The roles of impulsivity, self-regulation, and emotion regulation in the experience of self-disgust

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The roles of impulsivity, self-regulation and emotion regulation in the experience of self-disgust

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Abstract

Self-disgust is a distinct self-conscious emotion schema that is characterized by disgust appraisals directed towards the self. Recent studies have demonstrated the negative effects of self-disgust on physical and mental health, but little is known about the psychological characteristics that are associated with self-disgust experiences. The present study assessed the direct and indirect effects of impulsivity, self-regulation, and emotion regulation on self-disgust. Overall, 294 participants (*M* age = 21.84 years, *SD* = 4.56) completed structured and anonymous measures of trait impulsivity, self-regulation, emotion regulation strategies, and self-disgust. Path analysis showed that non-planning impulsivity and expressive suppression (positively) and cognitive reappraisal and self-regulation (negatively) predicted self-disgust. Intervening variable analysis showed that attentional and non-planning impulsivity had significant indirect effects on self-disgust via emotional regulation strategies and self-regulation. Our findings provide, for the first time, evidence about the association between self-disgust and individual differences in impulsivity, self-regulation, and emotion regulation, and have implications for the psychological phenomena that may lead to self-disgust experiences in non-clinical populations.

Keywords: Self-disgust; self-conscious emotions; self-regulation; emotion regulation; impulsivity.

The roles of impulsivity, self-regulation, and emotion regulation in the experience of self-disgust

Disgust is a universal emotion that serves survival in humans by alerting the body to potential contamination and exposure to biological pathogens (Rozin, Haidt, & McCauley, 2008). In this respect, disgust has been primarily associated with food and body products (Rozin & Fallon, 1987), and other stimuli that serve as primes for disease and pathogen exposure (Curtis & Biran, 2001; Curtis, Aunger, & Rabie, 2004). The disease and pathogen avoidance model of disgust posits that the core mechanism of disgust has been developed to bias behaviour against primes of disease, and through social development, this mechanism triggers disgust towards moral and social norm violations (Oaten, Stevenson, & Case, 2009). Similarly, Curtis and Biran (2001) argued that the emotion of disgust has biologically developed as an aversion to physical parasites, and socio-culturally developed as aversion to social parasites. Supporting evidence has also shown that disgust sensitivity is differentiated across domains pertaining to pathogen exposure, sexuality and moral violations (Tybur, Lieberman, & Griskevicius, 2009). Simpson, Carter, Anthony, and Overton (2006) demonstrated that disease-related and socio-moral disgust stimuli had some unique distinctive properties (e.g., temporal duration). In support of this view, recent evidence from cognitive neuroscience showed that a single neural region (the insula) may serve the three domains of disgust sensitivity (Vicario, Rafal, Martino, & Avenanti, 2017), and that core and moral disgust stimuli provoke similar facial motor activity (Chapman, Kim, Susskind, & Anderson, 2009).

While disgust is meant to serve an adaptive function to the biological and the socio-moral self, abnormal levels of disgust reactivity to a range of elicitors (e.g., measured by higher scores in proneness to disgust in self-reported surveys) has been associated with mental health problems, such as anxiety, mood, and eating disorders (e.g., Fox, 2009; Ille,

Schöggl, Kapfhammer, Arendasy, Sommer, & Schienle, 2014; Olatunji, Cisler, McKay, & Phillips, 2010), and may represent a risk factor for suicidal ideation (e.g., among people with eating disorders; Chu, Bodell, Ribeiro, & Joiner, 2015). Power and Dalgeish (2008) argued that a special form of disgust directed to the self (i.e., self-focused disgust or, simply, *self-disgust*) is more relevant to certain psychopathologies, and that self-disgust can explain the association between dysfunctional thought patterns, such as rumination and negative evaluations of the self and the world, and resulting depressive mood. Indeed, in his original, influential writings on depression, Beck (1967) argued that self-critical and maladaptive self-focused cognitions elicited negative self-directed feelings, which eventually resulted in depressive states. The role of affect was critical in this process, and was conceptualised by Beck as explicitly involving disgust: "the feeling of self-dislike is stronger and may progress to a feeling of disgust with himself" (Beck, 1967, p. 18).

In support of this argument, Overton, Markland, Taggart, Bagshaw, and Simpson (2008) developed a self-report measure of self-disgust (the Self-Disgust Scale [SDS]) and showed that self-disgust mediated the association between dysfunctional thoughts and depressive symptoms, a finding that was supported by subsequent studies (albeit with more complex structures; e.g., Powell, Simpson, & Overton, 2013; Simpson, Hillman, Crawford, & Overton, 2010). In their conceptualization and measurement of self-disgust, Overton et al. (2008) identified two dimensions of self-disgust: the "disgusting self", which reflects disgust towards the self (e.g., "I find myself repulsive"), and "disgusting ways", which represents disgust towards one's own actions and behaviour (e.g., "the way I behave makes me despise myself"). The two-dimensional structure of self-disgust and the conceptual distinction between self/personal and behavioural disgust were validated in another study that used an alternative measure of self-disgust (i.e., the Questionnaire for the Assessment of Self-Disgust [QASD]; Schienle et al., 2015). Although there are alternative explanations about the

development and adaptation of the basic disgust emotion towards physical and "social" parasites (Curtis & Biran, 2001), much less is known about the psychological antecedents of self-disgust - in other words, how and why people become to feel disgusted with aspects of their self. Partly, this may be attributed to the relatively more recent development of self-disgust research, and to the focus of this research on the effects of self-disgust on mental health and well-being (e.g., Azlan, Overton, Simpson, & Powell, 2017; Brake, Rojas, Badour, Dutton, & Feldner, 2017; Overton et al., 2008). Exploring the psychological origins of self-disgust, however, presents a compelling and equally important domain of research inquiry (Powell et al., 2015). In this paper, we particularly focus on the role of self-regulatory failure and impulsivity as potential explanatory variables of the self-disgust experience.

Self-Disgust as an Emotion Schema

Qualitative research into the subjective experience of self-disgust showed that social comparison processes and the internalization of other people's reactions and criticisms were frequently mentioned as contributing factors to the genesis of self-disgust (Powell, Overton, & Simpson, 2014). These findings suggest that self-disgust requires some sort of self-awareness and a symbolic representation of the self, a feature that is not necessary for the experience of basic emotions (e.g., fear, anger, surprise, disgust), but plays an important role in the experience of more complex, self-conscious emotions, such as pride, shame, guilt and embarrassment (Power & Dalgeish, 2008; Tracy & Robins, 2004). In particular, a main distinctive feature of self-conscious emotions is that they entail self-evaluation, self-reflection, and self-representation. People are aware of and reflect on their actions and evaluate them against socio-cultural and moral norms and standards, and accordingly experience a variety of self-conscious emotions (Leary, 2004; Tracy & Robins, 2007). Evidence has also shown that compared to other animals, social species that are capable of experiencing self-awareness (e.g., primates) are also capable of displaying emotional

reactions that are similar to self-conscious emotions, such as pride, shame, and embarrassment (Tracy & Robins, 2004; Weisfeld & Dillon, 2012). Because self-conscious emotions require self-referential appraisals as well as an appreciation of other people's emotions and thoughts, they are said to emerge later in development as compared to basic emotions that are experienced from childbirth (Izard, 2007; Muris & Meesters, 2014).

