The Role of Disgust Responses in Depressive and Anxious Outcomes in Cancer Patients

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ABSTRACT

Disgust has significant relevance in understanding psychological reactions to disease and has been established in the aetiology and maintenance of depressive and anxious symptoms. Disgust may be particularly relevant in the context of cancer, where patients typically endure a variety of disgust-eliciting experiences, both from the disease itself and the side effects of treatment. Through this present thesis, my intention was to argue that poor psychological wellbeing and stigma related to people with cancer may result either directly or indirectly from the dysfunction of disgust, as part of the disease avoidance system. Chapter I provides a literature review to elucidate the phenomenon of disgust within anxious and depressive experiences in people with cancer. Chapter II through a case-control study explores the evidence for the role of disgust in anxious and depressive symptoms in people with cancer, and how it may be different from healthy controls. Findings from this study suggest that there are specific disgust traits (disgust sensitivity and self-disgust) in people with cancer that have significant roles in predicting their anxious and depressive symptoms. To identify the potential source(s) of self-disgust in people with cancer which has been found significantly predicted both anxiety and depression in people with cancer in Chapter II, Chapter III utilized a dyadic study to examine the relationship between disgust traits in cancer patients' partners, and how it may influence the feelings of self-disgust, anxiety, and depression in cancer patients. Findings from this Chapter III suggested disgust reactions and stigma from others were potentially a significant cause and source of self-disgust in people with cancer, which may further lead to anxious and depressive symptoms. These findings led to the study in Chapter IV, which has two-phases, a survey and an experimental study exploring the role of disgust in predicting stigma towards people with cancer. Findings from this chapter suggest that some individuals - specifically those who have high

disgust propensity - may be more prone to stigmatise those with cancer. The findings in this thesis may contribute to efficacious therapeutic approaches for people with cancer manifesting significant symptoms of anxiety or depression.

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LIST OF ACRONYMS

ACT	Acceptance and Commitment Therapy
AIDS	Acquired Immune Deficiency Syndrome
APA	American Psychiatric Association
AR	Animal Reminder
ATC	Attitude to Cancer
BCA	Bias-corrected and Accelerated Bootstrapped
BPD	Borderline Personality Disorder
CASS	Cancer Stigma Scale
CB	Contamination Based
CBT	Cognitive-behavioural Therapy
CFI	Comparative Fit Index
CI	Confidence Interval
DP	Disgust Propensity
DPSS-R	Disgust Propensity and Sensitivity Scale – Revised
DS	Disgust Sensitivity
DSM	Diagnostic and Statistical Manual of Disorders
DS-R	Disgust Sensitivity Scale - Revised
HADS	Hospital Anxiety and Depression Scale
HIV	Human Immunodeficiency Virus
ITT	Integrated Threat Theory
LL	Lower Limit
NICE	National Institute for Health and Clinical Excellence
NCCN	National Comprehensive Cancer Network
NK	Natural Killer
OCD	Obsessive-compulsive disorder

RMSEA	Root Mean Square Error of Approximation
SD	Self-disgust
SDS	Self-disgust Scale
TMT	Terror Management Theory
TOSCA	Test of Self-Conscious Affect
UK	United Kingdom
UL	Upper Limit
VAS	Visual Analogue Scale
VIF	Variance Inflation Factor
WHO	World Health Organization

I. INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction to the topic of research

Emotions are complex systems established through the course of human evolutionary history that prepare an organism to act in response to environmental stimuli and challenges (Garnefski et al., 2002). Most forms of psychopathology are characterized by some type of emotional aberration (Gross & Barrett, 2013). The role of emotions within psychopathology research, however, has been historically neglected and only more recently have researchers begun to investigate the importance of individual differences in the experience and processing of emotion in the onset and maintenance of mental health problems (e.g., Joormann, & Gotlib, 2010; Mennin, Holoway, Fresco, Moore, Heimberg, 2007), including its dynamic integration with cognition in understanding and treating psychopathology (e.g., Rottenberg & Gross, 2003). Despite this increasing level of attention and effort, this trend occurred recently enough that the merging of affective science and psychopathology research can still be considered to be in its infancy (Tracy, Klonsky, & Proudfit, 2014).

One emotion that is constructed based on the interaction of cognitive and affective components, and which has been found to be associated with the development of psychopathology is disgust (e.g., Rozin & Fallon, 1987). It has been established that disgust responding towards external stimuli plays a crucial role in some psychopathologies (e.g., generalised anxiety disorder, Cisler, Olatunji, & Lohr, 2009; phobias, Matchett & Davey, 1991; contamination-based obsessive-compulsive disorder, Woody & Tolin, 2002). It has also been recently shown that disgust responding towards the "self" plays an important role in psychopathology (e.g., Overton, Markland, Taggart, Bagshaw, & Simpson, 2008; Phillips, Senior, Fahy, & David, 1998; Powell,

Simpson, & Overton, 2013; Power & Dalgleish, 2008; Simpson, Hillman, Crawford, Overton, 2010).

Given the significance of disgust in understanding psychopathology, research into this phenomenon may enhance the impact and quality of existing clinical treatment, underlining the importance of the present thesis and research herein. This thesis has been produced with the primary aspiration of elucidating further the role of emotions, specifically disgust, in people's adaptation to chronic physical health conditions. In this thesis, primary emphasis is placed on the role of disgust in anxious and depressive outcomes of people with cancer as very little is known about this area.

Cancer is a life-threatening disease, where its diagnosis and treatment are often a traumatic experience and significantly affect patients' psychological wellbeing (e.g., Greimel & Freidl, 2000). Variations in psychological wellbeing are generally explored through studies of cancer diagnosis and enduring cancer experiences (e.g., hopelessness; Breitbart et al., 2000). However, this thesis focuses exclusively on elucidation of anxiety and depression as domains of patients' psychological wellbeing, as accumulating evidence suggests that anxiety and depression are among the most common symptoms experienced by cancer patients (e.g., Jacobsen & Jim, 2008).

Within this introductory review of the literature, the broad phenomena of anxiety and depression, which account for the huge decline in overall measures of quality of life in people with cancer (e.g., Hutter et al., 2013; Moussavi et al., 2007), are outlined. Next, an overview of the theoretical concept of disgust experiences are introduced, followed by the phenomenon of disgust in cancer and its role in anxiety and depression. Finally, the research agenda underlying the work contained in the present thesis is mapped out.

1.2 Anxiety and depression in people with cancer

1.2.1 Anxiety and depression in people with cancer – diagnostic history and operationalization

Cancer is a global disease burden which caused over 8 million deaths worldwide in 2013 and has shifted from the third leading cause of death in 1990 to the second leading cause, behind cardiovascular disease, in 2013 (e.g., Lozano et al., 2013; Naghavi et al., 2015). Cancer diagnosis is increasing rapidly. In 2013, there were 14.9 million incidences of new cancer cases worldwide and incidence rates have increased in most countries since 1990 (Fitzmaurice et al., 2015). This number is expected to rise in the future, where in the UK alone more than 3 million people are predicted to have a diagnosis of cancer by 2030 (Department of Health England, 2013).

In the context of cancer, it is well documented that patients frequently suffer from symptoms of anxiety and depression (e.g., Newport & Nemeroff, 1998; Stark & House, 2000). Since anxiety is a frequent response to threat, it is found in all clinical populations, and sometimes can be adaptive (e.g., in motivating behaviour that helps individuals cope with threatening situations; Spielberger, 2010). However, in certain circumstances it can become maladaptive. Such pathological anxiety has been described in Stark and House (2000) and is identified by the World Health Organization's International Classification of Disorders (ICD–10; World Health Organization, 1993) and the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-IV; American Psychiatric Association, 2013) with a few characteristics including: 1. Being out of proportion to the level of threat; 2. Persistence or deterioration without intervention; 3. A level of symptoms which are unacceptable regardless of the level of threat (these include recurring panic attacks, severe physical symptoms, and abnormal beliefs such as thoughts of sudden death); and 4. A disruption

of usual or desirable functioning. In practice, these criteria may be problematic to apply to cancer patients as it is challenging to evaluate when anxiety is disproportionate to the threat of cancer, since the disease is always associated with some real threat, therefore, it was suggested that a series of unacceptable symptoms and disruption in functioning are often at least as useful in defining pathological anxiety in a cancer patient as other criteria (Stark & House, 2000).

In cancer populations, depression and anxiety exist together more often than occurring exclusively and therefore it has been recommended that clinicians assessing anxiety always look for co-existent depression, as treatment for depression may help resolve the anxiety (Wise & Rieck, 1993). Depression also may be secondary to anxiety, a result from altered physiological pathways or the psychological consequences of experiencing and failing to manage stress (Heron et al., 2004). Depression is characterised by sustained low levels of interest and joy (American Psychiatric Association [APA], 2013), and refers to an extensive range of associated mental health issues defined by a few characteristics including: 1. Feeling sad or having a depressed mood; 2. Loss of interest or pleasure in activities once enjoyed; 3. Changes in appetite; 4. Trouble sleeping or sleeping too much; 5. Loss of energy or increased fatigue; 6. Increase in purposeless physical activity (e.g., hand-wringing or pacing) or slowed movements and speech (actions observable by others); 7. Feeling worthless or guilty; 8. Difficulty in thinking, concentrating, or making decisions; and 9. Experiencing thoughts of death, or suicide. Similar to anxiety, it is difficult to distinguish depression in cancer patients from the normal reaction in coping with the diagnosis. Depression frequently coexists with other problems (e.g., pain; Massie, 2004), and the symptoms that may be associated with depression, such as fatigue, loss of weight, and nutritional disorders are universally accepted as an effect of cancer, which make the identification of depression

in this particular group relatively complex (Spiegel & Giese-Davis, 2003). Therefore, it has been suggested to conceptualize anxiety and depression on a continuum of severity rather than identifying morbid levels (e.g., Lewinsohn, Solomon, Seeley, & Zeiss, 2000). In this thesis, I apply the continuum approach to anxiety and depression measurement, as is common in psychology, as these phenomena can perhaps be best understood on a continuum of severity.

1.2.2 Anxiety and depression as a major burden for people with cancer

Anxiety and depression have a significant impact on oncology patients' quality of life (e.g., Edwards & Clarke, 2004; Hutter et al., 2013). This psychological burden may interfere with the patient's ability to cope with the illness; lead to rejection of treatment; greater use of healthcare resources (e.g., Satin, Linden, Phillips, 2009); and is associated with more severe symptoms (e.g., Hirschfeld, 2001), poor compliance with treatment (e.g., O'Mahony et al., 2005), poor disease outcomes (e.g., Edwards & Clarke, 2004), and greater risk of death (e.g., Satin et al., 2009). Serious mental health problems, such as depression may even lead to suicide, contributing to the increasing statistics of suicide among cancer patients (e.g., Prieto et al., 2002; Yousaf, Christensen, Engholm, & Storm, 2005), where studies have consistently reported that the major risk factor in cancer suicides is depression (Spoletini et al., 2011). Depression and anxiety may not only impact the patients but also their families and caregivers, which may make the physical and emotional reliance on the key support network rather difficult (e.g., Pitceathly & Maguire, 2003).

1.2.3 Prevalence

Affective disorders, especially anxiety and depression, are among the most common mental health issues in people with cancer, where one out of two cancer patients reports mental health problems (Spoletini et al., 2008), although it has been

suggested that less than half of all cancer patients (i.e., 20–50%) are formally diagnosed and subsequently treated for anxiety or depression (Sellick & Edwardson, 2007). The prevalence of anxiety disorders in the general population is reported as between 1.1% and 4.4% in the UK (National Institute for Health and Care Excellence [NICE], 2014). The reported prevalence of anxiety problems in cancer patient populations varies widely between studies, but in comparison with the general population, pathological anxiety is more common in people with cancer than in those without any chronic medical condition, estimated at around around 11.7 – 24.0 % (in a large cancer cohort study, N = 8,265; Brintzenhofe-Szoc, Levin, Li, Kissane, & Zabora, 2009). The same goes for the prevalence rates of depression which has been found to occur in approximately 7% of the general population (APA, 2013); and is significantly higher among those with cancer ranged from 8% to 24% and differed by the type of instrument, type of cancer and treatment phase (Krebber et al., 2014).

1.2.4 Anxiety and depression as a risk factor in the prognosis of cancer

Data regarding the influence of psychological factors on the prognosis of cancer are available. Research has established that persistent activation of the hypothalamic-pituitary-adrenal axis in the chronic stress response and in depression, may suppress the immune resistance to tumours (e.g., Spiegel & Giese-Davis, 2003), contributing to the development and progression of some types of cancer (e.g., Pasquini & Biondi, 2007; Reiche, Nunes, & Morimoto, 2004). Depression also may affect white blood cell counts and natural killer (NK) cell numbers in cancer patients (Andersen, Kiecolt-Glaser, & Glaser, 1994), where the reduction in NK is found to be associated with the progression of cancer (e.g., metastatic breast cancer; Levy, Herberman, Lippman, D'Angelo, & Lee, 1991).

In certain types of cancer (e.g., breast), abnormalities in the circadian rhythm of cortisol have been observed in patients, which is similar to the loss of normal circadian variation in cortisol observed in depression, and predicts earlier mortality among metastatic breast cancer patients (e.g., Sephton, Sapolsky, Kraemer, & Spiegel, 2000). There is also some evidence that supportive interventions (i.e., cognitive-behavioural stress management therapy [CBT]; Cruess et al., 2000; experiential-existential group therapy; van der Pompe et al., 1997) may reduce anxious and/or depressive stress and may normalize cortisol levels (Spiegel & Giese-Davis, 2003), confirming the notion that the disruption in diurnal cortisol patterns is associated with higher probability of depression.

As well as the physiological routes, anxiety and depression might also affect the incidence and progression of cancer through their effects on behaviour and adherence to medical treatments (e.g. Spiegel & Giese-Davis, 2003), even though there has been competing evidence in this area, with some earlier studies linking higher depression and anxiety scores to increased adherence to chemotherapy and other forms of cancer treatment (e.g., Ayres et al, 1994). Nevertheless, depression has also been suggested to result in physical symptoms becoming resistant to conventional treatments with improvement seen only as depression is appropriately treated (Smith, Gomm, & Dickens, 2003).

1.2.5 Aetiology of anxiety and depression in people with cancer

There is evidence of a bidirectional relationship between cancer and depression (e.g., Spiegel & Giese-Davis, 2003). It is also established that the complex aetiology of anxiety and depression in people with cancer may involve a past history of depression (e.g., Nordin, Berglund, Glimelius, & Sjöden, 2001), reaction to the cancer diagnosis (e.g., Osborn, Demoncada, & Feuerstein, 2006; Stark & House, 2000), physiological

effects of certain treatments (e.g., Osborn et al., 2006), and the presence of unpleasant symptoms (e.g., pain, nausea, and fatigue; Stark & House, 2000), although the causal direction is uncertain. Concerns about disruptions in life plans (e.g., Osborn et al., 2006) and lack of family (e.g., Nordin et al., 2001) also play an aetiological role in depression in people with cancer.

There are also specific risk factors which could heighten the chance of developing anxiety and depression in adults with cancer. For depression, the factors include being a singleton (single, widowed, or divorced), unemployed or of lower socioeconomic status, and female in gender, while several other factors including history of alcohol or substance use or abuse and the current presence of alcohol or substance use or abuse have been suggested as risk factors for anxiety (Andersen et al., 2014).

Efforts focusing on better methods for identifying and treating depression in cancer patients are progressing. The International Standards of Care by National Comprehensive Cancer Network (NCCN; 2013), suggests that all cancer patients should be screened for distress (which includes depression) at their initial visit and at appropriate intervals, and their distress should be monitored and treated promptly. In order to improve care, it is important to know how many patients attending cancer services have major depression, and which patients are most likely to be depressed (Walker et al., 2014).

Exploring emotional factors such as disgust in the aetiology and maintenance of anxiety and depression in cancer patients may contribute to the early diagnosis of anxiety and depression and may ascertain specific signs and symptoms that may provide a reliable basis for accurately predicting anxiety and depression. Assessment of emotional factors could be usefully introduced and included as a pre-diagnostic

assessment for anxiety and depression. Implementation of behavioural, cognitive, and emotional strategies that manage disgust responding in individuals could then be suggested to maximize treatment outcomes for anxiety and depression. This identification may have the potential advantage of allowing oncologists and clinical professionals to intervene specifically to help anxious and depressed cancer patients.

1.3 Experiences of disgust

1.3.1 Origin of disgust

Disgust is a universal human emotion (Ekman, 1992), which was initially based on the rejection of hazardous foods, protecting an organism from ingesting potentially noxious substances (Rozin & Fallon, 1987). This emotion, however, according to the principle of preadaptation, later developed into a more complex disgust evaluation system through the interaction of biological and cultural evolution and has come to serve various functions far beyond its oral defence origins. The disgust evaluation system has enlarged from a food rejection system related to pathogen avoidance to avoidance of reminders of humans' animal nature, especially death (Rozin, & Haidt, 2013), as well as people or social groups who potentially have an infectious disease or mimic a disease cue (e.g., Curtis, Aunger, & Rabie, 2004; Rozin, Haidt, & Fincher, 2009). The disgust evaluation system was further extended into one that has come to regulate our social interactions, and morality, which facilitate the avoidance and elimination of socio-moral transgressions that breach culturally-defined virtues of purity and divinity (e.g., sexual violations; Chapman & Anderson, 2012), and, in some circumstances could be directed onto one's self (e.g., Overton et al., 2008). These disgust evaluations, however, have a common core function in that they motivate disease avoidance and defend the body and mind against threats (e.g., Curtis, de Barra,

& Aunger, 2011). The outputs – expressive, physiological, and behavioural also were generally conserved across the adaptations (Rozin, & Haidt, 2013).

1.3.2 Disgust as disease avoidance mechanism

Disgust is a powerful mechanism that is designed to protect humans from threats, caused by pathogens, and is often thought of as a "disease-avoidance" emotion (e.g., Curtis et al., 2011). Experiencing disgust may induce nauseous or queasy feelings (e.g., Rozin et al., 1999), and, consequently, make people naturally avoid individuals who appear to have an infectious disease (Kouznetsova, Stevenson, Oaten, & Case, 2012), and also those with non-infectious conditions that mimic disease cues (e.g., obesity and asymmetry; Park, Schaller, & Crandall, 2007). Disease avoidance serves a valuable adaptive function of protecting an individual's health, particularly when the body is vulnerable to disease (e.g., in the first trimester of pregnancy; Fessler, Eng, & Navarrete, 2005). It may also motivate a healthier mating choice (e.g., Tybur, Lieberman, & Griskevicius, 2009), and motivate humans to engage in hygienic behaviours (e.g., Curtis, 2007). This disgust-related defence partly explains the significantly lower level of recent infections in individuals with a higher sensitivity to disgust (e.g., Stevenson & Oaten, 2009). Disgust-related defence has a constructive manifestation in social contexts in protecting the organism through sanitation and prevention of disease (e.g., development of negative attitudes toward certain potential disease carriers; Olatunji & Sawchuk, 2005). Besides motivating humans to avoid potential disease stimuli, disgust also motivates people to distance themselves from the people they love when they pose a hygienic threat, to protect themselves from potential disease (e.g., Clark, 2014).

1.3.3 Dysfunction of the disease avoidance system

Because pathogens can be detrimental but extremely hard to detect, the disgust system evolved to be hypervigilant against unfamiliar stimuli (Aarøe, Petersen, &

Arceneaux, 2017). This includes hypervigilance towards those with non-infectious conditions that imitate features of stimuli that could make us unwell (e.g., obesity; Park et al., 2007; cancer; Fife & Wright, 2000). Cues to the disease threat tend to be only probabilistic indicators of the presence of danger (e.g., Nesse, 2005) and the perceptions of a threat to health can occur (or persist) in the absence of objective threat (e.g., Nemeroff, & Rozin, 1994, Reynolds, Consedine, Pizarro, & Bissett, 2013). As per the law of contagion, stimuli that have been in contact with the potential disease threat may also be avoided (e.g., Rozin, Haidt, McCauley, Dunlop, & Ashmore, 1999). Interpretation of such stimuli is inherently difficult for individuals in higher pathogen pressure (i.e., in polluted environments; Curtis et al., 2011) as the system might become hyper-protective. This hyper-attentive mode of disgust is more likely to generate false alarms, in which a pathogen and disease avoidance response would needlessly be deployed (Tybur, & Lieberman, 2016).

1.3.4 Individual differences in disgust responding

Individuals show variation in pathogen avoidance. The sources of diversity in the disgust response may lie in individuals' levels of disgust traits (e.g., disgust propensity [DP], how easily people are disgusted; Deacon & Olatunji, 2007; and disgust sensitivity [DS], how unpleasant the experience of disgust is to the individual; Curtis et al., 2011). Individuals differ in the extent to which they report finding relevant stimuli (e.g. faeces) disgusting and DP describes an individual's tendency to experience disgust (van Overveld et al., 2006). Currently, several self-report instruments have been developed to assess inter-individual propensity to disgust across a number of domains, such as contamination-based and animal-reminder disgust (see van Overveld et al., 2006). A related concept, DS, can be defined as the degree to which the disgust response is unpleasant or distressing to an individual (van Overveld et al., 2006). This

trait has been demonstrated as psychometrically separable from DP (Fergus, & Valentiner, 2009).

Individuals with higher levels of disgust traits (e.g., DP; Deacon & Olatunji, 2007; and/or DS; Curtis et al., 201) worry more about contamination, and avoid sources of pathogens more actively than others and typically show higher concern about infectious disease (i.e., display more health anxiety attitudes; Olatunji, 2009), and tend to show stronger aversions to disgust stimuli (i.e., DS; van Overveld et al., 2006).

1.3.5 Disgust directed towards self (self-disgust)

Disgust is classically viewed as a response to external disgust elicitors. From what has been initially mentioned in the origin of disgust section, the occurrence of disgust has evolved from a basic disease-avoidance emotion to one that has come to regulate our social interactions, morality, and, in some circumstances could be directed onto one's self. Self-disgust (SD) has been discussed from a few different perspectives, however the definition of self-disgust is ambiguous in the literature prior to recent work. It has been variously defined as a negative personality trait (Olatunji, David, & Ciesielski, 2012), as a basic emotional experience of disgust towards the self (Overton et al., 2008), as theoretically similar to the self-conscious emotion of shame (Power & Dalgleish, 2008), and as a unique self-conscious emotion by itself (Roberts & Goldenberg, 2007). Another perspective on self-disgust is self-disgust as the disturbed sense of self by Moncrieff-Boyd, Byrne, & Nunn (2014). They propose that the disgust experience is grounded by the ability to discriminate between the self and non-self, where self and non-self discrimination is an adaptive mechanism that enables rejection and avoidance of potentially aversive external influences. Recently, a more structured definition has been provided by Powell, Simpson, & Overton (2015) who define self-disgust as a dysfunctional and persistent, self-focused generalisation of the otherwise

adaptive disgust response (i.e., incorporating congruent cognitive, emotional, behavioural, and physiological elements; Rozin & Fallon, 1987).

Self-disgust is theorised by Powell et al. (2015) as an "emotion schema", a unique reciprocal interaction between a stable pattern of disgust-based state and trait cognitive-affective constructs, which result in a dysfunctional, enduring disgust-based orientation towards the self. It is hypothesised that during the early stages of an emerging self-disgust schema, initial reactions which are state-like disgust responses to significant feature(s) of the self are developed. These disgust responses towards self can be adaptive (e.g., by promoting cleansing behaviour). However, if the disgust is directed to a significant aspect of self, and is appraised as relatively constant, uncleansable or impossible to alter, this self-disgust emotion will lose its adaptive value and this irresolvable disgust reaction is theorised as maladaptive. Further, as a result of persistent disgust responses, the elaborated cognitive content facilitates the development of enduring trait-like cognitive-affective disgust-based orientation to the self, or a stable self-aspect. This maladaptive emotion schema may then influence an individuals' perception, appraisals and future information processing.

The emotion schema may be also influenced by the levels of disgust experienced towards external disgust stimuli (DP and DS). Recent correlations showed that self-disgust, as measured by the SDS, is related with feelings of externally-oriented disgust (Overton et al., 2008; Simpson et al., 2010). These suggest that internal disgust experiences in oneself (SD) may be directly related to and may be reflected in the levels of disgust experienced towards external disgust stimuli.

The phenomenology of self-disgust has been noted to overlap with other self-conscious emotions, such as shame, guilt, and pride. Despite extensive debate on whether self-disgust may be exclusively distinct from other concepts such as shame and

guilt, and how it may represent an interesting topic for study in its own right (e.g., Roberts & Goldenberg, 2007; Simpson et al., 2010), emerging theory and evidence suggests that self-disgust is distinct and more extreme by comparison (Brake, Rojas, Badour, Dutton, & Feldner, 2017); this will be discussed below in more detail.

Self-disgust has been argued to be closely related to the self-conscious emotions, which involve complex evaluative processes that consist of activating attention to stable self-representations, a judgment of congruence of the situation with valued self-identities, and the appraisals of causal attributions that seek to explain specific outcomes (Tracy & Robins, 2004). To a certain extent, self-disgust could be described as a self-conscious emotion considering it fundamentally requires a concept of self, however, it may be theoretically distinguished from other self-conscious emotions such as shame, guilt and embarrassment by disgust-based, cognitive affective content (Powell, 2013), which invariably involves the aspect of disease avoidance mechanisms that underlie the development of the self-directed disgust emotion.

Furthermore, self-disgust may be specifically separated from guilt and embarrassment through the fact that the self-concept aspect in the construct of self-disgust is perceived as critical and enduring, whereas guilt and embarrassment are characterised as less global and embodied emotions, linked to specific, often incongruent and atypical actions (Powell, 2013). However, it remains unclear how self-disgust may be independent of shame as it is uncertain whether self-disgust is just a more severe derivative of shame, or that shame and self-disgust are complex versions of the basic emotion of disgust (Roberts & Goldenberg, 2007). Brake et al. (2007) suggests that self-disgust may be a distinct from shame by virtue of the different patterns of association that have been demonstrated between the construct and shame, when compared to certain personality traits (Penley & Tomaka, 2002), and differences

in physiological and facial response have been documented between these two constructs (Sambataro et al., 2006; Scherer & Wallbott, 1994; Tracy et al., 2009). The exact relationship between shame and self-disgust, however, requires further empirical investigation.

Another concept that has potential commonality with self-disgust is the general negative affectivity trait. Individuals high in trait negative affectivity typically focus on the negative side of life and tend to have negative views of themselves, other people and the world in general (Gemzøe, & Einarsen, 2002). Self-disgust may be plausibly separated from general negative affectivity, as negative affect is more about subjective distress, reflecting the extent to which one is feeling upset or unpleasantly aroused, not specifically focusing on the negative feelings that are involved in disgust, and not necessarily focused on the self (the negative affectivity may be directed to other people and the world in general), as conceptualised by self-disgust.

In this thesis, I will adopt the latest definition of self-disgust as an emotion schema, as has been defined by Powell et al. (2015), subsequently placing substantial emphasis and focus on disease avoidance (e.g., Curtis et al., 2011), which underline the repulsive feelings towards the self as one significant contributor to anxiety and depression in people with cancer.

1.4 The phenomenon of disgust in cancer

1.4.1 Propensity and sensitivity to disgust in people with cancer

Cancer patients have to endure many disgust elicitors, both from the disease itself and the side effects of treatment. Many of them experience massive bodily changes (e.g., disfigurement; Costa, Nogueira, de Souza Lima, Mendonça, & Leles, 2014; hair loss, Batchelor, 2001; wound infection; Sørensen, Hørby, Friis, Pilsgaard, & Jørgensen, 2002) and biological changes (e.g., immunosuppression; Medler, Cotechini,

& Coussens, 2015). They are also typically faced with disgust-inducing procedures during their treatments and the cancer care process (e.g., colostomy; Reynolds, McCambridge, Bissett, & Consedine, 2014). These changes and experiences may occasion the alteration in DP and DS in patients, which may cause cancer patients to find disgust stimuli more aversive and threatening. DP and DS have been documented to change during certain conditions (e.g., disease exposure; De Barra, Islam, & Curtis, 2014; Stevenson et al., 2009; periods of health vulnerability; Fessler et al., 2015; after aversive experiences of disgust; Engelhard, Olatunji, & de Jong, 2011).

