant to professionals who heavily scrutinize the behaviour of suspected deceivers, and who are

employed in organizations where substantial time and resources are allocated to the recording and careful review of videotaped interviewees (e.g., some police and government agencies). Or, they may be of relevance to behavioural scientists who train and consult with such agencies (e.g., Porter & ten Brinke, 2010; Vrij, 2008). It might appear this way, at least at first. But it has been argued that observation of behaviour is still the most commonly used approach for detecting deceit (Vrij et al., 2010a), despite the widespread use of many specialized tools. This was said to be the case because certain technologies and equipment may be either unavailable or impractical to implement in many situations. Even in legal cases, judges and jurors may be instructed to evaluate the demeanor of individuals whose credibility is under question (Porter & ten Brinke, 2009). As indicated in the first chapter, although it may be ideal to use tangible evidence to guide determinations on the veracity of matters, Porter and ten Brinke (2009) highlighted that such evidence may be unavailable in many cases. Thus, awareness of these findings may be of some relevance to any individual who considers verbal and nonverbal behaviour when making judgements concerning truthfulness.

Of what particular findings should individuals be aware? Indeed, it appears that many behavioural differences between truth-tellers and liars may be subtle and, therefore, difficult to spot (Hartwig & Bond, 2011; Vrij et al., 2010a; Vrij, 2008). Moreover, the potential usefulness of some cues may not be readily apparent from research that documents differences at the group level, including meta-analyses. Not only does there appear to be no Pinocchio's nose for diagnosing deception, but this dissertation research yielded additional evidence to suggest that a single behavioural profile also seems unlikely (Buller & Burgoon, 1996). This at least appears to be the case with respect to the

more popular cues that were investigated here. From a practical standpoint, having such knowledge may be protective against more simplistic views of behavioural indicators of deceit leading to inaccurate judgements, which may be further associated with the severe consequences that were highlighted in the introductory chapter of this dissertation.

A Profile-Matching Approach for Detecting Deception? Given that a single behavioural profile does not seem to be likely, the findings from this research raise the question of whether a profile-matching approach might be useful for aiding in the detection of deception. For example, a practitioner might be able to evaluate baseline behaviour that is observed when an individual is verified to be acting truthfully, and then contrast it against behaviour that is observed when deception is suspected to ascertain whether the differences are consistent with either a fluid or laboured style of lying. Additional research, however, would be necessary before the practical utility and accuracy of such an approach can be tested. These considerations will be discussed in the next section.

Limitations of Both Studies and Additional Recommendations for Future Research

As there does not appear to be any individual cue that is diagnostic of deception, nor should the subtype profiles uncovered here be considered diagnostic of deceit. In providing two separate accounts, there are plausible alternative explanations for why an individual may display a behavioural profile that resembles fluid lying or laboured lying. For example, an individual who provides two truthful accounts may become tired after providing the first account. As a result of fatigue, he or she may become sluggish in delivering the second account. This difference could result in a behavioural profile that resembles a laboured style of lying even though no deception is involved. As another

example, a person may provide two truthful accounts, but if one account has been told more often than the other for whatever reason, the difference in rehearsal of accounts may resemble a fluid style of lying even though no deception has occurred. Researchers have referred to such examples of failing to consider alternative explanations for observed behaviour as the “Othello error” (Ekman, 1985/1992, p. 170), named after the Shakespearean character who murdered his love over suspected infidelity. More specifically, Othello interpreted Desdemona’s fear as evidence of infidelity when he accused her, and failed to consider that she may have been afraid because she believed that she would be killed if she could not prove her innocence. The onus, thus, is on practitioners to consider and rule out alternative explanations for behavioural displays that may be consistent with deceit. When practitioners are unable to do so, it may be best to reserve judgment. This course of action, however, would depend on the context and the potential costs to those involved for any indecision. Thus, it is not possible for this author to provide decision rules that would be equally effective in all situations.

