The Dark Personality Behind a Poker Face

A Quantitative Study into Dark Triad Personality and Texas Hold'em Poker

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Abstract

Objective: Manipulativeness, apathy, malevolence, and egoism are characteristics that are often present in deceivers. These features, along with an increased tendency to use deception in interpersonal communication, are a typical representation of the Dark Triad. Individuals who score highly on dark personality traits such as Machiavellianism, narcissism, or subclinical psychopathy not only engage in deceptive behaviours more frequently, but also are supposedly proficient at them. This is based on the fact that some Dark Triad members can emotionally detach themselves from their behaviours, over which they often retain adept self-control. Since deceptive behaviour evokes certain emotions, which are then expressed through body movements, these individuals' acts are more likely to remain undetected. However, the Dark Triad's apparent success at deception is debatable, since most prior research faced limitations that bring into question the validity and generalizability of their findings. These include research bias, social desirability, human errors, lack of realism, and behavioural restrictions.

Method: This study considers said limitation by using poker as a research setting. This economic game of odds did not pose any restrictions on participant behaviour. The poker experiment included 53 participants spread across 14 games of Texas Hold'em that lasted 60 minutes each. Participants had to state after each round the extent to which they were bluffing and the emotions they experienced while doing so. Deceitful and truthful body movements recorded during the games were analysed using a key point detection program, OpenPose. Based on frame-by-frame changes in pixel location provided by OpenPose data, difference scores for the movement of various body parts were computed. Via a self-reported measure participants had to indicate to which they identified with statements that represented dark traits of Machiavellianism, narcissism, and subclinical psychopathy. In this manner, the current study investigated whether Dark Triad members indeed employed deception more frequently and successfully in addition to whether emotion and body movement expression could be predicted. The data was analysed by conducting regression, mediation, and moderation analyses using the PROCESS macro.

Results: Findings show that individuals with relatively high Dark Triad scores were more often inclined to use deceptive rather than truthful strategies when betting against opponents compared to individuals who had relatively low Dark Triad scores. However, Dark Triad scores did not have a significant effect on the likelihood of achieving success in deceptive games such as poker. Control over deceptive cues was measured through the contrast between expressed truthful and deceitful body movements in which a smaller contrast was thought to be less noticeable to others, increasing the likelihood of successful deception. The findings implied that, irrespective of experienced emotions, the amount of lower body part movement was higher in deceitful performances than in truthful performances. Furthermore, this difference was greater for individuals who scored highly on the Dark Triad as a cluster and in particular on trait subclinical psychopathy (but not Machiavellianism or narcissism) compared to those whose Dark Triad scores were relatively low.

Discussion: According to the current research, Dark Triad personality scores did not entirely predict the deceptive success in situations that endorse dishonest behaviour. A lack of significant results may be due to a small sample size, some restrictions in behaviour, or construct measure limitations. However, frequency of deception and the associated increase in lower body movement could translate to deceptive behaviour in the workplace. For example, proactive screening may prevent Dark Triad individuals from harming a workplace environment, as they exhibit a high tendency to use deception and manipulation in such scenarios. Within a team, members could also focus on lower body part movement when they suspect a team member who strongly exhibits dark traits by engaging in highly deceptive behaviour. However, such an approach should always be taken very cautiously, since deceptive cues always have to be considered in the context of the performed behaviour.

Conclusion: More research is needed on the concept behind Dark Triad personality traits and deceptive cues such as body movement expressions in order to make substantive conclusions about the abovementioned relationship. Furthermore, it is recommended to conduct research in a setting similar to the one in this study, as the combination of deceptive games such as poker and movement detection technology such as OpenPose proved to be a fruitful innovation in conducting deception research. This method significantly contributed to ecological validity, realism, and generalizability, which creates a multitude of opportunities for future research to study deception as realistically as possible, as it would occur naturally.

Keywords: Dark Triad, deception, deceptive success, poker, body movement, emotional stress

Introduction

Indicators of deception can be found all over an individual's body, which creates the impression that detecting a liar should not be difficult to learn nor put into practice. However, people are lied to 10 to 200 times per day without harbouring any suspicions (Jellison, 1977). This is because lying is considered an act of cooperation between two parties in which the deceived party must believe the deceiver's act to consider it the truth (Meyer, 2010). Hence, the power of a lie is determined by the credibility of the deceiver and the credulity of the deceived party.

People typically overestimate their ability to detect lies (Vrij, 2008), which in reality is scarcely better than chance (Zuckerman, DePaulo, & Rosenthal, 1981; DePaulo, Lindsay, Malone, Muhlenbruck, Charlton, & Cooper, 2003; Bond & DePaulo, 2006). When attempting to identify a liar, the person engaging in the detection often erroneously focuses on behavioural indicators that have been found to be invalid or non-existent in deception literature (Vrij, 2008; Levine, Kim, & Blair, 2010; Ströfer, 2016). One example is gaze aversion, in which the liar avoids eye contact to prevent emotions such as guilt or shame from being exposed. However, the literature on deception shows no differences in eye contact behaviours between truth tellers and liars, nor does gaze aversion occur consistently in deceivers (DePaulo et al., 2003; Levine et al., 2010). Therefore, one reason why so many lies remain unnoticed is that humans are generally poor lie detectors who make incorrect decisions based on incorrect beliefs.

Deception fails to surface for another reason, which considers the deceiver's theory of mind ability and self-control (Lee, 2016). Basically, the success of a deceiver is based on their awareness of the discrepancy in knowledge between the deceiver and the deceived party about a certain situation and their use of this advantage to fabricate a false belief to the deceived party (Ding, Wellman, Wang, Fu, & Lee, 2015). In addition, a deceiver must intentionally control behavioural actions regarding the lie, such as speech, body movements, and emotional expressions, to create a convincing impression of honesty (Ströfer, 2018; Vrij, 2008). However, no single deceiver executes these abilities flawlessly; there will always be some indicators of deception that have unconsciously slipped a deceiver's notice.

Despite the fact that there is no such thing as a perfect deceiver, certain characteristics such as manipulativeness, sociability, and concern for self-presentation do seem to contribute significantly to the deception's success rate (Kashy & DePaulo, 1996). Besides contributing to an increased chance of success in deception, the possession of such characteristics typically aligns with higher scores on the Dark Triad personality cluster. This cluster includes the traits of Machiavellianism, narcissism, and subclinical psychopathy, which all share a predisposition toward deception in interpersonal, academic, and romantic matters through an emotionally cold, malicious, and self-serving approach (Paulhus & Williams, 2002; Jones & Paulhus, 2009; Baughman, Jonason, Lyons, & Vernon, 2014; Jonason, Lyons, Baughman, & Vernon, 2014; Jones & Paulhus, 2017). As behavioural manifestations associated with these traits are found to be consistent over time and space (Roberts & Del Vecchio, 2000; Feist & Feist, 2009), the Dark Triad personality cluster could be considered an adequate indicator to predict the plausibility of success in deceptive behaviour.

However, a considerable number of research findings on dark personalities and malevolence lack generalizability and therefore bring into question the validity of the abovementioned assumptions (Azizli, Baughman, Chin, Vernon, Harris, & Veselka, 2016; Sarzyńska et al., 2017; Zyi & Elaad, 2018). The reasoning behind this invalidity is threefold. First, most deception studies are prone to bias (i.e. social desirability) and participants may refrain from sharing misbehaviours, as they perceive such acts to be socially unacceptable or embarrassing. Conversely, it is possible that participants fabricated deceptive deeds in order to please researchers (Levitt & List, 2007). Second, said studies face ecological limitations; participants were urged to perform only a given set of actions or behaviours that may deviate from performance in real life. Third, participants in most studies lacked an intrinsic motivation to behave dishonestly; often in research settings, the stakes of acting deceitfully are not as high as in real-life scenarios. As there were no punitive consequences for being caught, participants may have felt less intrinsically motivated to deceive and would as a result approach the artificial scenario differently compared to a real-life situation (Levitt & List, 2007).

Therefore, to test the extent to which Dark Triad personality indeed predicts successful deception, these three research limitations should be anticipated for through the use of a more feasible research setting. Since success is often associated with winning, a game simulation would be a viable solution. An economic game that addresses these limitations is Texas Hold'em poker. The latter is a

game of incomplete information that stimulates deceptive strategies (i.e. bluffing). From a game theory perspective, such strategies increase winning chances significantly, which eliminates any preconceptions about deceit being unethical (Chen & Ankenman, 2006; Palomäki, Yan, & Laakasuo, 2016). In addition, decisions made during a game have direct monetary consequences. For example, 'true bluffing' is a form of high-stakes deception resulting from relatively low-value cards held by a player, whereas 'slow playing' describes a form of low-stakes deception resulting from a relatively high-value hand. These high-risk and high-reward scenarios in poker make deceptive behaviours more intrinsically motivating and thus comparable to real-life deception (Hartwig, 2011; Palomäki, Yan, & Laakasuo, 2016).

In summary, simulating a Texas Hold'em poker game to observe whether the Dark Triad is related to successful deception holds considerable potential. The current study utilises this setting to capture deceptive behaviours without interfering in the participants' actions or the game itself. As a result, the realism of the study substantially contributes to the increased generalizability of the findings.

Cues to Deception: Underlying Factors

Behavioural performances such as falsification or lying, equivocations, concealments, exaggerations, and distortion or downplaying, all fall under the umbrella of deception (Guerrero, Andersen, & Afifi, 2014). What they have in common is the aspect of intentionally leading the deceived party to misperceive, fail to perceive, mis-predict, or fail to predict a certain outcome (Mechner, 2010). Despite prevailing definitions of deception that include an aspect of intention (e.g. Zuckerman, DePaulo, & Rosenthal, 1981; DePaulo, 1988; Buller & Burgoon, 1996), Vrij's (2008) definition of deception fits the aim of the current study more closely, as it also involves an element of success. It is defined as "a successful or unsuccessful deliberate attempt, without forewarning, to create in another a belief which the communicator considers to be untrue" (Vrij, 2008, p. 15). An attempt is considered successful if the verbal and non-verbal cues that would otherwise reveal the deceptive attempt are controlled in a manner that enables the deceiver's intentions to remain undetected by the deceived party.

The expression of deceptive cues is subject to multiple factors, which are thought to influence a deceiver's control over said cues. According to Ekman (1989), the interference of emotional stress and cognitive strain may affect the degree of control that a deceiver exerts when attempting to supress deceptive cues. Originally, besides emotional and cognitive factors, Zuckerman et al. (1981) also presented the attempted behavioural control as a factor more relevant to non-verbal cues to deception.

Emotional stress. Deception is typically related to negative emotions such as fear or guilt as well as positive emotions such as excitement and delight (Ekman 1992; Vrij, 2008). The fear of being caught may increase physiological arousal, which in turn increases small fidgeting behaviours such as touching one's clothes or hair. In addition, experiencing emotions of fear is often associated with increased movement of the eyebrows, as the upper face muscles are generally difficult to control during affective experiences (Hurley & Frank, 2011). Feeling guilty for the unjust act may cause withdrawal movements such as turning the head or body away from the other person. Delight or joy in deception could also increase head movement due to smiling or foot movement to compensate for the upper body's stiff posture in an attempt to hide excitement, otherwise known as the rigidity effect (Zuckerman et al., 1981; Ekman, 1992; Vrij, 2008; Chan, Khader, Ang, Chin, & Chai, 2016).

Cognitive strain. Performing deceptive behaviours often requires increased mental effort. A deceiver must formulate, remember, and maintain the deceitful act (Vrij, Granhag, Mann, & Leal, 2011), which is considered more cognitively taxing than being truthful. In addition, a deceiver must consider the stakes (i.e. likelihood of being caught versus succeeding at the deception). These are generally higher for deceivers, as they must prove their credibility, whereas truth tellers do not have such a burden since they have nothing to hide. In addition to concentrating on a credible demeanour, the deceiver also must monitor their communication partner's reactions to assess the likelihood of succeeding with the deceptive act (DePaulo et al., 2003; Vrij, 2008). These cognitive demands may be of such importance that the deceiver's motor activities are reduced to a minimum, reducing fidgeting behaviour and resulting in the decrease of both hand and arm movements (Shallice & Burgess, 1994; Ekman, 1997; Vrij, 2000).

Attempted control. The approach of attempted behavioural control builds on the cognitive factors, as controlling one's behaviour overlaps with the actions that cause mental effort in the first place. To maintain a truthful demeanour toward the communication partner, deceivers often attempt to

display behaviours that they believe to be credible whilst simultaneously attempting to refrain from behaviours that they believe to appear dishonest (DePaulo et al., 2003; Sporer & Schwandt, 2007). However, as most individuals are not aware of the non-verbal cues that they unconsciously leak during a deceptive act, their attempted control may evoke the opposite of their intentions (Vrij & Semin, 1996; Vrij, 2008). As a deceiver fails to become aware of the interference of either emotions or cognitive strain, inconsistencies in cues to deception may become noticeable. For example, whilst keeping their entire body in a stiff posture in an attempt to falsify their alibi in a police interview, a deceiver's feet may wiggle intensely, as they are not aware of the non-verbal cues of thrill and fear that their body imparts. Lack of awareness and control over such changes in behaviour may betray deceptive indicators that could be helpful to the keen eye of an observer (DePaulo et al., 2003; Vrij, 2008).

Interplay of factors. In summary, deceptive behaviour evokes non-verbal cues as a result of emotional stress and cognitive strain, which could interfere with the performance of deception. These non-verbal cues often feature increased (emotional stress) or decreased (cognitive strain) movements in the feet, legs, hands, arms, or head. To prevent these cues from occurring, deceivers attempt to adjust their non-verbal behaviours in a way that they believe conveys credibility. In actuality, attempting to regulate these behaviours often leads to a rather unusual inhibition of movements that may betray the act. However, this does not apply to all deceivers, as some individuals have a better awareness and more self-control over the behavioural cues exhibited during deception. These individuals are often found to have a higher association with dark personality traits, as will be explained in the next section.

The Dark Triad and Deception

Most of the literature that associates personality psychology with deceptive behaviour examines socially aversive or dark personalities united under the Dark Triad (Paulhus & Williams, 2002). The traits of Machiavellianism, narcissism, and subclinical psychopathy overlap in a range of features, most notably the inclination toward socially malevolent behaviours typified by self-promotion, exploitation, callousness, dishonesty, and hostility (Paulhus & Williams, 2002; Jones & Paulhus, 2009; Jones & Paulhus, 2017). Due to this overlap in behaviours, these personality traits are assumed to be interchangeable as they operate as one unitary trait construct (i.e. Dark Triad cluster), illustrating convergence across various appearances of deception (Burton, 1963; McHoskey, Worzel, & Syzarto, 1998; Paulhus & Williams, 2002; Jones & Paulhus, 2011). Despite this coherence, the dark traits appear to deviate from one another based on varying motivations and tactics (McLeod & Genereux, 2008; Azizli et al., 2016; Jones & Paulhus, 2017). Table 1 summarises these differences and similarities.