Disgust experiences are particularly intrinsically aversive and uncomfortable for cancer patients who have a higher trait of DP and DS, given higher levels of DP are assumed to increase the likelihood of individuals experiencing disgust (e.g., van Overveld et al., 2006), and DS may enhance the intensity with which individuals appraise cues of disgust and experience of disgust (Engelhard et al., 2011).

In cancer, a handful of studies have attempted to understand the effects of disgust traits, however it has only been studied in a colorectal context. DP has been associated with the avoidance of a colostomy bag (Reynolds et al., 2014), greater perceived stigma and lower life satisfaction (Smith, Loewenstein, Rozin, Sherriff, & Ubel, 2007), and prospectively predicts worse quality of life three months later in individuals with anal incontinence (Reynolds, Bissett, & Consedine, 2015). However, despite their potential relevance to all cancers, disgust traits have not yet been studied outside of the colorectal context.

1.4.2 Trait of self-disgust in people with cancer

The disgust-related changes and experiences due to cancer, not only may result in changes in patients' DP and DS towards external stimuli, it also may alter people with cancer's experiences of disgust towards themselves. The idea of a maladaptive

disgust response towards oneself, which is permanent, uncleansable, or difficult to alter, is based on the premise that people with cancer experience cumulative effects of changes resulting from the cancer diagnosis, which may eventually become an enduring and permanent transformation (Mathieson & Stam 1995). In addition, self-focused revulsion in cancer patients may not merely be developed by any persistent transformation following the cancer diagnosis, but rather may be cultivated by the persistent comparison of themselves with others due to their massive bodily changes (e.g., Hagedoorn, Sneeuw, & Aaronson, 2002). Comparisons with others is one of the major triggers or intensifiers of disgust towards the self (Powell, Overton, & Simpson, 2014), and potentially includes comparisons with one's old self before the cancer diagnosis (e.g., Mathieson & Stam, 1995; Rosman, 2004).

People with cancer also encounter behavioural side effects (e.g. incontinence, Reynolds, McCambridge, & Consedine, 2015; sickness and nausea, Hesketh, 2008), and shifts in self-identity (e.g., loss of masculinity, Chapple & Ziebland, 2002; or femininity, Schover, 1994; and the salience of mortality, Goldenberg, Arndt, Hart, & Routledge, 2008). Therefore, disgust towards behavioural and/or characterological aspects of the self may also emerge in people with cancer due to the behavioural consequences of the disease, including physiological symptoms that visibly impair behaviour (e.g., Larsson, Hedelin, & Athlin, 2003), normal daily functioning (e.g., Anderson, Alexander, & Rodriguez, 2008), and deterioration in sexual functioning resulting from certain cancer treatments, which may cause permanent sexual dysfunction (e.g., radical prostatectomy; Perez et al., 1997). Sexual dysfunctions might heighten the level of disgust towards the self (de Jong, van Lankveld, Elgersma, & Borg, 2010), potentially through a perceived lower mating quality (de Jong & Borg, 2015), where a person's physical appearance (e.g., altered body and physical deformation due to cancer surgery; Hopwood, Fletcher,

Lee, & Al Ghazal, 2001; skin discoloration due to cancer treatment; White, 2000) and disgust-inducing conditions (e.g., fungating wound; Probst, Arber, Trojan, & Faithfull, 2012; stoma usage; Smith et al., 2007) may elicit disgust in potential sex partners.

Another essential aspect of self-disgust as conceptualised by Powell et al. (2015) is that it is moulded by individual and sociocultural differences - self-disgust is theorised to be based on an individual's socioculturally-defined index of what is repulsive, and occurs when certain features of the self are perceived to belong within this set. In cancer patients, failing to accomplish or maintain certain standards or an "ideal self", signalled via numerous sources, including culture, family, and peers, including the loss of masculine or feminine roles and identities (e.g., Colyer, 1996), may elicit a feeling of disgust towards the self (Ridolfi & Crowther, 2013). However, in cancer, most of these experiences have been documented qualitatively (e.g., disgust towards the physical self, Rosman, 2004). No research to date has explored and quantified the psychological profile of self-disgust in a cancer sample.

1.4.3 Disgust as a disease-avoidance mechanism underlying individuals' responses towards people with cancer

As mentioned, grounded in the theory of disgust as an emotion that facilitates the avoidance of disease and contamination (e.g., Oaten, Stevenson, & Case, 2009), humans naturally have the tendency to exhibit negative responses and behaviours to cancer patients, such as avoidance, and potential stigma, which may be ingrained by aversion and disgust-based self-protection in individuals (i.e., disease avoidance). Neal (2007) cited a woman who recalls the rejection she encountered while undergoing treatment for her cancer:

> "They (friends and associates) said that if they go into my bathroom, maybe I had left some chemical residue and that maybe they will get infected. They stopped talking to me, greeting me, nobody was going to the house." (p. 3)

These disgust-based defence mechanisms are higher in individuals with higher levels of disgust traits, for whom disgust is more easily triggered (DP; Deacon & Olatunji, 2007), and once triggered, may be too sensitive or intensely experienced (DS; Curtis et al., 2011). Therefore, due to the nature of their disgust responses these individuals are potentially more inclined to display negative responses towards people with cancer.

This perspective subsequently directs attention to another crucial possibility, whether the levels of disgust traits in individuals around them, especially their significant others, may determine the level of the patients' self-disgust experiences, via others' disgust reactions, and consequently their anxiety and depression. Partners with high disgust traits may be easily triggered by disgust-eliciting stimuli when being around cancer patients and have a greater tendency to negatively appraise their experience of disgust. Individuals with cancer, consequently, may internalize the revulsion of others directed towards them in the form of self-disgust, which has been suggested to contribute to the emergence of a self-disgust schema (Powell et al., 2015). Regardless of these strong potential connections, no study of the dyadic effect of partners' or associates' disgust traits on self-disgust, anxiety and depression in cancer patients has yet been made.

1.4.4 Disgust as a disease-avoidance mechanism underlying individuals' avoidance and awkwardness stigma towards people with cancer.

In the context of cancer patients, it is assumed that self-disgust is likely to be substantially influenced by the public stigma associated with the illness, as most cancer

patients get treated as objects of disease, disgust and contamination (e.g., Neal, 2007). Yet it is possible that the negative attitudes expressed towards people with cancer are in fact people's attempts to defend themselves effectively against the disease and are manifestations of their psychological tendencies (i.e., DS; Curtis et al., 2011; DP; Deacon & Olatunji, 2007; and other associated negative emotions; Olatunji, 2009). A growing body of evidence has revealed that disgust traits in individuals may be predictive of their tendency to stigmatise others (e.g., towards people with different sexual orientation, Inbar, Pizarro, Knobe, & Bloom, 2009; Olatunji, 2008; obesity, Vartanian, 2010), suggesting some individuals may be more prone to stigmatise others. Disgust as a predictor of stigma towards people with cancer has been explored by Pryor, Reeder, Yeadon, and Hesson-McInnis (2004) who successfully proved that DP significantly predicted avoidance reactions to a composite of stigmatized health conditions, including Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome, obesity, and cancer, in a computerised behavioural task. However, individual effects on cancer were not explored in this study. Furthermore, the study did not include an experimental control or neutral comparison; control for bidirectional effects of existing stigma responses on disgust; consider different domains of disgust responding; or test a mechanism for their findings (e.g., via increases in negative emotions). Accordingly, the causal role that disgust traits in individuals may have in predicting stigma towards people with cancer remains unclear. Consistent with prior empirical work, there is the possibility of a causal relationship between stigma towards people with cancer and individuals' disgust traits and responses, which is fundamentally grounded in the concept of disgust as a disease-avoidance mechanism, that requires further validation and remains to be explored.

1.4.5 The phenomenon of disgust in cancer and its role in the development of anxiety and depression

Previously, anxiety and depression have been widely understood from the cognitive perspective (e.g., cognitive theory of depression; Beck, 1967, 1976; negative self-schemata; Alloy, Abramson, Keyser, Gerstein, & Sylvia, 2008). However, more effort is now being made to explore emotional factors, such as disgust, in the development of anxiety and depression (e.g., Greenberg, 2008; Power & Dalgleish, 2008; Powell et al., 2013).

Disgust has been highlighted as a correlate of poorer psychological health by over two decades of work in cancer-free samples (e.g., Davey, 2011), and as an indicator for mental health issues, including specific phobias (e.g., Matchett & Davey, 1991), contamination-based obsessive-compulsive disorder (e.g., OCD; Woody & Tolin, 2002), eating disorders (e.g., Fox & Power, 2009), generalised anxiety disorder (e.g., Cisler et al., 2009), and depression (Alanazi, Powell, & Power, 2015). High levels of DP have been found to be associated with greater perceived stigma and lower life satisfaction in people with a colostomy (e.g., Smith et al., 2007), and predicts worse quality of life three months later in individuals with anal incontinence (e.g., Reynolds et al., 2015). There is also a neural basis for disgust that may account for its role in the development of psychopathology (e.g., anxiety disorders; Krendl, Macrae, Kelley, Fugelsang, & Heatherton, 2006). Thus, disgust may be one of the factors contributing to poorer psychological adaptation to cancer.

Besides disgust towards external stimuli, recently disgust responding towards the self has been suggested to be involved in the genesis of depressive experience by being maladaptively self-focused (e.g., Overton et al., 2008; Phillips et al., 1998; Powell et al., 2013; Power & Dalgleish, 2008; Simpson et al., 2010; Surguladze et al., 2010).

The first, significant direct evidence for the involvement of disgust directed towards the self in depression was established by Overton et al. (2008) through a hypothesised mediation model, using a new measure to assess self-disgust (the Self-Disgust Scale; SDS; Overton et al., 2008). Their study found that levels of SD were significantly correlated with depressive symptoms, and that self-disgust partially mediated the relationship between dysfunctional cognitions and depressive symptomatology. These results were then replicated by Simpson et al. (2010) who found that both self-disgust and self-esteem acted as independent partial mediators between dysfunctional cognitions and depressive symptoms. The hypothesised mediation model then was scrutinised by Powell et al. (2013), who disputed the simplistic cross-sectional model by Overton et al. (2008). Utilizing a longitudinal path analysis, Powell et al. (2013) elucidated the temporal relations between the variables, showing that self-disgust can predict depressive symptoms over time. These findings are further strengthened by emerging evidence validating a degree of self-focused disgust in the development of psychopathology (e.g., eating disorders, Bell, Coulthard, & Wildbur, 2017; Ille, Schöggl, Kapfhammer, Arendasy, Sommer, & Schienle, 2014; borderline personality disorder [BPD], Abdul-Hamid, Denman, & Dudas, 2014; Ille et al., 2014; schizophrenia, Ille, Schony, Kapfhammer, & Schienle, 2010; Ille et al., 2014; major depression, Schienle, Ille, Sommer, Arendasy, 2014; Ille et al., 2014; and medication-free remitted Major Depressive Disorder, Zahn et al., 2015).

This evidence supports the idea that individuals with higher levels of disgust traits also show greater levels of psychopathology (e.g., DP; Davey, 2011; self-directed disgust; Powell et al., 2013). What is less clear, however, is whether these associations also will be observed in people with chronic physical health problems, and in particular cancer, who are exposed to a variety of disgust-eliciting experiences, both from the

disease itself and the side effects of treatment (e.g. colostomy, Reynolds et al., 2014), and as mentioned previously, who potentially undergo alterations in their disgust traits (i.e., propensity, sensitivity, self-disgust) as the result of cancer.

1.5 Research agenda of the present thesis

Based on the gaps in the literature highlighted above, the aim behind the current thesis is to provide greater insight into the role of disgust experiences in predicting depressive and anxious outcomes in cancer. It has three primary objectives scaffolding it: to elucidate and provide data on the relationship between individuals' disgust traits (as measured by self-disgust, DP, and DS) and anxious and depressive outcomes in people with cancer; to establish whether disgust traits in cancer patients' partners may determine the level of the cancer patients' self-directed disgust experiences, anxiety, and depression; and to establish a causal relationship between disgust traits and stigma towards people with cancer. Data collected to inform these objectives are addressed sequentially throughout the thesis, with each subsequent chapter focusing on a particular research question:

1.5.1 What is the disgust profile in terms of self-disgust, DP, and DS in cancer patients in comparison with age and gender matched controls? How do these disgust traits affect the levels of anxiety and depression in people with cancer, and how is it different from people without cancer?

Chapter II has been written in respect of the above question. In an attempt to understand how disgust traits in cancer patients may affect their levels of anxiety and depression, a cross-sectional study was carried out. In particular, this research aimed to address three issues: first, to measure the disgust profile (in terms of self-disgust, DP, and DS) in cancer patients in comparison with age and gender matched controls; second, to explore the predictive effect of these disgust traits on levels of anxiety and

depression in people with cancer; and third, to identify how those predictive effects may potentially differ between people with and without cancer. Note: This chapter has been published: Azlan, H. A., Overton, P. G., Simpson, J., & Powell, P. A. (2017). Differential disgust responding in people with cancer and implications for psychological wellbeing. *Psychology & health*, *32*(1), 19-37. Copyright Taylor & Francis.

1.5.2 How do partners' disgust traits influence levels of self-disgust in people with cancer and their subsequent anxiety and depression?

Findings from Chapter II suggested that there are specific disgust traits (disgust sensitivity and self-disgust) in people with cancer that have significant roles in predicting their anxious and depressive symptoms. To identify the potential source(s) of self-disgust, Chapter III utilized a dyadic study to examine the relationship between disgust traits in cancer patients' partners, and how it may influence the feelings of self-disgust, anxiety, and depression in cancer patients. Chapter III presents a report of a dyadic study that was carried out to establish whether DP and DS in cancer patients' partners, may determine the level of the cancer patients' self-disgust, and consequently their anxiety and depression. Note: This chapter has been published: Azlan, H. A., Overton, P. G., Simpson, J., & Powell, P. A. (2017). Effect of Partners' Disgust Responses on Psychological Wellbeing in Cancer Patients. *Journal of clinical psychology in medical settings*, *24*(3-4), 355-364.

1.5.3 How do disgust traits in individuals impact their avoidance- and awkwardness-based stigma towards people with cancer?

Findings from Chapter III suggested that the disgust reactions of others were potentially a significant cause and source of self-disgust in people with cancer, which may further lead to anxious and depressive symptoms. These findings led to the study in Chapter IV, which has been designed to explore the role of disgust in predicting

stigma towards people with cancer. Chapter IV presents a report of a study designed to establish a causal relationship between disgust traits and avoidance- and awkwardness-based stigma towards people with cancer in a two-phase study, with a survey and experimental component. With this current experiment, a mediation model was utilized to test the proposed direct and indirect relationships among the participants' exposure to disgust-evoking cancer stimuli on their avoidance- and awkwardness-based stigma towards people with cancer, through negative emotion. Moderated mediation models were carried out to test whether the mediational pathway described above was greater for those who were higher in disgust propensity. A general discussion of the above research, including its overall strength and limitations, and some recommendations for future studies, follows in the concluding Chapter V.

II. DIFFERENTIAL DISGUST RESPONDING IN PEOPLE WITH CANCER AND IMPLICATIONS FOR PSYCHOLOGICAL WELLBEING

2.1 Introduction

Disgust is a universal human emotion (Ekman, 1992), theorised to be an evolved derivative of distaste, which prevents an organism from ingesting potentially harmful substances (Rozin & Fallon, 1987). The emotion is thought to have been evolutionarily 'co-apted' to protect against broader pathogenic threats to the body from potentially infectious stimuli (Curtis e al., 2004), and wider interpersonal and social elicitors that violate sociocultural norms of purity and sanctity (e.g. sexual violations; Chapman & Anderson, 2012). Given its particular relevance in facilitating good health, the disgust response has an important role to play in understanding psychological reactions to disease, including chronic illnesses such as cancer (e.g. Reynolds et al., 2013).

There are at least two reasons why disgust responses may be particularly relevant in the context of cancer. First, people with cancer may be exposed to a variety of disgust-eliciting experiences, both from the disease itself and the side effects of treatment. These include, but are not limited to, significant bodily changes (e.g. malignant wounds, Lund-Nielsen, Müller, & Adamsen, 2005; cancer-related lymphedema, Beck, Wanchai, Stewart, Cormier, & Armer, 2012; colostomy, Reynolds et al., 2014; disfigurement, Costa et al., 2014; and hair loss, Batchelor, 2001), behavioural side effects (e.g. incontinence, Reynolds et al., 2015; sickness and nausea, Hesketh, 2008), and shifts in self-identity (e.g. loss of masculinity, Chapple & Ziebland, 2002; or femininity, Schover, 1994; and the salience of mortality, Goldenberg et al., 2008).

Second, cancer and certain cancer treatments may produce significant changes in one's biological functions, such as immunosuppression (e.g. Medler et al., 2015).

Major biological changes, for example those associated with menstrual phase (Fessler & Navarrete, 2003), pregnancy (Fessler et al., 2005) and ageing (Fajula, Bonin-Guillaume, Jouve, & Blin, 2013) are associated with a differential pattern of disgust responding. Therefore, potential differences in one's disgust responses as a consequence of cancer can be hypothesised.

Differences in disgust responses as a result of cancer may have serious psychological and behavioural health implications. Unregulated disgust reactions have been shown to be associated with the avoidance of cancer screening behaviours (Reynolds et al., 2013, 2014), wound care (Gaind, Clarke, & Butler, 2011) and social avoidance in the context of bowel/health problems (Reynolds, Lin, Zhou, & Consedine, 2015). Heightened disgust responses have also been shown to be associated with mental health problems, such as anxiety (Cisler et al., 2009) and depression (Alanazi et al., 2015), and, thus, may be one of the factors contributing to poorer psychological adaptation to cancer. Several disgust traits have been shown to predict symptoms of mental health in cancer-free samples. For example, being more prone to disgust predicts greater symptoms of anxiety (Cisler et al., 2009), while finding the disgust response more aversive has been associated with certain forms of anxious responding (van Overveld et al., 2006) and depression (Ille et al., 2010). Self-directed disgust is also a significant vulnerability factor for subsequent depressive symptoms (Overton et al., 2008; Powell et al., 2013).

While people's disgust responses (i.e., the intercept) may be affected by cancer and thus influence wellbeing, it is also plausible that the relationship between one's disgust responses and mental health outcomes (i.e., the slope) may differ in a cancer group. Psychological wellbeing in people who are well is influenced by a wide range of psychosocial factors (Diener, Suh, Lucas, & Smith, 1999). However, in a serious health

condition like cancer, I anticipate that the factors influencing wellbeing will narrow somewhat to become more focused on physical health. There is evidence that cancer, and other chronic physical illnesses, can become all-consuming (e.g. Gibson et al., 2016; Shragge, Wismer, Olson, & Baracos, 2007). For example, cancer patients often have difficulty focusing attention away from the disease, tend to ruminate on it (e.g. Bishop & Warr, 2003; Chan, Ho, Tedeschi, & Leung, 2011) and have cancer-related negative intrusive thoughts (e.g. Brenne et al., 2013; Walker, Nail, Larsen, Magill, & Schwartz, 1996). Thus, I expect that changes engendered by cancer and its treatment – that are disgust-provoking (Powell, Azlan, Simpson, & Overton, 2016) and germane to the diagnosis – may result in disgust reactions having a stronger influence on current psychological wellbeing in people with cancer (vs. cancer-free controls). Few studies, however, have examined the prediction of disgust responses on the psychological wellbeing of individuals with cancer, and those that have had a restricted focus on disgust proneness in colorectal cancer scenarios only (e.g. Reynolds et al., 2013, 2014; Smith et al., 2007). Disgust responses, however, are likely to be relevant to many types of cancer. Given the above literature, significant associations between disgust responses and symptoms of depression and anxiety can be expected in a cancer sample, and these may differ from a control sample.

In this study I tested the above hypotheses, by (i) exploring the expression of three discrete disgust traits (‘disgust propensity’, ‘disgust sensitivity’ and ‘self-disgust’) in a heterogeneous cancer sample, in comparison to a cancer-free, age- and gender-matched control comparison group; and (ii) quantitatively investigating their independent predictive relationships with participants’ symptoms of anxiety and depression in the two groups. I will first introduce the three disgust traits before outlining the predictions.

2.1.1 Disgust propensity

Perhaps the most studied of the disgust traits is DP. Individuals differ in the extent to which they report finding relevant stimuli (e.g. faeces) disgusting and several self-report instruments have now been developed to assess inter-individual propensity to disgust across a number of domains, such as contamination-based and animal-reminder disgust (see van Overveld et al., 2006). A heightened disgust proneness has been highlighted as a correlate of poorer psychological health by over two decades of work (Davey, 2011), and as a marker for mental health problems, including specific phobias (Matchett & Davey, 1991), contamination-based obsessive-compulsive disorder (OCD; Woody & Tolin, 2002) and generalised anxiety disorder (Cisler et al., 2009).

In colorectal cancer, higher levels of DP have been associated with avoidance of hypothetical treatment stimuli (i.e., a colostomy bag), delay in help seeking for bowel symptoms and a lower projected treatment adherence due to disgust-based side effects (Reynolds et al., 2014). It has also been shown to be associated with greater perceived stigma and lower life satisfaction in people with a colostomy (Smith et al., 2007), and prospectively predicts worse quality of life three months later in individuals with anal incontinence (Reynolds et al., 2015). However, despite its potential relevance to all cancers, DP has not yet been studied outside of the colorectal context.

2.1.2 Disgust sensitivity

The development of psychological problems may not only depend on their how often people experience disgust (i.e., DP), but also on how they appraise the experience (DS). DS has been demonstrated as psychometrically separable from DP (Fergus & Valentiner, 2009), and has independent links with mental health problems (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; van Overveld et al., 2006). For example, a study with people with emetophobia (fear of vomiting) found that DS was a better

predictor of anxious symptoms than DP (van Overveld, de Jong, Peters, van Hout, & Bouman, 2008). Moreover, when exploring posttraumatic stress in soldiers deployed to Afghanistan, DS was found to moderate the link between peritraumatic disgust and symptom severity (Engelhard et al., 2011). Indeed, work is increasingly exploring the role of cognitive appraisals in disgust experiences as a pathway to psychological distress (e.g. de Jong, van Overveld, & Peters, 2011; Teachman, 2006). Given the possible greater exposure to, and particularly aversive nature of, the disgust-eliciting stimuli that cancer patients may have to encounter, it is highly likely that the way an individual appraises these experiences will be important for their psychological adjustment. Nevertheless, no study to date has explored the psychological profile or correlates of DS in a cancer sample.

2.1.3 Self-disgust

A third way disgust responses may be detrimental to psychological wellbeing is if they are directed towards oneself (Overton et al., 2008). 'Self-disgust' can be defined as a schematic appraisal of physical and/or behavioural aspects of the self as objects of disgust (Powell et al., 2015a). Heightened SD has been associated with a range of mental health problems, including depression (Overton et al., 2008), sexual dysfunction (de Jong & Borg, 2015), eating disorders (Fox, Grange, & Power, 2015) and OCD (Olatunji, Cox, & Kim, 2015). Powell et al. (2013), for example, found SD to be a stable predictor of depressive symptoms measured 12 months later, when controlling for prior levels of depression, with disgust towards physical appearance making the strongest contribution.

Disgust and SD have an intimate link with one's body image (Powell, Simpson, & Overton, 2015b). For example, disgust has been linked to body dissatisfaction and appearance concerns (e.g. Griffiths & Page, 2008; O'Brien et al., 2013; Park et al.,

2007). Hence, physiological changes as a result of both the cancer itself and treatment (e.g. hair loss, surgical alterations, unpleasant odours etc.) have the potential to generate a disgust response that is not easy to evade (Reynolds, Bissett, et al., 2015). Indeed, physical SD has been recognised qualitatively in patients with cancer (e.g. Björklund, Sarvimäki, & Berg, 2010), and may be particularly pronounced after treatments such as surgery (e.g. Hopwood et al., 2001) and chemotherapy (e.g. Rosman, 2004). Self-disgust for behavioural and/or characterological aspects of the self may also be affected by cancer due to behavioural consequences of the disease (e.g. sexual problems, incontinence and other physiological symptoms that visibly impair behaviour; Larsson et al., 2003). As well as affecting psychological health, increased physical SD may have practical implications in a cancer context, for example by leading to avoidance in wound-care (Goode, 2004).

2.1.4 The present research

Disgust reactions have been notably absent from systematic investigations into the wellbeing of people with cancer. In the present study, I examined the expression of three discrete disgust traits, and their relative associations with anxious and depressive symptoms, in cancer patients and a matched cancer-free control group. I made the following predictions:

(1) Disgust propensity and sensitivity would be significantly different in people with cancer than controls. The increased exposure to, and aversive nature of, disgust elicitors in cancer, as well as immunosuppression effects, may cause DP and DS to increase. However, past evidence has also shown that DP may decrease as a consequence of repeated exposure to disgust elicitors through habituation (e.g. Rozin, 2008), while no work has investigated the effect of exposure on DS, so a non-directional prediction was adopted.

(2) Self-disgust would be significantly higher in people with cancer than controls. Based on the physical changes to the body that are apparent in cancer, and which have the potential to elicit disgust (Björklund et al., 2010), as well as the potential to see one's body as diseased and contaminated by cancer (Vidya & Nasira, 2014), I expected to observe higher physical SD in the cancer sample. Due to the behavioural consequences of cancer and its treatment that may elicit disgust (e.g. incontinence, vomiting), and the positive correlation with physical SD, the same pattern was also expected to be observed in behavioural SD, the experience of enduring disgust toward the way one acts (Powell et al., 2016).

(3) Cancer patients' disgust traits, particularly DS (appraising disgust negatively) and SD, would be independently positively associated with symptoms of anxiety and depression, and these disgust responses would matter significantly more for cancer patients' than controls' psychological wellbeing. Symptoms of anxiety and depression have been shown to have a stronger relationship with DS and SD than DP (Powell et al., 2016), and so I expected the former traits to have the stronger association. Given the nature of the eliciting stimuli (i.e., cancer and its side effects), a directional prediction that the disgust traits in people with cancer would have a larger relationship with symptoms of depression and anxiety than the same relationships in controls was made.

2.2 Method

2.2.1 Participants

One hundred and seven participants who reported a cancer diagnosis were matched by age and gender with 107 controls who reported never being diagnosed with cancer. Most participants were women (72.0%), with ages ranging from 19 to 84 years (M = 55.36, SD = 13.05). All patients were having an active cancer diagnosis at the

point of this study (either recently diagnosed, undergoing treatment, or experiencing some degree of persistent or recurrent disease) rather than being in remission. Participants had various types of primary cancer, the most common being breast (30.6%), head and neck (21.6%), and gynaecological cancers (18.0%; both genders considered together). A breakdown of cancer type by gender can be found in Table 2.1.

Table 2. 1 Primary cancer diagnosis (cancer sample) by gender.

Male			Female		
Primary cancer	N	%	Primary cancer	N	%
Head and neck	13	(40.1)	Breast	34	(42.0)
Prostate	7	(21.9)	Gynaecological	20	(24.7)
Brain	4	(12.5)	Head and neck	11	(13.6)
Skin	2	(6.3)	Brain	5	(6.2)
Blood	1	(3.1)	Colorectal	4	(4.9)
Colorectal	1	(3.1)	Bone	2	(2.5)
Lung	1	(3.1)	Lung	2	(2.5)
Testicular	1	(3.1)	Skin	1	(1.2)
Unspecified	2	(6.3)	Non-Hodgkin Lymphoma	1	(1.2)
			Blood	1	(1.2)

Note: One hundred and seven participants, however the absolute counts are greater because three participants reported more than one type of primary cancer.

Three participants reported more than one type of primary cancer. Time since cancer diagnosis averaged 4.99 years (*SD* = 4.93). The majority of participants (81.0%) had received multiple treatments for their cancer, with surgery (81.0%), radiotherapy (54.0%) and chemotherapy (44.1%) being the most common.

2.2.2 Procedure

Ethical approval was granted by the University of Sheffield prior to data collection. As part of a larger survey into psychological responses to cancer, cancer charities and support groups were approached with a link to an online survey. Participants from the cancer group were told that the purpose of the study is to find out how people of any age with any type of cancer feel about themselves and the consequences those feelings might have for mental health. For the control sample, an advert was distributed via the volunteer emailing list at the University of Sheffield and via online older adult social groups. They were told that the purpose of the study is to explore how people feel about themselves and the consequences those feelings might have for mental health. Volunteers completed the measures listed below in a counterbalanced order and were fully debriefed. Participants were assured that the information they provided would remain anonymous and their confidentiality would be protected.