What complicates matters further is the recognition among senior deception researchers that noteworthy changes from baseline truth-telling to lying are not always observed, so even if careful steps are taken in real-world situations to find comparable and verifiable truthful baselines to contrast against suspected deceptive communications, the potential for error still exists (Vrij et al., 2010a). Given that base rates of deception in many settings are not known, and that utility estimates (e.g., sensitivity, specificity, positive predictive power, negative predictive power) also are unknown for the vast majority of cues, it would appear that making decisions concerning the veracity of matters solely on the basis of interpreting verbal and nonverbal behaviour is a risky

enterprise. Practitioners, therefore, should seek to obtain corroborating evidence whenever possible. In the absence of such evidence, it might be better to think of the behavioural displays described in this dissertation, and in other readings, as more like flags to direct questioning. That is, when these behaviours are observed, the practitioner may have tapped an area in the interview that is worthy of further inquiry, but alternative explanations for the behaviours beyond deception must still be considered. Because many liars may not display cues during their communications, absence of them also should not be interpreted as definitive evidence for the truthfulness of matters.

Having stated this, researchers could still conduct further empirical investigations to examine the potential usefulness of a profile-matching approach for detecting deceit. To combat some of the issues mentioned above, in attempting to replicate the findings reported here, researchers also could include two conditions in which some participants provide only truthful accounts in each. This action would be taken because it is probably unreasonable to assume that the coded behaviours are likely to be exactly the same across two truthful accounts. For example, as discussed above, more general practice effects may lead to some changes. Researchers could then examine the behavioural profiles obtained under these conditions. A profile-matching approach may have some usefulness if the profiles differ substantially in degree or in kind from those of fluid and laboured liars. That is, based on the behaviours observed during two accounts for a given individual, one might be able to say whether the behaviour changes are most consistent with fluid lying, laboured lying, or profiles that are observed when individuals provide two truthful accounts and some random variation or practice effects are to be expected.

For comparative purposes, researchers also may want to examine profiles obtained under two conditions in which individuals provide only deceptive accounts.

Of note, if successfully developed, this approach also would necessitate consideration of interrelationships among cues in rendering decisions about profile similarity. Importantly, this consideration may lead to decreases in some errors, as this author has argued that a lack of knowledge regarding interrelationships could lead to overconfidence in decisions. Such a profile-matching approach may be even more promising if it were developed using multi-item composite measures of constructs. Thus, this author accepts that there may be alternative ways to subtype individuals with regard to the behavioural effects of deceit. Indeed, perhaps other informative findings would be obtained if individuals were subtyped according to cues of deceit that are different from the ones that were examined here. Additionally, perhaps meaningful but less common subtypes would be observed in studies that examine larger samples. Any efforts dedicated to devising a profile-matching approach, though, should attempt to do so in a manner that maximizes discriminant validity when it comes to differentiating truth-tellers from liars.

Even still, before the development of such a profile-matching approach is attempted, some preliminary research should probably be conducted. For example, it seems imperative to first establish whether relevant subtypes exist outside of the laboratory setting and in those situations in which such an approach may be used. For example, if one wanted to devise a profile-matching strategy for detecting deceit in a police interview, then it must be demonstrated that deceivers in this setting can be subtyped in meaningful ways with regard to relevant cues. Although preliminary, such research would be no small feat, as it is a time-consuming endeavour to establish the

ground truth of communications in real-world deception studies where random assignment to conditions is not feasible (Hartwig, 2011; Vrij, 2008).

On the point above, both dissertation studies were conducted in relatively low-stakes settings, so future attempts at replicating the findings in high-stakes scenarios are warranted. Even though real-world studies of deception may be costly and time-consuming to carry out, researchers could aim to increase the stakes in laboratory-based research to address the generalizability of the findings reported here. Rogers (2008f; Rogers & Gillard, 2011) has summarized some innovative ways in which researchers could motivate participants and create incentives that better approximate those found in real-world contexts; thereby, enhancing the external validity of lab-based investigations. For example, instead of providing a relatively small monetary reward to each participant for giving a convincing individual performance, researchers could examine the effect of offering a larger sum of money or even a weekend getaway at a nice hotel to the top performer(s) in a study. Such incentives may better approximate the “better life” sought in some cases of personal injury fraud (Rogers, 2008f, p. 419). To address negative incentives, Rogers and Cruise (1998) motivated student simulators by informing them that the names of failed deceivers would be posted on departmental bulletin boards. To circumvent ethical problems, it was suggested that researchers post fictitious names on the list (Rogers, 2008f).