Table 1.
Summary of Similarities and Differences in Dark Triad Traits

Trait	Bluffing frequency	Deceptive approach	Self-control over emotions	Self-control over body	Predicted game success
Machiavellianism	High	Strategic-competitive	High	High	High
Narcissism	High	Impulsive	Low	Low	Average
Sub. psychopathy	High	Aggressive	Low	Low	Low
Dark Triad as cluster	High	[a]	Low-Average [a]	Low-Average [a]	Average [a]

Note. a: Determined by a person's dominant trait in the Dark Triad cluster

Machiavellianism. Individuals who score highly on traits of Machiavellianism (also known as Machiavellians) are regularly described as masters of manipulation. Machiavellians are scheming deceivers; they frequently engage in lying, cheating, or manipulation, yet they refrain from deception when they are more likely to get caught (Vrij, 2008; Jones & Paulhus, 2017). Their motivational profile is often oriented toward seeking power and money, and their high competitiveness pushes them to achieve these instrumental and material goals at any cost (Ryckman, Thornton, & Butler, 1994; Stewart & Stewart, 2006). Machiavellians use tactics such as persuasion, self-disclosure, and ingratiation, which not only give them the charismatic appearance of being more sociable and easy-going, but also masks their callousness, lack of integrity, and cynical way of thinking (Jones & Paulhus, 2009). To maintain

this popular appearance, they engage in self-oriented lying, making them appear more confident, talented, or impressive (Kashy & DePaulo, 1996; Vrij, 2008).

In a game of poker, Machiavellians would make strong opponents. Not only do they engage in deception more frequently, they also strategically calculate the stakes involved in the act (Palomäki, Yan, & Laakasuo, 2016; Jones & Paulhus, 2017). Although they prioritize winning at any cost, they typically refrain from using duplicitous behaviour when the risk of detection is too high. In general, Machiavellians are more likely to withhold information if doing otherwise would impair them economically (Sakalaki, Richardson, & Thépaut, 2007). In poker, this translates to the use of deceptive tactics such as bluffing. In addition, Machiavellians greatly value their self-presentation and regularly show impression management tactics as supplication and intimidation. Due to their lack of empathy, they are also able to emotionally detach themselves from a deceptive action (Jones & Paulhus, 2009). During poker, this would manifest as Machiavellians being highly aware of their posture and exhibited body movements. In fact, such control over and awareness of behavioural expressions puts Machiavellians in an advantageous position; they are able to convincingly create the impression of helplessness (i.e. supplication) through slow-playing or threat (i.e. intimidation) through bluffing. It is therefore assumed that Machiavellians' control over deceptive cues makes them more successful in poker.

Narcissism. Individuals who score highly on traits of narcissism, or narcissists, are characterised by grandiosity, which is contrasted by underlying insecurities (Morf & Rhodewalt, 2001; Jones & Paulhus, 2014). This contradiction leads narcissists to continuously seek out attention and validation from others. Their motivation to deceive is rather selfish and often aimed at gaining reputational benefit, as increased attention and admiration from others are forms of acknowledgement to their perceived superiority (Harrison, Summers & Mennecke, 2018). To achieve this, narcissists deceive others with low-stakes, self-oriented lying such as making themselves appear more impressive than they are in actuality (Jones & Paulhus, 2017). Narcissists also tend to engage in higher-stakes deception such as academic cheating and financial fraud (Jonason et al., 2014; Baughman et al., 2014; Harrison et al., 2018). Such actions reflect pursuit of an instrumental purpose; for instance, cheating on an exam is perhaps used as a means to brag about the resultant diploma without any feelings of remorse.

In a game of poker, narcissists are more likely to resemble the profile of a macho player. They tend to engage in high-stakes deception more frequently (Kashy & DePaulo, 1996) and are willing to take greater risks as a means of winning the game, which would typically result in some form of admiration from other players. In addition, unlike Machiavellians, narcissists do not have strategic impulse control. When their self-oriented deception is challenged, they tend to persist in the act (Vrij & Holland, 1998). During poker, this behaviour would surface as continuously re-raising other players' bets through bluffing for the sole purpose of appearing superior to opponents. Despite lacking feelings of remorse (Morf & Rhodewalt, 2001; Harrison et al., 2018), narcissists do experience negative emotions such as fear (since being detected may tarnish their perceived superiority) and positive emotions such as delight (since succeeding at bluffing would result in ratification from others). However, as narcissists frequently engage in impression management, they often mistakenly adhere to a posture and corresponding body movements that they believe conveys honesty. It is therefore assumed that narcissists exhibit deceptive cues which they are not aware of nor have control over, making them more transparent and thus less successful as poker players.

Subclinical psychopathy. Contrary to its clinical counterpart, subclinical psychopathy does not involve a diagnosed mental disorder, nor does it require clinical or judicial supervision (Furnham, Richards, & Paulhus, 2013). Despite these differences, this trait is still suitable for describing an individual's more mischievous facets. For example, a clinical psychopath may experience a thrill from robbing a bank, whereas a subclinical psychopath would experience a similar thrill simply by stealing candy from a store.

Individuals who identify strongly with this trait (i.e. subclinical psychopaths) are commonly associated with a deficiency in affection and self-control (Cleckley, 1976; Hare, 1985; Lykken, 1995). As a result, subclinical psychopaths are mainly driven by impulse gratification; if they want something, they are willing to obtain it as rapidly as possible, at any cost or risk (Jones & Paulhus, 2011; Crysel, Crosier, & Webster, 2013). Hence, their motivation to deceive is instrumental in nature, as it serves as a means to attain material benefit. They are more likely to deceive in day-to-day scenarios to obtain these short-term rewards or to investigate whether they can remain undetected during the deceptive act

(Spidel, Herve, Greaves, & Yuille, 2011). Subclinical psychopaths also engage in behaviours such as cheating, conning, and fraud in academic and intimate contexts, which is representative of high-stakes deception (Azizli et al., 2015). In doing so, they typically lack feelings of anxiety or remorse due to their apathetic nature (Paulhus & Williams, 2002), but they do experience delight since they enjoy causing others misfortune (Baughman et al., 2014).

In a game of poker, subclinical psychopaths are considered to have a rather predictable style of play. They are found to have trouble resisting short-term rewards, even under high-risk conditions. In fact, sub-psychopaths blatantly deceive others even if punishment is unavoidable (Crysel et al., 2013). During poker, this would translate to aggressive and constant bluffing throughout the game, as each successful bluff may increase their stack size, as a form of immediate reward. Their thrill-seeking nature could make the fact that they enjoy deceiving others more apparent. In combination with a chronic lack of self-control and little to no concern for impression management, subclinical psychopaths are unlikely to stop the leakage of most indicators of deception linked to feelings of delight during a poker game (Baughman et al., 2014; Spidel et al., 2011). It is therefore assumed that subclinical psychopaths exhibit most – if not all – deceptive movements associated with experiencing positive emotions. As this probably occurs quite frequently throughout a game, subclinical psychopaths are presumed to be rather unsuccessful when it comes to deception in poker.

The Present Study

As shown in the aforementioned literature, this study aims to determine whether the possession of Dark Triad personality traits is a predictive indicator for successful deceptive performance. During games of Texas Hold'em poker, these performances were measured through exhibiting body movements. Movements associated with truthful performances served as the baseline behaviours; the differences between body movements in truthful and deceitful performances represent the extent to which an individual leaks cues through deceptive behaviour. Deceptive success is determined by the participants' ability to disguise these cues. Game success was measured by comparing the stack sizes and final rank of each player relative to their scores with regard to the Dark Triad cluster. Dark Triad scores were both collectively examined as a cluster, and separately as seen through the traits of Machiavellianism, narcissism, and subclinical psychopathy. In the process, the following research question was formulated: To what extent do Dark Triad personality traits predict success in deceptive performances under the realistic conditions of a Texas Hold'em poker game?

Hypotheses

To accomplish said objectives, the research experiment was conducted in a setting representative of Texas Hold'em poker. This allowed for deceptive behaviour to occur naturally without any undesirable external stimuli, which is thought to create more reliable data compared to studies based on reinforced or forced deception. The following section summarises the hypotheses based on the research question.

Dark Triad cluster. The Dark Triad cluster is typified by an increased tendency to engage in social interactions using a duplicitous approach. In fact, individuals with high scores on this cluster are thought to deceive more frequently (Baughman et al., 2014; Jonason et al., 2014) and with greater skill (DePaulo & Rosenthal, 1979) than lower-scoring individuals. It is therefore assumed that high scores on the Dark Triad as a cluster are predictive of more frequent bluffing compared with low scores (**H1a**). As poker is a skill-based game that is oriented toward deception, individuals who score highly on the cluster are assumed to be more successful at poker and thus have a higher likelihood of winning with a larger stack. As a result, they are more likely to end with a higher overall poker ranking (**H1b**). As shown in Table 1, control over bodily expressions is predicted to be low to average depending on the participant's dominant trait in the Dark Triad cluster. From this perspective, it is assumed that high scores on the Dark Triad as a cluster are predictive of more bodily expressions during deceitful performances than truthful performances compared with lower scores (**H1c**).

> **H1a**: The bluff ratio of participants with high scores on the Dark Triad as a cluster will be higher during a full poker game compared to participants with low scores on the cluster.
> **H1b**: Participants with high scores on the Dark Triad as a cluster will be more likely to finish a poker game with a higher ranking compared to participants with low scores on the cluster.

H1c: Participants with high scores on the Dark Triad as a cluster will exhibit a greater contrast in truthful and deceitful body movements due to greater emotional stress, compared to participants with low scores on the cluster.

Machiavellianism. Machiavellians demonstrate considerable skill when it comes to deceptive behaviour. Their ability to emotionally detach themselves from the deceptive act, combined with high awareness and control over their demeanour, makes Machiavellians highly successful deceivers (Jones & Paulhus, 2009; Palomäki, Yan, & Laakasuo, 2016). Due to these capabilities, Machiavellians are assumed to be less likely to experience either positive or negative emotional stress and should therefore not exhibit the increased body movements associated with emotions indicating deception. In addition, due to their high level of self-control, Machiavellians are assumed to show less contrast in bodily expressions between being deceptive and truthful (i.e. bluffing and non-bluffing, respectively).

H2: Participants with high Machiavellianism scores will exhibit a lower contrast in truthful and deceitful body movements due to lower emotional stress, compared to participants with low scores on this trait.

Narcissism. Narcissists are driven by insecurities that they try to compensate for with deception (Morf & Rhodewalt, 2001). In addition, when engaging in deception, they are likely to experience negative emotions such as fear of being caught as well positive emotions, such as excitement at successful deception (Harrison et al., 2018). As a result, narcissists are assumed to express their emotional stress through an increase in body movements when bluffing. Combined with their lack of self-control and low awareness, they are expected to show an increased contrast in bodily expressions between being deceptive and being truthful.

H3: Participants with high narcissism scores will exhibit a greater contrast in truthful and deceitful body movements due to greater emotional stress, compared to participants with low scores on this trait.

Subclinical psychopathy. Deceptive behaviour in subclinical psychopaths is primarily motivated by their impulses. They have no control over cues and generally experience great joy in deceiving others, but they exhibit no other emotions due to their emotional coldness (Baughman et al., 2014; Spidel et al., 2011). When bluffing in poker, sub-psychopaths are assumed to express only certain positive emotions such as excitement (as well as negative emotions such as anger and disappointment) through an increase in body movements. As they generally have no concern for impression management nor self-control over expressed body movements, they are unlikely to adjust their posture to convey greater honesty. Therefore, subclinical psychopaths are assumed to show more contrast in bodily expressions when bluffing compared to being truthful.

H4: Participants with high subclinical psychopathy scores will exhibit a greater contrast in truthful and deceitful body movements due to greater emotional stress, compared to participants with low scores on this trait.

Method

Design and Participants

This correlational study used a between-subjects design, which is visualised in Figure 1. The first part of the design includes the continuous dependent variable poker success and the continuous independent variable Dark Triad cluster. In this manner, the effect of Dark Triad score on an individual's success in poker was investigated. The second part of the design focused on the effect that participant's Dark Triad score had on the proportion of deceitful performances during a 60-minute poker game. Here, the continuous dependent variable was bluff ratio, and the continuous independent variable was Dark Triad cluster. The third part of the design included the continuous dependent variables of body movements (difference scores of full-body, head, arms, legs, and feet), the continuous mediator variables positive and negative emotional stress, and the continuous independent variable Dark Triad cluster or traits

(cluster, Machiavellianism, narcissism, subclinical psychopathy). Hence, the extent to which participants' Dark Triad score could predict their experience of emotions and expressions of body movements was investigated.

In total, 53 participants (F = 8, M = 45, M_{age} = 23.25, *SD* = 5.93, range = 18–59 years) were involved in the poker experiment after signing informed consent forms to allow anonymous data usage for academic purposes (Appendix A1). No participant withdrew their proof of attendance after the debriefing stage (Appendix A2). To take part, individuals had to be at least 18 years old and possess basic poker knowledge. All students enrolled via the Sona System (for the administration of "test subject hours") received three course credits for participation. A prize of 100 euros and 50 euros was awarded to participants with the largest and second largest stacks, respectively. Most participants (60.4%) were undergraduate University of Twente students, who were recruited via the online research system, Sona; the remaining 39.6% came from the researcher's social network. The nationality of most participants was either Dutch (n = 26) or German (n = 25), whilst two respondents specified their nationality as 'miscellaneous'. In this sample, 56.6% held a high school degree, 32.1% held a Bachelor's or Master's degree, and 11.3% held a college degree, as their highest completed level of education. Participants also had to rate their poker skills before the poker game on a scale of 1 (*very low*) to 5 (*very high*) with a mean score of 2.49 and a standard deviation of 0.99.

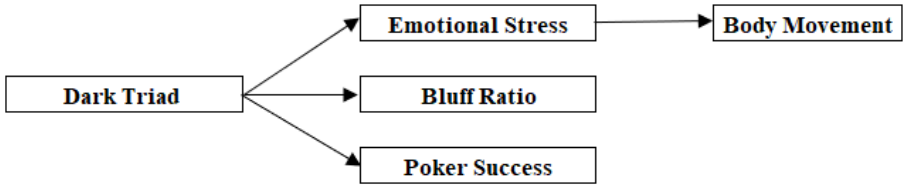

Figure 1. Conceptual model.

Apparatus and Materials

All body movements made by participants during the poker games were recorded on JVC GY-HM250E cameras using the following configuration: a high definition (HD) resolution of 1920 x 1080 pixels, a framerate of 50i, and a bitrate of 50m XHG.

VideoPad. For each participant, 60 minutes of video footage was reduced to three clips of deceitful performances and three clips of truthful performances, in line with answers to an in-game Qualtrics survey, Questions 2–5 (Appendix C1). Clip selection was conducted from end to beginning, thereby excluding the pre-flop betting phase, which generally involved fewer relevant body movements (e.g. picking up and inspecting the cards or passing on the big blind and small blind buttons) as involvement in this phase of the game was relatively low compared to later rounds. To aid observations of body movements in deceitful and truthful performances in the video recordings, an editing program called VideoPad was used. It facilitated the selection of footage by visualizing audio spikes produced by a table bell. The footage was cropped into clips of 38 frames per second, which varied in length from 10–120 seconds per clip and were formatted as AVI-files. The coding of clips was based on camera mount position (left or right), poker game (session number), and betting phase (river, turn, or flop).