2.2.3 Measures

2.2.3.1 Trait self-disgust.

Participants' trait SD was measured using the Self-Disgust Scale (SDS; Overton et al., 2008). For each of the 18 items, participants rate how much they agree it is descriptive of them on a seven-point Likert scale (1 = *strongly agree*, 7 = *strongly disagree*). The measure has been found to have a two-factor structure, with five items representing disgust towards physical aspects of the self (an example item from the

physical self-disgust subscale is “I find myself repulsive”), and five items representing disgust towards behaviour (an example item from the behavioral subscale is “I often do things I find revolting”) (Overton et al., 2008). In the cancer sample, the Cronbach’s alpha for physical SD was .89 and .83 for behavioural SD. In the control sample alphas were .84 for physical SD and .86 for behavioural SD.

2.2.3.2 Disgust propensity and sensitivity.

Participants’ DP (how easily people are disgusted) and DS (how unpleasant the experience of disgust is to the individual) were measured using the 16-item Disgust Propensity and Sensitivity Scale-Revised (DPSS-R; van Overveld et al., 2006). Participants read 16 statements and choose the answer which is most appropriate to them, on a five-point Likert scale (1 = *never*, 5 = *always*). Examples of disgust propensity items are “I experience disgust” and “I feel repulsed”, and examples disgust sensitivity items are “It scares me when I feel nauseous” and “I think disgusting items could cause me illness/infection.” Based on psychometric evaluations of the DPSS-R (Goetz, Cougle, & Lee, 2013; Olatunji et al., 2007), a recommended, reduced 10-item solution (six items for DP and four for DS) was used for analyses. In the cancer sample, the Cronbach’s alpha for DP was .81 and .82 for DS. In the control sample, alphas were .85 for DP and .78 for DS.

2.2.3.3 Anxiety and depression

Levels of anxiety and depression in participants were measured using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The scale consists of 14 items with 7 items measuring anxiety and another 7 items measuring depressive symptoms. Each item is rated on a four-point scale (0–3 with varying labels) according to the severity of difficulties experienced. Example items from the anxiety subscale are “I get sudden feelings of panic” and “I feel tense and wound up,” and

example items from the depression subscale are “I feel as if I am slowed down” and “I have lost interest in my appearance.” In the control sample, the alpha coefficient for HADS was .87 (anxiety) and .82 (depression). In the cancer sample, the alpha coefficient for HADS was .88 (anxiety) and .85 (depression).

2.2.4 Statistical analysis

All analyses were conducted on SPSS v. 20 (IBM Corp., Armonk, NY, US). Each patient with cancer was randomly matched with participant in the cancer-free group by their age and gender. Participants in the cancer-free group were randomly selected from 391 individuals without cancer. If there was more than one match for a cancer patient, an online research randomizer was utilized to select the match. To test predictions 1 and 2, bivariate differences between means in cancer patients and controls were tested using paired t-tests. As recommended by Breslow and Day (1980), conditional logistic regression (binomial) was then used to estimate the likelihood of classifying participants into either the cancer or control group dependent on their disgust traits, given the need to evaluate multiple possible disgust variants, when controlling for other variables (i.e., the other disgust traits, depression and anxiety). Before entering variables into the regression models below, I examined item inter-correlations for evidence of multi-collinearity (i.e., rs $\geq$ .80, Tabachnick & Fidell, 2001), and values of the variance inflation factor (VIF) ranged between 1.02 and 3.22 indicating no serious multi-collinearity problems (i.e., VIF $\geq$ 10, Tabachnick & Fidell, 2001).

To test prediction 3, correlations (Spearman’s rs) were conducted to initially examine the associations between disgust traits and the psychological wellbeing measures. Multiple regression analyses were then conducted to examine the independent predictive relationship between the three disgust traits and psychological

wellbeing (anxiety and depression), controlling for potential covariates (age, gender and ethnicity), in each sample. The predictors were entered with age, gender and ethnicity (1 = White British, 0 = Otherwise). One-tailed t-tests were used to compare whether the regression slopes from the disgust traits to each dependent variable were significantly greater in the cancer than control group.

Bootstrapping was used to account for data with a non-normal distribution. Bootstrapping provides a non-parametric robust alternative to parametric estimates when the assumptions of those methods may be violated (e.g. Fox, 2008). The significance of all regression path coefficients was assessed by computing bias-corrected and accelerated bootstrap estimates with 95% confidence intervals (BCa 95% CIs). Ten thousand resamples were used for the bootstrapped estimates (Mallinckrodt, Abraham, Wei, & Russell, 2006).

2.3 Results

2.3.1 Descriptives and differences in disgust profiles

The cancer sample was age- and gender-matched with the control sample. A $\chi 2$ test was used to examine differences in ethnicity between the groups. Significantly more participants identified themselves as 'White British' in the cancer sample than in the controls, $\chi 2(1) = 6.12$, BCa 95% CI [−0.34, −0.11], $p < .05$, $\Phi = 0.24$. Accordingly, this variable was included as a control variable in all multivariate analyses. Disgust propensity was significantly higher in women ($M = 15.08$, $SD = 4.14$) than men ($M = 12.67$, $SD = 3.78$) in the cancer sample, $t(105) = 2.77$, BCa 95% CI [0.69, 4.14], $p < .01$, $d = 0.61$, as was DS (women: $M = 9.79$, $SD = 3.77$; men: $M = 6.67$, $SD = 2.20$), $t(105) = 4.26$, BCa 95% CI [1.67, 4.58], $p < .001$, $d = 1.01$. Self-disgust was significantly higher in women ($M = 29.35$, $SD = 13.49$) than men ($M = 24.70$, $SD = 8.91$) in the control

sample, $t(105) = 1.74$, BCa 95% CI [0.24, 9.07], $p < .05$, $d = 0.41$. No other gender differences emerged.

As demonstrated in Figure 2.1, the means of most of the disgust traits were higher in the cancer than control sample, except for DP. In bivariate tests, cancer patients reported significantly higher levels of physical SD ($M = 13.85$, $SD = 7.93$) than controls ($M = 11.71$, $SD = 5.58$), $t(106) = 2.36$, BCa 95% CI [0.43, 3.83], $p < .05$, $d = 0.31$; significantly higher levels of DS ($M = 8.92$, $SD = 3.68$) than controls ($M = 7.79$, $SD = 3.16$), $t(106) = 2.43$, BCa 95% CI [0.22, 2.07], $p < .05$, $d = 0.33$; and significantly lower levels of DP ($M = 14.40$, $SD = 4.17$) than controls ($M = 16.03$, $SD = 4.07$), $t(106) = -3.16$, BCa 95% CI [−2.63, −0.62], $p < .01$, $d = -0.40$. However, there was no difference between cancer patients ($M = 11.56$, $SD = 6.26$) and controls ($M = 11.51$, $SD = 5.85$) in terms of behavioural SD, $t(106) = 0.06$, BCa 95% CI [−1.40, 1.50], $p = .954$, $d = 0.01$. There was a trend for greater symptoms of anxiety in the cancer group ($M = 7.93$, $SD = 4.78$) than in the controls ($M = 6.93$, $SD = 4.10$), $t(106) = 1.67$, BCa 95% CI [−0.13, 2.14], $p = .096$, $d = 0.22$. Depression was significantly higher in the cancer group ($M = 5.27$, $SD = 4.27$) than controls ($M = 4.13$, $SD = 3.33$), $t(106) = 2.17$, BCa 95% CI [0.10, 2.16], $p < .05$, $d = 0.30$.

The results of the conditional logistic regression (Table 2.2), stratified by the cancer-control set, showed that all the disgust traits were significantly independently associated with having a cancer diagnosis, even after controlling for levels of anxiety and depression. Cancer patients were 1.13 times as likely to exhibit higher physical SD and 1.30 times as likely to exhibit higher DS as the control sample. On the other hand, cancer patients were 0.88 times as likely to exhibit higher behavioural SD and 0.76 times as likely to exhibit higher DP as the controls. Accordingly, all results of the

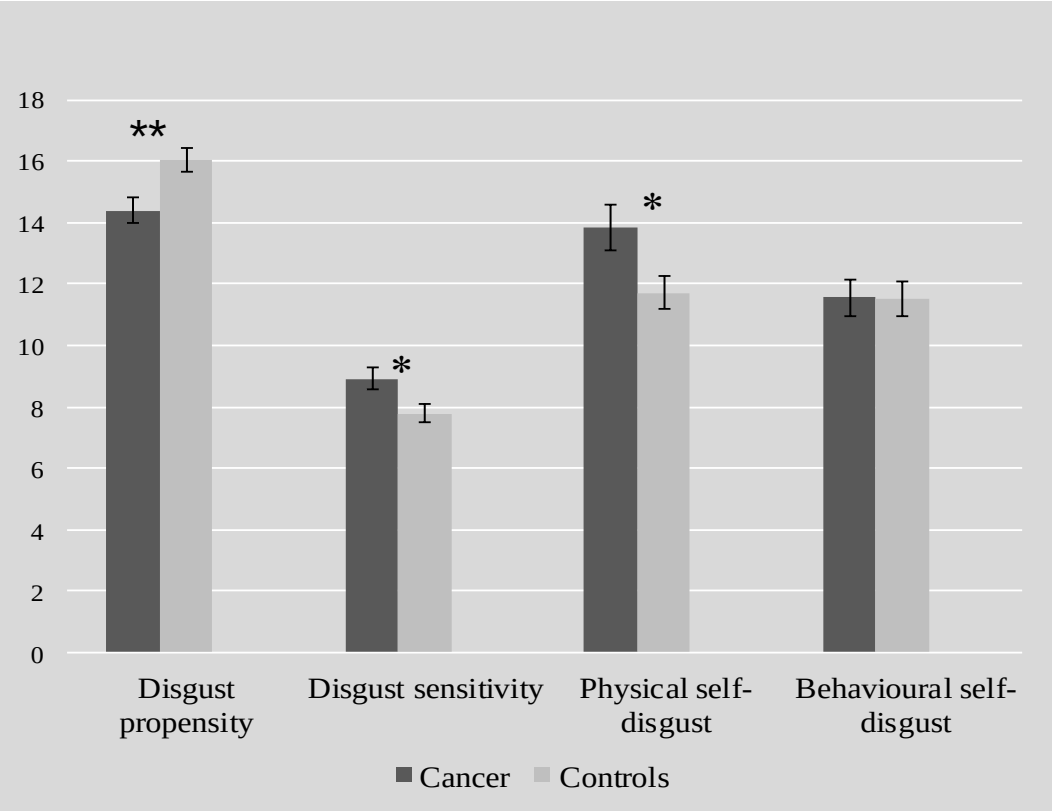

Figure 2. 1 Mean scores of disgust propensity, disgust sensitivity, physical self-disgust and behavioural self-disgust from various scales in cancer patients and controls.

Notes: Participants with cancer *(n* = 107) reported significantly higher physical self-disgust and disgust sensitivity to cancer-free controls (*n* = 107). Participants with cancer reported significantly lower disgust propensity to controls. There was no significant difference between cancer and controls in behavioural self-disgust. Error bars represent the standard error of the mean. DP = Disgust propensity; DS = Disgust sensitivity; SD (P) = Physical Self-disgust; SD (B) = Behavioural Self-disgust. Symbols denote significance at *$p < .05$; **$p < .01$.

bivariate t-tests were maintained in the multivariate logistic regression, when conditioning on the other disgust traits and mental health symptoms, except for behavioural SD, which was significant only after controlling for the other constructs.

Table 2. 2 Factors associated with cancer based on final conditional logistic regression model.

				BCa 95% CI *B*	
Factor	*B*	Wald test	Odds Ratio	LL	UL
Ethnicity	−1.03	7.36	0.36**	−1.75	−0.46
Anxiety	0.01	0.07	1.01	−0.09	0.11
Depression	0.07	1.23	1.07	−0.07	0.23
Physical self-disgust	0.12	7.53	1.13**	0.03	0.24
Behavioural self-disgust	−0.13	8.23	0.88**	−0.24	−0.05
Disgust propensity	−0.27	25.40	0.76***	−0.39	−0.19
Disgust sensitivity	0.27	15.99	1.30***	0.12	0.49
Total R^2 (Nagelkerke R^2)			.30		

Notes: One hundred and seven participants in each group. $\chi^2(7) = 55.12$, $p < .001$. BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval (10,000 resamples); LL = lower limit of B; UL = upper limit of B. Asterisked predictors are significant at $^{**}p < .01$ and $^{***}p < .001$.

2.3.2 Links between disgust traits and psychological wellbeing

Initial correlational analyses showed that there were significant associations between all the study variables for cancer patients and controls (see Table 2.3). In particular, all the disgust traits were found to be significantly correlated with levels of anxiety and depression, indicating that they may have important associations with

psychological wellbeing in individuals with (and without) cancer. Significant negative associations between years since diagnosis in the cancer patients and DS, DP, anxiety, and depression were also observed, indicating that these constructs may lessen in cancer survivors over time.

Table 2. 3 Bivariate correlation coefficients (Spearman's rho) among study variables in cancer patients (above diagonal) and matched controls (below diagonal).

Variable	1	2	3	4	5	6	7
1. Physical self-disgust	1	.78**	.30**	.30**	.59**	.67**	−.13
2. Behavioural self-disgust	.74**	1	.21*	.25*	.60**	.56**	−.12
3. Disgust propensity	.33**	.30**	1	.56**	.30**	.28**	−.21*
4. Disgust sensitivity	.31**	.35**	.47**	1	.43**	.36**	−.22*
5. Anxiety	.45**	.47**	.37**	.42**	1	.68**	−.22*
6. Depression	.64**	.53*	.34**	.30**	.58**	1	−.30**
7. Years since diagnosis	–	–	–	–	–	–	1

Notes: One hundred and seven participants in each group. Asterisked coefficients are significant at *$p < .05$ and **$p < .01$.

The results of the regression analyses showed different patterns for the cancer and control samples (see Table 2.4). In cancer, with anxiety as the dependent variable, physical SD, $\beta = .28$, BCa 95% CI [0.02, 0.30], $p < .05$; DS, $\beta = .27$, BCa 95% CI [0.07, 0.61], $p < .05$; and behavioural SD, $\beta = .26$, BCa 95% CI [0.03, 0.39], $p < .05$,

significantly predicted anxiety, whereas, in controls, only behavioural SD, β = .29, BCa 95% CI [0.02, 0.37], p < .05, statistically significantly predicted anxiety. In cancer, with depression as the dependent variable, physical SD, β = .60, BCa 95% CI [0.20, 0.43], p < .001, and DS, β = .24, BCa 95% CI [0.03, 0.50], p < .05, emerged as significant predictors, however, only physical SD, β = .54, BCa 95% CI [0.14, 0.52], p < .01, was found to significantly predict depression in controls. Tests of the regression slopes between the two samples showed that DS was a significantly stronger predictor of depressive symptoms in the cancer than control group, $t(210) = 1.69$, p < .05 (one-tailed).

2.4 Discussion

Qualitative studies have shown that people being treated for cancer frequently report themes related to contamination and disgust (e.g. Fu et al., 2013). This study was the first to compare quantitatively the disgust profiles of individuals diagnosed with cancer against age- and gender-matched controls. The contribution of the chapter can be broken down into two sections, which is further discussed below.

2.4.1 Disgust profiles in individuals with cancer

First, it is predicted that cancer patients would show a different disgust profile to that of matched controls, differing significantly in their trait levels of DP and DS, and having significantly greater SD. In line with predictions, DP and DS were found to significantly differ across the groups, with DS higher in the cancer sample and DP higher in the controls (despite being positively correlated). That DP was significantly

Table 2. 4 Multiple regression analyses predicting psychological wellbeing in cancer and healthy controls

	Anxiety							Depression						
	Cancer			Controls			Slope	Cancer			Controls			Slope
Variable	*B* [BCa 95% CI]	SE *B*	*β*	*B* [BCa 95% CI]	SE *B*	*β*	*t*	*B* [BCa 95% CI]	SE *B*	*β*	*B* [BCa 95% CI]	SE *B*	*β*	*t*
Gender	−0.18 [−1.94, 1.74]	.95	−.02	0.37 [−0.94, 1.71]	.65	.04	0.48	−1.56 [−2.87, −0.05]	.70	−.16	0.04 [−1.00, 1.13]	.50	.01	1.86†
Age	−0.02 [−0.09, 0.02]	.03	−.06	−0.01 [−0.06, 0.03]	.02	−.03	0.28	−0.01 [−0.06, 0.03]	.03	−.03	0.03 [−0.01, 0.06]	.02	.11	1.11
Ethnicity	0.36 [−1.34, 2.25]	.84	.04	−0.87 [−2.34, 0.69]	.71	−.08	1.12	0.15 [−1.11, 1.51]	.61	.02	−0.08 [−1.60, 1.35]	.66	−.01	0.26
SD (P)	0.17 [0.02, 0.30]	.07	.28*	0.13 [−0.09, 0.36]	.11	.18	0.28	0.32 [0.20, 0.43]	.06	.60***	0.32 [0.14, 0.52]	.09	.54**	0.00
SD (B)	0.20 [0.03, 0.39]	.09	.26*	0.21 [0.02, 0.37]	.10	.29*	0.07	0.06 [−0.09, 0.20]	.08	.08	0.07 [−0.08, 0.22]	.08	.12	0.09

DP	−0.01 [−0.23, 0.18]	.10	−.01	0.06 [−0.15, 0.30]	.11	.06	0.45	−0.02 [−0.22, 0.18]	.09	−.02	0.06 [−0.09, 0.20]	.08	.07	0.70
DS	0.35 [0.07, 0.61]	.14	.27*	0.26 [−0.03, 0.55]	.14	.20	0.45	0.28 [0.03, 0.50]	.13	.24*	−0.03 [−0.32, 0.24]	.13	−.03	1.69†
Total R^2	.42			.34				.55			.39			
F	11.74***			8.95***				19.63***			10.54***			

Notes: One hundred and seven participants in each group. SD (P) = Physical Self-disgust; SD (B) = Behavioural Self-disgust; DP = Disgust Propensity; DS = Disgust Sensitivity; BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval (10,000 resamples); LL = lower limit; UL = upper limit; SE B = bootstrapped standard error. Superscripted estimates are significant at $^{\dagger}p < .05$ (one-tailed) $*p < .05$ (two-tailed); $**p < .01$ (two-tailed) and $***p < .001$ (two-tailed).

lower in people with cancer is inconsistent with the hypothesis that DP increases during states of biological vulnerability (e.g. pregnancy, Fessler et al., 2005). Instead, one possible reason for lower DP in cancer is a decreased propensity to experience disgust due to habituation and exposure (e.g. Olatunji, Tart, Ciesielski, McGrath, & Smits, 2011; Rozin, 2008). Indeed, other recent work has shown that proneness to disgust may reduce rather than increase as a function of exposure to disgust stimuli, potentially as an adaptive means of facilitating contact, for example in mothers (i.e., in order to care for their offspring) versus childless women (Prokop & Fančovičová, 2016). Thus, if cancer patients are exposed to an increased frequency of disgust elicitors (i.e., as a result of their illness and its treatment), I may expect their DP to be decreased as a result of this. Supporting this idea, a significant negative correlation was observed between time (years) since cancer diagnosis and DP, yet this pattern was also apparent for DS (and anxiety and depression), suggesting that if any kind of habituation is occurring, it is not specific to DP. Complementary explanations are, of course, possible including a current lack of exposure to disgust elicitors relative to prior exposure, or that participants may have made changes in their behaviour following a cancer diagnosis that reduced their exposure to (external) disgust elicitors, and thus DP and/or DS.

Conversely to DP, however, DS was found to be higher in people with cancer com-pared to controls. Disgust sensitivity is associated with an overestimation of the unpleasant consequences of experiencing disgust (e.g. van Overveld et al., 2006). Higher DS in the cancer sample may be explained by a number of factors, including a heightened state of vulnerability (e.g. associated with immunosuppression). Given its link to sources of disease, people with cancer (and a compromised immune system) may find the disgust emotion particularly unpleasant and anxiety-provoking to experience. Work has shown that DS is significantly linked to hypochondriasis and health anxiety

(Davey & Bond, 2006), so a fear of future illness may explain the particularly negative appraisal of disgust experiences in the cancer group. Secondly, to the extent that cancer and its treatments are threatening to the individual, and elicit aversive dis-gust responses, repeated exposure to these kinds of threats may lead to a conditioned response to find the experience of disgust as more aversive and threatening than cancer-free controls.

As expected, physical SD was also significantly higher in the cancer than control group. As well as seeing the self as a physically diseased object, greater levels of physical SD in the cancer sample may be explained by the physiological changes that are common in cancer and its treatment (all treatments for cancer impact on physical appearance to a degree, Wallace, Harcourt, Rumsey, & Foot, 2007). The majority of participants in this sample (81.0%) reported having had surgery, which may cause pro-found physical changes, some of which are known to elicit disgust (e.g. colostomy, Smith et al., 2007). These findings confirm and extend previous qualitative studies, where cancer patients have described experiencing thoughts and feelings of disgust towards themselves, particularly relating to their appearance (e.g. as a result of disfigurement, Costa et al., 2014; scars or skin changes, Hopwood et al., 2001; malignant wounds, Lo et al., 2008; and hair loss, Rosman, 2004).

An unexpected finding was that behavioural SD did not differ across the two groups, and was found to be significantly diminished in the cancer group when control-ling for the other observed traits. Given their high positive correlation, it is at present unclear why behavioural SD did not show the same pattern of results as physical SD. While these results were not hypothesised, there are several promising avenues for further exploration. For example, it is possible that the cancer participants in the sample may have engaged in healthier behaviours since their diagnosis (e.g. Blanchard et al., 2003), resulting in less disgust towards their behaviour. It is also possible that the

presence of a serious health condition makes (affective) judgements about behaviour less important or salient to the cancer sample. However, more evidence is needed to help ascertain the reason(s) behavioural SD displayed a differential pattern to physical SD in this sample.

2.4.2 Links between disgust traits and psychological wellbeing

Multivariate regression analyses showed that DS and SD, and not DP, had significant independent associations with psychological wellbeing in patients with cancer, supporting the initial predictions. Furthermore, the prediction that disgust traits would have a stronger relationship with wellbeing in the cancer than control sample received partial support. First, different patterns were observed across the two samples. In the cancer sample, DS and (physical and behavioural) SD significantly independently predicted levels of anxiety, while physical SD and DS predicted levels of depression. By contrast, in the controls, only behavioural SD independently predicted levels of anxiety, and physical SD alone significantly predicted symptoms of depression. When controlling for the influence of the other traits, DP was not found to significantly predict anxiety or depression in either sample. Second, tests of the differences in the regression slopes between the cancer and control samples showed that disgust sensitivity was statistically a stronger predictor of depressive symptoms in the cancer than control sample. These findings, along with the higher levels of DS found in the cancer sample, suggest that DS may be particularly important in predicting psychological wellbeing in people with cancer.

One possible mechanism by which DS may be conductive to states of anxiety and depression in the cancer sample is via a conditioned inclination to overestimate the threat of disgust-related stimuli leading to states of anxiousness or defeat. As noted, disgust may be perceived as particularly threatening to people with cancer due to the

increased frequency, and aversive nature, of the disgust-eliciting stimuli to which cancer patients may be exposed, or its association with sources of ill health. The findings are broadly consistent with prior work, showing that DS is an important predictor of anxiety (e.g. Cisler et al., 2009) and may be heightened in people with clinical diagnoses of depression (Ille et al. 2010). However, these findings extend earlier work by suggesting that DS may operate as a stronger predictor of psychological wellbeing (depression) for some groups (i.e., cancer patients) than others (i.e., healthy controls).

Physical SD was a strong predictor of both anxiety and depression in cancer patients, and depression in the control sample. This result supports the proposition that the aetiology of depression might not involve a greater proneness to externally oriented disgust (i.e., DP), but may instead be associated with socially learned disgust reactions towards aspects of the self (or self-disgust; e.g. Overton et al., 2008; Powell et al., 2013; Power & Dalgleish, 2008), and particularly physical aspects of the self. Behavioural SD, on the other hand, did not predict depression after controlling for the other disgust traits (cf. Powell et al., 2013), but did predict anxiety in both groups. The unpleasant behavioural consequences of having cancer (e.g. urine/faecal incontinence) may expose individuals to a higher risk of contamination and infection (e.g. Gea-Banacloche & Segal, 2011), which may increase their level of anxiety, but not depression, associated with behaviours perceived as disgusting. This explanation follows a theoretical model for co-morbidity between anxiety disorders and major depression (Gray & McNaughton, 2000), which suggests that an avoidable potential threat can lead to anxiety, whereas an unavoidable potential threat may lead to depression (Middeldorp, Cath, Van Dyck, & Boomsma, 2005).

Finally, that DP was found to have no significant predictive role in psychological wellbeing (when controlling for the other disgust traits) appears to

contradict past work by Reynolds, Bissett, et al. (2015), which found DP to be positively linked with quality of life in a sample with anal incontinence. Reynolds, Bissett, et al. (2015), however, did not control for other disgust traits in their models, suggesting that they may have suffered from omitted variable bias (e.g. Ashenfelter & Greenstone, 2004). These findings suggest that the target (SD) and appraisals of disgust (DS) may be more important in determining current psychological wellbeing in cancer patients than measures of DP alone.

In the next chapter, I will identify the potential source(s) of self-disgust, utilizing a dyadic study to examine the relationship between disgust traits in cancer patients' partners, and how it may influence the feelings of self-disgust, anxiety, and depression in cancer patients.

2.4.3 Clinical implications

The findings from this research suggest that focusing on disgust responses, particularly (physical) SD and DS, could well be beneficial therapeutically to people with cancer who are exposed to a range of potentially disgust-inducing stimuli. The development of depression and anxiety potentially might be diminished by greater attention to the degree of SD and DS experienced by cancer patients, and interventions intended to reduce levels of these maladaptive responses (e.g. Powell et al., 2015b). Recent experimental work has shown that the self-affirmation of valued character traits may be a promising tool for reducing in-the-moment feelings of self-directed disgust (Powell et al., 2015b). 'Compassion-focused therapy' is another approach formulated to work with people with high levels of self-criticism, hatred and disgust (Gilbert, 2015). Nonetheless, research on the effective regulation and treatment of disgust is in its infancy and there are plentiful opportunities for future work in this area; what is critical is the acknowledgement that certain facets of disgust (i.e., physical SD, DS) may be

particularly detrimental for psychological wellbeing in cancer patients and that there is a need to explore therapeutically emotional factors, and not just cognitions, in the production and maintenance of mental health problems in people with chronic illnesses, such as cancer.

2.4.4 Limitations

While the current report represents a useful addition to understanding how disgust traits predict psychological wellbeing in cancer patients, there are limitations worth noting. Firstly, I used general rather than domain-specific measures of DP, which limits the identification of certain disgust subtypes that may be driving the overall reduction in DP observed. DP is conceptualized as multidimensional, and measures have been generated to assess DP to different types of disgust elicitors, such as: core disgust, which is characterized by a real or perceived threat of oral incorporation and a reactive sense of offensiveness; animal-reminder disgust (AR), which consists of reminders of our own mortality and inherent animalistic nature; and contamination based disgust (CB), which is based on the perceived threat of transmission of contagion (e.g., Haidt, McCauley, & Rozin, 1994; Olatunji et al., 2007; Olatunji, Haidt, McKay, & David, 2008; Rozin et al., 2008). The reduction of disgust through habituation usually displays some degree of domain specificity (e.g. Rozin, 2008) and it would be interesting in a future study to assess differences in cancer using measures that tap into disgust subtypes (e.g. the Disgust Scale-Revised [DS-R], Olatunji et al., 2007). A recent work suggests that 'core' disgust elicitors (conceptualised by Rozin, Haidt, & McCauley 2008, as related to food/eating and body waste products) are likely to be particularly problematic for people with cancer (Powell et al., 2016).

A second potential limitation of the present study is that the patient population was diverse, covering most common types of cancer (e.g. breast, prostate, head and

neck). While this increases its generalisability, differences in disgust traits across subtypes of cancer were not able to be tested for due to insufficient statistical power. Thus, there remains the possibility that the results were driven by specific cancer types and future work could look more closely at disgust responses in specific subtypes of cancer. The same is also true of gender – three quarters of the participants were female and the majority of the cancers were female-specific. Given the differences that were found between males and females in both the cancer and control samples in terms of their disgust responses, future work could explore whether the present findings hold for a predominantly (or exclusively) male sample.