Of course, participants in any of these kinds of studies would still have the right to withdraw their participation at any time (Vrij et al., 2010a), so researchers should at least attempt to keep track of the demographic characteristics of any participants who drop out in order to characterize those individuals for whom the results may not generalize. While

this sort of limitation may weaken the internal validity of a study, confidence in findings is ultimately enhanced by converging results across multiple studies that employ diverse methodologies (Rogers & Gillard, 2011; ten Brinke & Porter, 2013). To this end, it also is worth investigating whether the findings reported here generalize to paradigms that extend beyond the description of negative emotional material. It simply is not known whether these dissertation findings are generalizable to lies about transgressions. It is worth highlighting that Rogers (2008f; Rogers & Gillard, 2011) also has provided a useful overview of factors that should be assessed through manipulation checks in these kinds of lab-based studies.

With regard to the results concerning subtypes correlates, like all correlational findings, they must be interpreted with caution. This is especially the case for those variables examined in the second study, as participation in the experiment may have influenced how self-report measures were completed. Although there was a rationale for not counterbalancing participation in the experiment with completion of the measures, future investigations could aim to counterbalance these study procedures unless there is a rationale for not doing so. Moreover, counterbalancing these elements seems more permissible, so long as investigators still attempt to gauge the impact of methodological variables. Additionally, throughout this manuscript, this author has provided numerous suggestions on how researchers may test whether some of these correlates have a causal role in subtype expression.

Finally, some cautionary notes are warranted with respect to the use and interpretation of ipsative scores of cues as they were reported for the subtypes in this dissertation. Again, given that individuals may vary in their overall responsivity to

deception tasks, a transformation of the intraindividual distribution of profile scores was undertaken prior to clustering profiles to remove these differences (Nunnally, 1978). Such data transformations may be useful for researchers and practitioners who evaluate deceivers, especially when examining individuals who may not be very responsive in their verbal and nonverbal behaviour during deceptive communications. On this point, perhaps individuals who are good actors or natural performers represent some of these individuals (see Ekman, 1985/1992; Vrij, 2008, Vrij et al., 2010b). It should be remembered, however, that ipsative scores are *relative* scores, and that the magnitude of these scores should not be confused with the magnitude of *absolute* measures for the same set of attributes (Clemens, 1966). Thus, in any future meta-analyses, the statistics concerning the ipsative z-scores of cues reported here should not be combined with statistics concerning absolute scores of these cues.

Concluding Remarks

Most people are interested in identifying the kind of deception that could have a significant impact on their lives or on the lives those who are close to them. Other individuals seek to attain specific expertise in the ability to detect lies on account of their professional roles or scholarly interests. The studies that comprised this dissertation research yielded some novel findings concerning the behavioural effects of deceit, which could have important implications for theory, research, and practice. Recommendations for future deception research, therefore, were offered to assist the field with moving forward in these regards. Although these recommendations were ambitious and many, concluding this dissertation with the following quote from one of the field's most

influential figures seems fitting: “As always, the mantle of expertise must be earned through painstaking analysis and research” (Rogers & Jackson, 2005, p. 527).

APPENDIX A.

USE OF IPSATIVE Z-SCORES IN FORENSIC RESEARCH AND PRACTICE

Ipsative transformations of data have long been employed in the field of forensic psychology, specifically in the context of research and clinical practice involving the assessment and treatment of sexual offenders (see, e.g., Freund, 1967; Quinsey et al., 1975). Ipsative z-scores are the scores recommended for use in phallometric assessments, which involve the measurement of male sexual arousal via use of a penile plethysmograph that monitors changes in penis size while varying stimuli are presented to the examinee in a controlled manner (Quinsey et al., 2006). Forensic mental health professionals often utilize penile plethysmography in assessing denied sexual deviance (Rogers, 2008c). Examples of stimuli used in such assessments include photographs of persons who vary in age and sex (e.g., Freund, 1965), or audiotaped descriptions of sexual scenarios that vary in levels of coercion and brutality (e.g., Quinsey & Chaplin, 1988).