OpenPose. After editing and coding the footage, the clips were transferred to technology supervisors at the Behavioural, Management, and Social Sciences (BMS) Lab. To create more manageable movement data for the analyses, the multi-person key point detection program, OpenPose, was used. OpenPose can locate human body joints on single frames. It specifies exact body joint positions for each frame within a clip, which are rendered as X, Y coordinates and confidence levels (Flintbox, 2017). For the current study, OpenPose was adjusted to 38 frames per second and detected 25 key points per frame based on the BODY_25 output model shown in Table 2 (Hidalgo, 2019). The program presented the coordinates and confidence level per frame as a JavaScript Object Notation (JSON) file and visualised the key points in the video clips as a skeletal overlay on the participant (Figure 2).

Microsoft Excel. The JSON files per clip were subsequently converted into Microsoft Excel worksheets, in which the X coordinates, Y coordinates, and confidence levels per key point were displayed in the columns, and the frames per clip for each participant were displayed in the rows. Before constructing the movement variables, data normalisation was required. By calculating and subsequently averaging the absolute difference between frames per key point, the mean body movements score was generated and displayed as X and Y coordinates. To create a single score on average movement, the X and Y coordinates of the key point had to be equated. The average confidence score of that key point represented its validity. Based on these confidence scores, the key point data was filtered. In addition, when average movement scores peaked above 15, the output video with skeletal overlay was reviewed. Low confidence scores and frequent deviations between the skeletal overlay and participant ensued in omitting that data from further usage, thus retaining only valid body movements per key point. For each participant, the remaining movement scores that represented the same key point were subsequently averaged to compute the participant's mean body movements score for that key point during deceitful or truthful performances. Next, multiple key points were allocated to represent a certain body part, which in turn represented movements exhibited by that body part for each participant. Allocation was realised by averaging the movement scores of all key points representing a body part (see Table 2). Five truthful and deceitful body movements variables were created for each participant: full-body movement (all key points averaged), head movement, arm movement, leg movement, and foot movement. The *Measures* section further explains how scores for these movement variables were assessed and interpreted.

Table 2.
BODY_25 Key point allocation per body part

Body Part:	Head	Arms
Key Point:	0: Nose 1: Neck 15: Right Eye 16: Left Eye 17: Right Ear 18: Left Ear	2: Right Shoulder 3: Right Elbow 4: Right Wrist 5: Left Shoulder 6: Left Elbow 7: Left Wrist
Body Part:	Legs	Feet
Key Point:	9: Right Hip 10: Right Knee 11: Right Ankle 12: Left Hip 13: Left Knee 14: Left Ankle	11: Right Ankle 14: Left Ankle 19: Left Big Toe 20: Left Small Toe 21: Left Heel 22: Right Big Toe 23: Right Small Toe 24: Right Heel

Note. Adapted from "OpenPose Demo – Output", by Hidalgo, G., 2019, November 10. Retrieved from: https://github.com/CMU-Perceptual-Computing-Lab/openpose/blob/20d8eca4b43fe28cefc02d341476b04c6a6d6ff2/doc/output.md

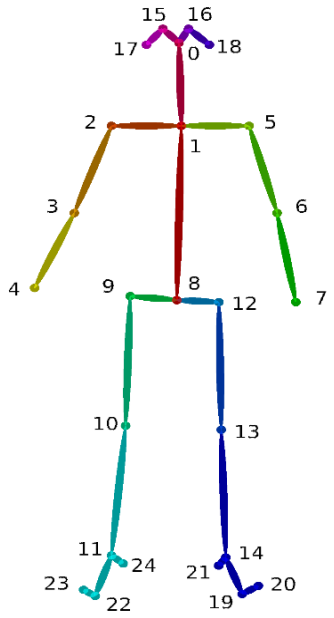

Figure 2. Skeletal overlay (Hidalgo, 2019)

Procedure

Texas Hold'em poker uses specific terminology to describe various in-game activities and concepts. A list of Texas Hold'em poker terms and definitions can be found in Appendix B2. This list only contains poker concepts that were relevant to the current research. All definitions were drawn from the glossary of the World Series of Poker official tournament rules (Caesars Interactive Entertainment Inc, 2018).

To enter the poker experiment, participants were required to register for available timeslots. Twenty-four hours before the start of the experiment, the participants were provided with instructions or their session was rescheduled in case of low attendance. All sessions took place in project rooms at the University of Twente, outfitted with a simplified poker table that could seat three to four participants (Figure 3). Before the game, participants signed an informed consent form. Then, they were instructed about the rules of Texas Hold'em, the setting and duration of the experiment, and the rewards for participating (Appendix B1). Once the cameras started recording, participants were asked to state their full name, age, current year of study, and perceived poker skill. The pre-game session involved a mock

round of poker to familiarise participants with the setup. At the end of each betting phase, the dealer rang a table bell to mark round progressions, as this would streamline subsequent editing of the recorded footage. Participants were notified that this bell had no influence on their actual poker game. In addition, they were required to fill in a one-page Qualtrics survey containing questions about deception at the ante, flop, turn, and river betting rounds as well as emotional stress associated with bluffing behaviour (Appendix C1).

After the pre-game, participants engaged in a 60-minute game of Texas Hold'em poker in which the researcher served as dealer (as well as a poker player if only three participants attended the session). No indication of time was provided in order to prevent all-in scenarios during the last round. After every round, participants were given a moment to fill in the aforementioned survey. In case of uncertainty about either the game or the Qualtrics survey, participants were allowed to consult the researcher. Upon reaching the 60-minute mark, the round in progress was played out and the recordings were stopped. Thereafter, participants were required to fill in a two-part Qualtrics survey (Appendix C2). The first part covered questions about participant number, stack size, final ranking, gender, age, educational background, student number (optional), and e-mail (optional). The second part included 27 statements concerning identification with Dark Triad traits Machiavellianism, narcissism, and subclinical psychopathy. After all participants in the session completed the survey, a debriefing followed in which the study's interest in the links between deception and Dark Triad traits were explained, as well as their relevance in poker. Afterward, participants were free to leave.

Figure 3. Poker table setup.

Measures

Body movements. To assess the varying degree to which participants expressed body movements in truthful and deceitful performances, variables for full-body movement, head movement, arm movement, leg movement, and foot movement were converted into difference score variables. By subtracting each participant's baseline score (movement during truthful performances) from their alternate score (movement during deceitful performances), a difference score was calculated. Positive values (up to 15.00) indicated relatively greater body movement in deceitful performances compared to truthful performances, whereas negative values (down to -15.00) indicated relatively limited body movement in deceitful performances compared to truthful performances.

Bluff ratio. Deceitful performances were measured through Questions 2–5 on the in-game Qualtrics survey (Appendix C1). Participants had to rank their bluffing behaviour in each betting phase (e.g. "Did you try to deceive your opponent before the flop?") on a five-point Likert scale ranging from 1 (*Yes, a great deal*) to 5 (*Not at all*) or 6 (*I folded my hand*). Selecting the options "Yes, a great deal", "Yes, a lot", "A moderate amount", and "Only slightly" represented deceitful performances on the part of the participant. Truthful performances were conveyed by the answers "Not at all" and "I folded my hand". The bluffing ratio was subsequently calculated by dividing all deceitful performances by the total count of in-game performances, resulting in a score between zero and one. Lower values suggested a limited number of deceitful performances in a game, whereas higher values indicated such performances to have occurred relatively frequently.

Poker success. In-game success was based on Part 1, Question 2–3 of the post-game Qualtrics survey (Appendix C1), which measured participants' final rankings and stack sizes. The items for final ranking ("At what place did you finish the poker game?") had to be answered with "first", "second",

"third", or "fourth". The item for stack size had to be answered with a number between 0 and 6,100. The measure for poker success was constructed by first arranging participants by final ranking, then sorting them further by stack size. This resulted in a unique rank for each participant, which translated to a continuous variable for poker success that ranged from 1 to 53. A score of 1 represented the lowest rank possible in the poker experiment (i.e. fourth place in the game, with a stack size of 0), whereas a score of 53 represented the highest rank possible (i.e. first place in the game, with a stack size of 5,170 chips).

Emotional stress. The Emotional Stress Reaction Questionnaire (Larsson, 1987) was used to assess the strength of participants' emotional experiences. Each person was asked to rate to which they identified with 14 emotions (e.g. "relaxed", "angry") during truthful and deceitful performances according to a four-point Likert scale ranging from 1 for *the words does not correspond to how I felt* to 4 for *the word completely corresponds to how I felt* (see Question 6 in the Qualtrics survey, Appendix C1 for the full list). Positive emotional stress (PES) was calculated by averaging the scores of the following emotion-related words: relaxed, pleased, glad, alert, focused, concentrated, and energetic (Larsson, 1987). The deceitful variant had a Cronbach's alpha of 0.87 and a Guttman's lambda-2 of 0.89. The truthful variant had a Cronbach's alpha of 0.91 and Guttman's lambda-2 of 0.92. Negative emotional stress (NES) represented the calculated average scores for the following emotion-related words: indifferent, concerned, uncertain, disappointed, heated, mad, and angry (Larsson, 1987). The deceitful variant had a Cronbach's alpha of 0.71 and a Guttman's lambda-2 of 0.74. The truthful variant had a Cronbach's alpha of 0.75 and a Guttman's lambda-2 of 0.78. Based on these reliability analyses, internal consistency was assessed as "good" and "excellent" for the NES and PES scales, respectively.

To determine whether participants experienced varying degrees of emotion between truthful and deceitful performances, difference score variables for NES and PES were computed. The difference score was calculated by subtracting each participant's baseline score (truthful performances) from their alternate score (deceitful performances). Positive values (up to 4.00) indicated relatively stronger emotional experiences during deceitful performances compared to truthful performances, whereas negative values (down to -4.00) indicated a relatively weaker association.

Dark Triad personality. The Short Dark Triad (SD3) Inventory (Jones & Paulhus, 2014) was used to measure the Dark Triad personality traits both separately and collectively. This inventory consists of 27 statements rated on a five-point Likert scale (in which 1 = *disagree strongly* and 5 = *agree strongly*). See the Qualtrics survey Part 2, Questions 1–27 in Appendix C2 for the full list.

The Dark Triad as a cluster score was computed by averaging scores on Questions 1–27 (e.g. "Most people can be manipulated"; "I'll say anything to get what I want") of the Qualtrics survey. An acceptable internal consistency was indicated by a Cronbach's alpha of 0.73 and Guttman's lambda-2 of 0.76. The Machiavellianism subscale had moderate internal consistency, as indicated by a Cronbach's alpha of 0.64 and a Guttman's lambda-2 of 0.68. The trait score was calculated by averaging the scores of Questions 1–9 (e.g. "Avoid direct conflict with others because they may be useful in the future") into a single score. Internal consistency for the subclinical psychopathy subscale was moderate, with a Cronbach's alpha of 0.66 and a Guttman's lambda-2 of 0.68. The trait score for this subscale was computed by calculating the average score of Questions 19–27 (e.g. "People often say I'm out of control"). The narcissism subscale had insufficient internal consistency, as indicated by a Cronbach's alpha of 0.52 and a Guttman's lambda-2 of 0.56, based on scores from Questions 10–18 (e.g. "I insist on getting the respect I deserve"). As a result, the narcissism trait was excluded from further analyses.

Results

Correlations

Means, standard deviations, and correlations for all variables included in further analyses are shown in Table 3. As educational degree and perceived poker skill were measured at an ordinal scale, associations between these variables were interpreted by Spearman's rank-order correlation coefficient (ρ) rather than Pearson's correlation coefficient (r).

For the Dark Triad cluster score, multiple significant positive correlations were found. Two movement difference score variables correlated significantly with the Dark Triad cluster: leg movement, $r = .300$, $N = 53$, $p < .05$, and foot movement, $r = .325$, $N = 53$, $p < .05$. It is therefore assumed that individuals who scored high on the cluster were also inclined to exhibit more movement in their legs and feet during deceitful performances compared to truthful performances. A significant correlation

with bluff ratio was found as well, $r = .288$, $N = 53$, $p < .05$, suggesting that individuals who scored highly on the Dark Triad cluster were likely to engage in deceitful performances more frequently than truthful ones during a 60-minute poker game. Finally, the Dark Triad cluster correlated significantly with educational degree and perceived poker skill, $\rho = .403$, $N = 53$, $p < .01$ and $\rho = .425$, $N = 53$, $p < .01$, respectively. This suggests that individuals who score highly on the Dark Triad cluster were more likely to have attained a higher degree and believed themselves to be more skilled poker players.

Trait Machiavellianism had a moderately positive and significant correlation with trait subclinical psychopathy, $r = .301$, $N = 53$, $p < .05$, assuming that individuals who score highly on the Machiavellianism trait also had high scores on the subclinical psychopathy trait. Another moderately positive, significant correlation was found with bluff ratio, $r = .271$, $N = 53$, $p < .05$. This implies that individuals who had high scores on the Machiavellianism trait applied deceptive strategies more frequently than truthful strategies during a 60-minute poker game. Finally, trait Machiavellianism correlated positively with educational degree, $\rho = .357$, $N = 53$, $p < .01$, indicating that individuals who scored highly on this trait were more likely to have completed a higher education degree. Trait subclinical psychopathy had a moderately positive, significant correlation with movement difference score foot movement, $r = .318$, $N = 53$, $p < .05$. This leads to the assumption that individuals who score highly on this trait are more likely to show increased foot movement during deceitful performances compared to truthful performances. Another moderately positive, significant correlation was found with perceived poker skill, $\rho = .281$, $N = 53$, $p < .05$, suggesting that individuals who score highly on subclinical psychopathy were more likely to perceive themselves as skilful poker players.

Table 3.
Means, Standard Deviations, and Correlations between Variables [a]

	Mean	*Standard Deviation*	1. Dark Triad Cluster	2. Machiavellianism	3. Subclinical Psychopathy	4. Positive Emotional Stress	5. Negative Emotional Stress	6. Full-Body Movement	7. Head Movement	8. Arm Movement	9. Leg Movement	10. Foot Movement	11. Bluff Ratio	12. Poker Success	13. Gender	14. Age	15. Educational Degree [b]	16. Perceived Poker Skill [b]
1.	*2.99*	*0.38*	---															
2.	*3.36*	*0.54*	**.676****	---														
3.	*2.65*	*0.59*	**.800****	**.301***	---													
4.	*0.22*	*0.44*	-.087	.074	-.100	---												
5.	*0.08*	*0.36*	.119	.083	.054	**.279***	---											
6.	*-0.32*	*1.15*	.101	.060	.110	.071	-.070	---										
7.	*-0.63*	*1.48*	-.058	.100	-.101	-.071	-.095	**.282***	---									
8.	*0.09*	*0.63*	.105	-.050	.101	-.163	-.257	**.341***	.119	---								
9.	*-0.12*	*0.98*	**.300***	.157	.206	.028	.101	**.307***	-.163	-.032	---							
10.	*0.07*	*2.26*	**.325***	.196	**.318***	**.286***	-.005	**.400****	-.073	.174	**.533****	---						
11.	*0.27*	*0.18*	**.288***	**.271***	.180	.097	**.493****	.261	-.050	-.055	.222	.116	---					
12.	*27.00*	*15.44*	.060	-.088	.086	**.295***	.149	.013	-.094	-.035	.246	.171	.028	---				
13.	*1.15*	*0.36*	-.243	-.053	-.121	-.077	.102	-.144	.116	-.193	-.083	-.230	.143	-.241	---			
14.	*23.25*	*5.93*	.084	-.022	.180	-.212	-.024	.003	.078	-.118	-.177	-.145	-.090	.219	-.269	---		
15.[b]	*2.77*	*0.95*	**.403****	**.357****	.183	-.200	.174	-.072	-.144	-.223	-.204	-.197	.134	-.180	**-.287***	**.591****	---	
16.[b]	*2.49*	*0.99*	**.425****	.267	**.281***	-.033	-.051	.018	-.104	-.027	-.018	.033	-.038	.164	**-.452****	.165	**.328***	---

*. $p < .05$, **. $p < 0.01$.
a. $N = 53$ b. Spearman's rank-order correlation

Deceitful Performances

Hypothesis 1a was tested by employing simple linear regression to assess the association between an individual's Dark Triad score and the proportion of deceitful performances during a 60-minute poker game. The analysis included bluff ratio as the dependent variable, and Dark Triad cluster as the independent variable. The assumptions for homoscedasticity, linearity, and normal distribution of residuals were met after visual inspection of the scatter plot, normal probability plot, and histogram, respectively. Data also had independence of observations (Durbin-Watson statistic = 1.88), and contained no significant outliers.