Cognitive complexity is another distinctive feature of self-conscious emotions. While basic emotions can involve more complex cognitive processes, they do not necessitate them in the same way as self-conscious emotions do (e.g., de Hooge et al., 2011; Tracy & Robins, 2007). Self-conscious emotions (e.g., shame, guilt, pride) typically involve more complex cognitive perquisites and processing than basic emotions (e.g., anger, fear), including a need for self-awareness; an awareness of others' appraisals; an understanding of social standards, norms and rules; the causal attribution of actions and goals to social actors, including things like intent; and an understanding of the surrounding situational and contextual factors during the emotion eliciting experience (de Hooge et al., 2011). The same degree of cognitive complexity is present in the conceptualization of self-disgust as a psychological phenomenon that entails "an enduring (or repetitive) disgust reaction elicited by particular aspect(s) of the self, which are deemed significant to an individual's sense of self, and appraised as relatively constant and/or not easily changeable" (Powell, Simpson, & Overton, 2015, p .5). Given the shared features between self-disgust and other self-conscious emotions, some researchers have argued that self-disgust represents a distinct self-conscious emotion (Roberts & Goldenberg, 2007), or that it represents a special form of shame (Power & Dalgeish, 2008). Powell et al. (2015) provided an encompassing definition of self-disgust as an *emotion schema* (see also Izard, 2007), or an enduring cognitive-affective orientation towards the self, involving an affective component similar to the emotional experience of disgust, with relevant cognitive and higher-order appraisals (e.g., "my body is revolting"). In their

definition, Powell et al. (2015) emphasized the self-referential dimensions of self-disgust, as well as the dynamic interaction between the emotional experiences of (self-directed) disgust, associated self-referential cognitive content, such as thoughts and beliefs about one's actions and physical body, and related behaviours (e.g., avoidance and rejection).

While self-disgust is thought to be often concomitant with other negative self-directed affective phenomena, such as shame (Powell et al., 2014), Powell et al. (2015) argue for unique, identifying properties, such as the phenomenological state of revulsion, a discrete expressive profile (e.g., facial expression), links with contamination and the laws of contagion and similarity, and specific appraisals (e.g., "yuck, that is repulsive"). Shame, on the other hand, is largely concerned with hierarchical submission and evaluations of reduced social rank (Gilbert, 2007). A small body of research has also confirmed independent predictive validity for self-disgust over and above other self-conscious emotions such as shame (e.g., Olatunji, Cox, & Kim, 2015; Penley & Tomaka, 2002). While there is scope for more research to empirically support the differentiation between self-disgust and other self-conscious emotions it is equally important to identify the experiences and psychological processes that may lead people to experience self-disgust (Powell et al., 2015). In this paper, we strongly emphasize the cognitive self-referential aspect of self-disgust and we argue that self-disgust partly stems from people's capacity (or the lack thereof) to resist impulses and exercise regulation of their thoughts, actions, and emotions.

Self-Disgust as Self-Regulatory Failure

Self-regulation is defined as people's capacity to focus on their long-term goals and resist temptation and impulses for immediate gratification (Carver & Scheier, 2016). As such, self-regulation involves the ability to alter thoughts, actions, and emotions in a way that serves goal striving, whether the goal is set by the self, the society or both. Self-regulation

has gained considerable research and media attention over the last 15 years, and some researchers have even proclaimed it as humanity's greatest strength, and as the key to success in life (Baumeister, Leith, Muraven, & Bratslavsky, 2002). Indeed, a large body of evidence has shown that higher self-regulation is associated with better academic and work performance, good interpersonal relationships, better mental health outcomes, emotional well-being, and life satisfaction (Hoffmann, Luhmann, Fisher, Vohs, & Baumeister, 2014; Tangney, Baumeister, & Boone, 2004). Accordingly, self-regulation failure has been associated with a whole host of adverse psychological and behavioural outcomes, such as substance use, impulsive purchase behaviour and overspending, school underachievement, relationship problems, violence, sexual risk-taking, and long-term unemployment (Baumeister, 2003; Carey, Neal, & Collins, 2004; Daly, Delaney, Egan, & Baumeister, 2015; DeWall, Baumeister, Stillman, & Gailliot, 2007; Raffaelli & Crocket, 2003; Tangney et al., 2004; Vohs & Faber, 2007).

Succumbing to impulses is perhaps one of the most obvious expressions of self-regulatory failure (DeYoung and Rueter, 2016), and behavioural impulsivity has been recognized as one of the key components of inadequate self-regulation (Baumeister & Heatherton, 1996; Baumeister & Vohs, 2007). According to Carver and colleagues (2009), trait impulsivity involves the presence of an urge or desire, and the inability to self-regulate, inhibit, and control that impulse. Trait impulsivity has been associated with psychopathology (e.g., Grano et al., 2007; Peluso et al., 2007; Whitesire and Lynam, 2001), and studies on children with ADHD have indicated a positive association between childhood impulsivity and later development of depression (Brodsky et al., 2001). Trait impulsivity has also been positively associated with a range of adverse behavioural outcomes, such as unhealthy eating and overeating (e.g., Jasinska et al., 2012), sexual risk-taking (e.g., Kahn, Kaplowitz, Goodman, & Emans, 2002), as well as substance-related and behavioural addictions (e.g.,

Lee et al., 2012; Verdejo-Garcia, Lawrence, & Clark, 2008). According to Barratt's three-factor model impulsivity reflects three main characteristics: greater motor activation (motor impulsivity), such as acting at the spur of the moment; less attention to the task at hand (attention impulsivity); and a reduced ability to plan actions (non-planning impulsivity; Patton et al. 1995; Stanford et al. 2009). Empirical support for this model has come from studies using self-reported measures, such as Barratt's Impulsiveness Scale (BIS; Patton et al. 1995), as well as studies showing a positive correlation between the BIS and objective neuropsychological and laboratory behavioural measures of impulsivity, event-related potentials (e.g., reduced P300 amplitude) and fMRI studies (Asahi et al., 2004; Ding et al. 2014; Moeller et al. 2001; Russo et al. 2008; Spinella, 2007).

Importantly, self-regulation and impulsivity have been differentially associated with the experience of self-conscious emotions. In particular, Tangney et al. (2004) reported a significant positive correlation between higher self-regulation scores and guilt, and a significant negative association between higher self-regulation and shame, even after controlling for the effects of social desirability. Another study showed that self-regulation failure in an exercise context (i.e., missing an exercise session) was associated with the experience of shame and guilt (Streuber, Meade, & Strachan, 2015). In a similar vein, Sheikh and Janoff-Bulman (2010) found that inadequate self-regulation (e.g., failing to restrain excessive eating, gambling, and overspending) were significantly associated with shame. Carver, Sinclair and Johnson (2010) reported that authentic pride (e.g., feelings of accomplishment and confidence) was positively associated with self-control, whereas hubristic pride (e.g., feelings of arrogance) was associated with impulsivity. Finally, an experimental study on consumer behaviour showed that participants with higher trait impulsivity succumbed to more impulsive purchase behaviours than consumers with lower impulsivity scores, and this self-indulgence was associated with experiencing negative

purchase-related self-conscious emotions, such as guilt and regret (Ramanathan & Williams, 2007; Experiment 1).

Taken together, these findings highlight the role of self-regulatory capacity (or the lack thereof) in the experience of self-conscious emotions in a simple but profound way. When people succumb to impulsive behaviour and fail to regulate their actions according to ideal self-representations or standards, they are likely to experience shame, guilt, and hubristic pride, whereas adequate self-regulation is associated with authentic pride (Carver et al., 2010). Possibly, these associations can be attributed to the self-representational and cognitive complexity of self-conscious emotions: people reflect on how well they can regulate their behaviour, evaluate their behaviour against personal or societal expectations and standards, and accordingly experience self-conscious emotions. Self-disgust is also characterized by self-representation and cognitive complexity (e.g., Powell et al., 2015), and this makes it theoretically plausible to anticipate an association between self-regulation, trait impulsivity, and self-disgust. People may experience more self-disgust from succumbing to impulsive behaviour and failing to self-regulate, and less self-disgust when adequate self-regulation is exercised and impulsive behaviour is restrained. Nevertheless, no study has addressed this question thus far.