Ipsative z-scores are preferred in phallometric assessments over raw change scores (e.g., millimetres of penile expansion) because they compensate for individual differences in responsivity to the stimuli presented, and better discriminate groups defined on the basis of their sexual histories (i.e., sexual offenders versus non-sexual offenders) (Harris, Rice, Quinsey, Chaplin, & Earls, 1992). Moreover, in addition to enhancing the discriminant validity of phallometric assessment data, ipsative z-scores also have evidenced predictive validity in this context. Specifically, phallometric test results that are based on ipsative z-scores, and that indicate deviant sexual preferences, are a significant predictor of recidivism for sexual offenders (Quinsey et al., 2006). The

demonstrated utility of ipsative z-scores in this forensic context suggested the transformation also may be useful in deception research, where individual differences in responsivity also appear to be an issue.

APPENDIX B.

RATIONALE FOR USING *K*-MEANS CLUSTER ANALYSIS WITH EUCLIDEAN DISTANCE SPECIFIED AS THE DISTANCE MEASURE

The term *cluster analysis* does not refer to one specific statistical technique, but rather to a group of multivariate techniques that may be used to identify homogenous groups in a dataset (DiStefano & Kamphaus, 2006; Hair et al., 2009; Norusis, 2011). There are many ways in which cases can be clustered into groups. Helpful overviews of popular techniques that have been employed in fields as diverse as psychology, biology, chemistry, medicine, geology, geography, engineering, economics, sociology, crime analysis, and marketing research can be found elsewhere (see, e.g., DiStefano & Kamphaus, 2006; Hair et al., 2009; Norusis, 2011; Rupp, 2013; Vermunt & Magidson, 2002). These overviews also often include discussion of some of the key choices that analysts are required to make when using the various techniques. It is not possible to review all of the available techniques in relation to the current research here given that Rupp (2013) indicated searches for clustering and classification techniques yielded thousands of results in the *PsychInfo* database alone. Instead, a brief rationale for selecting *k*-means cluster analysis with Euclidean distance specified as the distance measure is provided within the context of some of the other more popular subtyping techniques and distance measures that are available.

Hierarchical Cluster Analysis versus *K*-Means Cluster Analysis

Hierarchical clustering techniques were the first clustering techniques to be developed (Hair et al., 2009). These techniques follow either an agglomerative or a divisive approach (Hair et al., 2009; Norusis, 2011; Rupp, 2013). The former approach

begins the clustering process by treating each case as its own cluster and sequentially joins them until all cases form a single cluster, whereas the latter approach begins the clustering process with all cases in a single cluster and sequentially separates them until each case represents its own cluster. It should be noted that, once cases are joined in the agglomerative approach, these cases cannot be separated. Similarly, once cases are separated in the divisive approach, these cases cannot be merged with those that they were separated from earlier.

Hierarchical clustering techniques require selection of a measure of inter-cluster distance that connects clusters together in addition to selection of a measure of profile similarity/dissimilarity that provides only the direct distance between all cases individually in multivariate space (Hair et al., 2009; Norusis, 2011; Rupp, 2013).

According to Rupp (2013), the most commonly known inter-cluster distance measures for hierarchical clustering techniques are: (1) single linkage; (2) mean/average linkage; and (3) complete linkage. These inter-cluster distance measures correspond to taking: (1) the shortest distance between any two points in two different clusters; (2) the arithmetic mean of all pair-wise distances between points in two different clusters; and (3) the largest distance between any two points in two different clusters, respectively. In contrast to these techniques, Ward's method (1963) assigns cases to clusters such that the within-cluster variance of cases is minimized, which is a reflection of the basic idea behind cluster analysis to separate cases into maximally homogenous groups that are maximally different from each another (Rupp, 2013).

K-means cluster analysis is conceptually related to Ward's method. Rupp (2013) pointed out that the key similarity between these two techniques is that they both attempt

to minimize the within-group variance of cases in their respective clusters. The major difference between them is that the latter technique is a non-hierarchical partitioning clustering technique that allows for reallocation of cases across clusters during the clustering process. Although not the only partitioning technique, Rupp (2013) stated that *k*-means cluster analysis is probably the most commonly used partitioning technique. It assumes a fixed number of clusters that are characterized by their means and requires the algorithm to stop only when very minor improvements in the within-cluster variance can be made by reallocation of cases. This algorithm iteratively estimates these means and assigns cases to the cluster for which its distance to the cluster mean is smallest (Norusis, 2011). *K*-means cluster analysis was selected for use in the current research because it allows the user to control the number of clusters to be analyzed.