Summary statistics are presented in Table 4. For the hypothesis, relevant statistics were highlighted in bold font. The regression model was statistically significant, F (1, 51) = 4.63, p = .036, *adjusted* R^2 = .065, implying a small effect size. The Dark Triad cluster had a statistically significant positive effect on bluff ratio, B = 0.13, t (51) = 2.15, p = .036, 95% CI [0.01, 0.26]. In other words, when the average scores on the Dark Triad increased by 1 unit, the proportion of deceitful performances during a 60-minute poker game was predicted to increase by 0.13 units, supporting Hypothesis 1a.

Table 4
Regression Analysis Summary for Dark Triad Cluster Score Predicting Bluff Ratio.

Variable	*B*	*SE*	*β*	*t*	*p*	95% CI
(Constant)	-0.13	0.19		-0.67	.503	-0.50, 0.25
Dark Triad Cluster	**0.13**	**0.06**	**0.29**	**2.15**	**.036**	**0.01, 0.26**

Note. N = 53, R^2 = .083, *adjusted* R^2 = .076, CI = confidence interval for *B*.

Poker Success

To test Hypothesis 1b, a linear regression was performed to determine the effect of the Dark Triad score on overall success in deceptive games such as poker. The dependent variable was poker success and, again, the independent variable was the Dark Triad cluster. Similar to the regression for deceitful performances, observing the scatter plot, normality plot, and histogram resulted in satisfactory assumptions for homoscedasticity, linearity, and normal distribution, respectively. The data showed no evidence of significant outliers, nor dependence of observations (Durbin-Watson statistic = 2.29).

Table 5 presents an overview of statistics, with hypothesis-related statistics highlighted in bold font. The regression model for poker success was non-significant, F (1, 51) = 0.19, p = .669, *adjusted R2* = -.016, implying a trivial effect size. Moreover, within the model, the Dark Triad cluster could not significantly predict the ranking of poker success, B = 2.46, t (51) = 0.43, p = .669, 95% CI [-9.02, 13.94]. As a result, Hypothesis 1b had to be rejected.

Table 5.
Regression Analysis Summary for Dark Triad Cluster Score Predicting Poker Success.

Variable	*B*	*SE*	*β*	*t*	*p*	95% CI
(Constant)	19.65	17.22		1.14	.259	-14.93, 54.22
Dark Triad Cluster	**2.46**	**5.72**	**0.06**	**0.43**	**.669**	**-9.02, 13.94**

Note. N = 53, R^2 = .004, *adjusted* R^2 = -.016. CI = confidence interval for *B*.

Dark Triad and Body Movement

Assessment of Hypothesis 1c was realised through five separate parallel mediation analyses using model 4 of Hayes' (2017) PROCESS macro V3.4. Each analysis tested the effect of the Dark Triad cluster score, mediated by experience of positive and negative emotions, on exhibited movement of a body part. The analyses included movement of the full-body, head, arms, legs, and feet as dependent variables, positive and negative emotional stress as mediation variables, and the Dark Triad cluster as the independent variable. Prior to the analyses, various assumptions had to be met. Linearity was established after visual inspection of scatter plots. Normal distribution of residuals was established for all but the head movement variable, as its data was negatively skewed. Head movement was also the only variable that did not have independence of residuals (Durbin-Watson statistic = 1.15). Cases 17, 19, and 33 represented outliers for full-body movement (difference score = -5.73, and -3.14), and arm

movement (difference score = 2.69), respectively. The analyses were conducted regardless of certain assumptions being unsatisfactory.

This section starts with a visual overview of the results per body part; the regression coefficients of each movement variable are shown in the parallel mediation models in Figure 4. A more elaborate outline of statistics is presented in the data tables of Appendix D1.

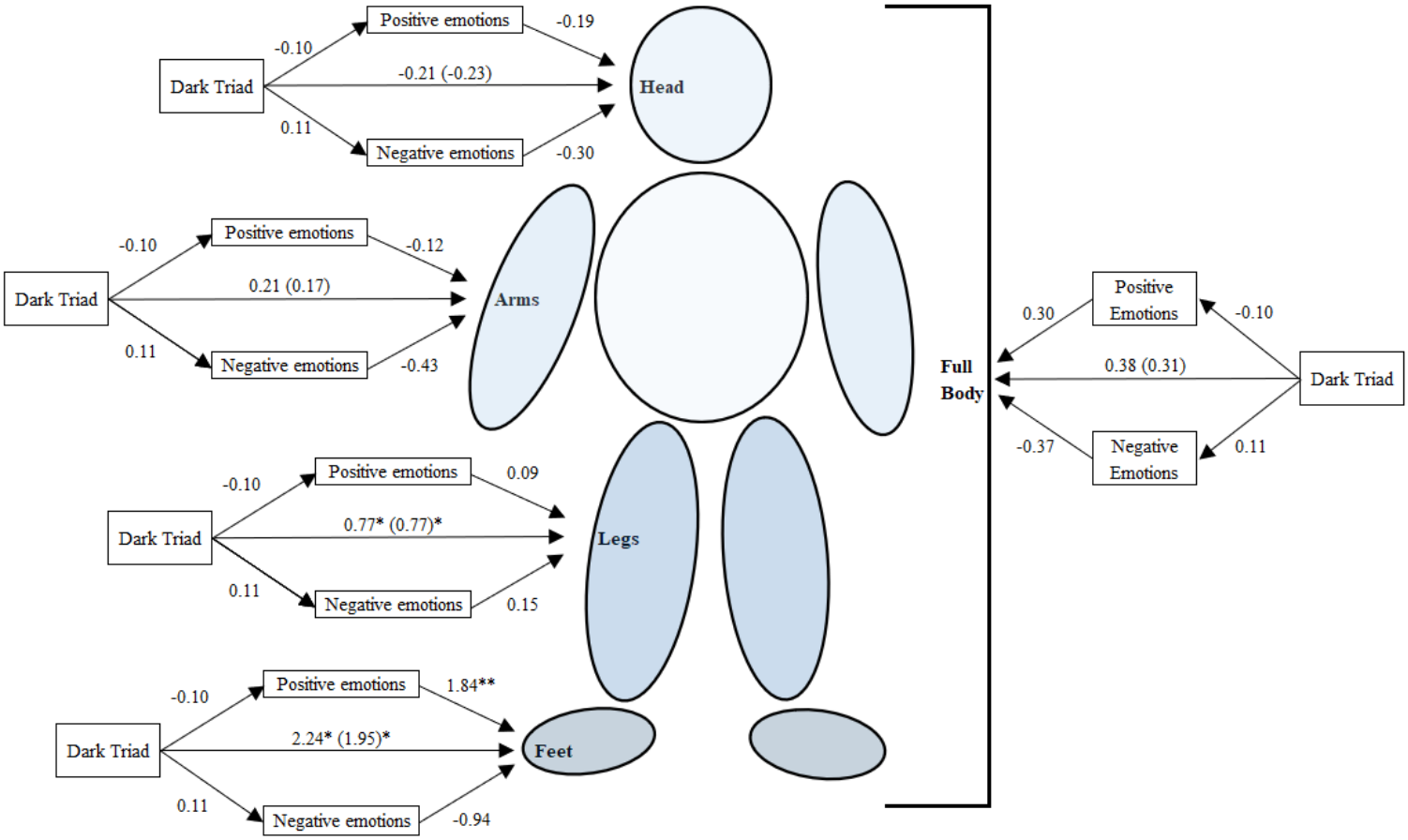

Figure 4. Parallel mediation model of Dark Triad cluster on movement of the full body, head, arms, legs, and feet, mediated by experiencing positive and negative emotions.
* $p < .05$ ** $p < .01$

Full-body movement. The total effect of the Dark Triad on full-body movement, ignoring the mediators, was non-significant, $B = 0.31$, t (51) = 0.72, $p = .474$, 95% CI [-0.54, 1.15]. the Dark Triad had a non-significant direct effect on both positive emotions, $B = -0.10$, t (51) = -0.62, $p = .538$, 95% CI [-0.43, 0.23], and on negative emotions, $B = 0.11$, t (51) = 0.85 $p = .397$, 95% CI [-0.15, 0.38]. This direct effect was identical for each body part and was therefore not reiterated in the remainder of this section. Controlling for the Dark Triad, positive and negative emotions both had a non-significant direct effect on full-body movement, $B = 0.30$, t (49) = 0.78, $p = .442$, 95% CI [-0.47, 1.07], and $B = -0.37$, t (49) = -0.79, $p = .435$, 95% CI [-1.31, 0.57], respectively. The direct effect of the Dark Triad on full-body movement, in the presence of the mediators was also found to be non-significant, $B = 0.38$, t (49) = 0.87, $p = .389$, 95% CI [-0.49, 1.25]. Therefore, bootstrapping was omitted.

Head movement. Without the mediators, the Dark Triad had a non-significant total effect on head movement, $B = -0.23$, t (51) = -0.42, $p = .678$, 95% CI [-1.33, 0.87]. The direct effects of positive and negative emotions on head movement were non-significant, $B = -0.19$, t (49) = -0.37, $p = .812$, 95% CI [-1.18, 0.81], and $B = -0.30$, t (49) = -0.49, $p = .627$, 95% CI [-1.52, 0.92], respectively. Even with the mediators included, the direct effect of Dark Triad on head movement remained non-significant, $B = -0.21$, t (49) = -0.38, $p = .707$, 95% CI [-1.34, 0.92]. No bootstrapping was conducted due to a lack of significance in the model.

Arm movement. The Dark Triad did not have a significant total effect on arm movement, B = 0.17, t (51) = 0.75, p = .453, 95% CI [-0.29, 0.64]. Positive and negative emotions had a non-significant direct effect on arm movement, B = -0.12, t (49) = -0.58, p = .565, 95% CI [-0.25, 0.67] and B = -0.43, t (49) = -1.74, p = .089, 95% CI [-0.52, 0.29], respectively. The direct effect of the Dark Triad, controlling for the mediators, was also non-significant, B = 0.21, t (49) = 0.92, p = .362, 95% CI [-0.25, 0.67]. As none of the paths showed significant effects, bootstrapping was omitted.

Leg movement. The total effect of the Dark Triad on leg movement, not including the mediators, was positive and statistically significant, B = 0.77, t (51) = 2.24, p = .029, 95% CI [0.08, 1.47]. Positive and negative emotions' direct effects on leg movement were non-significant, B = 0.09, t (49) = 2.71, p = .788, 95% CI -0.55, 0.72] and B = 0.15, t (49) = 0.39, p = .700, 95% CI [-0.62, 0.92], respectively. The direct effect of the Dark Triad on leg movement, including the mediators, was again positive and statistically significant, B = 0.77, t (49) = 2.15, p = .037, 95% CI [0.05, 1.48]. Bootstrapping (N = 5,000) showed no significant mediation effect in the model, as the 95% confidence intervals of positive emotional stress (indirect effect = -0.01) [-0.15, 0.04] and negative emotional stress (indirect effect = 0.02) [-0.09, 0.27] both included zero.

Foot movement. The Dark Triad's total effect on foot movement, was found to be positive and statistically significant, B = 1.95, t (51) = 2.46, p = .017, 95% CI [0.36, 3.54]. The direct effect for positive emotions on foot movement was also statistically significantly positive, B = 1.84, t (49) = 2.73, p = .009, 95% CI [0.49, 3.19], whereas the direct effect of negative emotions was not, B = -0.94, t (49) = -1.14, p = .261, 95% CI [-2.59, 0.72]. Finally, similar to the total effect, the direct effect of the Dark Triad on foot movement was positive and statistically significant, B = 2.24, t (49) = 2.93, p = .005, 95% CI 0.71, 3.78]. However, bootstrapping (N = 5,000) for mediation effects found no mediation in the model, as zero was included in the 95% confidence interval of positive emotional stress (indirect effect = -0.19) [-0.91, 0.43], and for negative emotional stress (indirect effect = -0.11) [-0.72, 0.29].

Summary. The results showed no statistically significant mediation effects of positive or negative emotional stress, when the Dark Triad is included as the independent variable and the body parts as dependent variables. Positive emotional stress was found to be a statistically significant predictor for foot movement, but this relationship did not apply for any other body part movement. Furthermore, it was found that the Dark Triad cluster had a significant effect on participants' movement difference score for the feet and legs but not the arms, head, and full-body. Therefore, these results only partially support Hypothesis 1c.

Dark Personality Traits and Body Movement

Hypotheses 2 through 4 were also tested using the PROCESS macro V3.4, model 4 (Hayes, 2017). Five parallel mediation analyses were separately conducted to investigate the effect of Machiavellianism and subclinical psychopathy scores as dark traits on exhibited body part movement, mediated by the experience of positive and negative emotions. Dependent variables were full-body, head, arm, leg, and foot movement, the mediation variables were positive and negative emotional stress, and the independent variables were trait Machiavellianism and subclinical psychopathy. Trait narcissism was excluded due to insufficient internal consistency.

Before conducting the analyses, assumptions were tested. After screening for unusual points, the data did not show any high leverage points nor any highly influential points. The outliers of cases 17, 19, and 33 mentioned in the Dark Triad cluster analyses remained in the analyses for dark traits Machiavellianism and subclinical psychopathy. Again, there was no independence of residuals for the head movement variable (Durbin-Watson statistic = 1.15). Visual inspection of normal probability plots and scatter plots confirmed linearity and homoscedasticity, respectively. Histograms for head movement and full-body movement showed negative skewness. Thus, normal distribution of residuals was only established for arm, leg, and foot movement variables. The data showed no signs of multicollinearity, as correlations among predictors and mediators were relatively low, and tolerance values did not exceed 0.10. Analyses proceeded with unsatisfactory assumptions.

First, a visualisation of the results per body part is presented in Figure 5. In it, parallel mediation models show the regression coefficients corresponding to each body movement variable, which will be elaborated on in the upcoming section. A more comprehensive overview of statistics is presented in the data tables of Appendix D2.