Emotion Regulation and Self-Disgust

Emotion regulation represents a group of automatic or controlled processes by which people try to modify their emotions in order to achieve a desired goal (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross, 2013; Webb, Miles, Gollwitzer & Sheeran, 2012), and this goal may entail increasing (up-regulation) or decreasing (down-regulation) the magnitude or the duration of emotional responses (Gross, 2013). According to the process model of emotion regulation (Gross & Thompson, 2007) people can regulate their emotions before

(antecedent-focused emotion regulation) or after (response-focused emotion regulation) the emotional response, and different emotion regulation strategies have different consequences (Gross, 2013). Cognitive reappraisal and expressive suppression represent two distinct and widely studied emotion regulation strategies. The former is an antecedent-focused strategy and involves the cognitive re-interpretation of events or situations in order to alter the emotional response or reduce its impact before it occurs, whereas the latter represents a response-focused strategy that aims to modulate emotional responses after they have occurred by inhibiting expressive behaviour (e.g., modulating anger by suppressing it; Gross, 2013; 2015).

Both cognitive reappraisal and expressive suppression are commonly used to down-regulate emotions but they have differential consequences on various levels of human functioning. At a cognitive level, expressive suppression is associated with poorer memory for the situation that elicited the emotional response, whereas cognitive reappraisal has been associated with improved memory and exam performance (Sheppes & Gross, 2011). Similarly, cognitive reappraisal, but not expressive suppression, attenuated the effect of negative emotions (e.g., disgust, fear) on decision-making (Heilman, Crisan, Houser, Miclea, & Miu, 2010). At a social level, suppression has been associated with less liking from interacting partners, whereas cognitive reappraisal does not seem to have an adverse impact on interpersonal relationships (Butler, Egloff, Wilhelm, Smith, & Erickson, 2003; Gross & John, 2003). At an affective level, cognitive reappraisal is associated with decreased negative emotional experiences and the increase of positive ones, but expressive suppression decreases positive emotional experiences and leaves negative ones unchanged (Gross & John, 2003; Gross & Thompson, 2007). Similarly, a cross-cultural study showed that cognitive reappraisal was associated positively with life satisfaction and trait positive affect, and negatively with depressed mood and trait negative affect, and the opposite pattern of

associations was observed for expressive suppression (Haga, Kraft, & Corby, 2009). Finally, expressive suppression has been positively associated with higher scores in mental health symptoms, such as anxiety, PTSD, and depression (Moore, Zoellner, & Mollenholt, 2008).

Despite the abundance of studies on the effects of cognitive reappraisal and expressive suppression on various aspects of human functioning, there is limited evidence about the effects of those emotion regulation strategies on the experience of self-conscious emotions, such as self-disgust. This is an important omission for the following reasons. First, the conceptualization of self-disgust as a self-conscious emotion schema involves a lasting appraisal of the self (or its actions) as disgusting and repulsive, and this appraisal may be activated by specific beliefs, situations or events (Powell et al., 2015). As an antecedent-focused strategy, cognitive reappraisal may counteract the effects of relevant eliciting events, thoughts, or situations before self-disgust is experienced, and accordingly lead to lower levels of self-disgust. Support for this argument comes from studies that have demonstrated how appraisals (e.g., causal attributions) can influence the experience of self-conscious emotions, such as shame and guilt (Tracy & Robins, 2006). Furthermore, as a response-modulation strategy, expressive suppression will require a great deal of resources to modulate self-disgust once it is experienced (Sheppes & Gross, 2011), and studies have shown that suppression is an ineffective strategy in undoing the effects of negative emotional states (Gross & John, 2003; Gross & Thompson, 2007). Therefore, if cognitive reappraisal and expressive suppression have differential effects on the emotional experience (Gross, 2015; Gross & Thompson, 2007), then it is theoretically plausible that they would be differentially associated with self-disgust, with cognitive appraisal negatively associated and expressive suppression positively associated with self-directed disgust responses. However, this assumption has not been empirically examined as yet.

The Present Study

Over the last decade a growing body of research has examined the association between self-disgust and physical and mental health outcomes in various domains (e.g., Azlan et al., 2017; Brake et al., 2017; Ille et al., 2014; Overton et al., 2008). Nevertheless, the psychological characteristics and processes that may give rise to self-disgust experiences have not been empirically investigated as yet. The focus of this paper is on the psychological characteristics that may lead people to experience self-disgust, and more specifically, on the roles of self-regulation, emotion regulation and impulsivity in this process. The existing evidence supports the contention that self-disgust represents a self-conscious emotion schema that incorporates some of the key features of other self-conscious emotions (i.e., cognitive complexity and symbolic self-representation); emerges from the complex interaction between perception, emotion, appraisals, and cognition; and can be triggered or "elicited" by a reflection on psychological or physical characteristics of the self (Powell et al., 2015). With this conceptualization in mind, we propose a model of self-disgust that particularly addresses the roles of impaired self-regulation, maladaptive emotion regulation, and high impulsivity as key psychological characteristics that may elicit self-disgust experiences. It is important to note that, within the context of the present study, the elicitation of self-disgust is not discussed as a stimulus-response process, such as the automatic activation of revulsion and disgust following exposure to disgust-related stimuli (e.g., faeces). Rather, following from Powell et al. (2015) we refer to the elicitation of self-disgust as the cognitive, affective and physiological response to lasting features of the self. This conceptualization is consistent with Izard's (2007; 2009) contention that emotion schemas, such as self-disgust, can be activated by certain environmental triggers (i.e., external stimuli), as well as "internal" stimuli, such as thoughts, memories and self-appraisals.

Our model is based on two contentions. First, the symbolic self-representation and cognitive complexity aspects of self-disgust allow people to reflect on their actions, judge

their actions against their self-ideals (or ideals posed by the society or referent others), and accordingly experience self-disgust. According to Powell et al. (2015), self-disgust involves a lasting appraisal of the self as disgusting, and the proxy factors that can elicit self-disgust experiences may involve individual characteristics and traits or other important aspects of the self (e.g., "the way I act makes me feel sick"). Relatedly, self-appraisals of one's own behaviour and actions is an important aspect of self-disgust, and this is reflected in the way self-disgust has been operationalized and measured in relevant quantitative studies (e.g., "the way I behave makes me despise myself", "I feel good about the ways I behave", and "my behaviour repels other people"; Overton et al., 2008). Poor self-regulation and higher impulsivity appear to be the cornerstones of a wide range of problem behaviours (Baumeister et l., 2002; Tangney et al., 2004), and should provide the factual basis for negative self-evaluations of one's own actions. Therefore, it is theoretically plausible that people should experience lower levels of self-disgust if they lived up to their ideal self-standards by exhibiting adequate self-regulation and restraining impulsive behaviour, and higher levels of self-disgust if they failed to self-regulate and succumbed to impulsiveness.

Secondly, emotion regulation strategies can differentially influence the experience of self-disgust. People who adopt adaptive emotion-regulation strategies, such as cognitive reappraisal, are allowed to re-construe and reinterpret the outcomes of their actions and, accordingly, the experience of self-disgust will be attenuated. In contrast, the use of maladaptive emotion regulation strategies, such as expressive suppression, is focused on inhibiting the emotional response that ensued from impaired self-regulation and is insufficient to modulate the negative experience of self-disgust. Finally, the ability to regulate one's emotions has been associated with reaching behavioural goals, whereas the lack of such ability is often associated with self-regulatory failure and the expression of impulsive behaviours (Roberton Daffern, & Bucks, 2012). Also, models of self-regulation posit that

higher (vs. lower) self-regulation act protectively against impulsive urges on behavioural outcomes (e.g., Baumeister & Heatherton, 1996; Baumeister & Vohs, 2007), and research has shown that the adverse effects of impulsivity on behavioural and mental health outcomes can be mediated by emotion regulation strategies and self-regulation (e.g., d'Acremont & Van der Linden, 2007; Liau et al., 2015). It is sensible to argue that emotion and self-regulation could also play an intervening role and explain the association between impulsivity and self-disgust. Based on these contentions, the following hypotheses were formed:

H1: Higher self-regulation and lower trait impulsivity will be associated with lower levels of self-disgust.