A final limitation was that there was an exclusive focus on disgust and ignored other negative emotions (such as anger and fear, both of which have been linked to depression; Gilbert, Gilbert, & Irons, 2004; Pine, Cohen, & Brook, 2001). It will be useful in future studies to incorporate other affective constructs into the models to examine the extent to which the relationships I see are specific to disgust.

In conclusion, the results of this study showed that certain facets of disgust (i.e., physical SD, DS) may be higher in cancer patients and may be important correlates of their current levels of anxiety and depression. Therefore, an emotional profiling of disgust responses following a cancer diagnosis and/or during cancer treatment may be an effective method for identifying cancer patients who have a higher tendency to develop anxiety and depression during their cancer experiences.

III. EFFECT OF PARTNERS' DISGUST RESPONSES ON PSYCHOLOGICAL WELLBEING IN CANCER PATIENTS

3.1 Introduction

Cancer is increasingly recognized and conceptualized as a disease that affects the entire family unit, especially the patient's significant other (Hodges, Humphris, & Macfarlane, 2005; Baik & Adams, 2011; referred to here as their 'partner' for brevity). Research indicates that the relationship with their partner plays a critical role in cancer patients' adaptation to the illness (e.g., Wimberly, Carver, Laurenceau, Harris, & Antoni, 2005). When attachment with the partner is less secure, the relationship can lead to the creation, transmission, and maintenance of poor psychological wellbeing (e.g., Rodin et al., 2007).

One potential means by which partners may influence patients' wellbeing is through negative emotions such as disgust. Patients with cancer often experience strong disgust reactions in response to a range of cancer-related stimuli (Powell et al., 2016). With cancer, the disgust emotion is not exclusively experienced by patients, but partners may also experience disgust towards their significant others as a result of symptoms and treatment side effects (e.g., stoma usage; Smith et al., 2002). As well as disgust arising from physical aspects of the disease and cancer care, disgust in the partners of cancer patients may also originate from anxiety concerning infection from (even a non-contagious) disease (e.g., Wortman & Dunkel-Schetter, 1979). People naturally avoid individuals who appear to have an infectious disease (Kouznetsova et al., 2012), and also those with non-infectious conditions that mimic disease cues, such as obesity (Park et al., 2007).

Partners of cancer patients, as with all other individuals, will exhibit differences in disgust responding. Van Overveld and colleagues (van Overveld et al., 2006) make a

distinction between “disgust propensity” (an individual’s tendency to experience disgust, i.e., the likelihood that an individual will be disgusted), and “disgust sensitivity” (the degree to which the response is unpleasant or distressing to an individual, i.e., the extent to which the disgust experience is negatively appraised), a distinction validated via the Disgust Propensity and Sensitivity Scale (van Overveld et al., 2006). This instrument measures propensity and sensitivity broadly and has been shown to have a two factor solution with items separately loading (> .30) on the two subscales. Hypervigilance to avoid impurity may be particularly prominent in individuals who have higher disgust propensity, where they may have enhanced sensory sensitivity (e.g., Schäfer, Leutgeb, Reishofer, Ebner, & Schienle, 2009), accompanied by a tendency to overestimate threats and the potential risk of infection (e.g., Deacon & Olatunji, 2007; Schaller & Park, 2011). A similar overstated reaction may also occur in individuals with higher disgust sensitivity, where they may experience difficulties in successfully controlling specific affective experiences (e.g., Cisler et al., 2009), and have a tendency to develop more intense disgust-related evaluations of disgust-relevant stimuli (e.g., Olatunji, Lohr, Smits, Sawchuk, & Patten, 2009).

The frequency (disgust propensity) and intensity (disgust sensitivity) of disgust reactions in cancer partners may be influential in affecting how patients feel about themselves. It has been suggested that individuals may internalize the revulsion of others directed towards them in the form of ‘self-disgust’ (Powell et al., 2014). Self-disgust has been proposed as an emotion schema consisting of two components, disgust towards the “self” and disgust towards one’s behaviour (“disgusting ways”; Powell et al., 2015a). Self-directed disgust has been conceptualized as part of the emotional pantheon centered on bodily characteristics (Fox, 2009; Neziroglu, Hickey, & McKay, 2010; Moncrieff-Boyd et al., 2014). Considerable theoretical interest has been directed

towards self-disgust as a pan-diagnostic concept relevant to the development and maintenance of a range of mental health problems including depression (Overton et al., 2008) and anxiety (Azlan et al., 2016). Self-disgust has also been found to significantly predict anxious and depressive symptoms in people with cancer in the previous chapter (Chapter II). Taken together, the evidence above suggests that disgust propensity and disgust sensitivity in the partners of cancer patients, and the ensuing responses to the patient's symptoms and side effects of treatments, may influence how disgusted patients feel about themselves and hence their subsequent psychological wellbeing.

In spite of the potential connection between disgust in cancer patients and partners, work conducted so far on the topic has been largely qualitative and has focused on issues of sexuality (e.g., Hawkins, Ussher, Gilbert, Perz, Sandoval, & Sundquist, 2009), post-treatment care of colorectal surgery (e.g., Persson et al., 2004) and side effects following therapy (e.g., Navon & Morag, 2003). Little is known about the contribution of partners' disgust responses to patients' psychological wellbeing, and no research has yet investigated the relationship quantitatively. In the present study an initial exploration of the effects of disgust traits in partners on self-disgust and anxious and depressive symptoms in cancer patients were conducted. Based on the considerations above, I hypothesised that self-disgust levels (and anxiety/depression) would be heightened in cancer patients and that this would be positively associated with trait disgust propensity and disgust sensitivity in partners[1].

3.2 Method

3.2.1 Participants

We recruited 50 participants with heterogeneous cancer diagnoses and their partners that had never been diagnosed with cancer. Two participants were recruited

[1] Note: This manuscript is published: Azlan, H. A., Overton, P. G., Simpson, J., & Powell, P. A. (2017). Effect of Partners' Disgust Responses on Psychological Wellbeing in Cancer Patients. Journal of clinical psychology in medical settings, 24(3-4), 355-364. doi:10.1007/s10880-017-9521-z.

from the previous sample (study in Chapter II). The rest of the participants in the cancer sample were recruited from cancer charities and support groups based in English speaking countries. Partners were recruited from the contact details left by the cancer patients. Patients were required to have an active cancer diagnosis (either recently diagnosed, undergoing treatment, or experiencing some degree of persistent or recurrent disease) rather than being in remission. Overall, 1008 organizations were initially approached and of those, 107 agreed to share the study advert with their members, with the eventual sample coming from organizations based in the United Kingdom, United States of America, and Canada. The recruitment was conducted in two phases. In Phase 1, the participants were recruited without remuneration (n = 18), and in Phase 2 (n = 32), the participants were rewarded with remuneration to boost recruitment (10 US dollars per patient, and 10 US dollars per partner). One British pound was donated to Worldwide Cancer Research for every dyad that took part. Patients had a mean age of 49.16 years (SD = 14.20) and partners a mean age of 49.70 years (SD = 12.80). Nine of the couples were same-sex, and of the remaining 41, patients were male in 15 and female in 26.

Of the patients, 36/50 were White (most frequently 'White Other', n = 17, or 'White European', n = 10), while 34/50 of the partners were White (most frequently 'White European', n = 14, or 'White Other', n = 13), the remainder of each group being White British. The majority of couples (38/50) had the same ethnicity. Participants had various types of primary cancer, the most common being gastrointestinal stromal tumour (14%), gynaecological (10%), breast (8%), colon (8%), and Hodgkin lymphoma (8%). One participant reported more than one type of primary cancer. Of those who chose to declare, the modal Stage (12/40) was II in terms of progression. The majority of participants had received multiple treatments for their cancer, with chemotherapy

(60%), surgery (44%), and radiotherapy (42%) being the most common. Only two participants had not had treatment for their cancer.

3.2.2 Measures

Patients provided demographic information and completed measures of trait self-disgust, disgust propensity, disgust sensitivity, and anxiety and depression, whereas their partners only completed demographics and measures of disgust propensity and disgust sensitivity.

3.2.2.1 Trait self-disgust.

Participants' trait self-disgust was measured using the Self-Disgust Scale (Overton et al., 2008). For each of 18 items, participants rate how much they agree it is descriptive of them on a 7-point Likert scale (1=*strongly agree*, 7=*strongly disagree*). The scale contains a number of filler items and two 5-item subscales, one measuring physical self-disgust (an example item from the physical self-disgust subscale is "I find myself repulsive") and the other behavioral self-disgust (an example item from the behavioral subscale is "I often do things I find revolting"). Hence the lowest score for the full scale (used here) was 10 and the highest – indicating the highest level of self-disgust – was 70. In the cancer patient sample, the Cronbach's alpha for self-disgust was .93.

3.2.2.2 Disgust propensity and sensitivity.

Participants' disgust propensity and disgust sensitivity were measured using a version of the 16-item Disgust Propensity and Sensitivity Scale-Revised (DPSS-R; Olatunji et al., 2007). Participants read 16 statements and chose the answer which is most appropriate to them, on a 5-point scale (1=*never*, 5=*always*). Examples of disgust propensity items are "I experience disgust" and "I feel repulsed", and examples disgust sensitivity items are "It scares me when I feel nauseous" and "I think disgusting items

could cause me illness/infection." Based on psychometric evaluations of the DPSS-R (Goetz et al., 2013), a recommended 10 item solution (six items for disgust propensity and four for disgust sensitivity) was used for analyses, with potential scores ranging from 6-30 on the propensity subscale and 4-20 on the sensitivity subscale, with higher scores indicating higher levels of disgust propensity and sensitivity (respectively). The 10-item solution proposed by Goetz et al. (2013) involves removing items that loaded onto a third factor in their study (i.e., neither propensity nor sensitivity), that factor concerning negative appraisals of oneself in response to feeling disgusted – "It embarrasses me when I feel disgusted," "I think feeling disgusted is bad for me." For the 10-item solution in the cancer sample, the Cronbach's alpha for disgust propensity was .79 and .69 for disgust sensitivity. In the partner sample, alphas were .83 for disgust propensity and .77 for disgust sensitivity.

3.2.2.3 Anxiety and depression

Levels of anxiety and depression in participants were measured using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The scale was developed for use amongst hospital inpatients and has been previously validated in patients with cancer (e.g., Smith et al., 2002). The HADS also has been used in control samples (e.g., Azlan et al, 2016). The scale consists of 14 items with seven items measuring anxiety and another seven items measuring depressive symptoms. Each item is rated on a 4-point scale (0–3 *with varying labels*) according to the severity of difficulties experienced, hence scores range from 0-21 on each subscale, with higher scores indicating higher levels of anxiety and/or depression. Example items from the anxiety subscale are "I get sudden feelings of panic" and "I feel tense and wound up," and example items from the depression subscale are "I feel as if I am slowed down" and

"I have lost interest in my appearance." In the cancer sample, the alpha coefficients for HADS were .82 (anxiety) and .81 (depression).

3.2.3 Procedure

Ethical approval was granted by the University of Sheffield prior to data collection. As part of a larger survey into psychological responses to cancer, cancer charities and support groups were approached with a link to an online survey. Participation was only available to those who had a partner. Before proceeding, patients were told that they and their partner would need to participate as a pair, and would be required to leave their and their partners' email addresses. Patients also were told that they would need to complete and submit their questionnaires separately from their partners. For the partners, they were approached with a separate link to an online survey by the email addresses left by the patients. Participants completed the measures listed above in a counterbalanced order and were fully debriefed.

3.3 Results

3.3.1 Descriptive and bivariate associations

Descriptive statistics and bivariate correlational analyses between partner and patient variables were carried out using SPSS version 22 (IBM Corp., Armonk, NY, US) and are presented in Table 3.1. Disgust sensitivity was higher in cancer patients than in their partners, while disgust propensity was lower (Azlan et al., 2016), but these trends did not reach statistical significance. There were significant positive correlations between partners' disgust sensitivity and two of three disgust traits in the cancer patients: self-disgust, and disgust propensity, but not disgust sensitivity. There was also a significant positive correlation between partners' disgust sensitivity and patients' depression. However, there were no significant correlations between disgust propensity

in partners and any of the cancer patients' disgust traits or measures of their psychological wellbeing.

Table 3. 1 Bivariate correlation coefficients (Pearson's r) among study variables in cancer patients and their partners

Variable	1	2	3	4	5	6	7
1. Disgust propensity (partner)	—						
2. Disgust sensitivity (partner)	.76**	—					
3. Disgust propensity(patient)	.07	.35*	—				
4. Disgust sensitivity(patient)	.07	.20	.65**	—			
5. Self-disgust (patient)	.11	.36**	.51**	.38**	—		
6. Anxiety (patient)	.11	.19	.49**	.39**	.48**	—	
7. Depression (patient)	.17	.36*	.52**	.40**	.55**	.59**	—
Range	10-28	4-20	6-24	4-16	14-67	1-18	0-19
M	15.80	9.16	14.44	9.60	37.00	8.46	7.02
SD	3.86	3.27	3.83	3.23	16.18	3.86	4.04

Notes: $N = 50$ patient-partner dyads. Asterisked coefficients are significant at $*p < .05$ and $**p < .01$.

3.3.2 Mediation analyses

A path model was developed using AMOS version 22 (IBM Corp., Armonk, NY, US) to examine the relationship between partners' disgust traits and patients'

psychological wellbeing. As recommended by Hayes (e.g., Hayes, 2009), bias-corrected bootstrapping was used to produce robust confidence intervals and standard errors (and hence probability values) for all estimates, including direct and indirect effects, removing any restrictions on the nature of the underlying sampling distribution. Ten thousand resamples were used for the bootstrapped estimates (Mallinckrodt et al., 2006). The bootstrap adjusted p value was interpreted to assess model fit based on the Chi-square statistic ($\chi 2$), along with the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA).

In the mediation path analyses, to examine the relationship between partners' disgust traits on patients' psychological wellbeing, through patients' self-disgust, the patient's gender, age of patients and partners, ethnicity (1 = White British, 0 = non-White British), the ethnic match within the couples (1 = same ethnicity, 0 = different ethnicity), and sexuality of the couples (1 = heterosexual, 0 = homosexual) were controlled. Gender (e.g., Rohrmann, Hopp, & Quirin, 2008), age (Curtis et al., 2004), and cultural background (Moretz et al., 2009) have all been shown to influence disgust responding. Furthermore, given that attitudes to same-sex and heterosexual couples differ (Inbar et al., 2009), insofar as self-disgust is constructed in part from the attitudes of others towards us (Powell et al., 2015a), this may in turn influence self-disgust levels in these two groups.

The results of the path analyses are presented in Table 3.2. The first analysis, without patients' disgust propensity and disgust sensitivity (Model 1; Figure 3.1; a reasonable fit to the data: $\chi 2$ (6) = 15.45, p = .017; CFI = 0.944, RMSEA = 0.179, 90% CI [.07, .29], p = .032), revealed a positive relationship between partners' disgust sensitivity and patients' self-disgust, which in turn had a positive relationship with patients' anxiety and depression. Patients' self-disgust fully mediated the association

between partners' disgust sensitivity and levels of anxiety and depression, controlling for patients' gender, sexuality, and the age of both partners and patients. Partners' disgust propensity also exerted a significant indirect effect on patients' anxiety and depression via patients' self-disgust, but the effect was in the opposite direction to that of disgust sensitivity (i.e., partners' disgust propensity was related to anxious and depressive symptoms via reduced self-disgust in patients).

When patients' disgust propensity and disgust sensitivity were also included in the model (Model 2; Figure 3.2; necessarily a perfect fit to the data, $\chi 2 = .00$), the indirect effects of partners' disgust sensitivity on patients' anxiety and depression, via patients' self-disgust, still approached significance. However, the indirect effects of partners' disgust propensity on patients' anxiety and depression via the patients' self-disgust, were no longer significant. The results suggest that the effect of partners' disgust traits on patients' anxiety and depression is partly driven by the shared variance they have with the patients' disgust traits.

3.4 Discussion

3.4.1 Study Findings

The main purpose of this study was to explore how partners' disgust traits affect psychological wellbeing in cancer patients. The strongest finding from the study – in line with the original hypothesis - was a positive relationship between partners' disgust sensitivity and patients' self-disgust, and between patients' self-disgust and patients' anxiety and depression; that is, the more intense the disgust sensitivity in partners, the poorer the psychological wellbeing in patients, a relationship in which patient's self-disgust plays a mediating role.

Table 3. 2 Direct and indirect effects and 95% confidence intervals for mediation models.

Model pathways	Model 1				Model 2			
	Estimates	*SE B*	95% CI		Estimates	*SE B*	95% CI	
			LL	UL			LL	UL
Direct effects								
Partners' DP –> Patients' SD	−.40	.22	−.71	.01	−.26	.25	−.61	.20
Partners' DS –> Patients' SD	.63*	.22	.24	.95	.41	.26	−.03	.82
Partners' DP –> Patients' anxiety	.17	.22	−.17	.53	.27	.22	−.07	.62
Partners' DP –> Patients' depression	.01	.24	−.36	.42	.09	.24	−.26	.50
Partners' DS –> Patients' anxiety	−.19	.25	−.57	.19	−.32	.26	−.73	.08
Partners' DS –> Patients' depression	.21	.22	−.16	.54	.09	.23	−.32	.43
Patients' SD –> Patients' anxiety	.53**	.14	.28	.74	.37*	.18	.10	.67
Patients' SD –> Patients' depression	.50**	.14	.31	.77	.40*	.19	.11	.71
Patients' DP –> Patients' SD	—	—	—	—	.30	.21	−.04	.64
Patients' DS –> Patients' SD	—	—	—	—	.08	.17	−.26	.30

Patients' DP –> Patients' anxiety	—	—	—	—	.30	.26	−.18	.67
Patients' DP –> Patients' depression	—	—	—	—	.27	.22	−.10	.61
Patients' DS –> Patients' anxiety	—	—	—	—	.06	.24	−.27	.48
Patients' DS –> Patients' depression	—	—	—	—	.09	.16	−.16	.36
Indirect effects								
Partners' DP –> Patients' SD –> Anxiety	−.20*	.13	−.47	−.04	−.10	.11	−.36	.01
Partners' DP –> Patients' SD –>Depression	−.22*	.13	−.48	−.04	−.11	.11	−.39	.01
Partners' DS –> Patients' SD –> Anxiety	.32**	.14	.14	.63	.15	.13	.01	.48
Partners' DS –> Patients' SD –>Depression	.33**	.14	.16	.64	.17	.13	.01	.50

Notes: N = 50 patient-partner dyads. SD = Self-disgust; DS = Disgust Sensitivity; DP = Disgust Propensity; BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval; LL = lower limit; UL = upper limit; *SE B* = bootstrapped standard error. Asterisked coefficients are significant at *$p < .05$ and **$p < .01$.

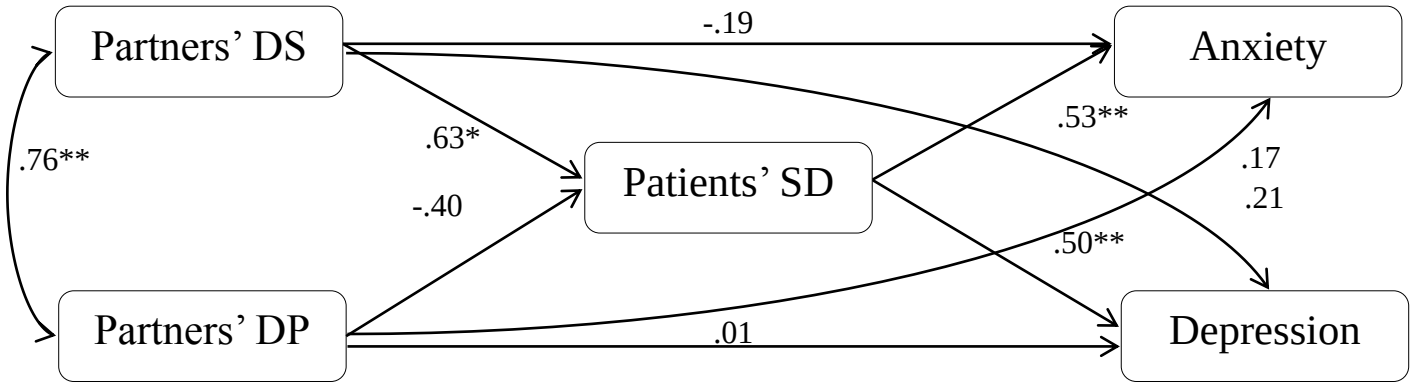

Figure 3. 1 Mediation model 1 - Effect of partners' disgust sensitivity (DS) and disgust propensity (DP) on anxiety and depression in people with cancer through patients' self-disgust (SD).

Control variables and error terms are omitted for clarity. Error terms for the two outcome variables (anxiety and depression) were correlated. All estimates are standardised betas (β). Significance levels were determined based on bootstrapped CIs (10,000 resamples). Asterisked coefficients are significant at $*p < .05$, and $**p < .01$.

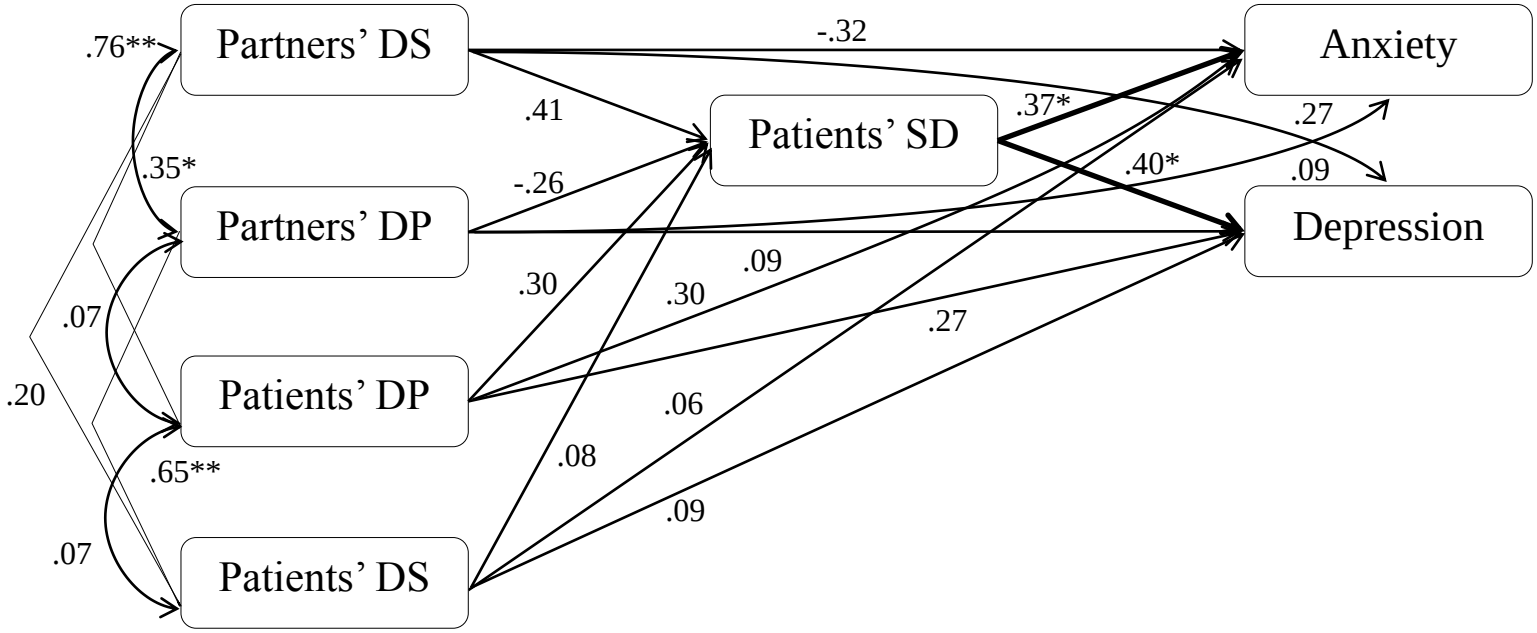

Figure 3. 2 Mediation model 2 - Effect of partners' disgust sensitivity (DS) and disgust propensity (DP) on anxiety and depression in people with cancer through patients' self-disgust (SD), controlling for patients' disgust traits.

Control variables and error terms are omitted for clarity. Error terms for the two outcome variables (anxiety and depression) were correlated. All estimates are standardised betas (β). Significance levels were determined based on bootstrapped CIs (10,000 resamples). Asterisked coefficients are significant at *p < .05, and **p < .01.

Existing studies acknowledge that partners experience disgust towards cancer patients (e.g., Hawkins et al., 2009; Persson et al., 2004; Wortman & Dunkel-Schetter, 1979), and aversion towards cancer patients generally stems from changes in the appearance of the patient and fears that the disease is contagious, which has been documented as a major cause of rejection of the patient (Crowther, 2010). Patients are explicitly aware of the rejection, some of them saying that their partners refuse to have any physical contact with them, due to the disgust evoked by the sight of their bodies (Navon & Morag, 2003).

The features of the facial disgust reaction are essentially defensive, with the narrowing of the nostrils and movements of the mouth region suggestive of expulsion and the prevention of penetration (Angyal, 1941). Disgust-related avoidance in cancer can take many forms (Reynolds, Bissett, Porter, & Consedine, 2016), and partners' heightened disgust sensitivity may serve as an instinctive response to protect them from infection and contamination (e.g., Curtis et al., 2004), possibly arising from a failure of emotion regulation and impulse control (e.g., Cisler et al., 2009). This is consistent with evidence elsewhere that disgust levels increase when the threat of infection (Fessler et al., 2005), or even the perceived threat of infection is high (Prokop & Fančovičová, 2013).

Behaviours engendered by the heightened disgust sensitivity in partners might be perceived as indicating rejection or disapproval by patients. For example, partners may engage in 'neutralizing' behaviours such as wiping their hands, or showering immediately after contact with the patients, which might be interpreted by patients as evidence for them being appraised as repulsive, leading to heightened self-disgust (e.g., de Jong & Borg, 2015). Consequently, if partners experience a greater intensity of disgust and are not effective in hiding their disgust, it might intensify self-disgust in

patients via internalization of the partners' expression of disgust (Powell et al., 2014; de Jong & Borg, 2015), which in turn may result in patients' mental health problems (e.g., Azlan et al., 2016; Powell et al., 2016).

Although there was a relationship between partners' disgust sensitivity and patients' self-disgust, contrary to the original hypothesis, the same was not true for partners' disgust propensity and patients' self-disgust. While it might be anticipated that partners' disgust propensity - their tendency to experience disgust, or how readily they respond with disgust - would influence patients' self-disgust in the same way as partners' disgust sensitivity, disgust propensity appears to be relatively malleable, being influenced (for example) by context (Viar-Paxton & Olatunji, 2012), emotion regulation (Cisler et al., 2009), and habituation (Azlan et al., 2016). That may make disgust propensity (versus disgust sensitivity) a fluctuating, 'noisy' source of information about the partners' emotional state, adding little to the information provided by disgust sensitivity, which appears to be more stable over time (cf. test-retest reliability; van Overveld et al., 2006; Olatunji et al., 2007).

In the context of cancer, therapy for couples has tended to focus almost exclusively on protecting and rebuilding their sexual relationship (e.g., Grayer, 2016). However, findings from the present research suggest that focusing on disgust responses, particularly self-disgust, could well be beneficial therapeutically to people with cancer. The development of depression and anxiety might be diminished by attention to the degree of self-disgust experienced by cancer patients, and interventions intended to reduce levels of these maladaptive responses (Azlan et al., 2016). Recent experimental work has shown that the self-affirmation of valued character traits may be a promising tool for reducing in-the-moment feelings of self-directed disgust (Powell et al., 2015b).

The findings from this chapter also suggested that disgust reactions of others were potentially a significant cause and source of self-disgust in people with cancer, which may further lead to anxious and depressive symptoms. These findings lead to the next chapter, where I will explore the role of disgust in predicting stigma towards people with cancer.

3.4.2 Clinical Implication

There may also be scope to develop therapeutic interventions for couples based on other aspects of disgust. Although, as has been mentioned above, disgust sensitivity remains relatively stable across time, disgust propensity appears to be more malleable (Azlan et al., 2016). Indeed, disgust propensity shows evidence of habituation in a domain-specific manner via exposure to relevant disgust elicitors (Rozin, 2008). It is possible that (for example) prior exposure to examples of disgust-eliciting stimuli ahead of treatment could lessen disgust propensity in partners, or at least inoculate them to the effect of upcoming elicitors. However, it must be remembered that in the present study partner's disgust propensity played a less important role than their disgust sensitivity in patient's anxiety and depression.