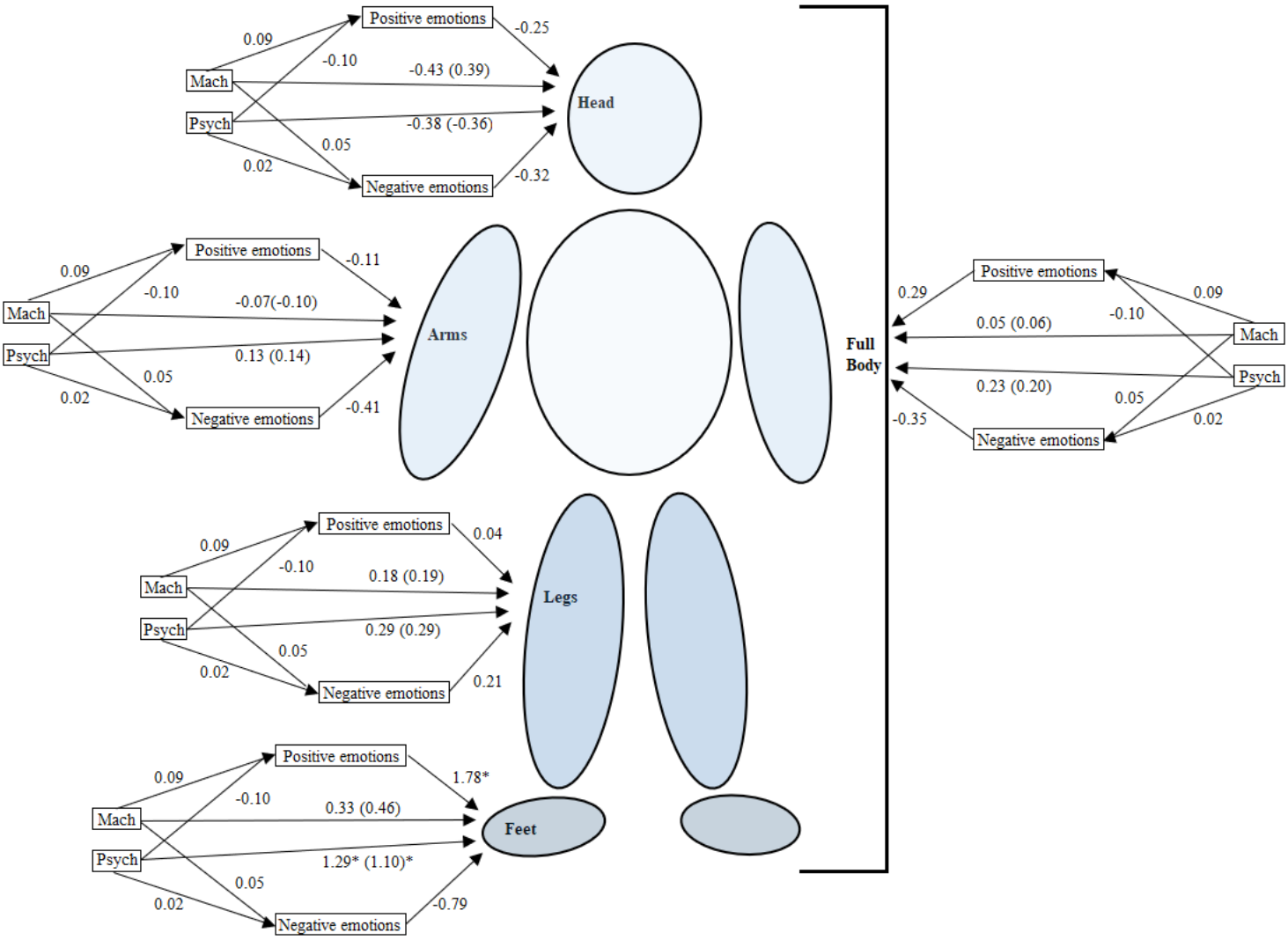

Figure 5. Parallel mediation model of Machiavellianism and subclinical psychopathy on movement of the full body, head, arms, legs, and feet, mediated by experiencing positive and negative emotions. * $p < .05$

Full-body movement. Without the mediators, the total effect of Machiavellianism and subclinical psychopathy on full-body movement was non-significant, $B = 0.06$, t (50) = 0.20, $p = .844$, 95% CI [-0.57, 0.69], and $B = 0.20$, t (50) = 0.69, $p = .494$, 95% CI [-0.38, 0.78], respectively. Both traits had a non-significant direct effect on positive emotions: Machiavellianism, $B = 0.09$, t (50) = 0.78, $p = .439$, 95% CI [-0.15, 0.33], subclinical psychopathy, $B = -0.10$, t (50) = -0.36, $p = .363$, 95% CI [-0.32, 0.12], as well as on negative emotions: Machiavellianism, $B = 0.05$, t (50) = 0.50, $p = .621$, 95% CI [-0.15, 0.25], subclinical psychopathy, $B = 0.02$, t (50) = 0.22, $p = .831$, 95% CI [-0.16, 0.20]. Since the direct effects of these traits on positive and negative emotions were identical for all body parts, they were not reiterated in the remainder of this section. Controlling for Machiavellianism and subclinical psychopathy, the direct effects of positive and negative emotions on full-body movement were also non-significant, $B = 0.29$, t (48) = 0.75, $p = .457$, 95% CI [-0.49, 1.07], and $B = -0.35$, t (48) = -0.74, $p = .464$, 95% CI [-1.29, 0.60], respectively. In the presence of the mediators, both traits once again had a non-significant direct effect on full-body movement, Machiavellianism: $B = 0.05$, t (48) = 0.16, $p = .872$, 95% CI [-0.59, 0.69], subclinical psychopathy: $B = 0.23$, t (48) = 0.80, $p = .429$, 95% CI [-0.36, 0.83]. None of the paths showed significant effects; therefore, bootstrapping was omitted.

Head movement. Both traits had a non-significant total effect on head movement, Machiavellianism: $B = 0.39$, t (50) = 0.99, $p = .330$, 95% CI [-0.41, 1.19], subclinical psychopathy: $B = -0.36$, t (50) = -0.99, $p = .329$, 95% CI [-1.10, 0.38]. Positive and negative emotions had a non-significant

direct effect on head movement, B = -0.25, t (48) = -0.51, p = .610, 95% CI [-1.25, 0.74], and B = -0.32, t (48) = -0.53, p = .596, 95% CI [-1.53, 0.89], respectively. Including the mediators, the direct effects of Machiavellianism and subclinical psychopathy were again non-significant, B = -0.43, t (48) = 1.06, p = .294, 95% CI [-0.39, 1.25], and B = -0.38, t (48) = -1.02, p = .315, 95% CI [-1.14, 0.37], respectively. Therefore, bootstrapping analysis was not performed.

Arm movement. Machiavellianism and subclinical psychopathy did not have a significant total effect on arm movement, B = -0.10, t (50) = -0.60, p = .552, 95% CI [-0.44, 0.24], and B = 0.14, t (50) = 0.87, p = .388, 95% CI [-0.18, 0.45], respectively. The direct effects of positive and negative emotions on arm movement were also non-significant, B = -0.11, t (48) = -0.55, p = .582, 95% CI [-0.53, 0.30], and B = -0.41, t (48) = -1.64, p = .108, 95% CI [-0.91, 0.09], respectively. Similar to the total effect, the direct effects of the traits on arm movement were non-significant as well, Machiavellianism: B = -0.07, t (48) = -0.42, p = .674, 95% CI [-0.41, 0.27], subclinical psychopathy: B = 0.13, t (48) = 0.85, p = .398, 95% CI [-0.18, 0.45]. Therefore, bootstrapping for mediation was omitted.

Leg movement. Neither Machiavellianism nor subclinical psychopathy had a significant total effect on leg movement, B = 0.19, t (50) = 0.73, p = .470, 95% CI [-0.33, 0.77], and B = 0.29, t (50) = 1.21, p = .234, [-0.19, 0.71], respectively. Neither positive nor negative emotions presented a significant direct effect on leg movement, B = 0.04, t (48) = 0.11, p = .513, 95% CI [-0.36, 0.74], and B = 0.21, t (48) = 0.54, p = .247, 95% CI [-0.21, 0.78], respectively. When the mediators were included, the direct effects of Machiavellianism and subclinical psychopathy remained non-significant, B = 0.18, t (48) = 1.17, p = .991, 95% CI [-0.62, 0.69], and B = 0.29, t (48) = 0.66, p = .590, 95% CI [-0.58, 1.00]. Bootstrapping was not conducted due to a lack of significance in the model.

Foot movement. The total effect of Machiavellianism on foot movement was non-significant, B = 0.46, t (50) = 0.79, p = .432, 95% CI [-0.71, 1.63]. However for subclinical psychopathy, this effect was statistically significant and positive, B = 1.10, t (50) = 2.04, p = .047, 95% CI [0.02, 2.18]. The direct effect of positive emotions on foot movement was also statistically significantly positive, B = 1.78, t (48) = 2.61, p = .012, 95% CI [0.41, 3.16], but the direct effect of negative emotions on foot movement was non-significant, B = -0.79, t (48) = -0.96, p = .342, 95% CI [-2.46, 0.87]. Comparable to the total effect, the direct effect of Machiavellianism was non-significant, B = 0.33, t (48) = 2.49, p = .554, 95% CI [-0.79, 1.46], whereas the direct effect of subclinical psychopathy was significant and positive, B = 1.29, t (48) = 2.61, p = .016, 95% CI [0.25, 2.34]. Despite one significant effect of emotional stress, the bootstrapping procedure (N = 5,000) showed no mediation effect for positive emotions (indirect effect = 0.17, 95% CI [-0.29, 0.79]) or negative emotions (indirect effect = -0.04, 95% CI [-0.35, 0.20]), as zero was included in both of the 95% confidence intervals.

Summary. None of the findings presented statistically significant mediation effects of emotional stress when trait Machiavellianism and subclinical psychopathy were included as independent variables and body part movements as dependent variables. However, on its own, positive emotional stress was a statistically significant predictor of foot movement but this relationship did not apply for any other body parts. Trait Machiavellianism did not significantly predict any of the mediation variables, nor any of the outcome variables. Consequently, Hypothesis 2 had to be rejected. By contrast, trait subclinical psychopathy had a statistically significant effect on participants' movement difference score for the feet, but not any other body parts. Therefore, Hypothesis 4 was only partially supported. As trait narcissism was excluded from the analyses, Hypothesis 3 was neither supported nor rejected.

Additional Analyses

In assessing the effect of the Dark Triad on bluffing behaviour and poker success, prior analyses did not incorporate any predictors associated with poker skill other than the tendency to deceive more frequently and more skilfully. However, consistent poker success is often associated with factors such as social intelligence, experience, and statistical knowledge of poker (Palomäki, Laakasuo, & Salmela, 2013; Bellin, 2002; Germain & Tenenbaum, 2011). In addition, according to Palomäki et al. (2016), bluffing behaviour may be influenced by factors such as gender and age in that young males tend to bluff more frequently. It would therefore be interesting to test whether including these variables into the model would add significance to the effect of the Dark Triad on deceitful performances and poker success.

Moderation in deception. Poker skill was examined as a moderator in the relationship between the Dark Triad score and the proportion of deceitful performances in poker, controlling for demographic characteristics. This was tested using model 1 of the PROCESS macro V3.4 (Hayes, 2017). The analysis

included bluff ratio as the dependent variable, perceived poker skill as a moderator, the Dark Triad cluster as the independent variable, and gender, age, and educational degree as control variables. After data screening, no significant outliers were found. The assumptions for regression were also met.

The overall model with the Dark Triad, poker skill, their interaction, and the control variables was found to be statistically significant, F (6, 46) = 3.21, p = .010, R^2 = .295. The interaction between the Dark Triad and poker skill explained a significant increase in variance for bluff ratio, F (6, 46) = 6.71, p = .013, ΔR^2 = .013. The Dark Triad significantly predicted bluff ratio, B = 0.18, t (46) = 2.61, p = .012, 95% CI [0.04, 0.31], whereas poker skill did not, B = -0.02, t (46) = -0.69, p = .492, 95% CI [-0.08, 0.04]. In addition, none of the control variables of gender, B = 0.13, t (46) = 1.72, p = .091, 95% CI [-0.02, 0.27], age, B = -0.01, t (46) = -0.87, p = .392, 95% CI [-0.01, 0.01], or educational degree, B = 0.04, t (46) = 1.49, p = .142, 95% CI [-0.01, 0.09], had a significant effect on bluff ratio. However, the interaction between the Dark Triad and poker skill was statistically significant in negatively predicting bluff ratio B = -0.19, t (46) = -2.59, p = .013, 95% CI [-0.33, -0.04]. Figure 6 visualises the interaction between the predictors. At low levels of perceived skill in poker, the Dark Triad score positively predicted the proportion of deceitful performances in poker, B = 0.36, t (46) = 3.73, p = .001, 95% CI [0.17, 0.55]. This relationship weakened when the perceived skill in poker reached average levels, B = 0.18, t (46) = 2.61, p = .012, 95% CI [0.04, 0.31]. At high levels of perceived skill in poker, the Dark Triad score no longer significantly predicted the proportion of deceitful performances during a game, B = -0.01, t (46) = -0.11, p = .915, 95% CI [-0.21, 0.19]. Relevant data tables for this moderation are presented in Appendix D3.

Moderation in poker success. Similar to the prior analysis, model 1 of the PROCESS macro V3.4 was used (Hayes, 2017) to test poker skill as a moderator of the relationship between the Dark Triad score and poker success, controlling for demographic characteristics. Whilst the independent variable, moderator, and control variables remained the same, the dependent variable was replaced with poker success. Regression assumptions were satisfactory and no outliers were found in the data.

The model for the Dark Triad, poker skill, the interaction, and gender, age, and educational degree was close to significance, F (6, 46) = 2.08, p = .074, R^2 = .214. The addition of the interaction to the model was non-significant, F (6, 46) = 0.49, p = .488, ΔR^2 = .008. Both the Dark Triad and poker skill failed to significantly predict poker success, B = 1.58, t (46) = 0.25, p = .800, 95% CI [-10.89, 14.04], and B = 3.99, t (46) = 1.51, p = .139, 95% CI [-1.34, 9.32], respectively. None of the control variables except for educational degree had a significant effect on game outcome ranking, gender: B = -6.42, t (46) = -0.95, p = .347, 95% CI [-20.01, 7.18], age: B = 0.63, t (46) = 1.73, p = .091, 95% CI [-0.10, 1.35], educational degree: B = -5.78, t (46) = -2.37, p = .022, 95% CI [-10.68, -0.87]. Likewise, the interaction between the Dark Triad and poker skill was also non-significant, B = -4.67, t (46) = -0.70, p = .488, 95% CI [-18.11, 8.77]. Related data tables are available in Appendix D4.