H2: Adaptive emotion regulation strategies (i.e., cognitive reappraisal) will be associated with lower levels of self-disgust.

H3: Maladaptive emotion regulation strategies (i.e., expressive suppression) will be associated with higher levels of self-disgust.

H4: The ability to regulate thoughts, emotions, and behaviour (i.e., emotion regulation and self-regulation) will indirectly account for (intervene in) the association between impulsivity and self-disgust.

Methods

Participants

Overall, 450 individuals were approached face to face by a trained research assistant. Four hundred and thirty one participants agreed to take part in the study and, of them, 294 cases were completed and eligible for analysis in the present study (final response rate = 65.3%). Only complete cases were used in analyses due to the ethical right to withdraw from the survey at any time. Missing data analysis showed that non-completers did not differ

significantly from the 294 cases, and that the missing cases could be classified as MCAR (Little's test $p > 0.05$). Participants were aged between 17 and 51 years ($M = 21.84$, $SD = 4.56$), 60.5% were females, and 89.5% had a British background, and included undergraduate and postgraduate students from three universities in South Yorkshire, England. The research was carried out in accordance with the Code of Human Research Ethics of the British Psychological Society, and participants were provided with consent forms to complete, and were duly informed about their participation rights (i.e., voluntary and anonymous participation; no penalties for withdrawing from the study at any stage without previous notice).

Measures

Demographics.

Demographic characteristics were assessed with open-ended questions asking participants to indicate their age (i.e., how old are you?), gender, and nationality.

Impulsivity.

Impulsivity was assessed with the Abbreviated Impulsiveness Scale (ABIS; Coutlee, Politzer, Hoyle, & Huettel, 2014). The ABIS is an 11-item measure of trait impulsivity, that is, people's tendency to act spontaneously and "on impulse" without thinking or reasoning about their actions. It consists of three sub-scales that reflect attentional (e.g., "*I don't pay attention*"), motor (e.g., "*I say things without thinking*"), and non-planning (e.g., "*I am future oriented*" reverse scored item) impulsivity. Calculating a total “impulsivity” score is not recommended psychometrically (Coutlee et al., 2014). Responses are coded on a 4-point Likert scale (1 = *rarely/never*, 4 = *almost always/always*). Following reverse scoring of 8 items, a mean score is computed for each subscale and higher scores indicate higher

impulsiveness. The reliability and validity of the ABIS has been reported by Coutlee et al. (2014). In the present study, the internal consistency reliability coefficients (Cronbach's α) for each ABIS subscale was acceptable (ABIS non-planning $\alpha = 0.74$; ABIS motor $\alpha = 0.75$; ABIS attention $\alpha = 0.67$).

Emotion regulation.

Emotion regulation was measured with the Emotion Regulation Questionnaire (ERQ; Gross & John, 2013). The ERQ is a 10-item measure that assesses individual differences in emotion regulation strategies. It consists of two sub-scales that reflect expressive suppression (e.g., "*I control my emotions by not expressing them*") and cognitive reappraisal (e.g., "*When I want to feel positive emotion (such as joy or amusement), I change what I'm thinking about*"). Responses are given on 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). A mean score is computed for each scale and higher scores indicate higher emotion regulation. The reliability and validity of the ERQ have been reported in previous studies (Gross & John, 2003). In the present study the internal consistency reliability for the ERQ sub-scales was high (cognitive reappraisal $\alpha = 0.81$; expressive suppression $\alpha = 0.72$).

Self-regulation.

Self-regulation was measured with the 31-item Short Self-Regulation Questionnaire (SSRQ; Carey et al., 2004). The SSRQ is the shorter version of the Self-Regulation Questionnaire (SRQ; Brown, Miller, & Lawendowski, 1999) and reflects different aspects of people's self-regulatory capacity, such as goal-setting and monitoring (e.g., "*I set goals for myself and keep track of my progress*"), self-control (e.g., "*I am able to resist temptation*"), and deliberate thinking/reasoning of actions (e.g., "*I usually think before I act*"). Responses are given on a 5-point Likert scale (1 = strongly disagree, 7 = strongly agree). A sum score is generated and higher scores reflect greater self-regulatory capacity. The reliability and

validity of the SSRQ has been reported previously (e.g., Carey et al., 2004) and in the present study the internal consistency reliability coefficient was high (α = 0.92).

Self-disgust.

Self-disgust was assessed with the Self-Disgust Scale (SDS; Overton et al., 2008), an 18-item measure reflecting disgust and repulsiveness directed to the self. Six items are filler items (e.g., "*I enjoy the company of others*") and 12 items reflect self-disgust towards the self (e.g., "*I find myself repulsive*"), and towards one's behaviour/actions (e.g., "*I often do things I find revolting*"). Responses are coded on a 7-point Likert scale (1 = strongly agree, 7 = strongly disagree), and after reverse scoring 9 items a total sum score is computed. Higher scores indicate higher levels of self-disgust. Self-disgust is reflected in the total sum score, as well as in the sub-scales of "disgusting self" (or physical self-disgust) and "disgusting ways" (or behavioural self-disgust), and the reliability and validity of this measure has been reported elsewhere (Overton et al., 2008). In the present study, the internal consistency reliability was acceptable for the total self-disgust scale (α = 0.88), and the subscales of behavioural (α = 0.76) and physical self-disgust (α = 0.79).

Design/Procedure

A cross-sectional, correlational, survey-based design was used to measure the associations between demographic characteristics (age, gender, and nationality), impulsivity, emotion regulation, self-regulation, and self-disgust. As part of a larger study, participants were approached and recruited in University premises and were asked to complete an online survey (hosted on Qualtrics, www.qualtrics.com). Only participants who completed all study measures were included in this study, all other data were discarded. No time restrictions were applied and survey completion required approximately 15 minutes.

Data Analysis

As some of the study variables were not normally-distributed (and regular linear regression methods resulted in non-normally-distributed residuals), Spearman's rho correlations were used to explore initial associations in the data, followed by a bootstrapped path analysis of the hypothesised relationships between the constructs. Path analysis has many advantages over standard regression techniques, including the ability to estimate direct and indirect effects (through multiple intervening variables), and multiple dependent variables, simultaneously, allowing the researcher to account for the interdependence in the outcome variables (by correlating their error terms). As recommended (e.g., Hayes, 2009; Hayes & Scharkow, 2013), we used bias-corrected and accelerated bootstrapping (10,000 resamples; Mallinckrodt, Abraham, Wei, & Russell, 2006) to obtain confidence intervals (and associated probability values) for all direct and indirect effects in the path model. Bootstrapping is a robust alternative to standard parametric estimates, when the assumptions around the latter may be violated (Fox, 2008). All data were analysed in SPSS v. 22 (IBM Corp., Armonk, NT, USA), and AMOS v. 24 (IBM Corp., Armonk, NT, USA).

Results

The descriptive statistics and inter-correlations among the study variables are presented in Table 1. In this sample, women reported significantly higher levels of physical self-disgust than men, $r_{rb} = .25$, $p < .001$. Cognitive reappraisal was negatively associated with physical, $rs = -.19$, $p < .01$, and behavioural, $rs = -.19$, $p < .01$, self-disgust. On the other hand, expressive suppression was positively associated with physical, $rs = .15$, $p < .01$, and behavioural, $rs = .24$, $p < .001$, self-disgust. The attention subscale of the ABIS was positively associated with physical, $rs = .14$, $p < .05$, and behavioural, $rs = .14$, $p < .05$, self-disgust. The motor subscale had a marginally significant relationship with physical self-

disgust, *rs* = .10, $p < .10$, and a significant positive relationship with behavioural self-disgust, *rs* = .13, $p < .05$. The non-planning subscale had a marginally significant negative relationship with physical self-disgust only, *rs* = −.10, $p < .10$. Finally, self-regulation was significantly negatively related to both physical, *rs* = −.32, $p < .001$, and behavioural, *rs* = −.41, $p < .001$, self-disgust.