In more general terms, the present study's focus on emotional factors in the genesis of anxiety and depression in people with cancer suggests that therapeutic approaches using 'second wave' cognitive behaviour therapy (CBT) based on challenging dysfunctional thoughts may be less be appropriate in this group. Recently, acceptance and commitment therapy (ACT) has been proposed as a useful approach for psychological distress in cancer patients (Angiola & Bowen, 2013). ACT involves the uses of mindfulness, acceptance, and cognitive defusion strategies to promote non-judgmental awareness and increase value-oriented living. These strategies in ACT are thought to reduce the use of maladaptive response-focused emotion regulation strategies

(e.g., suppression) by encouraging individuals to distance themselves from rigid thoughts, increase contact with the present moment, and reduce experiential avoidance (Davies, Niles, Pittig, Arch, & Craske, 2015). The findings from this study which stress the importance of emotional factors in psychological wellbeing in cancer patients adds further weight to this suggestion, given ACT's focus on emotional acceptance. Early indications are that ACT is indeed more effective than CBT at lowering levels of depression and anxiety in people with breast cancer (Paez, Luciano, & Gutierrez, 2007).

For partners, results of present study indicate that partner's DS played a prominent role in developing patient's anxiety and depression. Hence, reducing their DS might be the best way to help them managing their experience of disgust when they are around the cancer patients. Since it has been established that DS is associated with sub-domains of emotion dysregulation such as emotion non-acceptance and lack of strategies to regulate emotions (Cisler, Olatunji, & Lohr, 2009), psychological interventions that target dysfunctional appraisals and facilitate greater tolerance of unpleasant emotions, would be promising for reducing DS in partners (e.g., mindfulness; Goodall, Trejnowska, & Darling, 2012; Reynolds, Consedine, & McCambridge, 2014; Williams, Ciarrochi, & Patrick Deane, 2010).

3.4.3 Limitations

The primary limitation in this study is the moderate sample size, which reflects the challenge of conducting a dyadic study involving people with cancer, with only around ten percent of the organizations that have been approached being willing to share the study advert with their members. This recruitment difficulty is the likely cause of an aspect of the participant sample that adds a challenge to how representative they were, namely nine of the couples (18%) in the study were same sex, a figure that is much higher than the proportion of same sex couples in any of the countries in which

the recruiting organizations were based. In the UK for example, the most recent survey suggests that around 1% of couples are same sex (Office of National Statistics, 2015). As a consequence, this study sample may not be representative with respect to this dimension. In terms of the influence that this may have on relevant measures, as has been mentioned above, self-disgust levels may be different in same sex and heterosexual couples given differences in attitudes towards these groups (Inbar et al., 2009) and the role of the attitudes of others in constructing self-disgust schema (Powell et al., 2015a).

A further limitation of the present research is that it relies entirely on self-report measures. However, self-report measures have been extensively used in research on disgust as they are inexpensive, easy to administer (in comparison to physiological and neurological measures), and are particularly useful in studies (such as this) that are concerned with the simultaneous assessment of multiple emotional states (Simpson, Carter, Anthony, & Overton, 2006).

Finally, this study was also limited by its cross-sectional design, although longitudinal studies are very difficult to conduct and interpret in people with cancer, who have a chronic progressive illness, the nature of which and the treatments associated with which change over time. Furthermore, the attrition rate (particularly with negatively-valenced studies like this study) were found to be high in this group.

IV. DISGUST PRONENESS CAUSALLY PREDICTS AVOIDANCE- AND AWKWARDNESS-BASED STIGMATISATION OF PEOPLE WITH CANCER

4.1 Introduction

Stigma can be conceptualised as a process involving assigning unfavourable judgements (e.g., labelling, separation, stereotype awareness, stereotype endorsement, prejudice, and discrimination; Clement et al., 2015) to the behaviour, signs, and attributes of individuals or groups (e.g., Joachim, & Acorn, 2016), resulting in social exclusion, rejection, and degradation (e.g., Peters, Cunningham, Murphy, & Jackson, 2016). Stigma can have powerful detrimental effects on an individual's psychological and mental health through a heightened vulnerability to negative self-identification (e.g., Rosman, 2004), increased self-blame (e.g., Phelan et al., 2013), loss of emotional support (e.g., Bloom & Kessler, 1994), coping difficulties (e.g., Vanable, Carey, Blair, & Littlewood, 2006), increased psychological distress (e.g., Lebel et al., 2013; Quinn, & Chaudoir, 2009), and challenging individuals' psychological adjustment (e.g., Vanable et al., 2006).

Stigma also may have adverse consequences on people's physical health. Stigma has been associated with an increased risk of poor health outcomes (Cho et al., 2004; Lebel, & Devins, 2008), a shortened life span (Farnam, Zipple, Tyrell, & Chittinanda, 1999), a decline in quality of life (e.g., Cataldo, Jahan, & Pongquan, 2012), and a delay in people's recovery from illness via diminished social support (e.g., Perlick et al., 2001). Stigma also may perpetuate physical health issues through, for example, discouraging individuals from being tested or treated for the stigmatised disease or condition (e.g., Courtwright, 2009), causing diagnostic delay (e.g., Tod, Craven, & Allmark, 2008), and treatment discontinuation (e.g., Sirey et al., 2001). Stigma also potentially influenced the mental health in individuals. In the previous chapter (Chapter

III), the findings suggested that disgust reactions of others were a significant cause and source of self-disgust in people with cancer, which may further lead to anxious and depressive symptoms. The potentially serious impact of stigma underpins the aim of this chapter which seeks to explore the role of disgust in stigma towards people with cancer, a highly stigmatized group (e.g., Else-Quest, & Jackson, 2014; Greene, & Adelman, 2003).

4.1.1 Cancer and stigma

The effects of stigma can be particularly difficult for those with disease-associated stigma (Link & Phelan, 2006), such as people with cancer. Stigma has been shown to be one of the difficulties and challenges that cancer patients confront more often than some other illness groups (e.g., diabetes, heart disease, acne; Albrecht, Walker, & Levy 1982; hypertension, stroke, diabetes, herpes; Berman, & Wandersman, 1990). Among the cognitive factors that persistently contribute to stigma towards people with cancer is the attribution of patients' personal responsibility for the cause of the disease (e.g., from non-healthy lifestyles etc.; Lebel et al., 2013). Stigma also often arises from misinformation about the illness, such as a diagnosis of cancer being considered fatal (e.g., Clegg-Lamptey, Dakubo, & Attobra, 2009; Greene, & Adelman, 2003) and irrational beliefs, such as that cancer is contagious (e.g., Fife & Wright, 2000).

Besides cognitive factors, there are also emotional predictors theorised to contribute to stigma towards people with cancer, such as fear. Fear has been suggested to be one cause of negative attitudes towards people with cancer (e.g., Integrated Threat Theory [ITT] towards people with cancer; Berrenberg, Finlay, Stephan, & Stephan, 2002), for example, where individuals fear that interacting with someone who has cancer will compromise their own physical or mental health. They also fear that they

might experience discomfort, embarrassment, ridicule, or rejection in the presence of people with cancer. Accordingly, fear can lead to stigma-based avoidance, awkwardness, and rejection. Research has revealed that another emotional predictor of stigma is disgust. There is a body of evidence that disgust may be predictive of stigma, where DP has been found to be a strong predictor of negative attitudes toward obese people (e.g., Vartanian, 2010), and is linked to greater prejudice and stigma towards homosexuals (e.g., Inbar et al., 2009; Olatunji, 2008). DP also as in previous work being a significant, positive predictor of wanting less contact with non-cancer specific colostomy patients and with self-perceived stigma (e.g., Smith et al., 2007). Disgust propensity has also been found to demonstrate positive correlations with negative outgroup evaluations (e.g., Choma, Hodson, & Costello, 2012; Hodson et al., 2013; Navarrete & Fessler, 2006) and opposition to immigration (e.g., Aarøe et al., 2017). However, only minimal research has explored disgust as a predictor of stigma towards chronic diseases, such as cancer.

Perhaps the closest prior work is by Pryor et al. (2004). As part of a wider investigation, Pryor et al. (2004) showed that propensity to disgust significantly predicted avoidance reactions to a composite of stigmatized health conditions, including Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome (HIV/AIDS), obesity, and cancer, in a computerised behavioural task. However, individual effects on cancer were not explored in this study. Furthermore, the study did not include an experimental control or neutral comparison, control for bidirectional effects of existing stigma responses on disgust, consider different domains of disgust responding, or test a mechanism for their findings (e.g., via increases in negative affect). Accordingly, the causal role that disgust *traits in individuals may* have in predicting stigmatisation

towards people with cancer remains unclear. In this chapter I am interested in exploring this link, using complementary survey and experimental methods.

4.1.2 Disgust and stigma

Disgust is a universal human emotion (Ekman, 1992), originally theorised to be an evolved derivative of the distaste response, which prevents an organism from ingesting potentially harmful substances (Rozin & Fallon, 1987). The emotion has since extended, via evolutionary co-option, to protect against broader pathogenic threats to the body from potentially infectious stimuli (Curtis et al., 2004), as well as facilitating the avoidance and rejection of wider pathogenic stimuli, and sociomoral transgressions that breach culturally-defined virtues of purity and divinity (e.g., certain sexual violations; Chapman & Anderson, 2012).

Disgust is a disease-avoidance emotion (Curtis et al., 2011), and has been argued to be the affective component of our 'behavioural immune system', by generating intense negative affect towards potentially infectious stimuli (Stevenson et al., 2009), which motivates avoidance of people or situations that might result in contamination (Neuberg, Kenrick, & Schaller, 2011; Rachman, 2004; Schaller & Park, 2011). People were found to report much greater disgust to stimuli linked to disease transmission (Curtis et al., 2004). Oaten et al. (2011) suggest that the emotion of disgust explains the heuristic, quick-firing aversive response of stigma, at least to some extent. According to this perspective, disease cues may activate disgust, and motivate avoidance of entities that could potentially be carriers of disease and contamination as a form of self-protection from the disease threat.

However, the disgust response is to some extent imprecise and causes false alarms, where the perceptions of a threat to health can occur (or persist) in the absence of an objective threat (e.g., Nemeroff, & Rozin, 1994; Reynolds et al., 2013). Stimuli

that either have been in contact with or imitate features of stimuli that could make us unwell can elicit disgust as well (e.g., the "law of contagion" and "law of similarity"; Rozin et al., 1999). Thus, as a natural consequence of this, many people suffering from infectious diseases are more prone to being stigmatized (Schaller, 2011), and this effect extends to non-contagious diseases (e.g., cancer; Fife & Wright, 2000) that mimic the signs of infectious disease (e.g., via distinguishing features such as hair loss, handicap, etc.; Goffman, 1963; Rosman, 2004). Via the "law of similarity", individuals are more likely to associate physical differences with disease, leading to stigmatization (Park et al., 2007). Via the "law of contagion", individuals were also found to display disgust feelings in response to cervical cancer patients particularly when they were informed that its cause is intricately connected to sexual behaviour (e.g., Shepherd, & Gerend, 2014). Activation in brain regions associated with disgust also has been found in individuals when they were exposed to stigmatized groups (Krendl et al., 2006). Therefore, disgust is likely to be a predictor of health-based stigma, yet there is little evidence in this area.

Individuals show variation in their disgust traits, including in their DS and DP. DP is conceptualized as multidimensional, and measures have been generated to assess DP to different types of disgust elicitors, such as: core disgust, which is characterized by a real or perceived threat of oral incorporation and a reactive sense of offensiveness; animal-reminder disgust (AR), which consists of reminders of our own mortality and inherent animalistic nature; and contamination based disgust (CB), which is based on the perceived threat of transmission of contagion (e.g., Haidt et al., 1994; Olatunji et al., 2007; Olatunji et al., 2008; Rozin et al., 2008). Previous work that has explored disgust traits and cancer stigma has found significant positive associations, but has failed to take this dimensionality into account.

Possessing higher levels of disgust traits may have a causal role in increasing cancer stigma by influencing the frequency and/or intensity of disgust reactions (e.g., Deacon & Olatunji, 2007) and other associated negative emotions (e.g., Olatunji, 2009; Olatunji et al., 2007) when being exposed to emotive cancer stimuli (i.e., being around people with cancer, watching cancer-related surgery, anticipating the disease-threat related to cancer, etc.). Therefore, some people may be more prone to stigmatise others. Several domains of disgust may relate to stigma towards people with cancer. Core disgust may predict stigma towards people with cancer because it is associated with physical disease cues from cancer that suggest pathogen risk (e.g., faeces in colostomy usage; distinguishing features that mimic the signs of infectious disease such as hair loss, etc.). AR disgust also may be a predictor of stigma towards people with cancer as people with cancer might remind and confront us with the idea of our physicality, our vulnerability and inevitable death, which have been previously linked with animal-reminder disgust (e.g., Haidt, Rozin, McCauley, & Imada, 1997; McGinn, 2011; Rozin & Fallon, 1987). CB disgust consists of interpersonal disgust that is based on concerns of contamination and disease through direct or indirect contact with others (Rozin et al., 2008) and people with higher CB disgust may exhibit higher stigma towards people with cancer, possibly through the perceived contagion and negative effect of being physically close to someone with cancer.

Stigma is multifaceted and of the attributes of stigma commonly researched two main aspects that are theoretically and empirically linked to disgust are avoidance (Curtis et al., 2011; Pryor et al., 2004) and awkwardness (e.g., awkwardness as measured in intergroup anxiety toward the homeless; Hodson, Dube, & Choma, 2015), therefore, avoidance- and awkwardness-based stigma may be particularly influenced by individuals' disgust traits and are the focus of the current study.

Despite the compelling rationale outlined above, there has been relatively little research into the role of disgust traits and stigma in cancer. Furthermore, the direction and nature of causality in the relationship is unclear, that is if disgust traits cause increased stigma or if the reverse is true (or a third variable explains both). Understanding specifically how, and which type(s), of disgust traits may contribute to stigma is a prerequisite to understanding how I could approach a resolution.

4.1.3 The present research – disgust traits as a predictor of cancer stigma

In the present chapter, I tested the link between disgust traits and cancer stigma in a two-phase study, with a survey and experimental component. Phase 1 was designed to establish the links between disgust traits with particular dimensions of stigma towards people with cancer. Phase 2 was designed to examine a potential causal mechanism between the two constructs through an experimental study. In particular, four main predictions were explored:

4.1.4 Predictions for phase 1 (survey):

(1) Based on past research (e.g., Inbar et al., 2009; Olatunji, 2008; van Overveld et al., 2006; Vartanian, 2010), I hypothesized that individuals with a higher DP would display increased stigma towards people with cancer. As no work has investigated the effect of DS on stigma, there was no priori prediction.

(2) Given that people's propensity to disgust in different domains can be meaningfully separated (e.g., Rozin et al., 2008), I expected to observe differences in the extent to which core, AR, and CB domains of disgust predicted (different types of) stigma.

4.1.5 Prediction for phase 2 (experimental):

(3) Exposure to emotive cancer-relevant stimuli (i.e., watching a cancer surgery video) would invoke negative emotional reactions (e.g., disgust and other

negative emotions; Olatunji, 2009; Olatunji et al., 2007), which may lead to increased avoidance- (e.g., Curtis et al., 2011) and awkwardness- (e.g., Reynolds et al., 2015) based stigma responses.

(4) Given that DP influences the ease of experiencing disgust (Deacon & Olatunji, 2007), and other associated negative emotions (e.g., Olatunji, 2009; Olatunji et al., 2007), DP will have a causal effect on avoidance- and awkwardness-based stigma by heightening (moderating) the level of disgust, and associated negative emotions, participants experience as a consequence of exposure to emotive cancer-related stimuli.

(5) Since some specific DP domains may be predictive of particular types of stigma (e.g., Rozin et al., 2008), I expected to observe distinctive causal effects of core, AR, and CB on avoidance- and awkwardness-based stigma by heightening (moderating) the level of disgust, and associated negative emotions, participants experienced as a consequence of exposure to emotive cancer-related stimuli.

4.2 Phase 1 – Survey Study

4.2.1 Methods

4.2.1.1 Participants

Two hundred and seventy-two participants were recruited online. Most participants were women (n = 196), with ages ranging from 18 to 67 years (M = 26.72, SD = 10.71). All participants reported not having being diagnosed with cancer. The participants were recruited from the university volunteer's list and several online recruitment pages, such as "Callforparticipants.com", "Psychology Research on Net", and "Research Studies".

4.2.1.2 Measures

4.2.1.2.1 General disgust propensity and sensitivity. Participants' DP and DS were measured using the 16-item Disgust Propensity and Sensitivity Scale-Revised

(DPSS-R; van Overveld et al., 2006). Participants read 16 statements and chose the answer which is most appropriate to them, on a 5-point scale (1=*never,* 5=*always*), resulting in a total score from 16–80. Example items include: "I avoid disgusting things" (DP) and "When I notice I feel nauseous, I worry about vomiting" (DS). Based on psychometric evaluations of the DPSS-R (Olatunji et al., 2007; Goetz, Cougle, & Lee, 2013), a recommended revised 10-item solution (six items for DP and four for DS) was used for analyses. In this sample, the Cronbach's alpha for DP was .81 and .77 for DS.

4.2.1.2.2 Domain-specific disgust propensity. Participants' disgust propensity to three different types of disgust elicitors was measured using the 25-item Disgust Sensitivity Scale-Revised (DS-R; Haidt et al., 1994; modified by Olatunji et al., 2007). This measures proneness to disgust in three domains: "core" (12 items measuring basic disgust elicitors such as vomit); "contamination" (5 items measuring interpersonal contagion threats such as "let any part of body touch the toilet seat in public restrooms" or "drinking from someone else's soda"); and "animal-reminder" (8 items measuring revulsion at reminders of our animal nature such as corpses or ashes of a person who has been cremated). The measure uses a 5-point Likert scale from 0 to 4 for all items (0 = *strongly disagree*, 4 = *strongly agree*), resulting in a total score from 0 to 100. Items were reverse scored as needed. The Cronbach's alpha coefficients in the current study were .79 for the core, .77 for the AR and .59 for the CB subscales.

4.2.1.2.3 Attitudes to cancer. Participants were asked to rate 30 statements expressing both positive and negative sentiments about a person with cancer using a 6-point Likert scale for the Attitudes to Cancer Scale (ATC; Tichenor & Rundall, 1977). Example items include: "Persons with cancer are not as self-confident as physically normal persons". Six responses were given to the participants for each statement,

indicating a range from strong agreement to strong disagreement with the statement (3 = *I agree very much*, −3 = *I disagree very much*) and items were reverse scored as needed. Eleven of the statements were worded positively, whereas the remaining 19 items were worded negatively. The signs of the responses to statements with negative wording were first reversed, and the individual scores were then totalled. The lowest possible score attainable was −90 and the highest was 90. A constant of +90 was added to eliminate negative values. Thus, the final ATC scored ranged from 0-180. A high score indicated that the people with cancer were viewed in a similar manner to people without cancer, while a low score indicated a perception of dissimilarity between people with cancer and people without cancer. In this sample, the Cronbach's alpha for the ATC was .81.

4.2.1.2.4 Cancer stigma. Participants completed the 25-item Cancer Stigma Scale (CASS; Marlow, & Wardle, 2014) which assesses multiple aspects of cancer stigma including: awkwardness (5-items, e.g. "I would find it hard to talk to someone with cancer"), severity (5-items, e.g. "Getting cancer means having to mentally prepare oneself for death"), avoidance (5-items, e.g. "If a colleague had cancer I would try to avoid them"), policy opposition (4-items, e.g. "The needs of people with cancer should be given top priority"), personal responsibility (4-items, e.g. "If a person has cancer it's probably their fault"), and financial discrimination (3-items, e.g. "It is acceptable for insurance companies to reconsider a policy if someone has cancer"). Responses for each item were made on a 6-point Likert scale (1=*disagree strongly*, 6=*agree strongly*), resulting in a total score from 25 to 150. Items were reverse scored as needed. Cronbach's alpha scores in the present sample were: severity: .66; personal responsibility: .88; awkwardness: .82; avoidance: .81; financial discrimination: .73; and policy opposition: .74.

4.2.1.3 *Procedure*

Ethical approval was granted by the host institution prior to data collection. In the first instance, the link to the URL and the corresponding password were e-mailed to participants. To minimize response bias, participants were informed that the aim of the study was to investigate their attitudes towards health, and the actual objective of the study was only disclosed in the debriefing at the end of the study. Participation was available to those who were aged 18 and above and had no cancer diagnosis. Participants were informed at the consent stage in the survey that they may be contacted after three days to take part in a related study and were required to leave their email addresses if they consented to be contacted for this. A prize draw of £100 was offered for those who completed both phases of the study. As part of the survey study, participants completed a brief demographics questionnaire (age, gender, ethnicity, education), and the questionnaires outlined above in a counterbalanced order.

4.2.1.4 *Data analysis*

Following descriptive and correlational analyses on SPSS v. 22 (IBM Corp., Armonk, NY, US), multiple regression analyses were conducted to test the objectives related to prediction (1) to examine the predictive effect of DP and DS on stigma, and prediction (2) to observe differences in the extent to which core, AR, and CB domains of disgust predicted (different types of) stigma. Bootstrapping was used to account for data with a non-normal distribution. Bootstrapping provides a non-parametric robust alternative to parametric estimates when the assumptions of those methods may be violated (e.g., Fox, 2008). The significance of all regression path coefficients was assessed by computing bias-corrected and accelerated bootstrap estimates with 95% confidence intervals (BCa 95% CIs). This technique was utilised because it performs optimally with regard to statistical power and type I error rates compared to other

methods (Efron, 1987). Ten thousand resamples were used for the bootstrapped estimates (Mallinckrodt et al., 2006). Age, gender, education, and ethnicity might be potential observed confounds; therefore, these variables were entered as covariates in all regression models.

4.2.2 Results

4.2.2.1 Descriptive and bivariate associations

Descriptive statistics and bivariate correlations among disgust and stigma variables are presented in Table 4.1. Central to the interests of this chapter was whether disgust had a significant link with cancer stigma. Initial correlational analyses showed that there were significant associations between DP with most of the study variables. In particular, DP was found to be significantly negatively correlated with ATC, $r = -.17$, $p < .01$, indicating that the higher a person's DP, the more they were inclined to view people with cancer in a dissimilar manner to people without cancer. DP had significant positive associations with most of the CASS subscales; severity, $r = .27$, $p < .01$, awkwardness, $r = .30$, $p < .01$, and avoidance, $r = .15$, $p < .05$. However, there was no significant correlation of DP with responsibility, discrimination, or policy opposition stigma. DS was found to significantly correlate only with severity, $r = .13$, $p < .05$.

All of the subscales for DS-R; core, animal reminder (AR) and contamination-based (CB) were found to significantly correlate with ATC in a negative direction, core, $r = -.22$, $p < .01$, AR, $r = -.23$, $p < .01$, and CB, $r = -.25$, $p < .01$. The domain-specific subscales were significantly correlated positively with severity, core, $r = .25$, $p < .01$, AR, $r = .15$, $p < .05$, and CB, $r = .21$, $p < .01$; responsibility, core, $r = .14$, $p < .05$, AR, $r = .12$, $p < .05$, and CB, $r = .24$, $p < .01$; awkwardness, core, $r = .24$, $p < .01$, AR, $r = .36$, $p < .01$, and CB, $r = .17$, $p < .01$; and avoidance, core, $r = .16$, $p < .01$, AR, $r = .22$,

Table 4. 1 Bivariate correlation coefficients (Pearson's *r*) among study variables in Phase 1.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	—															
2. Gender	.04	—														
3. Education	.35**	−.08	—													
4. Ethnicity	.05	.05	−.04	—												
5. DP	−.17**	−.02	−.19**	−.02	—											
6. DS	−.20**	−.09	−.13*	−.09	.48**	—										
7. Core	−.09	−.30**	−.10†	−.20**	.53**	.40**	—									
8. AR	−.24**	−.21**	−.08	−.16**	.41**	.43**	.58**	—								
9. CB	−.10	−.12†	−.13*	−.33**	.38**	.31**	.58**	.46**	—							
10. Attitude to Cancer	.08	−.10†	−.01	.21**	−.17**	−.04	−.22**	−.23**	−.25**	—						

11. Severity	−.07	.11†	−.09	.04	.27**	.13*	.25**	.15*	.21**	−.42**	—					
12. Responsibility	−.13*	.08	.01	−.21**	.10†	.07	.14*	.12*	.24**	−.22**	.22**	—				
13. Awkwardness	−.10†	.03	−.00	−.14*	.30**	.11†	.24**	.36**	.17**	−.41**	.38**	.19**	—			
14. Avoidance	−.02	.05	.01	−.09	.15*	.08	.16**	.22**	.18**	−.27**	.29**	.27**	.55**	—		
15. Discrimination	−.08	.03	.00	.03	.01	−.04	−.04	−.04	−.04	−.12*	.26**	.26**	.20**	.23**	—	
16. Policy opposition	−.14*	−.03	−.05	.01	−.04	−.09	−.19**	−.11†	−.14*	.19**	−.06	.14*	−.01	.10†	.22**	—
Range	18-67	0-1	1-4	0-1	6-29	4-19	5-47	0-31	0-17	63-156	1-6	1-5	1-5	1-4	1-5	1-6
M	26.72	0.28	1.81	0.59	16.79	9.60	24.21	13.86	5.44	111.49	3.05	1.60	2.20	1.29	2.14	2.23
SD	10.71	0.45	0.89	0.49	3.73	3.46	8.57	6.69	3.65	19.01	0.87	0.85	0.96	0.49	1.04	0.91

Notes: $N = 272$. Correlations represent Pearson's r, pointbiseral (r_{pb}), or phi (r_{Φ}) coefficients. DP = disgust propensity; DS = disgust sensitivity; AR = animal reminder disgust, CB = contamination based disgust. Asterisked coefficients are significant at †$p < .10$. *$p < .05$. **$p < .01$. Values for gender: 0 = female; 1= male, values for ethnicity: 0 = other ethnicities; 1= White British.

$p < .01$, and CB, $r = .18$, $p < .01$. None of them significantly correlated with discrimination, and only core and CB disgust were found to be significantly correlated with policy opposition, core, $r = -.19$, $p < .01$, and CB, $r = -.14$, $p < .05$, however the correlations were in a negative direction.

4.2.2.1 Effects of disgust on stigmatization of people with cancer

In order to examine which disgust traits independently predicted stigma towards people with cancer, multiple regression models were tested. The regression models included DP and DS as predictors, ATC, and the subscales of the CASS (severity, responsibility, awkwardness, avoidance, discrimination and policy opposition) as the dependent variables, along with gender, age, education, and ethnicity as covariates. DP was found to significantly predict severity, $\beta = .26$, $p < .01$, awkwardness, $\beta = .33$, $p < .01$, and avoidance, $\beta = .16$, $p < .05$, and negatively predict ATC, $\beta = -.20$, $p < .01$. However, there were no significant effects of DP on responsibility, discrimination, and policy opposition stigma. DS did not significantly predict any of the stigma outcomes. The results of these regression analyses are presented in Table 4.2.

To identify whether high propensity in response to specific stimuli (core, AR, and/or CB disgust) significantly predicted stigma, models with the DS-R rather than the DPSS-R as the measure of disgust, with core, AR, and CB as predictors were tested. In these models, each trait of core, AR, and CB emerged as a significant predictor of different subscales of the CASS. Core disgust exclusively predicted severity in a positive direction, $\beta = .26$, $p < .01$. Core disgust also predicted policy opposition, but in a negative direction, $\beta = -.19$, $p < .05$. AR exclusively predicted awkwardness, $\beta = .33$, $p < .01$, and avoidance, $\beta = .18$, $p < .05$. CB disgust exclusively predicted responsibility, $\beta = .18$, $p < .05$. There were no significant effects on ATC and discrimination. The results of these regression analyses are presented in Table 4.3.