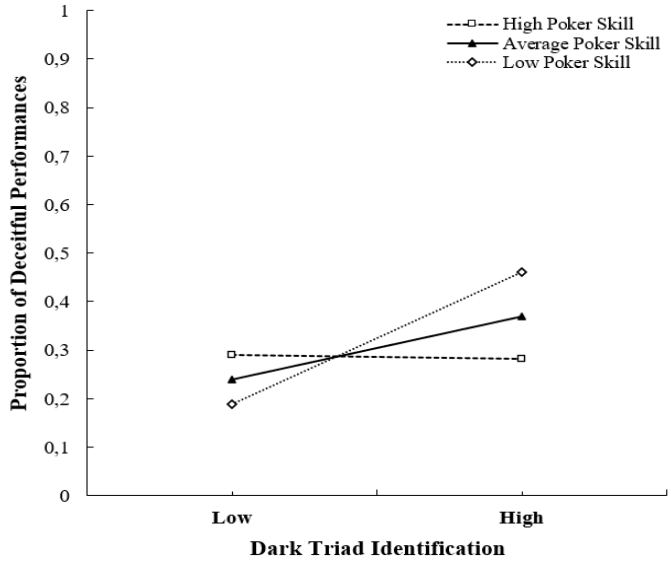

Figure 6. Moderation of the effect for the Dark Triad score on the proportion of deceitful performances at values of the moderator poker skill.

Discussion

The purpose of this study is to explain whether the Dark Triad personality could predict success in deceitful behaviour by utilizing poker as a research setting. Via the Short Dark Triad inventory as self-report measure, participants had to identify with statements that represented traits of Machiavellianism, narcissism, and subclinical psychopathy, which translated to Dark Triad personality scores (Jones & Paulhus, 2014). Deceitful behaviour and the degree to which it was successful, were measured in several ways. During the poker experiment, deception was based on in-game performances involving deceptive strategies (i.e. bluffing or slow-playing). As the Dark Triad is known for its increased tendency to include such strategies, and some poker games involve more deception than others due to the pacing, deception frequency was measured as a bluffing ratio. This was calculated by dividing the number of self-reported deceitful performances by all self-reported in-game performances; low scores represented a relatively low number of bluffs throughout the game, whereas high scores represented a relatively high number of bluffs. The success of deceitful behaviour was measured in two ways. First, poker success was based on participants' final ranking and stack size in which an increase in both equals higher ratings of poker success, and vice versa. Second, successful deception was based on the expression of non-verbal cues – or rather, the lack thereof. These cues translated to participants' felt emotions, that in turn evoked body part movements during truthful and deceitful in-game performances. These emotions were measured via a self-report questionnaire for emotional stress (Larsson, 1987). Deceitful and truthful body movements were recorded on video and evaluated via key point detection technology, OpenPose. After quantifying body part movements as data, difference scores between deceitful and truthful movements were computed; a higher score indicated relatively more deceitful movements than truthful movements. Presumably, the closer that deceitful and truthful movements were to one another, the more difficult it would be to detect irregularities in behavioural expressions (i.e. deceptive cues) and, thus, the more successful the deception would be. The upcoming section elaborates on interpretations of the results and reflects on how these correspond to or contradict the literature. Subsequently, research limitations and implication for future research are discussed.

Deceitful Performances

In line with Hypothesis 1a, high scores on the Dark Triad cluster predicted significantly larger bluff ratios during a 60-minute poker game than low scores. This implies that, in poker, individuals with high Dark Triad scores were more often deceitful than they were truthful when betting against opponents, compared to individuals whose Dark Triad scores were relatively low. This supports research in which the Dark Triad positively predicted deception frequency during social interactions (Baughman et al., 2014; Jonason et al., 2014), and aligns with the theory that individuals with Dark Triad traits are predisposed to using deception in interpersonal communication (Paulhus & Williams, 2002; Jones & Paulhus, 2017). To substantiate the abovementioned relationship, its effect remained statistically significant even when controlling for demographics. This suggests that individual differences based on age, gender, or educational achievement did not influence the relationship between the Dark Triad and bluff ratio. However, this finding contradicts research in which gender and age were significantly related to bluffing frequency (Palomäki et al., 2016; Palomäki, Yan, & Laakasuo, 2016). An explanation for the demographic control variables' lack of significance may be due to the relatively small sample size and its resulting lack of power. The Dark Triad's relationship with bluff ratio was also examined with poker skill as a moderator; with increasing poker skill, the aforementioned relationship weakened and became non-significant at a high level of poker skills. Presumably, as poker skill increased, more factors which this study did not account for emerged and influenced the effect on bluff ratio. This could be explained by the fact that poker is a skill-based game in which frequency of bluffing is only one factor. For instance, Leonard and Williams (2015) found that social information processing, working memory capacity, and risk perception played a significant role during poker. As the level of poker skills increases, these factors may diminish the strength of the Dark Triad's effect on the proportion of deceitful performances during the game.

Poker Success

Hypothesis 1b lacked statistical support, as the Dark Triad score had a non-significant effect on in-game success during the poker experiment, meaning that the likelihood of achieving success in deceptive games such as poker did not differ between individuals with higher or lower Dark Triad scores. Even when poker success was examined in the presence of a moderator – poker skill – and demographic covariates, the effect of the Dark Triad could not be statistically substantiated. This deviates from findings in Furnham, Richards, and Paulhus' (2013) 10-year review of Dark Triad personality research, in which they reflected on Dark Triad members as being more successful in various contexts, including work, education, and mating. However, the current research finding is in line with the results of Leonard and Williams (2015), who also did not find a significant relation between success at poker, and personality traits such as impulsiveness, excitement-seeking, trust (or the lack thereof), or straightforwardness (or the lack thereof); Big Five facets with which Dark Triad members seem to correlate relatively steadily (Jakobwitz & Egan, 2006; Kowalski, Vernon, & Schermer, 2019). Therefore, although the Dark Triad has been found to be successful in a variety of domains, the context of deceptive games such as poker does not appear to be one of them. In addition, in the current study, the measure for skill was based on participants' perceived experience in poker rather than their actual level of competency. This may have led to an inaccurate representation of how "skill" influenced the likelihood of success and, hence, resulted in a non-significant relationship. On another note, educational achievements as a demographic covariate negatively predicted game ranking, implying that individuals with a lower educational degree were more likely to be successful in the poker experiment. An explanation for this could be that the majority of participants in this study were students with only a high school degree as highest attained diploma, resulting in a positively skewed outcome for analyses that included highest educational achievement as a variable. However, according to Leonard and Williams (2015), neither educational achievements nor educational level were significant predictors for proficiency at poker.

Body Movement

Hypotheses 1c and 4 were partially supported by the current research, as the Dark Triad score significantly predicted movement difference scores. However, this was true only for movement of the legs and feet, and trait subclinical psychopathy only significantly predicted foot movement. However, none of these effects were significantly mediated by emotional stress. These findings imply that, irrespective of experienced emotions, movement of legs and feet (but not other body parts) was higher during deceitful performances than during truthful performances; and that contrast was greater for individuals with high scores on the Dark Triad compared to those with relatively low scores. A similar interpretation could be made for the findings related to trait subclinical psychopathy, but this would only relate to foot movement. According to Navarro and Karlins (2006), the lower body parts are the most difficult to control during deception; since difficulty with self-control is a key element of the Dark Triad, especially for the trait subclinical psychopathy (Jones & Paulhus, 2014; 2017), these findings are not exceptional.

The findings regarding the mediators were more surprising. Negative emotional stress did not predict movement of any body parts, whereas positive emotional stress only predicted foot movement. The latter finding is in line with the attempted control approach (Zuckerman et al., 1981), in which deceivers overcontrol for stereotypical cues (e.g. fidgeting and minor upper body movements) but forget the non-verbal cues they often have the least control over (Navarro & Karlins, 2006). However, the non-significant effects of positive and negative emotional stress on the movement of other body parts contradicts the prevailing model of the fundamental processes behind deception in the literature (Zuckerman et al., 1981). It shows that experiencing either positive or negative emotions elicits increased movement in various body parts as non-verbal cues to deception. An explanation for the absence of this effect may be due to the construct of the moderators. These variables were calculated by subtracting the average score of seven emotions experienced whilst being truthful from the average score of seven emotions experienced whilst being deceitful. Subtraction was necessary to compute the difference scores, but this may have affected the measure's accuracy, leading to a lack of significance.

Hypothesis 2 was also rejected, as trait Machiavellianism failed to significantly predict any of the difference scores, which implies that the score on this dark trait is unlikely to have an effect on the differences between deceitful and truthful performances with regard to either perceived emotions or

expressed body part movements. This finding is rather surprising given that Machiavellians are typically highly strategic and skilled deceivers (Jonason et al., 2014; Geis & Moon, 1981) due to their high levels of self-control (Jones & Paulhus, 2011; 2017). In other words, Machiavellians should have a significantly lower contrast between truthful and deceitful body movements, as they are aware of and are able to control these cues. A possible answer for why the results deviated from the literature has to do with low internal consistency for the Machiavellianism construct, which had a Cronbach's alpha of 0.64, or the overall lack of power in the data.

In contrast with lower body parts, upper body parts were not included as outcome variables in any of the significant effects. This lack of significance can be explained in three ways. First, participants were requested to keep hands and arms in a fixed position, above the game table, throughout the entirety of their participation. Such restrictions may have narrowed the arm movement difference scores, making it less likely to find a statistically significant outcome. The data was not affected by outliers for this body part, as analyses which included and excluded the outliers did not show any significant results. Still, outliers did not represent unrealistic movements; therefore, exclusion would only negatively affect this study's generalizability. Second, the data for head movement were negatively skewed and did not exhibit independence of observations. This implies that participants from the same game affected each other's movements. This seems apparent, as participants had to sit next to instead of facing each other, and thus were more likely to make excessive head movements to interact with or peer at their opponents. This skewness may have lowered the accuracy of the difference score for head movement and may explain why head movement analyses did not find any significant outcomes. Third, body part movement scores were based on three rather than all instances of a participant's bluffing and truthful behaviours. This may have narrowed down the variance in movement expression for both the upper and lower body, thus resulting in non-significant findings for said body part analyses. Future research should consider basing movement scores on all observations rather than only a few; however this would take significantly more time and effort to process.

Hypothesis 3 could be neither supported nor rejected, as the narcissism construct had insufficient internal consistency. Jones and Paulhus' (2014) introductory study into the Short Dark Triad found alpha reliabilities between 0.74 to 0.80 for narcissism, and a more recent study also showed acceptable internal consistency (Jones & Paulhus, 2017). However, including narcissism in the analyses with the current alpha value may have led to misleading results. Perhaps the use of a narcissism measure that is separate from the Dark Triad, either by itself or in combination with a larger data sample, would yield higher alpha reliabilities.

Research Limitations

The current study faced a number of limitations. Firstly, the research sample lacked size and consequently led to some power issues. According G*Power v3.1.9.7, a sample size of 68 to 92 participants would have been needed to attain a power value of 0.80 for the analyses conducted in this study, depending on the predictors. However, this study relied on mostly undergraduate students to participate in the experiment in groups of at least three people in a relatively short time frame, which made reaching a satisfactory sample size significantly more difficult. Due to this deficiency, it is conceivable that existing relationships remained undetected. In addition, the sample overly represented Western, educated, industrialised, rich and democratic (WEIRD) participants, what may have limited the study's generalizability in non-WEIRD societal settings. Therefore, an increase in the size and diversity of the research sample is recommended.

Secondly, the setting in which the research was conducted may have limited the exhibition of natural behaviour in participants. For instance, participants were seated next to each other. It was already previously assumed that this induced them to make more effort to move their body in order to interact with or peer at opponents during a poker game. In addition, participants were restricted in *how* they were seated, even if this restriction was minimal. To obtain proper movement data for OpenPose, all of the participants' body parts had to be visible in the video image. Therefore, participants were required to keep their hands above the table and position their legs and feet away from the table legs. Since this was quite an uncomfortable posture to hold throughout the game, participants often relapsed into positions that interfered with proper collection of movement data, deducing the reliability of such data. Both these challenges can be addressed by requiring that participants sit face-to-face with one another to restrain excessive body movement, as is typical in poker. Such a setting may also reveal bodily expressions not

apparent in this study. Additionally, another measure that is less dependent on the research setting would be the use of more reliable technology for digitally recording body movements. For example, the Xsens full body motion capture system is a reliable alternative in which participants wear a with sensors fitted suit that tracks bodily expressions (Al-Amri et al., 2018; Karatsidis et al., 2019). This could overcome challenges faced in the current research setting.

Thirdly, this study assumes that poker is cognitively taxing throughout the entire game. Poker stimulates the use of deceptive strategies, which increase both the chances of winning as well as the risk of losing, with either positive or negative financial consequences. As consequences increase, such strategies often involve relatively high stakes, which typically increase the mental effort required for an individual to successfully perform and maintain the deceptive act (Vrij et al., 2011). However, not every round in poker is a high-stakes round and, thus, not every round is equally cognitively taxing. To account for cognitive strain, future research could measure this construct based on how high the stakes are in each round. This could be determined using a poker odds calculator in which the number of players, the community cards in each round, and all player hands are inputted. Based on these factors, the winning chance for each player is presented, where a higher chance equals lower stakes, and a lower chance equals higher stakes. For example, given a certain set of community cards in the turn phase [♦5, ♦3, ♣Q, ♣9] where player 1 has a high-stakes hand [♠K, ♠A] and player 2 has a low-stakes hand [♣8, ♥3], then player 1 has a low chance of winning (13.9%), and player 2 has a high chance of winning (86.1%). In this manner, the influence of cognitive effort and involved risk on the Dark Triad's deceptive success can be more structurally and reliably investigated.

Fourth (and perhaps most importantly), one limitation concerned construct measures. To begin with, the current study used difference scores for experienced emotions by the participants and exhibited body movement. In these analyses, the Dark Triad cluster or trait scores were only used to make predictions about the strength and direction of the difference between being truthful and deceitful, but individual differences for these opposing performances were not considered. For instance, the expressed movements may have been relatively high for one participant (deceitful score = 15, truthful score = 10) but relatively low for another participant (deceitful score = 6, truthful score = 1). These subjects would share the same difference score despite the obvious contrast between their body movement expression. Therefore, it is recommended to analyse Dark Triad scores in both truthful and deceitful performances rather than their contrast, as this would allow individual differences between participants' Dark Triad scores to be explained in more depth. In addition, the Dark Triad trait constructs had relatively low alpha reliabilities compared to other studies that used the Short Dark Triad Inventory (Azizli et al., 2016; Baughman et al., 2014; Jones & Paulhus, 2017). This may be explained by the small sample size, as the referenced studies recruited four to eight times more participants than the current study. An alternative would be to use separate Dark Triad trait measures such as the 20-item Mach-IV (Christie & Geis, 1970), the 40-item Narcissistic Personality Inventory (Raskin & Hall, 1979), and the 64-item Self-Report Psychopathy Scale (Paulhus, Neumann, & Hare, in press). However, these would take significantly more time to complete (27 items versus 124 items).

Lastly, the poker skill construct was not accurately represented in this study, because it was based on the perceived self-competence rather than the actual competency of participants in poker. In actuality, people tend to be positively biased about rating their own skills, which may have decreased the validity of poker skill findings since it did not measure the construct as intended. A recommendation would be to use a more objective measure for poker skill, such as the Poker Skill Measure constructed by Leonard, Staples, and Williams (2014). This 35-item questionnaire tests respondents on poker knowledge and skills in various scenarios that increase in complexity. This measure would also aid in pre-selecting participants prior to the study. In this case, participants with insufficient poker skill could be excluded from participating, as their lack of skill may cease the continuity of the game, in not knowing how to play poker.