Direct Effects of Impulsivity, Emotion Regulation and Self-Regulation on Self-Disgust.

The results of the path analysis are presented in Table 2. When conditioned on all other variables, the non-planning impulsivity subscale had a negative and significant direct effect on physical, β = −.27, $p < .001$, and behavioural, β = −.20, $p < .01$, self-disgust. Cognitive reappraisal significantly negatively predicted physical self-disgust, β = −.12, $p < .05$, and had a marginally significant effect on behavioural self-disgust, β = −.09, $p = .093$. Expressive suppression significantly positively predicted physical, β = .17, $p < .01$, and behavioural, β = .20, $p < .001$, self-disgust. Finally, self-regulation was significantly and negatively associated with both physical, β = −.25, $p < .001$, and behavioural, β = −.42, $p < .001$, self-disgust.

Indirect Effects of Impulsivity on Self-Disgust.

The results of our hypothesised indirect path analyses are presented at the bottom of Table 2. In combination, the three regulation variables (i.e., self-regulation, emotion regulation/cognitive reappraisal, and emotion regulation/expressive suppression) had a significant intervening effect between attentional impulsivity and physical, β = .12, $p < .01$, and behavioural, β = .20, $p < .001$, self-disgust. This multivariate effect was driven strongly by the self-regulation scale, which was the only significant univariate intervening variable in this relationship (see Table 2). There was also a marginally significant indirect effect of the

self-regulation scale and the emotion regulation subscales between non-planning impulsivity and physical self-disgust, $\beta = .05$, $p = .050$. This effect was driven again by the self-regulation variable (see Table 2), but also cognitive reappraisal, which was a significant intervening variable in the relationship between non-planning impulsivity and physical self-disgust, $\beta = .02$, $p < .05$ (see Figure 1).

Discussion

Self-disgust is a self-conscious emotion schema that shares common features with other self-conscious emotions, such as shame and guilt, but has a unique expressive and phenomenological profile (Powell et al., 2015). Although research interest on the association between self-disgust and psychopathology has significantly increased over the last 7 years (e.g., Brake et al., 2017; Ille et al., 2014; Overton et al., 2008), there is a paucity of research on the psychological phenomena and processes that may elicit self-disgust responses (Powell et al., 2014; Powell et al., 2015). The present study assessed the association between self-regulation, emotion regulation, trait impulsivity, and self-disgust, and examined different hypotheses with respect to these associations.

First, we hypothesized that, because self-disgust involves symbolic self-representation and cognitive complexity (Powell et al., 2014; Powell et al., 2015), people evaluate their behaviour against their self (or social) ideals and experience lower self-disgust when their ideals are met through effective self-regulation and inhibition of impulsive behaviour; accordingly, higher self-disgust is more likely to occur when self-regulation fails and higher impulsivity is exhibited. Second, based on the emotion regulation literature (d'Acremont & Van der Linden, 2007; Gross & John, 2003; Gross & Thompson, 2007; Haga, Kraft, & Corby, 2009), we anticipated that expressive suppression (positively) and cognitive reappraisal (negatively) would predict self-disgust. Our findings supported these hypotheses

and showed, for the first time, that the two facets of self-disgust that were measured in the present study (i.e., disgusting self/physical self-disgust and disgusting ways/behavioural self-disgust) were differentially associated with self-regulatory variables and trait impulsivity both in terms of statistical significance and effect size. More specifically, the disgusting self subscale was negatively associated with cognitive reappraisal and self-regulation, and positively associated with expressive suppression and attentional impulsivity. The disgusting ways subscale was negatively associated with cognitive reappraisal and self-regulation, and positively associated with expressive suppression, attentional, and motor impulsivity. Although the effect sizes between self-disgust and the trait impulsivity and emotion regulation subscales were small according to Cohen (1992), the effect sizes between the self-disgust subscales and self-regulation were moderate. This indicates that self-regulation is more strongly associated with the experience of self-disgust, as compared to emotion regulation strategies and impulsivity. These findings were further corroborated by path analysis which showed that self-regulation was more strongly and directly associated with both dimensions of self-disgust, as compared to the effects of emotion regulation strategies and impulsivity dimensions. Our final hypothesis was that self-regulation and emotion regulation would act as intervening variables in the effects of impulsivity on the experience of self-disgust. The results from the path analysis partially supported this hypothesis by showing significant indirect effects of attentional impulsivity on physical and behavioural self-disgust, and significant indirect effects of non-planning impulsivity on physical (but not behavioural self-disgust), via self-regulation and emotion regulation strategies.

Taken together, the present study has important theoretical implications. Firstly, although most research on self-disgust suggests that behavioural outcomes (e.g., being overweight) are associated with experiencing self-disgust, our findings show that self-disgust may be also related to the psychological characteristics (i.e., self-regulation and impulsivity)

that are associated with and have been found to lead to such undesirable and disgust-eliciting behavioural outcomes (e.g., Tangney et al., 2004). Secondly, and relatedly, impulsivity dimensions, and more specifically attentional and non-planning impulsivity, seem to play a role in the experience of self-disgust. The tendency to behave in an automatic and non-planned manner is associated with higher self-disgust, and this association is partly explained by self-regulation, and to lesser extent by emotion regulation strategies. This lends support to our argument that people may experience self-disgust when they fail to resist impulses and exhibit poor regulation of their thoughts, actions, and emotions. Our cross-sectional design and the use of self-reports, however, do not rule out the possibility of reverse causality and response bias (e.g., socially desirable responding or self-deception; Paulhus, 2002). Future studies should examine if behavioural measures of impulsivity (e.g., disinhibition/attentional tasks; Moeller et al., 2001) are related to self-disgust, and whether such an association is explained indirectly by self-regulation. Furthermore, our study provided findings about the association between self-disgust and individual differences in self-regulatory capacity without focusing on specific behavioural outcomes. It is possible that the observed associations may be stronger in the context of more specific problem behaviours (e.g., dysfunctional drinking, sexual misconduct, problem gambling) that have been associated with poor self-regulation and higher impulsivity, and this is something that further research may look into.

Second, a wide range of adverse psychological, behavioural, and mental health outcomes have been independently associated high trait impulsivity (Grano et al., 2007; Moeller et al., 2001; Peluso et al., 2007), low self-regulation (e.g., Baumeister, 2003; Tangney et al., 2004), and higher self-disgust (Brake et al., 2017; Ille et al., 2004; Overton et al., 2008). Our findings suggest that impulsivity, self-regulation, and self-disgust may not necessarily be independent predictors of such effects. Rather, these variables seem to be

associated with each other in a dynamic way that may explain the bivariate associations described in previous research. Of course, this process needs to be more thoroughly examined in future studies that incorporate measures of mental health (e.g., depression) and/or adverse behavioural outcomes, as well as longitudinal designs that will allow for more valid assessments of temporally-unfolding associations.

Third, although the effect size of the associations between self-disgust and emotion regulation strategies were small they were statistically significant, even after controlling for the effects of self-regulation and trait impulsivity. This is the first study to demonstrate the differential association of emotion regulation strategies with self-disgust. In line with previous research on the differential effects of expressive suppression and cognitive reappraisal (e.g., Gross & John, 2003; Gross & Thompson, 2007), the present findings showed that cognitive reappraisal was negatively associated with self-disgust; thus, suggesting that cognitive reappraisal can act protectively against the negative effects of self-disgust on psychological well-being. Of course this needs to be determined by future research that will employ specific measures of well-being and psychological functioning. On the other hand, expressive suppression was positively associated with self-disgust, and this is in accordance with previous studies which suggested that expressive suppression cannot sufficiently modify adverse emotional experiences (Gross & Thompson, 2007). Future studies may further extend our findings by assessing whether self-disgust is associated with other aspects of response modulation strategies, such as physiological responding, avoidance, and memory impairment (see Gross, 2002).