Euclidean Distance versus Other Measures of Profile Similarity and Dissimilarity

Both hierarchical and non-hierarchical clustering techniques require selection of a measure of profile similarity/dissimilarity. As mentioned earlier, these measures quantify the direct distance between all cases individually in multivariate space (Rupp, 2013). There are many measures of profile similarity/dissimilarity. To place the number into perspective, at the time of this writing, there were 30 such measures available in SPSS alone (Norusis, 2011).

Rupp (2013) asserted that the selection of this measure should be based on its appropriateness for a given data set. For example, measurement scales, distributions of variables, or the covariance structure may be used to guide selection. Some measures, such as Euclidean distance, may be suitable only for continuous variables, while other measures may be suitable only for categorical variables (Norusis, 2011). On these points,

correlation coefficients and distance measures (e.g., the Euclidean distance) appear to be the most widely used in social science research (Aldenderfer & Blashfield, 1984; DiStefano & Kamphaus, 2006). Euclidean distance was selected for use not only on account of its popularity, but also because it captures information relevant to profile shape in addition to profile level and dispersion (Skinner, 1978). Calculating the value of Euclidean distance involves finding the difference between vectors of two cases, where each vector is represented by a profile of scores across the set of variables used in the cluster analysis (Aldenderfer & Blashfield, 1984; DiStefano & Kamphaus, 2006).

Previous Use of *K*-Means Cluster Analysis and Other Traditional Techniques

The aforementioned techniques have been used in various ways. Some researchers have used multiple techniques in a competing fashion within the same study. For example, Rice and Harris (1988) used a successive and multifaceted approach when clustering forensic psychiatric patients with regard to common clinical problems (e.g., assaultiveness, active psychotic symptoms, social withdrawal). These researchers compared cluster solutions of different sizes that were obtained by using both agglomerative hierarchical techniques (i.e., complete, single and average linkage, and Ward's method) and non-hierarchical techniques (i.e., *k*-means cluster analysis). Rice and Harris (1988) also compared cluster solutions that were obtained using different distance measures (e.g., Euclidean and squared Euclidean distance). The various obtained cluster solutions were evaluated in a sequential manner according to several criteria that included cluster dispersion, clinical significance, and classification agreement. Results indicated high agreement between the two strongest cluster solutions, which were obtained via *k*-means cluster analysis and Ward's method. Rice and Harris (1988), however, found that

k-means cluster analysis produced a more meaningful solution. More specifically, the cluster solution obtained via the *k*-means cluster analysis was favoured because Ward's method clustered patients who displayed profound intellectual impairments along with some high-functioning psychopaths. This finding was noteworthy given that Rice and Harris (1988) pointed to earlier empirical investigations and Monte Carlo studies showing that Ward's method tended to generate better solutions than a variety of other clustering techniques (see Blashfield, 1976, 1980).

Other researchers have used the techniques in a complementary manner. For example, Holtzworth-Munroe, Meehan, Herron, Rehman, and Stuart (2000) used both Ward's method and *k*-means cluster analysis to subtype male batterers on dimensions related to the severity of domestic violence, generality of violence outside the home, and psychopathology. Results indicated that there was substantial concordance between these two techniques regarding assignment of the offenders as either family only, borderline-dysphoric, low-level antisocial, or generally violent-antisocial batterers. These researchers decided for final cluster membership of each batterer to be based on the cluster in which he appeared most often across several analyses. Such an approach may be further contrasted against those of other researchers who have used Ward's method first on a dataset to indicate the number of clusters to be formed when performing a subsequent *k*-means cluster analysis (e.g., Stewart, Zack, Collins, Klein, & Fragopoulos, 2008).

Importantly, other researchers have acceptably chosen to use only *k*-means cluster analysis in their research (e.g., McKillop and Nielson, 2011), albeit with more specialized indicators of the optimal number of clusters to retain (e.g., The CH Index; Calinski &

Harabasz, 1974). This latter approach was used in the current study because calculation of the CH Index involves comparisons of between-cluster and within-cluster variance. Like *k*-means cluster analysis, use of the CH Index reflects the main idea behind cluster analysis to identify maximally homogenous groups that are maximally different from each other.