Strengths and Future Directions

Despite the aforementioned limitations, the current study features several strong points. First, it may be one of the first, to examine the Dark Triad's relationship with deceitful capabilities, as measured through frame-by-frame body movement expressions. Other studies on deception and the Dark Triad mostly rely on self-report measures of deception or assessors that visually code deceptive cues. Such methods are often prone to bias, social desirability, human error, and other unforeseen limitations that could

negatively affect research outcomes. By contrast, this study uses OpenPose to objectively assess body joint movements through changes in pixel location between multiple frames in deceitful and truthful behaviours. Not only is this method highly objective, it also removes human error, since the technological coding is not impeded by the limitations of the naked eye. It also controls for participants' intention to possibly influence the study; even very small, unconscious movements are captured. OpenPose as a measure of body movements is fairly consistent, which adds to the current study's reproducibility. Another strong point of this study is the use of poker as a research setting. In the poker games, it was entirely up to the participants to decide how to play through each round (with regular poker rules in effect). This level of freedom with regard to participant behaviour is an important addition to the generalizability of this study in terms of deceptive behaviour in naturalistic environments, as this research setting presented hardly any restrictions that would prevent participants from using deception. In fact, when knowledge in poker was lacking, participants had to rely on their ability to deceive their opponents to increase their odds of winning. Such a scenario led participants to draw on a larger pool of cognitively taxing resources, as increased risk required more complex decision-making, which is also an accurate reflection of high-stakes deception processes in a real-world setting.

The combination of realistic poker games and the use of a key point detection program (OpenPose) provided a unique opportunity for reliably measuring naturally occurring deception and consistently capturing the movements that accompany this kind of behaviour in an accurate manner. This research method proved to be fruitful for studying the psychology of deception, especially in economic games such as poker, thus representing high ecological validity. Future research can build on this premise in various ways. As a starting point, the current study did not consider individual differences in the movement data. It would be interesting to investigate how the strength of Dark Triad scores relates to the expression of both truthful and deceitful body movements rather than only the difference between both types of movement. In doing so, future research may also be interested in exploring how these body movements are exhibited differently or similarly across the traits Machiavellianism, narcissism, and subclinical psychopathy, as all Dark Triad members have varying levels of self-control when it comes to behavioural expression. It is recommended to conduct a multilevel analysis to compare Dark Triad members, as this would allow for the comparison of data clusters such as subjects who identify with Machiavellianism versus subjects who identify with narcissism versus subjects who identify with subclinical psychopathy. When comparing the Dark Triad members, future research should also consider a measure to quantify the height of stakes involved during deception, as each trait has its own approach for addressing various levels of risk. Finally, when studying non-verbal cues in deception, additional coding of deceitful body movements in terms of emblems, illustrators, and self-adaptors could be considered. By adding these categories as extra dimensions to the movement data, the implications of the research would become more practical. For example, "hand scratching" or "foot wiggling" would be easier to recognize and notice compared to "increased hand or finger movements".

Conclusion

The current study demonstrates that success in deceptive games such as poker cannot be predicted by Dark Triad personality traits. However, the Dark Triad positively predicted the frequency of deceptive behaviour in the context of a poker game. In the same context, individuals with high scores on the Dark Triad, especially on the subclinical psychopathy trait, appear to move their lower body more when acting deceitfully compared to when they are being truthful. The increased frequency of deceptive behaviour in Dark Triad members observed during the poker experiment, could translate to other contexts in which these individuals deceive in order to gain in power, reputation, or material benefit. Such intentions are particularly harmful to the people around the Dark Triad member. The workplace would be an example of a context in which these individuals could cause harm through frequent deceiving and manipulating. In the working environment, if a team member or employee exhibits Dark Triad characteristics, especially those associated with psychopaths, increased lower body movement could be indicative of deceit, but this is by no means a guiding principle. Depending on the situation, "deceptive" cues such as body part movement may not be deceptive at all, which should be considered at all times. Alternatively, screening applicants for dark personality traits may be a viable solution for proactively preventing the hiring of deceitful and manipulative individuals who might harm the workplace environment. This may also be applicable to the public sector; In their exemplary role governmental organisations have to

represent a certain degree of responsibility and trustworthiness toward their citizens, in order to keep the society save. Proactively screening in vital sectors for individuals with a dark personality could aid in reducing the risk these individuals pose with their malevolent and detrimental actions to society. As wrong-doing in public services may have a larger impact on society, it cannot be justified by a governmental institution why an individual with malevolent and dark traits ended up providing said services in the first place (e.g. police brutality). Therefore, prevention is better than cure.

The findings of the current study are rather modest and limited. Nonetheless, future studies may benefit from conducting deception research in a poker setting and employing key point detection technology similar to the one in the current study, as this combination was found to be a fruitful innovation for studying the phenomenon of deception. This research provided a method to overcome limitation commonly found in deception studies and aimed to contribute to the literature on the Dark Triad related to non-verbal indicators of deception. In conclusion, the current poker experiment attempted to reveal non-verbal deceptive cues concealed behind the personality of a Dark Triad poker face. Despite achieving only a glimpse behind that mask, it opened up a variety of opportunities for future research.

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Appendix A

A1 Informed Consent

Dear participant,

Thank you for participating in this study. By signing this informed consent, you agree that you have been clearly informed about the nature and method of this research. The received data will be confidential and processed anonymously, meaning that your name will not be associated with any research findings and no outcome can be connected to you as an individual. Furthermore, this data is not accessible for third parties. With signing this form you confirm that your participation is completely voluntarily, meaning your presence is at free will and you can stop the research (the poker game) at any time. During the game you are able to consult an official rule book for when you do not agree with any decisions during and about the game made by the researcher or at that time the dealer.

If further clarification or information is needed about this research, please feel free to make contact with the researchers; Levy Brandes (l.brandes@student.utwente.nl) or Quinten Mandjes (q.c.t.mandjes@student.utwente.nl).

_____	_____	____ – 03 – 2019
Participant name	Signature	Date

A2 Debrief

First of all. Thank you for participating in this study. As part of it I have to debrief you about the true nature of the study, and based on the questions you might feel it's not just about poker, or recording your movements. This project tries to link people's association with dark personality traits with the inclination to deceive, or in this case bluffing. Based on certain factors such as emotional stress or cognitive strain, people show more or less body movements when deceiving respectively. That's why you were filmed during the poker game, to record your body movements when bluffing. As I did not want to influence your possible bluffing behaviour OR bodily movements, I could not tell the actual goal at forehand. If there are any questions or ambiguities, please present them now, or contact me or Quinten via the emails provided.

Appendix B

B1 Instructions

Thank you for coming. I would like to go over some important information before we start the actual game. We're going to play Texas Hold'em poker for about sixty minutes. You won't hear an alarm at the end, I will notify you when the game is over. All of you have five coloured stacks, with 25 white chips: each value 5 // 15 red chips: each 15 // 10 blue chips: each 25 // 10 green chips: each 50 // 5 black chips: each 100. We have a dealer button, small blind (which is 5), and big blind (which is 10). The dealer is always the final player, except in the first round. The small blind always starts, except in the first round. The buttons rotate throughout the game, but they won't increase in bet.

Okay, let's start with a few questions. Starting with the participant on the far left, can you state your:
- Name [go to next participant];
- [start over at the left participant] Age [go to next participant];
- [start over at the left participant] Current educational year [go to next participant];
- [start over at the left participant] Perceived poker skill on a scale of 1 to 5 [go to next participant].

We start off with a mock round, so this round does not count for the actual 60 minutes of poker. You'll only have to do as I instruct, so we're not actually playing right now. I have a bell here, and that's purely for editing purposes, so I can find back the rounds in the video footage. It has no further influence on your game. If I bell twice, that means the round either starts or ends; If I bell ones, that means I deal the cards. Can you open the first link that I send you guys via the mail? You only have to fill in your participant number, which you can find on the sticker in front of you. And press the button at the end, that's it.

- [bell twice, deal cards] You don't have to do anything with the cards
- Please put forward 5 white chips
- [burn, bell, flop]
- Please put forward 5 red chips
- [burn, bell, turn]
- Please put forward 5 blue chips
- [burn, bell, river]
- Please put forward 5 green chips
- [bell twice]

Okay retrieve your chips and put out your questionnaire to fill in the next 6 or so questions; For question 2 to 5, you can answer that you folded, and for the others questions, selected the centred answer. Any questions so far? Let's start the actual poker game (clock starts).

B2 Poker Terminology

Concept	Definition
Game	All rounds completed within 60 minutes of Texas Hold'em poker.
Hand	Two cards dealt face-down to each player during a round.
Community card	Five cards dealt face-up on the table, to be used by all players during a round.
Burn card	The top card discarded from the deck before dealing a community card.
Dealer	Distributes cards and controls actions without in-game participation.
Chips	Tokens of different colours representing different values, serving as (in-game) money.
Stack	A player's total amount of chips during a round.
Blind	A designated bet of five (small blind) or ten (big blind) before the hands are dealt.
Round	A recurring sequence of four betting phases players have to complete within a game.
Ante	A forced bet of predetermined amount each player has to pay before the hands are dealt.
Flop	The first three community cards dealt face-up after the first betting phase.
Turn	The fourth community card dealt face-up after the second betting phase.
River	The final community card dealt face-up after the third betting phase.
Action	The option to perform a check, call, raise or fold as a response to the most recent turn.
Bet	The wager a player puts in a betting round when facing action.
Check	The option to place no bet, but retain the rights to perform an action in future turns.
Call	A bet equal to the previous player's action.
Raise	A bet that consists of a call plus an amount in excess of the previous action.
Fold	To discard a hand and withdraw future action from a round.
All-in	A bet equal to a player's entire stack during a round.

Note. Adapted from "*2018 World Series of Poker® Official Tournament Rules" by* Caesars Interactive Entertainment Inc. (2018). Retrieved from: https://www.wsop.com/2018/2018%20WSOP%20Tournament%20Rules.pdf.

Appendix C

C1 In-Game Qualtrics Survey

Question	Answer option
0. What is your participant number? (Mock round-only)	#1 to #100
1. What hand did you receive?	Combination of ♣/♦/♠/♥ and 2/ 3/ 4/ 5/ 6/ 7/ 8/ 9/ 10/ J/ Q/ K/ A.
2. Did you try to deceive your opponents before the flop?	Yes, a great deal / Yes, a lot / A moderate amount / Only slightly / Not at all / I folded my hand.
3. Did you try to deceive your opponents after the flop?	Yes, a great deal / Yes, a lot / A moderate amount / Only slightly / Not at all / I folded my hand.
4. Did you try to deceive your opponents after the turn?	Yes, a great deal / Yes, a lot / A moderate amount / Only slightly / Not at all / I folded my hand.
5. Did you try to deceive your opponents after the river?	Yes, a great deal / Yes, a lot / A moderate amount / Only slightly / Not at all / I folded my hand.

6. Respond as follows. The word:

1. does not correspond to how you felt right then.
2. partly corresponds to how you felt right then.
3. fairly well corresponds to how you felt right then.
4. completely corresponds to how you felt right then.

A. Indifferent	1 / 2 / 3 / 4
B. Relaxed	1 / 2 / 3 / 4
C. Pleased	1 / 2 / 3 / 4
D. Glad	1 / 2 / 3 / 4
E. Alert	1 / 2 / 3 / 4
F. Focussed	1 / 2 / 3 / 4
G. Concentrated	1 / 2 / 3 / 4
H. Energetic	1 / 2 / 3 / 4
I. Concerned	1 / 2 / 3 / 4
J. Uncertain	1 / 2 / 3 / 4
K. Disappointed	1 / 2 / 3 / 4
L. Heated	1 / 2 / 3 / 4
M. Mad	1 / 2 / 3 / 4
N. Angry	1 / 2 / 3 / 4

Note. Question 6 Reprinted from "Snabb mätning av individuell stressreaktionsstyrka: Utveckling av den Emotionella Stressreaktions Enkäten: Utveckling av den Emotionella Stressreaktions Enkäten (ESE)", by Larsson, G. (1987). Stockholm, Sweden: *FOA rapport C 50050-5.3*.

C2 Post-Game Qualtrics Survey

Dear participant,

By completing this questionnaire, you'll finalize your participation in the poker project. First, you have to provide some information about the poker game and some demographic information, which will only be used for academic purposes, so anonymity is fully granted. Next, you have to indicate how much you agree with 27 statements regarding your personality by selecting ONE answer per statement. The entire questionnaire would take you no longer than 5-10 minutes.

PART 1

Question	Answer
1. What is your participant number?	#1 - #100
2. At what place did you finish the poker game?	1st / 2nd / 3rd/ 4th
3. What was the number of chips in your stack at the end of the poker game?	[One to four digit number]
4. What is your gender?	Male – Female
5. What is your current age?	[Two digit number]
6. What is your highest received educational degree?	None / High school / College / Bachelor's / Master's
7. What is your student/SONA number? (optional)	…
8. What is your e-mail? (optional)	…

PART 2

Next will follow three blocks of nine statements each that you have to indicate (dis)agreement with. Take your time to read the questions carefully. In case of uncertainty, ask the researcher.
Indicate how much you agree with the following statements:
1. Disagree strongly / 2. Disagree / 3. Neither agree nor disagree / 4. Agree / 5. Agree strongly

Statement
1. It's not wise to tell your secrets.
2. I like to use clever manipulation to get my way.
3. Whatever it takes, you must get the important people on your side.
4. Avoid direct conflict with others because they may be useful in the future.
5. It's wise to keep track of information that you can use against people later.
6. You should wait for the right time to get back at people
7. There are things you should hide from other people to preserve your reputation.
8. Make sure your plans benefit yourself, not others.
9. Most people can be manipulated.
10. People see me as a natural leader.
11. I hate being the centre of attention.
12. Many group activities tend to be dull without me.
13. I know that I am special because everyone keeps telling me so.
14. I like to get acquainted with important people.
15. I feel embarrassed if someone compliments me.
16. I have been compared to famous people.
17. I am an average person.
18. I insist on getting the respect I deserve.
19. I like to get revenge on authorities.
20. I avoid dangerous situations.
21. Payback needs to be quick and nasty.
22. People often say I'm out of control.
23. It's true that I can be mean to others.
24. People who mess with me always regret it.
25. I have never gotten into trouble with the law.
26. I enjoy having sex with people I hardly know
27. I'll say anything to get what I want.

Note. Reprinted from "Introducing the Short Dark Triad (SD3): A Brief Measure of Dark Personality Traits" by Jones, D.N. & Paulhus, D.L., 2014, *Assessment, 21*(1), p. 28-41.