Our study is not free of limitations. First of all, we used a cross-sectional design and self-reported measures and this limits our ability to draw conclusions about causal associations and processes. Future studies with prospective designs can directly assess the temporal association between trait impulsivity, self and emotion regulation, and self-disgust,

and provide more robust findings concerning the ontogenesis of self-disgust experiences. Second, as already mentioned we did not measure psychological well-being and mental health outcomes. This is a major limitation for the following reasons: we cannot establish if the associations we found account for variations in mental health and psychological outcomes, and we cannot ensure that our findings were not confounded by pre-existing mental health conditions, such as depression. Given the strong association between self-disgust with a range of mental health disorders (e.g., Ille et al. 2014; Overton et al., 2008), it is recommended that future research incorporates relevant measures. Third, self-reported measures of impulsivity do not always correlate with behavioural, lab-based measures (Reynolds, Ortengren, Richards, & de Wit, 2006). Future research should employ a wider range of impulsivity measures (e.g., response inhibition tasks; ERPs; fMRI; Moeller et al., 2001) in order to assess the association between self-disgust and state measures of impulsivity. Fourth, due to the number of parameters estimated in the path models, and the increased risk of Type I error, the present results should be considered exploratory and warrant replication in further confirmatory studies.

Notwithstanding those limitations, however, our study was the first one to demonstrate important associations between trait impulsivity, self-regulation, emotion regulation strategies, and self-disgust. Furthermore, using robust statistical analyses we demonstrated intervening effects of self-regulation and emotion regulation on the association between impulsivity and self-disgust. This is an important step towards better understanding the psychological phenomena and processes that are related to the deleterious experience of self-disgust (Powell et al., 2015).

References

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*(2), 217-237.

Azlan, H.A., Overton, P.G., Simpson, J., & Powell, P.A. (2017). Differential disgust responding in people with cancer and implications for psychological wellbeing. *Psychological Health*, *32*(1), 19-37.

Baumeister, R. F. (2003). Ego depletion and self-regulation failure: A resource model of self-control. *Alcoholism: Clinical and Experimental Research*, *27*(2), 281-284.

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry*, *7*(1), 1-15.

Baumeister, R. F., Leith, K. P., Muraven, M., & Bratslavsky, E. (2002). Self-regulation as a key to success in life. In D. Pushkar, W. M. Bukowski, A. E. Schwartzman, D. M. Stack, & D. R White (eds.). *Improving competence across the lifespan* (pp. 117-132). Boston, MA: Springer.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*(6), 351-355.

Beck, A.T. (1967). *Depression. Clinical, experimental, and theoretical aspects*. New York: Hoeber Medical Division, Harper and Row.

Brake, C.A., Rojas, S.M., Badour, C.L., Dutton, C.E., & Feldner, M.T. (2017). Self-disgust as a potential mechanism underlying the association between PTSD and suicide risk. *Journal of Anxiety Disorders*, *47*, 1-9.

Brodsky, B. S., Oquendo, M., Ellis, S. P., Haas, G. L., Malone, K. M., & Mann, J. J. (2001). The relationship of childhood abuse to impulsivity and suicidal behavior in adults with major depression. *American Journal of Psychiatry*, *158*(11), 1871-1877.

Brown, J. M., Miller, W. R., & Lawendowski, L. A. (1999). The self-regulation questionnaire. In L. VandeCreek & T. L. Jackson (Eds.), *Innovations in clinical practice: A source book,* Vol. 17, pp. 281-292). Sarasota, FL: Professional Resource Press/Professional Resource Exchange.

Butler, E. A., Egloff, B., Wlhelm, F. H., Smith, N. C., Erickson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion*, *3*(1), 48.

Cacioppo, J. T., Berntson, G. G., & Decety, J. (2010). Social neuroscience and its relationship to social psychology. *Social Cognition*, *28*(6), 675-685.

Carey, K. B., Neal, D. J., & Collins, S. E. (2004). A psychometric analysis of the self-regulation questionnaire. *Addictive Behaviors*, *29*(2), 253-260.

Carver, C. S., & Scheier, M. F. (2016). Self-regulation of action and affect. In K. D. Vohs & R. F. Baumeister (eds.). *Handbook of self-regulation: research, theory and applications* (pp. 3-23). New York, NY: Guilford Press.

Carver, C. S., Sinclair, S., & Johnson, S. L. (2010). Authentic and hubristic pride: Differential relations to aspects of goal regulation, affect, and self-control. *Journal of Research in Personality*, *44*(6), 698-703.

Carver, C. S., Johnson, S. L., & Joormann, J. (2009). Two-mode models of self-regulation as a tool for conceptualizing effects of the serotonin system in normal behavior and diverse disorders. *Current Directions in Psychological Science*, *18*(4), 195-199.

Chapman, H.A., Kim, D.A., Susskind, J.M., & Anderson, A.K. (2009). In bad taste: Evidence for the oral origins of moral disgust. *Science, 323*(5918), 1222-1226.

Chu, C., Bodell, L. P., Ribeiro, J. D., & Joiner, T. E. (2015). Eating disorder symptoms and suicidal ideation: the moderating role of disgust. *European Eating Disorders Review*, *23*(6), 545-552.

Coutlee, C. G., Politzer, C. S., Hoyle, R. H., & Huettel, S. A. (2014). An abbreviated impulsiveness scale constructed through confirmatory factor analysis of the Barratt impulsiveness scale version 11. *Archives of Scientific Psychology*, *2*(1), 1.

d'Acremont, M., & Van der Linden, M. (2007). How is impulsivity related to depression in adolescence? Evidence from a French validation of the cognitive emotion regulation questionnaire. *Journal of adolescence*, *30*(2), 271-282.

Daly, M., Delaney, L., Egan, M., & Baumeister, R. F. (2015). Childhood self-control and unemployment throughout the life span: Evidence from two British cohort studies. *Psychological Science*, *26*(6), 709-723.

DeWall, C. N., Baumeister, R. F., Stillman, T. F., & Gailliot, M. T. (2007). Violence restrained: Effects of self-regulation and its depletion on aggression. *Journal of Experimental Social Psychology*, *43*(1), 62-76.

DeYoung, C. G., & Rueter, A. R. (2016). Impulsivity as a personality trait. In K. D. Vohs & R. F. Baumeister (eds.). *Handbook of self-regulation: research, theory and applications* (pp. 345-363). New York, NY: Guilford Press.

de Hooge, I.E., Zeelenberg, M., & Breugelmans, S.M. (2010). Self-conscious emotions and social functioning. In I. Nyklicek, A. Vingerhoets, & M. Zeelenberg (Eds.), *Emotion regulation: Conceptual and clinical issues* (pp. 197-210). New York, NY: Springer.

Fox, J. (2008). *Applied regression analysis and generalized linear models* (2nd ed.). London: Sage.

Fox, J. R. (2009). Eating disorders and emotions. *Clinical Psychology & Psychotherapy*, *16*(4), 237-239.

Gilbert, P. (2007). The evolution of shame as a marker for relationship security. In J.L. Tracy, R. W. Robins & J. P. Tangney (Eds.), *The self-conscious emotions: Theory and research* (pp. 283–309). New York, NY: Guilford.

Granö, N., Keltikangas-Järvinen, L., Kouvonen, A., Virtanen, M., Elovainio, M., Vahtera, J., & Kivimäki, M. (2007). Impulsivity as a predictor of newly diagnosed depression. *Scandinavian Journal of Psychology*, *48*(2), 173-179.

Gross, J. J. (2013). Emotion regulation: taking stock and moving forward. *Emotion*, *13*(3), 359.

Gross, J. J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, *26*(1), 1-26.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality & Social Psychology*, *85*(2), 348.

Gross, J.J., & John, O.P.. (2013) . Emotion Regulation Questionnaire. Measurement Instrument Database for the Social Science. Retrieved from www.midss.ie

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. Handbook of Emotion Regulation. 3-27.

Haga, S. M., Kraft, P., & Corby, E. K. (2009). Emotion regulation: Antecedents and well-being outcomes of cognitive reappraisal and expressive suppression in cross-cultural samples. *Journal of Happiness Studies, 10*(3), 271-291.