Latent Class Cluster Analysis versus *K*-Means Cluster Analysis

It should be highlighted that there are alternative approaches to the more traditional clustering techniques described previously that may be used to identify subtypes. Latent Class (LC) cluster analysis is a model-based clustering approach. In this approach, a statistical model is presumed to underlie the population data in question and the model is used to identify individuals that are similar to each other on a categorical latent variable (Muthén & Muthén, 2004). LC cluster analysis includes both latent class analysis (LCA) and latent profile analysis (LPA). The former technique is employed when the variables being clustered are categorical in nature, and the latter technique is used when the variables being clustered are continuous variables. More detailed summaries of the major similarities and differences between LC cluster analysis and *k*-means cluster analysis can be found elsewhere (see DiStefano & Kamphaus, 2006; Eshghi, Haughton, Legrand, Skaletsky & Woolford, 2011; Magidson & Vermunt, 2002).

DiStefano and Kamphaus (2006) described the most common way in which LC clustering techniques are used to uncover the number of subtypes in a dataset. Summarized briefly, this was accomplished by testing the fit of the data to a variety of models with increasing numbers of latent classes. It was further stated that model fit tends to improve as classes are added, so the optimal solution was defined as the one with

the smallest number of classes while still obtaining satisfactory model fit. As with structural equation modelling (SEM), with latent class clustering models there are various statistical indicators that may be used to assess model fit (Herman, Ostrander, Walkup, Silva, & March, 2007). These statistical indicators include, for example, the Akaike information criteria (AIC), Bayesian information criteria (BIC), and entropy (Vermunt & Magidson, 2002). Similar to the chi-square test, some of these indicators (e.g., the AIC and BIC) provide an indication of the difference between an estimated model and the observed data (Fox & Farrington, 2012). The indices may be used to compare different solutions to determine which model fits the data best (DiStefano & Kamphaus 2006). It should be noted that the final class solutions must be theoretically interpretable, however, and not solely a reflection of optimal statistical fit (Vaughn, DeLisi, Beaver, & Howard, 2008).

Use of LC clustering techniques appears to be increasing in forensic-related research (Fox & Farrington, 2012). This trend is probably partly related to improvements in computer capabilities and the increased availability of software that can conveniently perform the intensive calculations involved (Vermunt & Magidson, 2002). Additionally, it has been argued that employing LC cluster analysis confers specific advantages over more traditional forms of clustering analysis. On this point, Vermunt and Magidson (2002) argued that one advantage of using a statistical model-based approach to cluster analysis is that the selection of the cluster criterion is less arbitrary. These users also argued that a model-based clustering approach does not require decisions to be made about the scaling of variables. It was further argued that dealing with variables involving different scale types could be done with relative ease, and that there are less subjective

criteria for making decisions about the number of clusters to retain and other model characteristics.

Previous Use of *K*-Means Cluster Analysis and Latent Class Cluster Analysis

Not all of the arguments above have been fully accepted by users of LC cluster analysis, however (e.g., Marsh, Lüdtke, Trauwein, & Morin, 2009). Moreover, research appears to be mixed on whether one technique is superior to the other. For example, while some researchers have reported that LC cluster analysis outperforms *k*-means cluster analysis when using simulated data (e.g., Magidson & Vermunt, 2002), other researchers have reported the opposite finding when using non-simulated data (e.g., Eshghi et al., 2011). Even still, other researchers have reported a high degree of overlap in the results obtained from both techniques, further stating that each technique may provide unique information (e.g., DiStefano & Kamphaus, 2006).

Some of the aforementioned findings led Eshghi and colleagues (2011) to argue that it may be important for researchers to pay more attention to the underlying assumptions associated with various subtyping techniques in order to choose the best one for a given purpose. On this note, there is some indication that LC cluster analysis may be inappropriate for use with small samples (see Marsh et al., 2009). Given this, *k*-means cluster analysis was deemed to be more appropriate for the current study.

The above is not to say that techniques such as LCA or LPA would not be useful for subtyping the behavioural effects of deception. Borrowing from a position taken by Ruscio and Ruscio (2004) on the topic of taxometrics, the various subtyping techniques may be highly useful when employed in a complementary fashion within a comprehensive program of research. Ruscio and Ruscio (2004) pointed to a previous

recommendation of viewing more traditional forms of cluster analysis as a descriptive tool that is potentially useful for summarizing data and posing hypotheses (Everitt, 1993). Ruscio and Ruscio (2004) elaborated that other techniques, including LCA or LPA, may be used later in a line of research for further elaborations or refinements. In other words, LC cluster analysis may lead to further informative findings in this field when data from larger samples is available for examination.