Dear poker enthusiast,

Thanks for participating in the poker project. We will contact you via e-mail within three weeks in case you won a price (1st: 100 euro cash, 2nd: 50 euro cash). We hope you enjoyed the poker experience as much as we did! You hereby reached the end of the survey and therefore the end of the poker project. In case you have any unanswered questions, please contact us at q.c.t.mandjes@student.utwente.nl or l.brandes@student.utwente.nl

Have a nice day, Quinten and Levy

Appendix D

D1 Mediation Analyses Predicting Movement by Dark Triad cluster

	Feet Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
Path c	R^2 = *.088, F* (1,51) = 6.04, *p* = **.017**								
	Cluster * Feet	1.95	0.79	0.32	2.46	**.017**	0.36, 3.54		
Path a_1	R^2 = *.008, F* (1,51) = 0.39, *p* = .538								
	Cluster * Pos. Emotion	-0.10	0.16	-0.87	-0.62	.538	-0.43, 0.23		
Path a_2	R^2 = *.014, F* (1,51) = 0.73, *p* = .397								
	Cluster * Neg. Emotion	0.11	0.13	0.12	0.85	.397	-0.15, 0.38		
	R^2 = *.475, F* (3,49) = 4.76, *p* = **.005**								
Path c’	Cluster * Feet	2.41	0.76	0.37	2.93	**.005**	0.71, 3.78		
Path b_1	Pos. Emotion * Feet	1.84	0.67	0.36	2.73	**.009**	0.49, 3.19	-0.19	-0.91, 0.43
Path b_2	Neg. Emotion * Feet	-0.94	0.82	-0.15	-1.14	.261	-2.59, 0.72	-0.11	-0.72, 0.29

	Legs Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
Path c	R^2 = *.090, F* (1,51) = 5.04, *p* = **.029**								
	Cluster * Legs	0.77	0.35	0.30	2.24	**.029**	0.08, 1.47		
Path a_1	R^2 = *.008, F* (1,51) = 0.39, *p* = .538								
	Cluster * Pos. Emotion	-0.10	0.16	-0.87	-0.62	.538	-0.43, 0.23		
Path a_2	R^2 = *.014, F* (1,51) = 0.73, *p* = .397								
	Cluster * Neg. Emotion	0.11	0.13	0.12	0.85	.397	-0.15, 0.38		
	R^2 = *.096, F* (3,49) = 1.73, *p* = .174								
Path c’	Cluster * Legs	0.77	0.36	0.30	2.15	**.037**	0.05, 1.48		
Path b_1	Pos. Emotion * Legs	0.09	0.31	0.04	0.27	.788	-0.55, 0.72	-0.01	-0.15, 0.04
Path b_2	Neg. Emotion * Legs	0.15	0.38	0.06	0.39	.700	-0.62, 0.92	0.02	-0.09, 0.27

	Arms Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
Path c	R^2 = *.011, F* (1,51) = 0.57, *p* = .455								
	Cluster * Arms	0.17	0.23	0.10	0.75	.455	-0.29, 0.64		
Path a_1	R^2 = *.008, F* (1,51) = 0.39, *p* = .538								
	Cluster * Pos. Emotion	-0.10	0.16	-0.87	-0.62	.538	-0.43, 0.23		
Path a_2	R^2 = *.014, F* (1,51) = 0.73, *p* = .397								
	Cluster * Neg. Emotion	0.11	0.13	0.12	0.85	.397	-0.15, 0.38		
	R^2 = *.091, F* (3,49) = 1.63, *p* = .194								
Path c’	Cluster * Arms	0.21	0.23	0.13	0.92	.362	-0.25, 0.67		
Path b_1	Pos. Emotion * Arms	-0.12	0.20	-0.08	-0.58	.565	-0.52, 0.29	0.01	-0.09, 0.08
Path b_2	Neg. Emotion * Arms	-0.43	0.25	-0.25	-1.74	.089	-0.93, 0.07	-0.05	-0.22, 0.10

D1 Continued

	Head Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
Path c	R^2 = *.003*, *F* (1,51) = 0.17, *p* = .678								
	Cluster * Head	-0.23	0.55	-0.06	-0.42	.678	-1.33, 0.87		
Path a_1	R^2 = *.008*, *F* (1,51) = 0.39, *p* = .538								
	Cluster * Pos. Emotion	-0.10	0.16	-0.87	-0.62	.538	-0.43, 0.23		
Path a_2	R^2 = *.014*, *F* (1,51) = 0.73, *p* = .397								
	Cluster * Neg. Emotion	0.11	0.13	0.12	0.85	.397	-0.15, 0.38		
	R^2 = *.014*, *F* (3,49) = 0.23, *p* = .872								
Path c’	Cluster * Head	-0.21	0.56	-0.05	-0.38	.707	-1.34, 0.92		
Path b_1	Pos. Emotion * Head	-0.19	0.50	-0.06	-0.37	.710	-1.18, 0.81	0.02	-0.11, 0.30
Path b_2	Neg. Emotion * Head	-0.30	0.61	-0.07	-0.49	.627	-1.52, 0.92	-0.03	-0.30, 0.34

	Full Body Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
Path c	R^2 = *.010*, *F* (1,49) = 0.52, *p* = .474								
	Cluster * Full Body	0.31	0.42	0.10	0.72	.474	-0.54, 1.15		
Path a_1	R^2 = *.008*, *F* (1,51) = 0.39, *p* = .538								
	Cluster * Pos. Emotion	-0.10	0.16	-0.87	-0.62	.538	-0.43, 0.23		
Path a_2	R^2 = *.014*, *F* (1,51) = 0.73, *p* = .397								
	Cluster * Neg. Emotion	0.11	0.13	0.12	0.85	.397	-0.15, 0.38		
	R^2 = *.029*, *F* (3,49) = 0.49, *p* = .694								
Path c’	Cluster * Full Body	0.38	0.43	0.12	0.87	.389	-0.49, 1.25		
Path b_1	Pos. Emotion * Full Body	0.30	0.38	0.11	0.78	.442	-0.47, 1.07	-0.05	-0.26, 0.17
Path b_2	Neg. Emotion * Full Body	-0.37	0.47	-0.12	-0.79	.435	-1.31, 0.57	-0.06	-0.30, 0.15

D2 Mediation analyses predicting movement by Machiavellianism and sub. Psychopathy

	Feet Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
	R^2 = .112, *F* (2,50) = 3.17, *p* = .051								
Path c_1	Mach * Feet	0.46	0.58	0.11	0.79	.432	-0.71, 1.63		
Path c_2	Psych * Feet	1.10	0.54	0.29	2.04	**.047**	0.02, 2.18		
	R^2 = .022, *F* (2,50) = 0.56, *p* = .574								
Path $a_{1.1}$	Mach * Pos. Emotion	0.09	0.12	0.11	0.78	.439	-0.15, 0.33		
Path $a_{1.2}$	Psych * Pos. Emotion	-0.10	0.11	-0.14	-0.36	.363	-0.32, 0.12		
	R^2 = .008, *F* (2,50) = 0.20, *p* = .822								
Path $a_{2.1}$	Mach * Neg. Emotion	0.05	0.10	0.07	0.50	.621	-0.15, 0.25		
Path $a_{2.2}$	Psych * Neg. Emotion	0.02	0.09	0.03	0.22	.831	-0.16, 0.20		
	R^2 = .223, *F* (4,48) = 3.45, *p* = **.015**								
Path $c’_2$	Mach * Feet	0.33	0.56	0.08	2.49	.554	-0.79, 1.46		
Path c’l	Psych * Feet	1.29	0.52	0.34	2.61	**.016**	0.25, 2.34		
Path b_1	Pos. Emotion * Feet	1.78	0.68	0.33	2.61	**.012**	0.41, 3.16	0.17	-0.29, 0.79
Path b_2	Neg. Emotion * Feet	-0.79	0.83	-0.13	-0.96	.342	-2.46, 0.87	-0.04	-0.35, 0.20

D2 Continued

	Leg Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
	R^2 = .052, F (2,50) = 1.38, p = .261								
Path c_1	Mach * Legs	0.19	0.26	0.11	0.73	.470	-0.33, 0.77		
Path c_2	Psych * Legs	0.29	0.24	0.17	1.21	.234	-0.19, 0.71		
	R^2 = .022, F (2,50) = 0.56, p = .574								
Path $a_{1.1}$	Mach * Pos. Emotion	0.09	0.12	0.11	0.78	.439	-0.15, 0.33		
Path $a_{1.2}$	Psych * Pos. Emotion	-0.10	0.11	-0.14	-0.92	.363	-0.32, 0.12		
	R^2 = .008, F (2,50) = 0.20, p = .822								
Path $a_{2.1}$	Mach * Neg. Emotion	0.05	0.10	0.07	0.50	.621	-0.15, 0.25		
Path $a_{2.2}$	Psych * Neg. Emotion	0.02	0.09	0.03	0.22	.831	-0.16, 0.20		
	R^2 = .060, F (4,48) = 0.76, p = .556								
Path c'_2	Mach * Legs	0.18	0.27	0.10	1.17	.911	-0.62, 0.69		
Path c'_1	Psych * Legs	0.29	0.25	0.17	0.66	.590	-0.58, 1.00		
Path b_1	Pos. Emotion * Legs	0.04	0.33	0.02	0.11	.513	-0.36, 0.74	0.03	-0.11, 0.09
Path b_2	Neg. Emotion * Legs	0.21	0.39	0.08	0.54	.247	-0.21, 0.78	0.01	-0.06, 0.17

	Arm Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
	R^2 = .017, F (2,50) = 0.44, p = .646								
Path c_1	Mach * Arms	-0.10	0.17	-0.09	-0.60	.552	-0.44, 0.24		
Path c_2	Psych * Arms	0.14	0.16	0.13	0.87	.388	-0.18, 0.45		
	R^2 = .022, F (2,50) = 0.56, p = .574								
Path $a_{1.1}$	Mach * Pos. Emotion	0.09	0.12	0.11	0.78	.439	-0.15, 0.33		
Path $a_{1.2}$	Psych * Pos. Emotion	-0.10	0.11	-0.14	-0.92	.363	-0.32, 0.12		
	R^2 = .008, F (2,50) = 0.20, p = .822								
Path $a_{2.1}$	Mach * Neg. Emotion	0.05	0.10	0.07	0.50	.621	-0.15, 0.25		
Path $a_{2.2}$	Psych * Neg. Emotion	0.02	0.09	0.03	0.22	.831	-0.16, 0.20		
	R^2 = .090, F (4,48) = 1.18, p = .332								
Path c'_2	Mach * Arms	-0.07	0.17	-0.06	-0.42	.674	-0.41, 0.27		
Path c'_1	Psych * Arms	0.13	0.16	0.13	0.85	.398	-0.18, 0.45		
Path b_1	Pos. Emotion * Arms	-0.11	0.21	-0.08	-0.55	.582	-0.53, 0.30	-0.01	-0.13, 0.04
Path b_2	Neg. Emotion * Arms	-0.41	0.25	-0.24	-1.64	.108	-0.91, 0.09	-0.02	-0.12, 0.07

	Head Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
	R^2 = .029, F (2,50) = 0.75, p = .480								
Path c_1	Mach * Head	0.39	0.40	0.14	0.99	.330	-0.41, 1.19		
Path c_2	Psych * Head	-0.36	0.37	-0.14	-0.99	.329	-1.10, 0.38		
	R^2 = .022, F (2,50) = 0.56, p = .574								
Path $a_{1.1}$	Mach * Pos. Emotion	0.09	0.12	0.11	0.78	.439	-0.15, 0.33		
Path $a_{1.2}$	Psych * Pos. Emotion	-0.10	0.11	-0.14	-0.92	.363	-0.32, 0.12		
	R^2 = .008, F (2,50) = 0.20, p = .822								
Path $a_{2.1}$	Mach * Neg. Emotion	0.05	0.10	0.07	0.50	.621	-0.15, 0.25		
Path $a_{2.2}$	Psych * Neg. Emotion	0.02	0.09	0.03	0.22	.831	-0.16, 0.20		
	R^2 = .044, F (4,48) = 0.55, p = .697								
Path c'_2	Mach * Head	-0.43	0.41	0.16	1.06	.294	-0.39, 1.25		
Path c'_1	Psych * Head	-0.38	0.38	-0.15	-1.02	.315	-1.14, 0.37		
Path b_1	Pos. Emotion * Head	-0.25	0.50	-0.08	-0.51	.610	-1.25, 0.74	-0.02	-0.23. 0.17
Path b_2	Neg. Emotion * Head	-0.32	0.60	-0.08	-0.53	.596	-1.53, 0.89	-0.02	-0.16, 0.21

D2 Continued

	Full body Movement	*B*	*SE(B)*	*Beta*	*t*	*p*	*95% CI*	*Bootstrap effect*	*Bootstrap 95% CI*
	R^2 = .0.30, *F* (2,50) = 0.38, *p* = .825								
Path c_1	Mach * Full body	0.06	0.31	0.03	0.20	.844	-0.57, 0.69		
Path c_2	Psych * Full body	0.20	0.29	0.10	0.69	.494	-0.38, 0.78		
	R^2 = .022, *F* (2,50) = 0.56, *p* = .574								
Path $a_{1.1}$	Mach * Pos. Emotion	0.09	0.12	0.11	0.78	.439	-0.15, 0.33		
Path $a_{1.2}$	Psych * Pos. Emotion	-0.10	0.11	-0.14	-0.92	.363	-0.32, 0.12		
	R^2 = .008, *F* (2,50) = 0.20, *p* = .822								
Path $a_{2.1}$	Mach * Neg. Emotion	0.05	0.10	0.07	0.50	.621	-0.15, 0.25		
Path $a_{2.2}$	Psych * Neg. Emotion	0.02	0.09	0.03	0.22	.831	-0.16, 0.20		
	R^2 = .0.30, *F* (4,48) = 0.38, *p* = .825								
Path c'_2	Mach * Full body	0.05	0.32	0.02	0.16	.872	-0.59, 0.69		
Path c'_1	Psych * Full body	0.23	0.29	0.12	0.80	.429	-0.36, 0.83		
Path b_1	Pos. Emotion * Full body	0.29	0.39	0.11	0.75	.457	-0.49, 1.07	0.03	-0.08, 0.19
Path b_2	Neg. Emotion * Full body	-0.35	0.47	-0.11	-0.74	.464	-1.29, 0.60	-0.02	-0.10, 0.14

D3 Moderation analyses predicting Bluff Ratio based on Dark Triad Cluster, moderated by Poker Skill.

Variable	*B*	*SE*	*T*	*p*	95% CI
(Constant)	0.13	0.15	0.86	.396	-0.18, 0.44
Dark Triad Cluster	**0.18**	**0.07**	**2.61**	**.012**	**0.04, 0.31**
Poker Skill	-0.02	0.03	-0.69	.492	-0.08, 0.04
Interaction	**-0.19**	**0.07**	**-2.59**	**.013**	**-0.33, -0.04**
Gender	0.13	0.07	1.72	.091	-0.02, 0.27
Age	-0.01	0.01	-0.87	.392	-0.01, 0.04
Educational Degree	0.04	0.03	1.49	.142	-0.01, 0.09

Note. *N* = 53, *F* (6, 46) = 3.21, *p* = .010, R^2 = .295, CI = confidence interval for *B*.

D4 Moderation analyses predicting Overall Poker Ranking based on Dark Triad Cluster, moderated by Poker Skill.

Variable	*B*	*SE*	*T*	*p*	95% CI
(Constant)	**36.65**	**14.07**	**2.60**	**.012**	**8.32, 64.97**
Dark Triad Cluster	1.58	6.19	0.25	.800	-10.89, 14.04
Poker Skill	3.99	2.65	1.51	.139	-1.34, 9.32
Interaction	-4.67	6.68	-0.70	.488	-18.11, 8.77
Gender	-6.42	6.76	-0.95	.347	-20.01, 7.18
Age	0.63	0.36	1.73	.091	-0.10, 1.35
Educational Degree	**-5.78**	**2.44**	**-2.38**	**.022**	**-10.68, -0.87**

Note. *N* = 53, *F* (6, 46) = 2.08, *p* = .074, R^2 = .214, CI = confidence interval for *B*.