Hayes, A.F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs, 76*, 408-420.

Hayes, A.F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science, 24*, 1918-1927.

Heilman, R. M., Crişan, L. G., Houser, D., Miclea, M., & Miu, A. C. (2010). Emotion regulation and decision making under risk and uncertainty. *Emotion, 10*(2), 257.

Hofmann, W., Luhmann, M., Fisher, R. R., Vohs, K. D., & Baumeister, R. F. (2014). Yes, but are they happy? Effects of trait self-control on affective well-being and life satisfaction. *Journal of Personality, 82*(4), 265-277.

Ille R, Schöggl H, Kapfhammer HP, Arendasy M, Sommer M, Schienle A. Self-disgust in mental disorders—symptom-related or disorder-specific?. *Compr. Psychiatry*. 2014; 55: 938-943.

Izard, C. E. (2007). Basic emotions, natural kinds, emotion schemas, and a new paradigm. *Perspectives on Psychological Science, 2*(3), 260-280.

Jasinska, A. J., Yasuda, M., Burant, C. F., Gregor, N., Khatri, S., Sweet, M., & Falk, E. B. (2012). Impulsivity and inhibitory control deficits are associated with unhealthy eating in young adults. *Appetite, 59*(3), 738-747.

Kahn, J. A., Kaplowitz, R. A., Goodman, E., & Emans, S. J. (2002). The association between impulsiveness and sexual risk behaviors in adolescent and young adult women. *Journal of Adolescent Health*, *30*(4), 229-23.

Leary, M. R. (2004). Digging deeper: The fundamental nature of" Self-conscious" emotions. *Psychological Inquiry*, *15*(2), 129-131.

Lee, H. W., Choi, J. S., Shin, Y. C., Lee, J. Y., Jung, H. Y., & Kwon, J. S. (2012). Impulsivity in internet addiction: A comparison with pathological gambling. *Cyberpsychology, Behavior, & Social Networking*, *15*(7), 373-377.

Liau, A. K., Neo, E. C., Gentile, D. A., Choo, H., Sim, T., Li, D., & Khoo, A. (2015). Impulsivity, self-regulation, and pathological video gaming among youth: testing a mediation model. *Asia Pacific Journal of Public Health*, *27*(2), NP2188-NP2196.

Mallinckrodt, B., Abraham, W.T., Wei, M., & Russell, D.W. (2006). Advances in testing the statistical significance of mediation effects. *Journal of Counselling Psychology*, *53*, 372-378.

Moore, S. A., Zoellner, L. A., & Mollenholt, N. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms?. *Behaviour Research and Therapy*, *46*(9), 993-1000.

Muris, P., & Meesters, C. (2014). Small or big in the eyes of the other: On the developmental psychopathology of self-conscious emotions as shame, guilt, and pride. *Clinical Child and Family Psychology Review*, *17*(1), 19-40.

Olatunji, B. O., Cisler, J., McKay, D., & Phillips, M. L. (2010). Is disgust associated with psychopathology? Emerging research in the anxiety disorders. *Psychiatry Research*, *175*(1), 1-10.

Olatunji, B.O., Cox, R., & Kim, E.H. (2015). Self-disgust mediates the associations between shame and symptoms of bulimia and obsessive-compulsive disorder. *Journal of Social and Clinical Psychology, 34*(3), 239-258.

Overton, P. G., Markland, F. E., Taggart, H. S., Bagshaw, G. L., & Simpson, J. (2008). Self-disgust mediates the relationship between dysfunctional cognitions and depressive symptomatology. *Emotion, 8*(3), 379.

Paulhus, D. L. (2002). Socially desirable responding: The evolution of a construct. In H. I. Braun, D. N. Jackson, & D. E. Wiley. *The role of constructs in psychological and educational measurement* (pp. 49-69). Mahwah, NJ: Erlbaum.

Peluso, M. A. M., Hatch, J. P., Glahn, D. C., et al. (2007). Trait impulsivity in patients with mood disorders. *Journal of Affective Disorders, 100*(1), 227-231.

Penley, J.A., & Tomaka, J. (2002). Associations among the Big Five, emotional responses, and coping with acute stress. *Personality and Individual Differences, 32*, 1215-1228.

Powell, P. A., Overton, P. G., & Simpson, J. (2014). The revolting self: An interpretative phenomenological analysis of the experience of self-disgust in females with depressive symptoms. *Journal of Clinical Psychology, 70*(6), 562-578.

Powell, P. A., Simpson, J., & Overton, P. G. (2013). When disgust leads to dysphoria: A three-wave longitudinal study assessing the temporal relationship between self-disgust and depressive symptoms. *Cognition & Emotion, 27*(5), 900-913.

Powell, P. A., Simpson, J., & Overton, P. G. (2015). An introduction to the revolting self: Self-disgust as an emotion schema. In P. A. Powell, P. G. Overton, & J. Simpson (eds.) *The revolting self: Perspectives on the psychological, social, and clinical implications of self-directed disgust* (pp. 1-24). London: Karnak.

Power, M., & Dalgleish, T. (2008). *Cognition and emotion: From order to disorder* (2nd ed.). Hove: Psychology Press.

Raffaelli, M., & Crockett, L. J. (2003). Sexual Risk Taking in Adolescence: The Role of Self-Regulation and Attraction to Risk. *Developmental Psychology, 39*(6), 1036-1046.

Ramanathan, S., & Williams, P. (2207). Immediate and Delayed Emotional Consequences of Indulgence: The Moderating Influence of Personality Type on Mixed Emotions, *Journal of Consumer Research*, Volume 34, Issue 2, 1 August 2007, Pages 212–223,

Reynolds, B., Ortengren, A., Richards, J. B., & de Wit, H. (2006). Dimensions of impulsive behavior: Personality and behavioral measures. *Personality & Individual Differences, 40*(2), 305-315.

Roberton, T., Daffern, M., & Bucks, R. S. (2012). Emotion regulation and aggression. *Aggression and Violent Behavior, 17*(1), 72-82.

Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review, 94*(1), 23-41.

Rozin, P., Haidt, J., & McCauley, C. R. (1993). Disgust. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (pp. 575-594). New York: Guilford Press.

Rozin, Haidt, & McCauley (2000). Disgust as Embodied Moral Judgment, Personality and *Social Psychology Bulletin 34*, 1096 - 1109.

Rozin, P., Lowery, L., & Ebert, R. (1994). Varieties of disgust faces and the structure of disgust. *Journal of Personality and Social Psychology, 66*(5), 870-881.

Schienle, A., Wabnegger, A., Schöngassner, F., & Leutgeb, V. (2015). Effects of personal space intrusion in affective contexts: an fMRI investigation with women suffering from

borderline personality disorder. *Social cognitive and affective neuroscience, 10(10),* 1424-1428.

Sheikh, S., & Janoff-Bulman, R. (2010). The "shoulds" and "should nots" of moral emotions: A self-regulatory perspective on shame and guilt. *Personality and Social Psychology Bulletin, 36(2),* 213-224.

Sheppes, G., & Gross, J. J. (2011). Is timing everything? Temporal considerations in emotion regulation. *Personality and Social Psychology Review*, *15*(4), 319-331.

Simpson, J., Carter, S., Anthony, S. H., & Overton, P. G. (2006). Is disgust a homogeneous emotion?. *Motivation and emotion*, *30*(1), 31-41.

Simpson, J., Hillman, R., Crawford, T., & Overton, P. G. (2010). Self-esteem and self-disgust both mediate the relationship between dysfunctional cognitions and depressive symptoms. *Motivation and Emotion*, *34*(4), 399-406.

Streuber, B., Meade, L., & Strachan, S. M. (2015). Understanding the role of guilt and shame in physical activity self-regulation. *Journal of Exercise, Movement, and Sport*, *47*(1), 228.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of personality*, *72*(2), 271-324.