Table 4. 2 Regression analyses of disgust propensity and sensitivity in predicting stigma towards people with cancer

	Attitude to Cancer			Severity			Responsibility			Awkwardness		
Variable	*B [BCa 95% CI]*	*SE B*	*β*	*B[BCa 95% CI]*	*SE B*	*β*	*B[BCa 95% CI]*	*SE B*	*β*	*B[BCa 95% CI]*	*SE B*	*β*
Gender	−5.01 [−10.21, 0.46]	2.66	−.12†	0.22 [−0.00, 0.45]	0.12	.12†	0.19 [−0.05, 0.43]	0.12	.10	0.11 [−0.13, 0.34]	0.13	.05
Age	0.13 [−0.12, 0.38]	0.12	.07	−0.00 [−0.01, 0.01]	0.01	−.02	−0.01 [−0.02, −0.00]	0.00	−.14**	−0.01 [−0.02, 0.00]	0.01	−.08
Education	−0.99 [−3.61, 1.79]	1.40	−.05	−0.02 [−0.14, 0.09]	0.06	−.02	0.07 [−0.05, 0.20]	0.07	.08	0.08 [−0.06, 0.22]	0.07	.08
Ethnicity	8.12 [3.51, 12.70]	2.37	.21**	0.08 [−0.13, 0.28]	0.11	.04	−0.35 [−0.56, −0.15]	0.11	−.20**	−0.27 [−0.48, −0.06]	0.11	−.14*
DP	−1.01 [−1.72, −0.31]	0.36	−.20**	0.06 [0.03, 0.09]	0.02	.26**	0.02 [−0.01, 0.06]	0.02	.09	0.08 [0.05, 0.12]	0.02	.33**
DS	0.39 [−0.32, 1.10]	0.36	.07	0.00 [−0.03, 0.04]	0.02	.01	0.00 [−0.03, 0.04]	0.02	.00	−0.02 [−0.05, 0.02]	0.02	−.06
Total R^2	.07			.07			.06			.10		
F	4.46			4.31			3.74			6.04		

	Avoidance			Discrimination			Policy opposition		
Gender	0.06 [−0.06, 0.19]	0.06	.06	0.06 [−0.22, 0.35]	0.15	.03	−0.08 [−0.31, 0.16]	0.12	−.04
Age	0.00 [−0.01, 0.01]	0.00	−.00	−0.01 [−0.02, 0.00]	0.01	−.10†	−0.01 [−0.03, −0.00]	0.01	−.16*
Education	0.02 [−0.04, 0.08]	0.03	.04	0.05 [−0.11, 0.20]	0.08	.04	−0.02 [−0.16, 0.13]	0.07	−.02

Ethnicity	−0.09 [−0.21, 0.03]	0.06	−.09	0.06 [−0.20, 0.32]	0.13	.03	0.01 [−0.21, 0.24]	0.12	.01
DP	0.02 [0.01, 0.04]	0.01	.16*	0.01 [−0.03, 0.05]	0.02	.04	−0.00 [−0.04, 0.03]	0.02	−.01
DS	0.00 [−0.02, 0.02]	0.01	.00	−0.02 [−0.06, 0.02]	0.02	−.06	−0.03 [−0.07, 0.00]	0.02	−.12†
Total R^2	.01			−.01			.02		
F	1.55			0.53			1.70		

Notes: $N = 272$. DP = disgust propensity; DS = disgust sensitivity; BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval; LL = lower limit; UL = upper limit; *SE B* = bootstrapped standard error. Asterisked coefficients are significant at †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 4. 3 Regression analyses of core, animal reminder and contamination based disgust in predicting stigma towards people with cancer

	Attitude to Cancer			Severity			Responsibility			Awkwardness		
Variable	*B [BCa 95% CI]*	*SE B*	β	*B[BCa 95% CI]*	*SE B*	β	*B[BCa 95% CI]*	*SE B*	β	*B[BCa 95% CI]*	*SE B*	β
Gender	−8.04 [−13.47, −2.49]	2.70	−.19**	0.38 [0.14, 0.61]	0.12	.20**	0.24 [−0.00, 0.50]	0.13	.13	0.30 [0.05, 0.54]	0.13	.14*
Age	0.09 [−0.15, 0.33]	0.12	.05	−0.00 [−0.01, 0.01]	0.01	−.04	−0.01 [−0.02, −0.00]	0.00	−.14†	−0.00 [−0.01, 0.01]	0.01	−.04
Education	−1.20 [−3.75, 1.48]	1.33	−.06	−0.01 [−0.13, 0.10]	0.06	−.01	0.09 [−0.03, 0.22]	0.06	.09	0.05 [−0.09, 0.19]	0.07	.05
Ethnicity	5.15 [0.45, 9.89]	2.40	.13*	0.22 [0.02, 0.42]	0.11	.12*	−0.24 [−0.45, −0.03]	0.11	−.14*	−0.18 [−0.39, 0.03]	0.11	−.09
Core	−0.26 [−0.63, 0.11]	0.19	−.12	0.03 [0.01, 0.04]	0.01	.26**	0.01 [−0.01, 0.02]	0.01	.05	0.01 [−0.00, 0.03]	0.01	.11
AR	−0.36 [−0.75, 0.05]	0.20	−.13†	0.00 [−0.02, 0.02]	0.01	−.00	−0.00 [−0.02, 0.02]	0.01	−.02	0.05 [0.03, 0.07]	0.01	.33**
CB	−0.54 [−1.27, 0.18]	0.38	−.10	0.03 [−0.01, 0 .06]	0.02	.11	0.04 [0.01, 0.08]	0.02	.18*	−0.02 [−0.06, 0.02]	0.02	−.07
Total R^2	.11			.10			.08			.14		
F	5.71			5.08			4.51			7.15		

	Avoidance			Discrimination			Policy opposition		
Gender	0.12 [−0.02, 0.26]	0.07	.11†	0.05 [−0.26, 0.37]	0.16	.02	−0.19 [−0.43, 0.06]	0.12	−.10
Age	0.00 [−0.01, 0.01]	0.00	.02	−0.01 [−0.02, 0.00]	0.01	−.10	−0.01 [−0.02, −0.00]	0.01	−.16*
Education	0.02 [−0.04, 0.08]	0.03	.04	0.04 [−0.11, 0.19]	0.08	.04	−0.04 [−0.18, 0.11]	0.07	−.04
Ethnicity	−0.03 [−0.16, 0.10]	0.06	−.03	0.05 [−0.22, 0.32]	0.14	.03	−0.07 [−0.31, 0.17]	0.12	−.04
Core	0.00 [−0.01, 0.01]	0.01	.04	−0.00 [−0.02, 0.02]	0.01	−.01	−0.02 [−0.04, 0.00]	0.01	−.19*
AR	0.01 [0.00, 0.02]	0.01	.18*	−0.01 [−0.03, 0.02]	0.01	−.04	−0.01 [−0.03, 0.02]	0.01	−.04
CB	0.01 [−0.01, 0.03]	0.01	.08	−0.00 [−0.05, 0.05]	0.02	−.01	−0.01 [−0.05, 0.02]	0.02	−.05
Total R^2	.04			−.02			.05		
F	2.72			0.42			2.96		

Notes: *N* = 272. AR = animal reminder, CB = contamination based; BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval; LL = lower limit; UL = upper limit; *SE B* = bootstrapped standard error. Asterisked coefficients are significant at †*p*< .10. **p*< .05. ***p*< .01. ****p*< .001.

4.2.3 Discussion

The present study established that individuals with certain disgust traits were found to have higher stigma levels towards people with cancer, in particular domains. DP was found to significantly predict ATC, severity, awkwardness, and avoidance, while an individual's propensity to disgust in core, AR, and CB domains exclusively predicted different dimensions of stigma respectively; severity, awkwardness, avoidance, responsibility, and policy opposition (negative direction).

These findings validate prediction (1), that individuals with a higher DP would display increased stigma towards people with cancer, and confirm previous findings from Pryor et al. (2004), which indicated that DP significantly predicted avoidance reactions to a composite of stigmatized health conditions, including HIV/AIDS, obesity, and cancer. These findings are also consistent with prior research that demonstrated positive links between DP and negative attitudes towards obese people (e.g., Vartanian, 2010), and DP is linked with higher prejudice and stigma towards homosexuals (e.g., Inbar et al., 2009; Olatunji, 2008), negative outgroup evaluations (e.g., Choma et al., 2012; Hodson et al., 2013; Navarrete & Fessler, 2006), and opposition to immigration (e.g., Aarøe et al., 2017), as well as being a significant, positive predictor of wanting less contact with non-cancer specific colostomy patients and with self-perceived stigma (e.g., Smith et al., 2007). The present findings also show for the first time that DS does not affect any dimensions of stigma, potentially suggesting the non-relevance of this trait in understanding stigma, particularly towards people with cancer.

As had been expected in prediction (2), there were differences in the extent to which core, AR, and CB domains of disgust predicted (different types of) stigma. There was an exclusive effect of core in predicting severity, and policy opposition (negative direction); AR on awkwardness, and avoidance; and CB on responsibility. These

different predictive effects suggest that an individual's propensity to different domains of disgust-elicitor may have exclusive properties and capabilities (e.g., Rozin et al., 2008), exhibited by their differential effects on stigma (e.g., core disgust uniquely predicts negative attitudes toward people with different sexual orientation; Olatunji, 2008). This is a unique contribution of the present study.

Unexpectedly, individuals who possessed high core disgust were found to endorse higher support for policy initiatives to protect, care for, and provide treatment for those with cancer. A potential explanation for this discrepancy might be that individuals with high core disgust possibly expressed support for policy initiatives to treat and cure cancer patients as a mechanism to alleviate cancer (i.e., the disgust elicitor), as a self-protection strategy, in order to protect themselves from aversion and exposure to the disease (cf. children who perceived themselves to be vulnerable to diseases had better pro-environmental attitudes as they have greater concerns about environmental threat such as pollution; Prokop, & Kubiatko, 2014). While higher in some dimensions of stigma, this work suggests that people with higher (core) disgust might actually be more receptive to policy and charitable initiatives for people with cancer.

All these findings confirm that stigma is driven by a conservative defence against disease (mediated via disgust), and individuals or situations that might result in contamination as has been previously established (e.g., Neuberg et al., 2011; Oaten et al., 2011; Rachman, 2004; Schaller & Park, 2011). However, a significant limitation of this first phase of the work is that it only demonstrates *associational* relationships between DP and cancer stigma. In the next phase of the work I sought to examine a potential *causal* mechanism between the two constructs through an experimental study.

This experimental study aimed to explore the effect of being exposed to emotive cancer-related stimuli on avoidance and awkwardness-based stigma, through the negative emotion experienced, as a function of participants' underlying trait DP. Stigma is multifaceted and of the attributes of stigma commonly researched two main aspects that are theoretically and empirically linked to disgust are avoidance (Curtis et al., 2011; Pryor et al., 2004) and awkwardness (Hodson et al., 2015), therefore, this experimental study focused on avoidance- and awkwardness-based stigma. This has precedent, as the findings in Phase 1 demonstrated that individuals with high DP were found to have an increased tendency to feel uncomfortable around someone with cancer (awkwardness) and have a higher tendency to avoid people with cancer (avoidance).

Mediation and moderated mediation path analyses were conducted to test the central interests in this next phase of study which were: (a) experimentally testing a causal effect of exposure (i.e., exposure to emotive cancer-relevant stimuli) on stigma towards people with cancer, through negative emotional reactions; and (b) providing insights into the psychological mechanisms explaining how individuals' DP may lead to greater avoidance and awkwardness-based stigma.

4.3 Phase 2 – Experimental Study

4.3.1 Methods

4.3.1.1 Participants

One hundred and forty-one participants were recruited from the sample in Phase 1. To ensure that a representative number of subjects from various subgroups is randomly selected, participants were stratified using a spreadsheet based on their age, gender, and propensity to disgust scores (as measured by the DP subscale from Disgust Propensity and Sensitivity Scale-Revised, DPSS-R; van Overveld et al., 2006), and then randomized to an emotive cancer-relevant surgery video condition (n = 73), or neutral

video condition (n = 68). Most participants in the experimental condition were women (n = 53). The participants' ages ranging from 18 to 65 years (M = 27.88, SD = 10.84). Most participants in the neutral condition were women (n = 50), with participants' ages ranging from 18 to 61 years (M = 26.99, SD = 9.41).

4.3.1.2 Measures

4.3.1.2.1 Avoidance- and awkwardness-based stigma. In order to index experimentally-induced variation in stigma I designed a brief 4-item Visual Analogue Scale (VAS) measure to use as the dependent variable in the experimental phase of this research (Appendix B), adapted from the Cancer Stigma Scale (CASS; Marlow, & Wardle, 2014). Two subscales of stigma that were a priori hypothesised to be most related to disgust were awkwardness and avoidance behaviours, which are known to be significantly influenced by DP (Curtis et al., 2011; Hodson et al., 2015). To make a brief VAS measure, 4 items from 10 were randomly selected from these subscales. The four items included were: "Responding honestly, I would try to avoid a person with cancer", "I would find it difficult being around someone with cancer", "I would find it hard to talk to someone with cancer", and "I would distance myself physically from someone with cancer". Participants responded to each stem on a 100-point VAS (e.g., 0 = *not at all*, 100 = *extremely so*). Factor analysis on these items revealed that they associated together as one factor, with primary loadings between .57 and .71 (Appendix C). The Cronbach's alpha score for this measure in the present sample was .85. This 4-item measure was designed to minimise participant burden, while maximising variance in the experimental outcome through the use of 100-point VAS scales.

4.3.1.2.2 State emotion. In order to measure disgust and other negative emotions, a VAS (adapted from Powell et al., 2015) was used to record how much disgust and other negative emotions participants currently felt after watching the videos.

The VASs recorded how much of 4 basic negative emotions (disgust, anger, sadness, and fear) participants currently felt after watching the videos. In order to keep the participants blind to the objectives of the study, one positive emotion was also included, to record how much happiness participants currently felt after watching the videos (Appendix D). For each emotion, participants responded to the stem: "Responding honestly, how disgusted/angry/sad/afraid/happy did the video make you feel" on a 100-point VAS (e.g., 0 = *not at all*, 100 = *extremely*).

Since many complex disgust stimuli clearly elicit a range of emotional responses (Marzillier & Davey, 2004), and the present data showed that the experimental induction affected more than one negative emotion (disgust, fear, anger, and sadness), I decided to combine the emotions into one factor as an overall measure of negative emotion, and considered them as one latent variable to act as a mediator in the analyses[2]. There were high correlations between the emotion variables, and the outcome variable, and a one-factor solution avoided potentially problematic multi-collinearity. Factor analysis revealed that the 4 negative emotions loaded onto one latent factor; with primary loadings between .55 and .81 (Appendix E). The Cronbach's alpha score for this measure in the present sample was .69. Happiness was unrelated to stigma so was omitted from further consideration.

4.3.1.3 Control variables

Any covariates that significantly predicted awkwardness- or avoidance-based stigma in the first study (i.e., gender and ethnicity) were controlled for in the analysis along with the participants' pre-existing level of stigma towards people with cancer (the combined scores of the 4-items on the CASS that were used as the VAS stigma during

[2]The interpretation of the results was qualitatively the same if using disgust scores instead of the negative emotion composite variable, where the indirect effect of condition on stigma, through disgust, was positively significant, β = .13, $p < .05$ for the DPSS-R model, and β = .19, $p < .01$ for the DS-R model.

the survey study). DS also was controlled for in the model using DPSS-R as the disgust propensity predictor.

4.3.1.4 Experimental stimuli

A pilot study was conducted to select suitable videos for the experimental study. The link to the URL and the corresponding password were e-mailed to ten postgraduate students in psychology. Participants were asked to watch three freely-available emotive cancer-relevant videos,
(https://sheffieldpsychology.eu.qualtrics.com/jfe/form/SV_8GKcPDrIVrGLTDv)
and another three neutral videos,
(https://sheffieldpsychology.eu.qualtrics.com/jfe/form/SV_8q6o5tMmU16XAXP).

The videos were administered in a counter-balanced order using Qualtrics.com. Five visual analogue scales were administered after viewing each video to record how much of five basic emotions (disgust, anger, sadness, fear, and happiness) participants currently felt after watching each video. For each emotion, participants responded to the stem: "Responding honestly, how disgusted/afraid/angry/sad/happy did the video make you feel" on a 100-point VAS (0 = *not at all*, 100 = *extremely*). One additional scale assessing the distress level of each of the videos was also included. Finally, a positive video was included to help counterbalance the inherent negativity of the emotive cancer-relevant videos. Based on the results of this study (see Table 4.4), the video which had been rated with the highest disgust emotion and the most distressing was chosen for the emotive cancer-relevant video (*ovarian cancer surgery*), and the least disgusted video was chosen for the neutral video (*cone*).

4.3.1.5 Procedure

Participants were recruited from the contact details that had been left by the participants in the survey (Phase 1). Prior to this study, participants gave their informed

consent. Participants were exposed to an emotive cancer surgery video or a neutral video through a Qualtrics link, which was sent by email three days after their survey study. In order to ensure their attention and engagement with the videos, the participants were asked a few memory questions related to the videos after watching the video (e.g., "what was the human organ involved in the surgery?")[3]. Participants then completed the VAS emotion measures and VAS stigma scale after they watched the video. Finally, a positive video was offered to participants who were exposed to the emotive cancer surgery video to help counterbalance the inherent negativity of the video. Participants who fully completed their participation in both studies were debriefed at the final stage of their participation.

Table 4. 4 Results (mean) for videos in the pilot study

Videos	Disgust	Fear	Angry	Sad	Happy	Distress
Experiment 1 (*ovarian cancer surgery*)	81.0	35.0	9.6	9.5	0.6	70.0
Experiment 2 (*liver cancer*)	51.4	31.0	6.8	26.3	0.4	47.0
Experiment 3 (*ostomy*)	19.9	8.3	0.7	4.1	9.5	18.1
Control 1 (*cone*)	0.6	1.8	21.6	0.5	0.7	18.2
Control 2 (*crawling snail*)	1.6	2.2	8.8	0.3	17.3	22.9
Control 3 (*dripping tap*)	3.7	0.4	16.3	1.4	0.8	20.2

[3]Participants did not receive feedback on these questions.

4.3.1.6 Data analysis

Path analysis with AMOS v. 22 (IBM Corp., Armonk, NY, US) was used to model the hypothesised relationships between the variables (i.e., mediation and moderated mediation models). Path analysis has several advantages over standard multiple regressions, including the estimation of direct and indirect effects (through mediating variables) simultaneously.

In the mediation model to test prediction (3), that exposure to emotive cancer stimuli (i.e., watching cancer surgery) would invoke negative emotional reactions, which may lead to increased avoidance- and awkwardness -based stigma, variables included were group condition, along with DP as exogenous predictors, negative emotional state as a hypothesized mediator, and stigma as outcome (see Figure 4.1). In this model, the regression weights on the group condition*DP interaction term were constrained to zero.

In order to test prediction (4), which anticipates that DP will have a causal effect on avoidance- and awkwardness-based stigma by heightening (moderating) the level of disgust, and associated negative emotions, participants experience as a consequence of exposure to cancer-related emotive stimuli, a moderated mediation model was used to model the hypothesised relationships between the variables. In this model, the parameter constraint on the group condition*DP interaction term in the mediation model described above was removed.

Next, in two separate analyses I tested both previous mediation and moderated mediation models with the DS-R rather than the DPSS-R as the measure of disgust, with core, AR, and CB as predictors (see Figure 4.2). These analyses were performed to test the prediction (5), that there will be distinctive causal effects of core, AR, and CB on avoidance- and awkwardness-based stigma by heightening (moderating) the level of

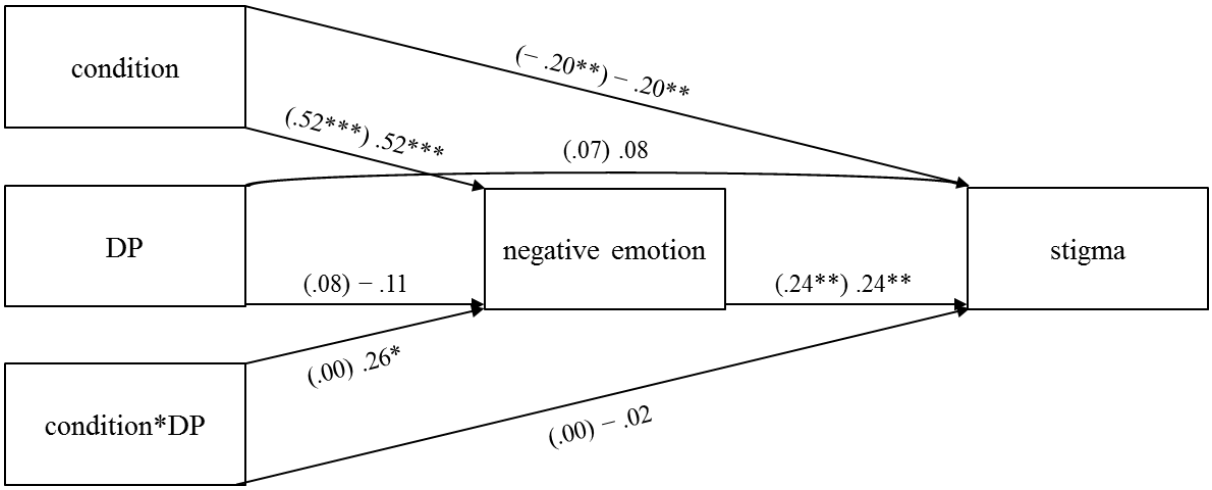

Figure 4. 1 Model 1 (Moderated mediation model with DPSS-R).

Negative emotion significantly mediated the effect of condition on stigma, and propensity to disgust significantly positively moderated the effect of condition on stigma, through negative emotion (β = .06, p < .01). Control variables and error terms are omitted for clarity. Estimates on the endogenous variables were conditioned on: gender, ethnicity, the initial level of stigma towards people with cancer, and disgust sensitivity. The regression weight on the condition*DP effect interaction term was constrained to zero in the mediation model. All exogenous variables were inter-correlated. The estimates in the brackets represent the estimates in the mediation model. All estimates are standardised betas (β). Significance levels were determined based on bootstrapped CIs (10, 000 resamples). Asterisked coefficients are significant at *p < .05. **p < .01. ***p < .001. DP = disgust propensity; condition*DP = interaction between condition and disgust propensity.

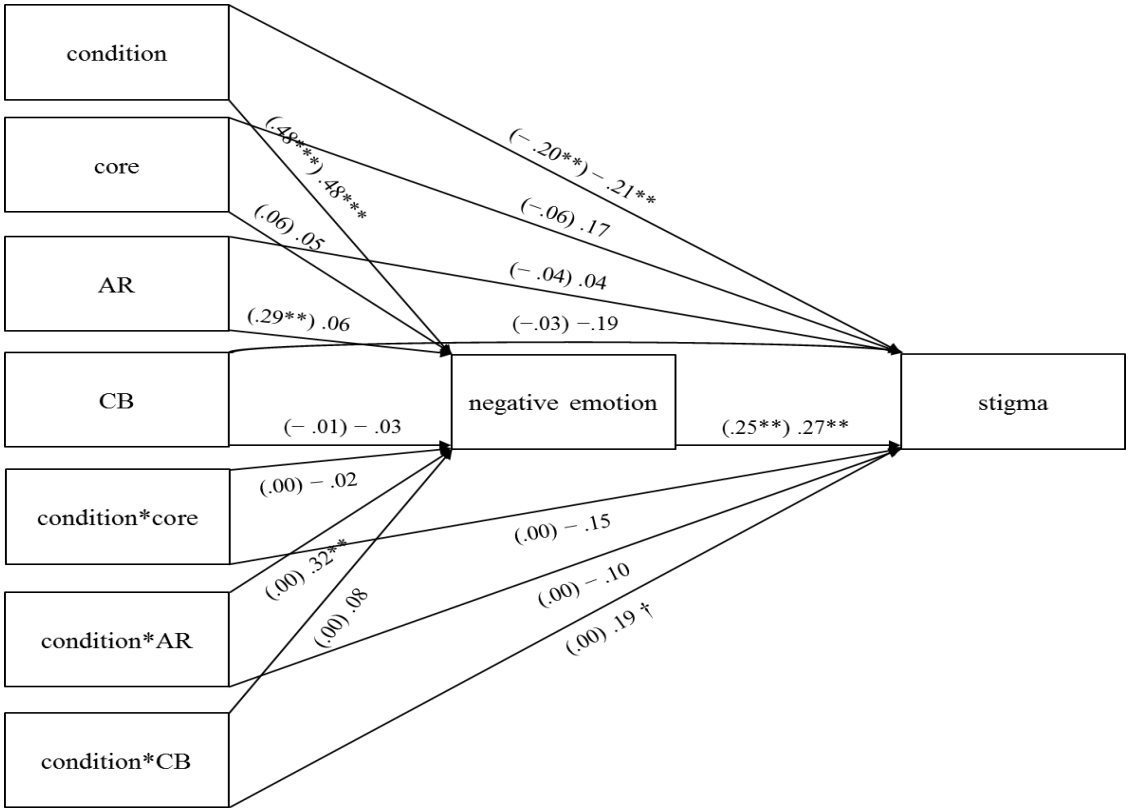

Figure 4. 2 Model 2 (Moderated mediation with DS-R).

Negative emotional state significantly mediated the effect of condition on stigma, and propensity to animal reminder disgust significantly positively moderated the effect of condition on stigma, through negative emotion (β = .06, p < .01). Control variables and error terms are omitted for clarity. Estimates on the endogenous variables were conditioned on: gender, ethnicity, and the initial level of stigma towards people with cancer. The regression weight on the condition*DP effect interaction term was constrained to zero in the mediation model. All exogenous variables were inter-correlated. The estimates in the brackets represent the estimates in the mediation model. All estimates are standardised betas (β). Significance levels were determined based on bootstrapped CIs (10, 000 resamples). Asterisked coefficients are significant at †p < .10. *p < .05. **p < .01. ***p < .001. AR = animal reminder; condition*AR = interaction between condition and animal reminder disgust; CB = contamination based; condition* CB = interaction between condition and contamination based disgust.

disgust, and associated negative emotions, participants experience as a consequence of exposure to cancer-related emotive stimuli. In the mediation model, the regression weights on the group condition*Core, group condition*AR, group condition*CB interaction terms were constrained to zero. Then in the moderated mediation model, the parameter constraints on all the interaction terms in the mediation model were removed.

Two extreme positive outliers of VAS emotion scores were identified in the neutral condition in the experimental study (phase two) and were excluded (being more than 2 SD above the mean)[4]. To allow for inter-variable comparisons, prior to the analysis, continuous scores were standardised based on Gelman (2008), where each numeric variable was centred and divided by two times its standard deviation, so that the generic comparison is with inputs equal to the mean ±1 standard deviation (i.e., an equally distributed binary variable). This also facilitated the creation and inclusion of an interaction term without any problematic multicollinearity.

4.3.2 Results

4.3.2.1 Randomisation and manipulation checks

Experimental and neutral condition participants did not significantly differ on gender, χ^2 (1, N = 141) = 0.02, p = .901, Φ = .01; and age, U = 141, $n_{xperimental}$ = 73, $n_{neutral}$ = 68, p = .604, t = −.52. Moreover, there were no significant group differences in DP, U = 141, $n_{experimental}$ = 73, $n_{neutral}$ = 68, p = .309, t = *1*.02. Accordingly, the randomisation of these variables between the two group conditions was successful. Supporting the manipulation, exposure to the emotive cancer surgery video (M = 86.53, SD = 75.96) induced significantly more negative emotion relative to those exposed to the neutral video (M = 23.99, SD = 34.47), t(139) = −6.22, p < .01, d = 1.06. In

[4] The interpretation of the results was qualitatively the same with the outliers left in, where the indirect effect of condition on stigma, through moderate DP, β = .12, p < .01, and high DP, β = .31, p < .01 were positively significant for the DPSS-R model, and the indirect effect also were positively significant through moderate AR, β = .13, p < .01, and high AR, β = .37, p < .01, for the DS-R model.

contrast, exposure to the emotive cancer surgery video (M = 11.79, SD = 14.85) induced significantly less stigma relative to those exposed to the neutral video (M = 17.59, SD = 17.69), $t(139) = 2.11$, $p < .05$, $d = 0.36$. Descriptive statistics and bivariate correlations among disgust and stigma variables for the experimental and neutral groups are presented in Table 4.5.

4.3.2.2 Path models

4.3.2.2.1 Model 1 (DPSS-R). The model fit for the data was $\chi^2(2) = 7.017$, $p = .030$; CFI = 0.983. All path estimates and bootstrap *SEs/CIs* are presented in Table 4.6. The indirect effect of experimental condition on stigma, through negative emotion was positively significant, $\beta = .12$, $p < .01$, demonstrating a different direction of influence from the direct effect of condition on stigma, which was negatively significant, $\beta = -.20$, $p < .01$. A moderated mediation model was then estimated by removing the parameter constraints on the group condition*DP interaction term. Figure 4.1 shows the moderated mediation model explaining the moderating effect of DP on the link between group condition and negative emotional state, which then leads to stigma. This model showed a significant improvement in overall fit over the constrained model, $\Delta\chi^2(2) = -7.017$, $p < .05$. The interaction term significantly positively predicted negative emotion, $\beta = .26$, $p < .05$, and significantly positively predicted stigma, through negative emotion, $\beta = .06$, $p < .01$. All path estimates and bootstrap SEs/CIs are presented in Table 4.6.