APPENDIX C.

CODING PROCEDURE FOR VERBAL AND NONVERBAL BEHAVIOUR

1. Smiles: View the video in slow-motion (two times slower than the default/natural speed of play), and zoom in as close as possible on the participant's face. Using a counter, count the number of full-mouthed smiles observed in the lower half of the face. For prototypes of smiles, see the relevant images presented in the *Facial Action Coding System* (Ekman, Friesen, & Hagar, 2002). If helpful, identify a point in the video when confident that a participant is smiling. Note the facial musculature during the smile and look for that configuration again. Laughs may be used as a cue for smiles; however, subtler smiles are not necessarily accompanied by laughs. When smiles occur frequently in a short amount of time, they are counted separately if the muscles in the face return to a baseline state in between the smiles, or if the smile disappears completely and then another appears. Be careful not to count displays of contempt as smiles.
2. Head movements: View the video in slow-motion (three times slower than the default/natural speed of play), and zoom in as close as possible on the participant's head. Count the number of times the participant's head moves. Count each nod, shake, turn in direction, etc. To facilitate coding, start the video with the cursor on the tip of the participant's nose. Using a counter, count the number of times the cursor must be moved to keep it on the tip of the participant's nose. If using this approach, the size of the screen and the screen settings must be consistent across the coding of participants.

3. Illustrators: These are defined as hand movements that are used to supplement or modify speech. Illustrators are hand gestures that convey information. They can be any movement/gesture of the arms and/or hands, designed to demonstrate what the participant is saying. Do not include when the participant simply touched/scratched the hands, head, or body unless it was done to convey what was being said (see also self-manipulations below). View the video in real-time and pay attention to language to identify any movements of the hands that were used to convey/supplement speech. Count these actions using a counter.
4. Self-manipulations: Using a counter, count the number of times the participant touched the hands, body, or head (including the neck or hair) with his or her hands. For hand-to-hand self-manipulations, view the video in slow-motion (one or two times slower than the default/natural speed of play) and zoomed in as close as possible. Count the number of times the hands come into contact with each other. Hand-to-hand self-manipulations are counted separately if the hands come away completely from each other and then come back together. If the participant begins the narrative with hands together then this counts as the first hand-to-hand self-manipulation. For hand-to-body self-manipulations, view the video in slow-motion (one or two times slower than the default/natural speed of play) and zoomed in as close as possible. Count the number of times the hands touch a part of the body other than a hand or the face, head, neck, or hair. This may involve contact with the torso, shoulders, legs or feet, or arms above the wrists, etc. To facilitate coding, count the number of hand-to-body self-manipulations for the left hand and right hand separately, then tally up the results for each to obtain the total number of hand-to-

- body self-manipulations. For hand-to-head self-manipulations, view the video in real-time and count the number of times the hands touch a part of the face, head, neck or hair. Lastly, tally up the number of hand-to-hand, hand-to-body, and hand-to-head self-manipulations to obtain the total number of self-manipulations.
5. Time / length of the narrative: Record the length of the video file. Convert the time from minutes to seconds.
 6. Words: From the transcript and using a counter, count every word and speech hesitancy uttered. Do not count words in brackets [e.g., (speech pause) or (laughs)], which may be present in some parts of the transcript.
 7. Speech rate (words per minute): Take the total number of words and divide it by the total length of the narrative in seconds. Next, take the obtained value and multiply it by 60.
 8. Filled pauses: From the transcript and using a counter, count the number of times the participant says words like: “umm”, “err”, “ehh”, “uhh”, “ahh”, “well”, “hmm”, or “mmm”.
 9. Speech pauses: From the transcript and using a counter, count the number of speech pauses that occurred. Speech pauses are identified in brackets [i.e., (speech pause) or (pause)].
 10. Self-references: From the transcript and using a counter, count the number of times a participant referred to him or herself (e.g., using the words “I”, “me”, “my”, “we”, “us”, “our”, “mine”, or “myself”).

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