Tracy, J. L., & Robins, R. W. (2004). " Putting the Self Into Self-Conscious Emotions: A Theoretical Model". *Psychological Inquiry*, *15*(2), 103-125.

Tracy, J. L., & Robins, R. W. (2007). Emerging insights into the nature and function of pride. *Current directions in psychological science*, *16*(3), 147-150.

Verdejo-García, A., Lawrence, A. J., & Clark, L. (2008). Impulsivity as a vulnerability marker for substance-use disorders: review of findings from high-risk research, problem gamblers and genetic association studies. *Neuroscience & Biobehavioral Reviews*, *32*(4), 777-810.

Vicario, C. M., Rafal, R. D., Martino, D., & Avenanti, A. (2017). Core, social and moral disgust are bounded: A review on cognitive and neural bases of repugnance in clinical disorders. *Neuroscience & Biobehavioral Reviews*.

Vohs, K. D., & Faber, R. J. (2007). Spent resources: Self-regulatory resource availability affects impulse buying. *Journal of consumer research*, *33*(4), 537-547.

Webb, T. L., Schweiger Gallo, I., Miles, E., Gollwitzer, P. M., & Sheeran, P. (2012). Effective regulation of affect: An action control perspective on emotion regulation. *European Review of Social Psychology*, *23*(1), 143-186.

Weisfeld, G. E., & Dillon, L. M. (2012). Applying the dominance hierarchy model to pride and shame, and related behaviors. *Journal of Evolutionary Psychology*, *10*(1), 15-41.

*Table 1***.** Descriptive statistics and inter-correlations of study variables

	1	2	3	4	5	6	7	8	9	10	11
1. Age	-										
2. Gender	−.15*	-									
3. Nationality	−.31***	.06	-								
4. Cognitive reappraisal	.13*	−.06	−.11†	-							
5. Expressive suppression	−.04	−.19**	.05	−.09	-						
6. ABIS Attention	−.14*	.16**	.08	−.13*	−.08	-					
7. ABIS Motor	−.12*	.00	.15*	−.05	−.07	.45***	-				
8. ABIS Non-planning	−.00	−.08	−.10	−.20**	−.02	.58***	.35***	-			
9. SDS Self	−.05	.25***	.02	−.19**	.15**	.14*	.10†	−.10†	-		
10. SDS Ways	−.03	.03	−.08	−.19**	.24***	.14*	.13*	.01	.64***	-	
11. Self-regulation	.12*	−.19**	−.07	.24***	−.14*	−.58***	−.36***	−.38***	−.32***	−.41***	-
Range	17-51	0-1	0-1	6-42	4-28	5-18	4-16	4-16	5-35	5-34	50-145
M	21.84	0.61	0.89	27.64	14.87	11.15	9.70	8.25	14.97	14.73	107.26
SD	4.56	0.49	0.31	6.35	4.97	2.62	2.57	2.61	6.73	6.28	16.49
Median	21	1	1	28	15	11	9	8	14	13.50	108
IQR	2	1	0	8	8	3	3	4	9	9	22

Note. N = 294. Correlations represent Spearman's rho (*rs*), rank-biseral (r_{rb}), or phi (r_{Φ}) coefficients. ABIS = Abbreviated Impulsiveness Scale. SDS = Self-Disgust Scale. †p < .10. *p < .05. **p < .01. ***p < .001.

Table 2. Direct and indirect effects in the hypothesised path model.

Model pathways	β	BCa 95% CI β		*p*
		Lower	Upper	
Direct path estimates				
Attention -> reappraisal	−.06	−.22	.11	.466
Attention -> suppression	−.03	−.18	.13	.736
Attention -> self-regulation	−.48	−.60	−.36	.000
Attention -> SDS self	.07	−.09	.23	.418
Attention -> SDS ways	−.07	−.23	.10	.418
Motor -> reappraisal	.09	−.03	.22	.142
Motor -> suppression	−.10	−.22	.03	.145
Motor -> self-regulation	−.10	−.22	.02	.093
Motor -> SDS self	.08	−.05	.22	.222
Motor -> SDS ways	.09	−.04	.21	.193
Non-planning -> reappraisal	−.20	−.36	−.04	.018
Non-planning -> suppression	.01	−.14	.16	.894
Non-planning -> self-regulation	−.10	−.22	.02	.102
Non-planning -> SDS self	−.27	−.40	−.13	.000
Non-planning -> SDS ways	−.20	−.33	−.06	.004
Reappraisal -> SDS self	−.12	−.22	−.02	.017
Reappraisal -> SDS ways	−.09	−.18	.02	.093
Suppression -> SDS self	.17	.06	.27	.003
Suppression -> SDS ways	.20	.09	.31	.000
Self-regulation -> SDS self	−.25	−.39	−.11	.000
Self-regulation -> SDS ways	−.42	−.57	−.28	.000
Indirect path estimates				
Attention -> reappraisal -> SDS self	.01	−.01	.04	.326
Attention -> suppression -> SDS self	−.01	−.04	.02	.669
Attention -> self-regulation -> SDS self	.12	.05	.20	.000
Attention -> ALL -> SDS self	.12	.04	.21	.002
Attention -> reappraisal -> SDS ways	.01	−.01	.03	.296
Attention -> suppression -> SDS ways	−.01	−.04	.03	.690
Attention -> self-regulation -> SDS ways	.20	.13	.30	.000
Attention -> ALL -> SDS ways	.20	.12	.31	.000
Motor -> reappraisal -> SDS self	−.01	−.04	.00	.091
Motor -> suppression -> SDS self	−.02	−.05	.00	.097
Motor -> self-regulation -> SDS self	.03	−.00	.06	.055
Motor -> ALL -> SDS self	−.00	−.05	.05	.921
Motor -> reappraisal -> SDS ways	−.01	−.03	.00	.117
Motor -> suppression -> SDS ways	−.02	−.06	.00	.107
Motor -> self-regulation -> SDS ways	.04	−.01	.10	.077
Motor -> ALL -> SDS ways	.02	−.05	.08	.619
Non-planning -> reappraisal -> SDS self	.02	.00	.07	.017
Non-planning -> suppression -> SDS self	.00	−.02	.03	.842
Non-planning -> self-regulation -> SDS self	.03	−.00	.07	.068
Non-planning -> ALL -> SDS self	.05	.00	.11	.050
Non-planning -> reappraisal -> SDS ways	.02	−.00	.05	.056
Non-planning -> suppression -> SDS ways	.00	−.03	.04	.862
Non-planning -> self-regulation -> SDS ways	.04	−.01	.10	.085
Non-planning -> ALL -> SDS ways	.06	−.01	.14	.077

Note. *N* = 294. SDS = Self-Disgust Scale. Estimates conditioned on age, gender, and nationality. Probability values determined on bias-corrected and accelerated (BCa) bootstrapped CIs (10,000 bootstrap resamples).

Figure 1 caption.

Path model explaining the effect of impulsivity in three domains (attention, motor, and non-planning) on self-disgust via individual differences in three types of regulatory mechanisms (cognitive reappraisal, expressive suppression, and self-regulation). Self-regulation significantly moderated the effect of attention impulsivity on physical (SDS self), $\beta = .12$, 95% CI [.05, .20], $p < .001$, and behavioural (SDS ways), $\beta = .20$, 95% CI [.13, .30], $p < .001$, self-disgust. Non-planning impulsivity had a significant indirect effect on physical self-disgust via cognitive reappraisal, $\beta = .02$, 95% CI [.00, .07], $p = .017$ (see Table 2 for full results). Control variables and error terms are omitted for clarity. Estimates were conditioned on participants' gender, age, and nationality. Error terms for the three intervening variables were correlated, as were the error terms for the two outcome variables. All estimates are standardised. Statistical significance was determined based on bias-corrected and accelerated bootstrapped CIs (10,000 resamples). $^{\dagger}p < .10$. $*p < .05$. $**p < .01$. $***p < .001$.