To further clarify the nature of the moderating effect, the effect of group condition on stigma, via negative emotion was estimated at three levels of DP, at two standard deviations below the mean (low), at the mean, and two standard deviations above the mean (high; based on Gelman, 2008's standardisation)[5].

[5] The interpretation of the results the same when using conventional standardisation methods, -+1SD.

Table 4. 5 Bivariate correlation coefficients (Pearson's *r*) among study variables in the experimental group (above diagonal) and neutral group (below diagonal)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	—	−.04	.45**	−.11	−.34**	−.26*	−.16	-.27*	−.16	−.38**	−.06	−.07	.00	−.01	−.19	−.19
2. Gender	−.01	—	−.20†	.03	.04	−.02	−.30*	-.27*	−.06	−.01	−.12	.08	−.07	.03	.01	−.05
3. Education	.49**	.03	—	−.17	−.17	−.20	−.02	-.11	−.05	−.12	.00	−.04	−.18	−.13	.03	−.12
4. Ethnicity	.31*	.11	.22†	—	−.10	−.22†	−.27*	-.33**	−.38**	−.06	−.20†	−.20†	−.18	−.04	−.17	−.19
5. DP	−.10	−.12	−.24†	−.19	—	.45**	.56**	.43**	.24*	.41**	.21†	.16	.17	.01	.30*	.33**
6. DS	−.17	−.10	−.16	−.13	.45**	—	.49**	.38**	.22†	.36**	.25*	−.01	.09	.00	.25*	.26*
7. Core	−.17	−.41**	−.20†	−.27*	.62**	.36**	—	.59**	.52**	.38**	.32**	.01	.20†	−.10	.20†	.33**
8. AR	−.36**	−.16	−.15	−.14	.32**	.37**	.46**	—	.36**	.53**	.40**	.25*	.33**	−.12	.28*	.51**
9. CB	−.08	−.30*	−.20	−.38**	.51**	.39**	.58**	.46**	—	.06	.35**	.23†	.22†	.11	.28*	.27*
10. VAS disgust	.07	.11	−.11	.11	−.19	.10	−.03	.16	−.01	—	.53**	.42**	.28*	−.06	.42**	.76**
11. VAS afraid	−.19	−.24†	−32**	−.06	.14	.13	.21†	.24†	.11	.20	—	.46**	.53**	.00	.51**	.83**
12. VAS angry	−.21†	.10†	−.25**	.06	.09	.19	.09	.09	.01	.26*	.20†	—	.65**	.24*	.41**	.74**
13. VAS sad	.01	.04	−.07	.16	−.04	.06	−.05	−.05	−.13	.46**	.25*	.26*	—	.10	.35**	.77**

14. VAS happy	.24*	.26*	.20	.10	−.09	−.03	−.08	−.12	−.09	.08	−.07	−.08	.11	—	−.10	.05
15. VAS stigma	−.11	−.03	−.11	−.07	.27*	−.00	.25*	.19	.03	.19	.18	.22†	.11	−.11	—	.54**
16. Negative emotion	−.22†	−.06	−.30*	.04	.10	.20	.16	.19	.05	.45**	.75**	.76**	.53**	−.05	.27*	—
Range, neutral	18-61	0-1	1-4	0-1	9-29	4-17	5-42	0-26	0-14	0-19	0-82	0-100	0-31	0-51	0-68	0-143
Range, experimental	18-65	0-1	1-4	0-1	6-25	4-17	6-45	0-29	0-15	0-100	0-100	0-83	0-100	0-91	0-76	0-350
M, neutral	26.99	0.26	1.94	0.63	17.21	9.78	23.60	12.18	4.84	2.04	9.62	9.44	2.88	3.82	17.59	23.99
M, experimental	27.88	0.27	1.93	0.58	16.58	9.26	22.73	12.99	5.48	42.52	19.34	5.90	18.77	9.36	11.79	86.53
SD, neutral	9.41	0.44	0.93	0.49	3.70	3.41	8.34	6.34	3.37	3.70	19.53	19.55	6.33	10.27	17.69	34.47
SD, experimental	10.84	0.45	0.86	0.50	3.63	3.25	8.29	6.63	3.26	30.72	26.13	14.25	26.46	19.21	14.85	75.96

Notes: N = 141. $n_{experimental}$ = 73, $n_{neutral}$= 68. Correlations represent Pearson's r, pointbiseral (r_{pb}), or phi (r_{Φ}) coefficients. Asterisked coefficients are significant at †p< .10. *p< .05. **p< .01. ***p< .001. Values for gender: 0 = female; 1= male, values for ethnicity: 0 = other ethnicities; 1= White British.

Table 4. 6 Standardised direct and indirect effects and 95% confidence intervals for the mediation and moderated mediation models for model DPSS-R

Model pathways	Estimates		95% CI	
		SE B	LL	UL
Mediation model DPPS-R				
Direct effects				
Condition –> vas negative emotion	.52***	.05	.41	.61
vas negative emotion –> vas stigma	.24**	.08	.08	.39
Condition –> vas stigma	−.20**	.07	−.34	−.06
DP –> vas negative emotion	.08	.10	−.11	.27
DP –> vas stigma	.07	.08	−.09	.21
Indirect effects				
Condition –> vas negative emotion –> vas stigma	.12**	.04	.05	.21
DP –> vas negative emotion –> vas stigma	.02	.02	−.02	.07
Moderated mediation model DPPS-R				
Direct effects				
Condition –> vas negative emotion	.52***	.05	.42	.62
Condition x DP –> vas negative emotion	.26*	.09	.07	.43
vas negative emotion –> vas stigma	.24**	.08	.08	.40
Condition –> vas stigma	−.20**	.08	−.35	−.05
Condition x DP –> vas stigma	−.02	.10	−.21	.19
DP –> vas negative emotion	−.11	.08	−.28	.06
DP –> vas stigma	.08	.13	−.18	.30
Indirect effects				
Condition x DP –> vas negative emotion –> vas stigma	.06**	.03	.02	.14
Condition –> vas negative emotion –> vas stigma (low DP)	−.05	.07	−.20	.06

Condition –> vas negative emotion –> vas stigma (moderate DP)	.12**	.04	.05	.22
Condition –> vas negative emotion –> vas stigma (high DP)	.30**	.12	.11	.59
DP –> vas negative emotion –> vas stigma	−.03	.02	−.10	.01

Notes: N = 141, $n_{experimental}$= 73, $n_{neutral}$ = 68. DP = disgust propensity; condition*DP = Interaction condition and DP; BCa 95% CI = Bias-corrected and accelerated bootstrapped 95% confidence interval; LL = lower limit; UL = upper limit; *SE B* = bootstrapped standard error. Asterisked coefficients are significant at *p < .05. **p < .01. ***p < .001. Some potentially confounding variables were controlled in the models; these were gender, ethnicity, the initial level of stigma towards people with cancer, and disgust sensitivity.

As shown in Figure 4.3, simple slopes analysis revealed that condition significantly predicted stigma, through negative emotion, at high, β = .30, p < .01, and moderate, β = .12, p < .01, but not low, β = −.05, p = .245, levels of disgust propensity. Furthermore, all three slopes were significantly different from one another (p < .05).

4.3.2.2.2 Model 2 (domain-specific; DS-R). Another mediation model was tested with the DS-R rather than the DPSS-R as the measure of disgust (see Figure 4.2). The model fit for the data was, χ^2 (6) = 18.022, p = .006; CFI = 0.983. All path estimates and bootstrap *SEs/CIs* are presented in Table 4.7. The indirect effect of experimental condition on stigma, through negative emotion, was positively significant, β = .12, p < .01. Again, the direct effect of condition on stigma was negatively significant, β = −.20, p < .01. A moderated mediation model was then estimated by removing the parameter constraints on the group condition*Core, group condition*AR, and group condition*CB interaction terms.

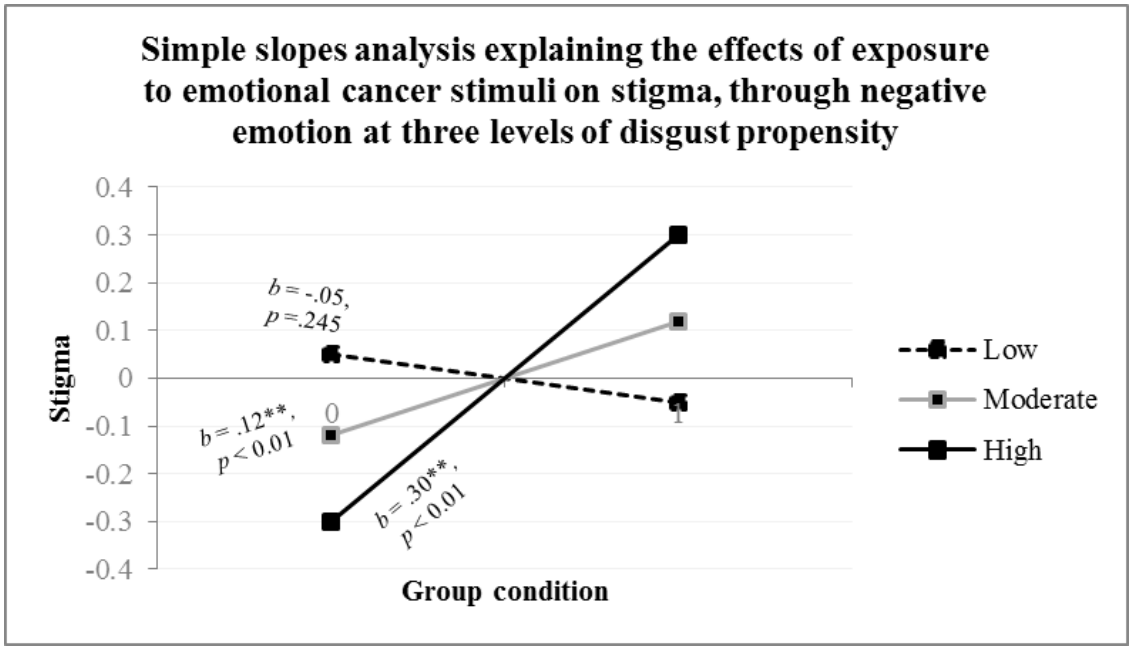

Figure 4. 3 Simple slopes analysis explaining the effect of condition significantly predicting stigma, through negative emotion, at three levels of disgust propensity. Simple slopes analysis explaining the effect of condition significantly predicting stigma, through negative emotion, at three levels of underlying disgust propensity (− 2 *SD* = "low"; *M* = "mean"; + 2 *SD* = "high"). Experimental condition significantly predicted stigma, through negative emotion, at high, β = .30, p < .01, and moderate, β = .12, p < .01, but not low DP, β = −.05, p = .245.

Figure 4.2 shows the moderated mediation model explaining the moderating effect of Core, AR and CB on the link between group condition and negative emotional state, which then leads to stigma. This model shows a significant improvement in overall model fit over the constrained model, $\Delta\chi^2$ (6) = −18.022, p < .05. The effect of the Condition*AR interaction on stigma, through negative emotion, was the only interaction that was significant, β = .09, p < .01. All path estimates and bootstrap SEs/CIs are presented in Table 4.7.

Table 4. 7 Standardised direct and indirect effects and 95% confidence intervals for the mediation and moderated mediation models for model DS-R

Model pathways	Estimates		95% CI	
		SE B	LL	UL
Mediation model DS-R				
Direct effects				
Condition –> vas negative emotion	.48***	.05	.38	.58
vas negative emotion –> vas stigma	.25**	.08	.10	.44
Condition –> vas stigma	−.20**	.07	−.33	−.07
Core –> vas negative emotion	.06	.10	−.14	.26
Core –> vas stigma	.06	.10	−.13	.25
AR –> vas negative emotion	.29**	.09	.11	.46
AR –> vas stigma	−.04	.08	−.23	.14
CB –> vas negative emotion	−.01	.12	−.20	.17
CB –> vas stigma	−.03	.07	−.18	.12
Indirect effects				
Condition –> vas negative emotion –> vas stigma	.12**	.04	.05	.21
Core –> vas negative emotion –> vas stigma	.01	.03	−.03	.08
AR –> vas negative emotion –> vas stigma	.07**	.03	.02	.15
CB –> vas negative emotion –> vas stigma	−.00	.03	−.06	.04
Moderated mediation model DS-R				
Direct effects				
Condition –> vas negative emotion	.48***	.05	.37	.58
Condition x AR –> vas negative emotion	.32*	.12	.07	.55
vas negative emotion –> vas stigma	.27**	.08	.11	.44
Condition –> vas stigma	−.21**	.07	−.34	−.07

Condition x AR –> vas stigma	−.10	.13	−.36	.17
AR –> vas negative emotion	.06	.10	−.14	.25
AR –> vas stigma	.04	.14	−.23	.30
Core –> vas negative emotion	.05	.10	−.15	.24
Core –> vas stigma	.17	.13	−.07	.46
Condition x Core –> vas negative emotion	−.02	.14	−.29	.24
Condition x Core –> vas stigma	−.15	.14	−.43	.10
CB –> vas negative emotion	−.03	.10	−.23	.15
CB –> vas stigma	−.19	.12	−.43	.06
Condition x CB –> vas negative emotion	.08	.13	−.18	.31
Condition x CB –> vas stigma	.19†	.11	−.01	.41
Indirect effects				
Condition x AR –> vas negative emotion –> vas stigma	.09**	.05	.02	.22
Condition –> vas negative emotion –> vas stigma (low)	−.13	.10	−.40	.01
Condition –> vas negative emotion –> vas stigma (moderate)	.13**	.04	.05	.22
Condition –> vas negative emotion –> vas stigma (high)	.39**	.16	.15	.82
Core –> vas negative emotion –> vas stigma	.01	.03	−.04	.08
AR –> vas negative emotion –> vas stigma	.02	.03	−.04	.08
CB –> vas negative emotion –> vas stigma	−.01	.03	−.07	.04
Condition x Core –> vas negative emotion –> vas stigma	−.01	.04	−.09	.07
Condition x CB –> vas negative emotion –> vas stigma	.02	.04	−.04	.10

Notes: N = 141, $n_{experimental}$ = 73, $n_{neutral}$= 68. AR = animal reminder; condition*AR = Interaction condition and animal reminder; CB = contamination based; Condition X CB = Interaction condition and contamination based. BCa 95% CI = Bias-corrected and accelerated

bootstrapped 95% confidence interval; LL = lower limit; UL = upper limit; *SE B* = bootstrapped standard error. Asterisked coefficients are significant at †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$. Some potentially confounding variables were controlled in the models; these were gender, ethnicity, and the initial level of stigma towards people with cancer.

To clarify the nature of the moderating effect, the effect of group condition on the mediator (negative emotion), then leading to stigma, was estimated at three levels of AR at two standard deviations below the mean (low), at the mean, and two standard deviations above the mean (high). As shown in Figure 4.4, simple slopes analysis revealed that experimental group significantly predicted stigma, through negative emotion, at high, $\beta = .39$, $p < .01$, and moderate, $\beta = .13$, $p < .01$, but not low AR disgust, $\beta = -.13$, $p = .065$. All three slopes were significantly different from one another ($p < .05$).

4.3.3 Discussion

The primary findings from this investigation were that participants who were exposed to the emotive cancer-relevant stimuli *and* experienced greater negative emotion had greater stigma. This mediation effect was moderated by trait DP: those with greater DP experienced greater negative emotion in response to the emotive cancer surgery video, which led to a greater tendency to experience awkwardness- and avoidance-based stigma towards people with cancer (while controlling for prior levels of stigma). These results establish a causal role for DP in heightening cancer stigma, where DP (as measured at initial phase) moderated the path of exposure to emotive

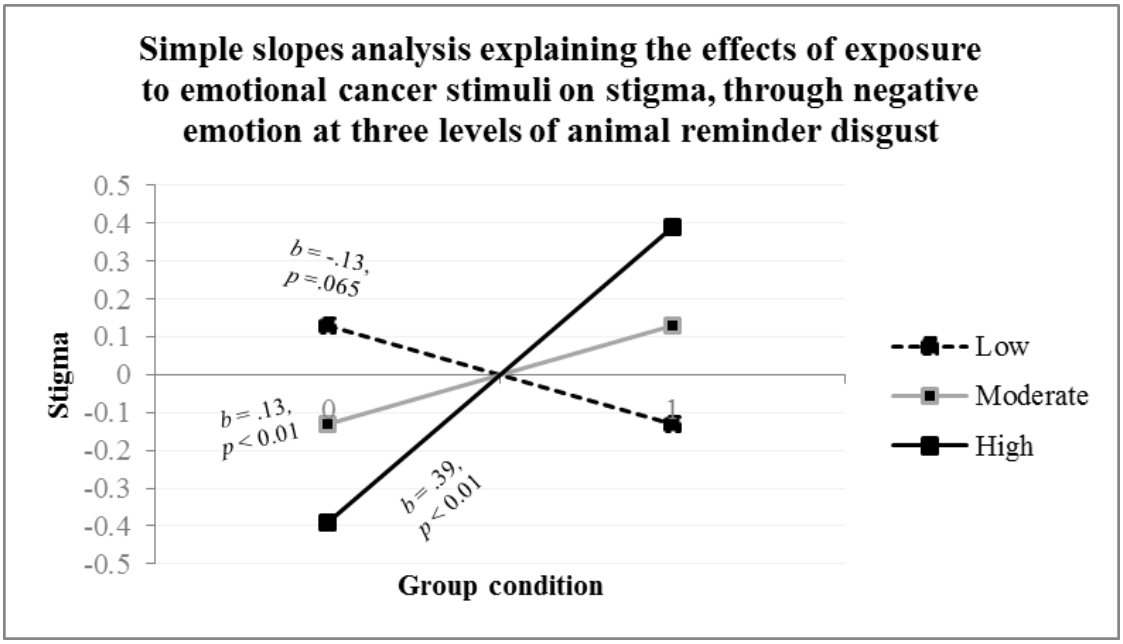

Figure 4. 4 Simple slopes analysis explaining the effect of condition significantly predicting stigma, through negative emotion, at three levels of animal reminder.

Simple slopes analysis explaining the effect of condition significantly predicting stigma, through negative emotion, at three levels of underlying animal reminder (AR) disgust (− 2 *SD* = "low"; *M* = "mean"; + 2 *SD* = "high"). Experimental condition significantly predicted stigma, through negative emotion, at high, β = .39, p < .01, and moderate, β = .13, p < .01, but not low AR disgust, β = −.13, p = .065.

cancer-relevant stimuli on stigma, through the extent of the negative emotion experienced (which had been measured at Phase 2). This supports and extends previous works on disgust and negative attitudes (e.g., Inbar et al., 2009; Olatunji, 2008), specifically towards people with chronic diseases (Pryor et al., 2004; obesity; Vartanian, 2010; colostomy patients; Smith et al., 2007).

In the domain-specific model, AR was a significant moderator of the effect of exposure to emotive cancer-relevant stimuli on negative emotion. While this effect may be driven partly by the nature of the video stimuli used (cancer surgery), this finding is

consistent with the findings in Phase 1, where AR exclusively predicted avoidance and awkwardness-based stigma. People with cancer might remind of and confront us with the idea of our physicality, our vulnerability, and the inevitable decay of death, which may intensify our negative emotional reactions (e.g., disgust; Haidt et al., 1997; McGinn, 2011; Rozin & Fallon, 1987), then leading to avoidance- and awkwardness-based stigma. Since death-thought accessibility results from animal-nature disgust (Cox et al., 2007), and was found to uniquely predict the fear of death (Olatunji et al., 2008), the mortality of people diagnosed with cancer may elevate the link between exposure to cancer stimuli (e.g., Haidt et al., 1997; McGinn, 2011; Rozin & Fallon, 1987) and stigma. This finding confirms evidence which suggests that among these three-disgust elicitors (Core, AR, and CB), the one that is consistently relevant and extensively used to symbolically mark social boundaries is disgust that is in conjunction with animality (Clark, & Fessler, 2014).

4.4 General Discussion

The present research examined the role of disgust in the stigmatization of people with cancer. Findings of Phase 1 provided support for the idea that disgust traits have significant links with particular dimensions of stigma towards people with cancer. Findings in Phase 1 also established that specific disgust propensity domains are predictive of particular types of stigma, in line with previous findings that showed that there are distinctive causal effects of different disgust propensity domains on stigma (e.g., Olatunji, 2008; Rozin et al., 2008). However, the findings were based solely on self-report ratings and were correlational and cross-sectional in nature. Phase 2 sought to build on this first study and aimed to experimentally demonstrate a causal effect of manipulating emotion (i.e., exposure to emotive cancer-relevant stimuli) on stigma towards people with cancer; providing insights into the nature of those relationships and

reinforcing the concept that greater trait DP in individuals is associated with greater stigma (specifically across avoidance and awkwardness dimensions) towards people with cancer. The findings in Phase 2 demonstrated that negative emotion is strongly evoked following the exposure to emotive cancer-relevant stimuli, especially in people with high and moderate levels of DP and, specifically AR disgust, which then leads to greater stigma.

4.4.1 Study findings (Phase 1)

Results in Phase 1 strengthen and add further support to the theoretical and empirical link between two main dimensions of stigma that are commonly researched with disgust, which are avoidance (Curtis et al., 2011; Pryor et al., 2004) and awkwardness (Hodson et al., 2015). Individuals with high DP were found to have an increased tendency to feel uncomfortable around someone with cancer (awkwardness) and have a higher tendency to avoid people who have cancer (avoidance), supporting the previous findings that an elevated DP has been associated with awkwardness (e.g., Hebl, Tickle, & Heatherton, 2000; Mader, Hart, & Bergin, 1989; Reynolds et al., 2015) and avoidance towards potential disgusting stimuli (e.g., Berle, et al., 2012; Pryor et al., 2004; Reynolds et al., 2014). Findings from a study by Aarøe, Osmundsen, & Petersen (2016) suggest that DP is not foremost linked with avoiding outgroup members per se. Rather, it is associated with avoidance across one's extended social network and, hence, there may be an effect of disease avoidance motivations on perceptions of people in general.

These findings were further supported by the fact that the specific AR domain predicted both awkwardness and avoidance stigma. Individuals who have a higher tendency to experience disgust towards AR disgust stimuli were more likely to experience awkwardness and avoidance stigma towards people with cancer. The

prediction of AR on both of these dimensions is potentially explained by the tendency of people with higher AR to avoid people who might remind them of their animality, reflected through physical injury, death, and decay issues (e.g., Haidt et al., 1994) that are commonly associated with people who have cancer. Further, these exclusive predictions concerning AR and awkwardness and avoidance stigma towards people with cancer (independent of core and CB disgust) may suggest that awkwardness and avoidance stigma towards people with cancer is most likely driven by the reminders of death, bodily distortions, and mortality, rather than concerns about core pathogens or contamination (disease-transmission).

4.4.2 Study findings (Phase 2)

Phase 2 also yielded some interesting results, where the path models showed that watching an emotive cancer surgery video and not experiencing negative emotion (i.e., via a direct path to stigma in the mediational models) was associated with *reduced* awkwardness- and avoidance-based stigma, suggesting that exposure can be beneficial when it is not accompanied by heightened negative emotion (e.g., Olatunji et al., 2011; Rozin, 2008). This may suggest that the effect of exposure to cancer-related stimuli associated with stigma towards people with cancer is not an absolute, but may be specifically related to the extent to which negative emotions are experienced.

It is not really surprising that there was the lack of core and CB effects in the model in Phase 2. The lack of core and CB effects just replicates and extends the findings in Phase 1 that AR disgust (and not core or CB) predicted awkwardness and avoidance based stigma. This also potentially may be explained by the use of a video involving surgery as the experimental stimulus in this study, which is more relevant to the AR domain (i.e., body envelope violations during surgery rather than potential contaminants like a stoma bag).

4.4.3 Implications

This study addressed significant gaps in the literature. Disgust has been proven to be significant in causally predicting stigma, particularly the awkwardness- and avoidance-based stigma. The causal prediction was successfully established through experimentally testing a causal effect of exposure (i.e. exposure to emotive cancer-relevant stimuli compared with non-exposure) on stigma towards people with cancer, through negative emotion, controlling for prior levels of stigma, facilitating an explicit understanding of how, and which type(s), of disgust traits may contribute to heighten stigma. This study also provides evidence that there were distinctive causal effects of domain-specific disgust propensity measures (core, AR, and CB) on avoidance- and awkwardness-based stigma.

Given the findings that stigma is closely related to disgust traits in individuals, particularly their DP and AR disgust, challenging stigma towards people with cancer may be resolved by challenging these trait dimensions of disgust that primarily motivate avoidance and awkwardness. The findings in the present study have at least three valuable practical implications to assist with the development of effective interventions for reducing stigma towards people with cancer.

First, the findings suggest that trait disgust matters in understanding stigma. Identification can thus be made of those individuals who might more easily react with stigma towards people with cancer, and methods to help individuals to combat or to cope with this visceral reaction might be useful in reducing stigma. It has been suggested that activated compassion (Gilbert, 2010) may promote acceptance and reduce the disgust and threat systems in humans, and so encouragement of compassionate aspects in individuals also may be a solution to reduce stigma, by inducing incompatible or contrasting positive emotional reactions, as has been applied

in relaxation therapy for anxiety (e.g., Pagnini, Manzoni, Castelnuovo, & Molinari, 2013). Since only AR disgust was found to uniquely moderate the link between the exposure to emotive cancer stimuli and negative emotion (but see below for a caveat), which then leads to stigma, one possible way in reducing stigma might be to reduce the exposure to reminders of mortality through an increased awareness that cancer is not entirely fatal and is a survivable disease (e.g., Clegg-Lamptey et al., 2009; Greene, & Adelman, 2003). Increased awareness that cancer is not contagious also may challenge the public to reassess their assumptions that the disease is contagious. This awareness may potentially lower the false alarms that are naturally activated by their disease avoidance system, where their aversion towards cancer patients generally stems from fears that the disease is contagious (Crowther, 2010), despite the fact that cancer is a non-contagious disease (e.g., Fife & Wright, 2000).

Second, negative emotion (upon exposure to emotive cancer-relevant stimuli) was found to be associated with awkwardness and avoidance based stigma, therefore efforts to reduce stigma may centre on processing negative emotions, such as the procedures used in Acceptance and Commitment Therapy, which has proven effective in previous studies (e.g., self-stigma; Luoma, & Platt, 2015; Skinta, Lezama, Wells, & Dilley, 2015; stigma towards people with psychological disorders; Masuda et al., 2007). Further, considering the intense negative affective experience, training in distress tolerance or emotion regulation (Gayner et al., 2012), which has proven effective in reducing self-stigma, may be potentially useful for individuals, with pronounced negative emotion, in combating external stigma.

Third, another interesting finding from this study is that, in the absence of negative emotion, exposure to an emotive cancer surgery video induced less stigma relative to those exposed to a neutral video, when controlling for prior levels of stigma.

Therefore, exposure to cancer-relevant stimuli without a negative emotional reaction may be effective for reducing stigma, validating previous work and psychological therapies that incorporate exposure in reducing stigma (e.g., positive interpersonal contact with transgender individuals is associated with lower sexual stigma and prejudice, Walch et al., 2012; hypothetical exposure resulted in less stigma toward people with dementia, Cheng et al., 2011). This also may suggest that exposure could be beneficial in reducing stigma towards people with cancer, through the reduction of individuals' DP (e.g., DP may lessen through habituation and exposure; Olatunji et al., 2011; Rozin, 2008), but in the absence of or in the presence of reduced negative emotion (e.g., through the implementation of graded exposure or incompatible positive emotions, such as compassion or relaxation). The gradual exposure-based interventions, which based on the systematic exposure to the feared stimulus, either in the imagination or real contact, for instance, may help individuals down-regulate their negative emotions while learning to tolerate provocative unpleasant emotion-inducing stimuli until the negative feeling decreases and eventually extinguishes (i.e., fails to be triggered by the same stimulus; e.g., Grecucci, Theuninck, Frederickson, & Job, 2015).

Another intervention that has been found effective and more accessible in reducing or tackling stigma is public education (e.g., Corrigan, Morris, Michaels, Rafacz, & Rüsch, 2012). Students reported less stigmatizing views including avoidance-based stigma through educational interventions (toward people with mental illness; Spagnolo, Murphy, & Librera, 2008). It is critical to improve adolescents' attitudes toward people with mental illnesses in an attempt to reduce stigmatizing attitudes and discriminatory behaviours in later life. Educational interventions are generally classified into the following three methods: direct contact, indirect contact and an explanation about (people with) illness by professionals (Yamaguchi, Mino, & Uddin,

2011). Yamaguchi et al. (2011) pointed out that a number of studies have shown that direct contact with stigmatized people can often contribute to lessening stigma. This strengthens the idea that incorporating exposure in an intervention approach to combat stigma could be beneficial. Furthermore, even indirect contact works - recent efforts to tackle stigma via videos or computer programs that show the lives of people with specific illness were also useful in reducing young people's stigmatization (Yamaguchi et al., 2011). This evidence suggests that shaping any opportunities for most forms of exposure towards people with cancer may serve to influence attitudes in individuals and reduce stigma towards this particular group.

4.4.4 Limitations and ideas for future research

One limitation of this present study is that there is a possibility that the role of AR disgust over and above other dimensions was artificially inflated since the emotive cancer-relevant video clip (i.e., cancer surgery) used in the experimental study was preferentially relevant to the domain of AR disgust. Therefore, future research could potentially include different stimuli that may elicit other domains of disgust (e.g., contamination via a stoma bag). There is also evidence to suggest that exposure to horrific images is relevant specifically to the dimension of AR disgust, while CB disgust may be relevant for events involving physical contact (i.e., Engelhard et al., 2011). Therefore, future work could incorporate different methods (using images/videos and imagined physical contact) to avoid the possible confounding of the effects with the methods, and allow for the comparison between those different approaches. However, it should be noted that the finding in Phase 1 also showed that AR exclusively predicted avoidance- and awkwardness-based stigma, in the absence of exposure to AR elicitors, suggesting that this finding is worthy of future investigation.

A second limitation arises from the lack of attention towards the underlying complex variation of stigma towards different cancer types. Certain cancer types may elicit different dimensions of stigma (e.g., lung cancer has been identified to be highly associated with responsibility stigma as its poor prognosis and established link with smoking behaviours mean that it is perceived to be personally controllable; Marlow, Waller, & Wardle, 2015). Therefore, in future work, the moderated mediation model could be expanded to examine stigma specific to cancer types. A further limitation in this study is, in the experimental phase, the work only focused on awkwardness and avoidance stigma, which have been theoretically and empirically related to disgust. Future studies may involve extensions to more holistic or broader dimensions of stigma.

4.4.5 Conclusion

In conclusion, this is the first study to establish a potential causal mechanism for underlying disgust traits to produce cancer stigma, through heightened negative emotional reactions via cancer-relevant exposure. These results help to understand the mechanisms and natural consequences of disgust as an overly-conservative behavioural immune system, which may lead to stigma towards people who present a potential disease threat, such as cancer. Specifically, these results suggest that AR disgust and not pathogen or contamination related disgust (which are typically related to the behavioural immune system) has been found to be particularly relevant in predicting avoidance- and awkwardness-based stigma. This exclusive prediction of AR disgust suggests that avoidance- and awkwardness-based stigma towards people with cancer may be dominantly driven by the physicality, vulnerability, and the inevitable decay of death of people with cancer, which may intensify our negative emotional reactions (e.g., disgust; Haidt et al., 1997; McGinn, 2011; Rozin & Fallon, 1987), then leading to avoidance- and awkwardness-based stigma. It is therefore suggested that efforts to

reduce stigma, particularly towards people with cancer, should put more emphasis on underlying disgust propensity as a predictor, and should focus on reducing negative emotion following the exposure to cancer-relevant stimuli, to create more positive exposure experiences.

V. DISCUSSION

5.1 Summary of research findings

The strongest and clearest conclusion that can be drawn from the studies in this thesis is that disgust responses make a substantial contribution in determining the anxiety and depression of people with cancer. In this thesis, data were gathered to serve three related purposes, designed to understand how disgust from a disease avoidance perspective may impact symptoms of anxiety and depression in people with cancer: the primary objective, to elucidate and provide data on the relationship between disgust traits (Self-disgust [SD], Disgust Propensity [DP], and Disgust Sensitivity [DS]) and psychological wellbeing (anxiety and depression) in people with cancer; the second aim, to establish whether disgust traits in partners (as measured by DP and DS) may determine the level of cancer patients' SD, anxiety and depression; and the third purpose, to establish a causal mechanism linking disgust traits (as measured by DP and DS) and avoidance- and awkwardness-based stigma towards people with cancer. These purposes were represented in the former research chapters that establish the main content of the present thesis.

The study in Chapter II was carried out to investigate the following questions: what is the disgust profile (in terms of SD, DP, and DS) in cancer patients in comparison with age and gender matched controls? How do these disgust traits affect the levels of anxiety and depression in people with cancer, and how, if at all, is that different from people without cancer? Since disgust traits had not been studied outside of the context of colorectal cancer, and no study to date had explored and quantified the psychological profile of self-disgust in a cancer sample, profiling disgust traits in cancer patients in comparison with age and gender matched controls was considered valuable. A cross-sectional study was reported, with participants completing measures of DS, DP,

SD, anxiety, and depression. The participants were matched with cancer-free controls by age and gender. DS and physical SD were found to be significantly higher in the cancer than control sample, while DP and behavioural SD were lower; the disgust traits had a different pattern of associations to psychological wellbeing across the two groups, with DS predicting depressive symptoms to a marginally significantly greater extent in the cancer than control group. Accordingly, people with cancer were observed to differ from matched controls in their disgust responses, and these responses were shown to have significant predictive relationships with aspects of their psychological wellbeing.

The study in Chapter III was undertaken to answer the question: how do partners' disgust traits influence levels of self-disgust in people with cancer and their subsequent anxiety and depression? This was a crucial question to be considered, as previous investigations had suggested that individuals may internalize the revulsion of others directed towards them in the form of SD, and partners may struggle with the cancer care process. A dyadic study was reported, with people with cancer completing measures of DS, DP, SD, anxiety, and depression, while their partners completed measures of DS and DP. Analysis of the dyadic data indicated that partners' DS was significantly positively correlated with cancer patients' SD, DP, and depression. Further, mediation analyses suggested that patients' SD played a role in mediating the effect of partners' DS on patients' anxiety and depression. This study provided the first quantitative evidence that a meaningful variance in anxious and depressive symptoms in cancer patients is contingent on their partners' DS, and that patients' SD plays a mediating role in this process.

Chapter IV comprised work exploring a potential causal relationship between disgust traits and stigma towards people with cancer, and was designed to answer the question: how do disgust traits in individuals affect their avoidance- and awkwardness-

based stigma of people with cancer? A two-phase study, with a survey and experimental component, was undertaken. The findings from the survey phase indicated that DP was significantly related to the degree of stigma shown towards people with cancer. Experimentally, it was found that DP significantly moderated the effects of exposure to an emotion-eliciting cancer video on negative emotion, which significantly predicted the degree of in-the-moment avoidance- and awkwardness-based stigma towards people with cancer, even after controlling for prior trait stigma. This effect was most pronounced for Animal Reminder (AR) disgust. As DP was found to have a causal role in predicting stigmatization of people with cancer, by heightening negative emotions to cancer stimuli, findings from this study highlight the importance of emotions, like disgust, in predicting stigma related to chronic diseases, like cancer, as part of an over-conservative disease-avoidance response.

5.2 Disgust has a predictive role in cancer patients' anxiety and depression

The unique research presented in this thesis contributes to the arguments surrounding the involvement of disgust in the aetiology and maintenance of certain mental health disorders, especially anxiety (e.g., Cisler et al., 2009), and depression (e.g., Olatunji, & McKay, 2007, Phillips et al., 1998). As discussed in Chapter I, there is evidence that disgust plays an important role in determining psychological wellbeing (e.g., SD; Overton et al., 2008; Powell et al., 2013; Power, & Dalgleish, 2008; DS; Cisler et al., 2009).

In the regression results presented in Chapter II, different prediction patterns were observed across the cancer and control samples. In the cancer sample, DS and (physical and behavioural) SD significantly independently predicted levels of anxiety, while physical SD and DS predicted levels of depression. By contrast, in the controls, only behavioural SD independently predicted levels of anxiety, and physical SD alone

significantly predicted symptoms of depression. Tests of the differences in the regression slopes between the cancer and control samples showed that DS was statistically a stronger predictor of depressive symptoms in the cancer than control sample.

These findings showed that there were substantial differences in the disgust profile between cancer patients and the matched controls, where DS was significantly higher in the cancer sample, suggesting that DS may be particularly important in predicting psychological wellbeing in people with cancer. The significance of DS may be accounted for, in part, by the fact that individuals with high DS tend to overestimate the threat of disgust-related stimuli, which may further lead to states of anxiousness or defeat. Consistent with previous studies, DS has been demonstrated to be an important predictor of anxiety (e.g. Cisler et al., 2009) and may be elevated in people with clinical diagnoses of depression (Ille et al., 2010). This impact of DS may be greater in people with cancer due to the increased frequency, and aversive nature, of the disgust-eliciting stimuli to which cancer patients are exposed and encounter in daily life. These results extend earlier work by suggesting that DS may act as a substantial predictor of psychological wellbeing (depression) for some groups (i.e., cancer patients) more than others (i.e., healthy controls).

There appears to be some contradiction when DP was found to have no significant predictive role in psychological wellbeing (when controlling for the other disgust traits) in both samples. DP also was found to be significantly higher in the controls. That DP was significantly lower in people with cancer is inconsistent with the hypothesis that DP increases during states of biological vulnerability (e.g. pregnancy, Fessler et al., 2005) and previous work by Reynolds, Bissett, et al. (2015), which found that DP was positively linked with quality of life in a sample with anal incontinence.

Findings by Reynolds, Bissett, et al. (2015) however may potentially have suffered from omitted variable bias, as they did not control for other disgust traits, such as DS, in their models (e.g. Ashenfelter & Greenstone, 2004). The studies reported in this thesis were the first to do so. That DP was significantly lower in people with cancer nevertheless concurs with the notion that a decreased propensity to experience disgust can follow exposure and habituation (e.g. Olatunji et al., 2011; Rozin, 2008). A temporal-longitudinal study in the future might be useful to provide a better understanding of the predictive direction and causality of disgust traits on anxiety and depression in people with cancer.

5.3 Disgust sensitivity in partners may influence levels of self-focused disgust in people with cancer and their subsequent anxiety and depression

As has been alluded to in Chapter III, the second significant prediction of the thesis was that reported anxiety and depression in cancer patients would be higher in those who have partners with higher disgust traits, through the patients' elevated SD. This was indeed found to be the case, suggesting that SD in patients may be influenced by their partners' DS, which may be characterised by their intense reaction to disgust stimuli. This finding resonates with previous qualitative work by Powell et al. (2014) that suggests that individuals may internalise the disgust reaction from people around them, especially their significant others. On the basis of the study in Chapter III it might be suggested that levels of SD in patients grows along with their partners' DS, the intensity of experiencing disgust when confronted with disgust-related stimuli. I reasoned that partners, who have high DS, may experience a greater intensity of disgust and are not as effective in hiding their disgust when they are confronted with disgust-related stimuli around the cancer patients (e.g., during the cancer care process). These reactions might be perceived as indicating rejection or disapproval by patients, and

consequently may intensify their feelings of SD. Cancer patients have previously been reported to be explicitly aware of and sensitive to rejection, describing how their partners refused to have any physical contact with them, due to the disgust evoked by the sight of their bodies (e.g., Navon, & Morag, 2003). The lack of longitudinal data however makes it impossible to determine fully the direction of the relationship between partners' disgust traits and patients' SD and psychological wellbeing (anxiety and depression). It is plausible that patients' SD, anxious, and depressive symptoms may make their partners become more anxious about experiencing disgust in response to, and in the company of, their partners (increasing their DS). This effect could operate as a vicious circle. A longitudinal study is needed to enable us to determine the direction of effects.

This finding also remains inconclusive as the effect of partners' DS, acting through patients' SD, on patients' anxiety and depression became marginally significant after controlling for patients' (shared) disgust traits. This marginal significance, however, was perhaps due to the small sample size and subsequent low power of the study. It also may have been driven by the potential high degree of confound between the variables, where the effect of partners' disgust traits on patients' anxiety and depression is partly driven by the shared variance between the patients' disgust traits. Therefore, there is a good chance of concluding that there is a significant influence of partners' disgust traits on self-disgust and anxiety and depression of patients with cancer.

5.4 Disgust propensity has a significant role in predicting stigma towards people with cancer

As previously demonstrated in Chapter IV, another significant prediction of the thesis was the significant role of DP in causally predicting stigma towards people with

cancer, by heightening negative emotion to emotive cancer-relevant stimuli. These results confirm an inclination of people particularly with high DP to express avoidance- and awkwardness-based stigma towards people with cancer. Cross-sectionally, DP was significantly related to the degree of stigma in particular dimensions towards people with cancer. Experimentally, DP significantly moderated the effect of exposure to an emotive cancer-relevant video on negative emotion, which significantly predicted the degree of in-the- moment avoidance- and awkwardness-based stigma towards people with cancer, even when controlling for prior trait stigma. These results establish a causal role for DP in heightening cancer stigma, and support and extend previous works on disgust and negative attitudes (e.g., Inbar et al., 2009; Olatunji, 2008), specifically towards people with chronic diseases (Pryor et al., 2004; obesity, Vartanian, 2010; colostomy patients, Smith et al., 2007).

This effect in Chapter IV was most pronounced for animal-reminder disgust. While this effect may be driven partly by the nature of the video stimuli used (cancer surgery), this finding is consistent with the findings in Phase 1, where AR independently predicted avoidance- and awkwardness-based stigma. Such results accord nicely with the idea that people with cancer might evoke reminders of the animal origins of humans through the physicality, vulnerability, and the inevitable decay of death (Cox et al., 2007), which may intensify negative emotional reactions in others (e.g., disgust, Haidt et al., 1997; McGinn, 2011; Rozin & Fallon, 1987), then leading to avoidance- and awkwardness-based stigma.

Greater stigma towards people with cancer following the exposure to a mortality-salience eliciting video also may be further explained by terror management theory (TMT; Greenberg, Pyszczynski, & Solomon, 1997), a social psychological theory positing that the human need to deny their mortality underlies many social

behaviours and motivations, including cancer-related stigma (e.g., Mosher, & Danoff-Burg, 2007). From this theory's perspective, defences against death awareness may be threatened during an encounter with a person with serious physical illness (Hirschberger, Florian, & Mikulincer, 2005). Human's need to manage their terror of death may shape emotional reactions, particularly stigma toward people with cancer, and this need may potentially be higher in people with higher AR disgust levels, who are more prone to have greater aversion, based on the thoughts of death and the reminders of physical mortality. These findings offer a conceptualization for how stigma may be developed in response to exposure to emotive cancer-relevant stimuli, while also suggesting a potential target (DP and AR disgust traits) for therapeutic interventions that may prevent and/or alleviate propensity to disgust, and potentially consequent stigma.

5.5 A dysfunction of the disease avoidance system underlies the anxiety, depression, and stigma related to cancer

As reviewed in the current chapter, the results provide answers to wider issues including the role of disgust as a disease avoidance mechanism in anxiety, depression, and stigma related to cancer. Disgust functions to protect the organism from disease and contamination (Curtis et al., 2011). However, in certain circumstances this protective emotion may turn maladaptive, where sometimes disgust may generate false alarms, in which a pathogen and disease avoidance response would needlessly be deployed to innocuous stimuli (Tybur & Lieberman, 2016). Throughout this thesis, I argue that anxiety, depression, and stigma related to people with cancer may result either directly or indirectly from the dysfunction of the disease avoidance system. This assertion derives from three main findings in the chapters of the thesis (Chapter II, III, and IV).

The first is that the findings in Chapter II revealed that the inclination of DS in predicting anxiety and depression was found to be particularly prominent in people with cancer (compared to the cancer-free controls), who are typically exposed to the aversive nature of disgust-eliciting stimuli and experiences (e.g., colostomy; Reynolds et al., 2014). Therefore, it may be established that frequently dealing with disease threats may activate disgust as a disease avoidance mechanism (e.g., Curtis et al., 2011) in people with cancer. This constant activation however may prompt hyper-vigilance which may expose them to a difficulty in interpreting false alarm data (e.g., experience cancer-related negative intrusive thoughts; Brenne et al., 2013; Walker et al., 1996), where the perceptions of a threat to health can occur (and persist) in the absence of an objective threat (e.g., Nemeroff, & Rozin, 1994; Reynolds et al., 2013), leading to anxiety and depression.

The second is that, as has been elaborated in Chapter III, anxious and depressive symptoms were reported to be higher in cancer patients with partners who have higher disgust traits, through the patients' elevated SD. These are mostly likely explained by the difficulties in managing disgust stimuli and reactions around the cancer care process, which fits in with the perspectives of a dysfunction of the disease avoidance system. Partners may struggle to inhibit false alarms activated by their disease avoidance system, where their aversion towards cancer patients generally stems from fears that the disease is contagious (Crowther, 2010), despite the fact that cancer is a non-contagious disease (e.g., Fife & Wright, 2000). They may suppress their disgust feelings, thoughts, and responses around the cancer patients, which may further disinhibit the emotion regulation process (Olafson, Emmelkamp, Gunnarsdóttir, Snæbjörnsson, Ólason, & Kristjánsson, 2013), which may lead to the use of ineffective emotion regulation strategies (e.g., suppression; Giese-Davis, & Spiegel, 2001).

The third assertion has been established from the findings in Chapter IV, that stigma related to people with cancer may be in part a consequence of a dysfunction of traits relating to the disease avoidance system, whereby those higher in DP may develop a higher tendency to stigmatize people with cancer. These findings resonate with the notion which suggest reactions to people who have features that mimic a disease cue (i.e., cancer; Fife & Wright, 2000), are similar to reactions to people with an infectious disease (e.g., Curtis et al., 2004; Rozin et al., 2009) as a form of self-protection from the potential disease threat (e.g., Oaten et al., 2011).

Based on the findings, studies in Chapter II and III found that DS (patients and partners) was associated with SD and psychological well-being in people with cancer and not DP. On the contrary, the study in the Chapter IV found that DP is more prominent in understanding stigma towards people with cancer. Altogether, on the basis of the present thesis, one important point can be posited that dysfunction of disgust as the emotion of the disease-avoidance system is fundamental in understanding the anxiety, depression, and stigma related to people with cancer.

5.6 Validity of the measurements of disgust traits

Throughout the thesis, reasonable correlations were reported between quantitative measures of SD with measures of external disgust (i.e., DP, & DS) which helps to demonstrate the theoretical validity of SD, a little-researched construct. Based on the findings in Chapter II and III, SD was found to be significantly correlated with DP and DS, in both cancer and control samples (Chapter II), which was then replicated in chapter III, where SD in cancer patients was found to be significantly correlated with their DP and DS. Thus, it is strongly established that internal disgust experiences in oneself are related to and reflected in the levels of disgust experiences towards external

disgust stimuli. This establishes crucial evidence for the theoretical validity of the Self-disgust Scale (Overton et al., 2008).

Besides the validity of Self-disgust Scale, as has been thoroughly discussed in Chapter II, III, and IV, this thesis also strengthens the validity and separateness of DP and DS. The results fit with the findings of earlier studies, validating the unique and distinct properties of these constructs (e.g., van Overveld et al., 2006; Olatunji et al., 2007). DS in cancer patients was found to be elevated, compared to the control sample, and further found to impact their anxiety and depression. Partners' DS was further found to impact the cancer patients' SD and anxiety and depression, whereas DP was found to be more relevant and has a prominent role in avoidance- and awkwardness-based stigma *towards* cancer patients, in people without cancer.

It might be argued that these separate properties and specificities may be largely explained by past evidence which has shown that DP may decrease as a consequence of repeated exposure to disgust elicitors through habituation (e.g., Rozin, 2008). Disgust-eliciting stimulus encounters usually increase along with the cancer diagnosis and treatments (e.g., wounds; Reilly et al., 1996) and may have reduced DP along the way. By contrast, it is highly likely that DS was heightened and intensified through impaired emotional regulation (e.g., Cisler et al., 2009) following pervasive cancer experiences. Emotion regulation strategies are suggested to be impaired in people with cancer (e.g., suppression, repressive-defensiveness, restraint, and distress; Giese-Davis, & Spiegel, 2001).

High DP in people without cancer was shown to play the most important role in predicting higher levels of stigma (in specific dimensions), confirming previous findings from Pryor et al. (2004), which indicated that DP significantly predicted avoidance reactions to a composite of stigmatized health conditions, including

HIV/AIDS, obesity, and cancer. On the basis of the present thesis a conclusion can be drawn that both DP and DS have significant roles to play in understanding the psychological wellbeing of people with cancer.

On the one hand, these findings suggest that healthier emotion regulation may promote better psychological wellbeing in people who are involved with cancer (patients and partners), through the potential reduction of DS. An individual with high DS is suggested to not have adequate coping strategies and to be suffering from deficient emotion regulation leading to pronounced stress responses under the exposure to disgust stimuli (Rohrmann, Hopp, Schienle, & Hodapp, 2009). Therefore, psychological interventions which have been formulated to improve emotion regulation might be beneficial (e.g., compassion-focused therapy which is formulated to improve emotion regulation in people with high levels of self-criticism, hatred, and disgust; Gilbert, 2015). On the other hand, for people without cancer, exposure could be beneficial in reducing stigma towards people with cancer, through the reduction of individuals' DP (e.g., DP may lessen through habituation and exposure; Olatunji et al., 2011; Rozin, 2008), but in the absence of or in the presence of reduced negative emotion (e.g., through the implementation of graded exposure; Hirai et al., 2008; or incompatible positive emotions, such as relaxation; Ducasse et al., 2013).

5.7 Research strengths and limitations

The studies in this thesis concerning the role of disgust traits in the anxious and depressive outcomes of people with cancer led to novel findings. For example, the study in Chapter II provided evidence for disgust traits predicting anxiety and depression in people with cancer, which previously had not been studied outside of the colorectal context in a cancer sample. These findings are likely to be useful in developing and improving the effectiveness of psychological interventions in people with cancer. In

addition to that, the study also provided evidence to improve understanding of the role of the new and emerging psychological construct of SD in anxiety and depression, particularly in cancer samples.

Apart from novelty, another strength of this thesis is that it presents a variety of research methodologies (i.e., case-control, association of partner-patient, and experimental) to answer complementary research questions. First, the case-control study has several advantages over other designs, especially than a standard cross-sectional design because of matching (it is quasi-experimental; William, Shadish, Cook, & Campbell, 2002). Secondly, this thesis explored the impact of partner–patient interactions on SD and anxiety and depression in patients with cancer, in which the influence exerted by an individual on their partners depends on dyadic or pairwise characteristics of both parties (Aral & Walker 2012). This approach provides a method to simultaneously examine how a cancer patient's own SD and the DS of his or her spouse is related to anxious/depressive symptomatology. Finally, a causal relationship was successfully established through experimentally testing a causal manipulation of exposure on stigma towards people with cancer, through negative emotion, facilitating an explicit understanding of how, and which type(s) of, disgust traits may contribute to heightened stigma.

However, it is quite early to make decisive conclusions from this work, as replication is needed, perhaps involving longitudinal samples. Another noteworthy limitation of the current research is its small sample size, and the extent of heterogeneity and uneven representation of cancer types, stages, and treatments in the sample. Therefore, it might be wise to consider the homogeneity of the sample in the future to increase targeted generalisability. However, the heterogeneous cancer samples also constitute a potential strength. Having a wide set of types and conditions of cancer

represented in the sample may improve external validity, given that the effects held in a heterogeneous sample where the only known commonality was being diagnosed with cancer.

Another limitation of the present study was the lack of qualitative assessment of disgust experiences (Study 1). As cancer may induce personality changes (e.g., Jokela, Hakulinen, Singh-Manoux, & Kivimäki, 2014), it is possible that disgust traits, such as DS and DP, were different before the onset of the disease, and a qualitative investigation could be useful to reveal the unfolding (if any) of disgust experiences. Therefore, future investigations may utilize interview approaches in their research designs (i.e., qualitative interview studies, critical incident techniques, focus group research, and narrative inquiry) with cancer patients (and their partners) to explore disgust experiences related to their disease. These qualitative data may provide a basis for the quantitative assessments and could be valuable in specifying the relation of DS and DP with respect to SD in Study 1.

A further limitation is that discriminant validity analysis was not conducted between DP, DS, and SD in the present sample prior to the regression and mediation analysis in the studies (Study 1 and 2). Considering DP, DS, and SD are measuring disgust-related traits, Confirmatory Factor Analysis (CFA) could have been used to demonstrate that the measures of DP, DS, and SD in the present sample have acceptable discriminant validity prior to regression models and mediational tests.

Another limitation is that these studies (Studies 1 and 2) may not have controlled for all possible confounding variables. Although self-disgust may be theoretically distinguished from other self-conscious emotion such as shame, guilt and embarrassment by its disgust-based, cognitive affective content (Powell, 2013) and the disease avoidance mechanisms that underlying the development of the self-directed

disgust emotion, the neglect of self-conscious emotions and negative affect measures as the confounding variables remains a potential limitation. For example, the effects of shame, guilt (e.g., as measured by Test of Self-Conscious Affect [TOSCA; Tangney, Dearing, Wagner, & Gramzow, 2000; Tangney, Wagner, & Gramzow, 1989]), negative affectivity in predicting depressive symptoms and other mental health outcomes (alongside SD) could have been examined. This is a possible limitation because these variables could potentially have a significant impact on mental health when included in the model.

Another measurement-related limitation is that for study 2, since patients were described as being explicitly aware of the disgust-based rejection from their partners and capable of inferring their partner's disgust experiences (e.g., Navon & Morag, 2003), an emotional intelligence questionnaire (or any measure for inferring other people's emotions) to measure the accuracy or the ability of individuals to correctly infer the thoughts and feelings of their partners could be useful to measure the potential moderator effect between the partner's disgust and the patient's self-disgust. This might be necessary as individuals' emotional intelligence may affect judgments about expressed emotions made by their partners.

As mentioned in the Chapter III, primary limitation in study 2 is the moderate sample size, which raises concerns about inadequate statistical power. The statistical analyses include 5 predictor variables and 4 control variables (see below), hence with 100 participants, the subject/predictor ratio falls below the criteria suggested for regression-based models (for example, Green 1991, suggests $n>50+8$ m, where n is the number of participants and m is the number of predictors), with a consequent increase in the likelihood of Type 2 errors. At the same time, it is worth noting that there is no "one size fits all" approach to minimum sample sizes for Structural Equation Modelling

(SEM) and path analysis, with recent simulations suggesting between 30 and 460 people for SEM, depending on innumerable other criteria (see Wolf, Harrington, Clark, & Miller, 2013), although previous rules of thumb have included at least 10 cases per variable (Nunnally, 1967), or a minimum of 100 (Bollen, 1989), while others have been higher.

Echoing the aforementioned concern, a post hoc power analysis was conducted using the software package GPower (Faul, Erdfelder, Buchner, & Lang, 2009). With a sample size of 100, 9 predictor variables and an alpha level of .05, post hoc analyses revealed that the statistical power for this study was .81 for detecting a moderate effect size ($f_2 = .15$), whereas the power exceeded .99 for the detection of a large effect size ($f_2 = .35$). Thus, there was sufficient power (i.e., power * .80) at the moderate to large effect size level, but less than adequate statistical power at the small effect size level. Hence, for the mediational test (Model 2; Figure 3.2, which revealed that partners' DS marginally positively predicted cancer patients' anxiety, $\beta = .15$, BCa 95% CI [0.01, 0.48], and depression, $\beta = .17$, BCa 95% CI [0.01, 0.50], via patients' SD, when patients' DP and DS in the model; Table 3.2), it is believed that this finding would have a stronger level of significance given more statistical power. In addition, the effect of partners' DP on patients' anxiety and depression, via their SD potentially could reach statistical significance.

A final limitation is specific to Study 3, related to the absence of a measure of empathy and affiliation with cancer patients. Previous findings suggest that enhancing empathy for a member of a stigmatized group can improve attitudes toward the group as a whole (e.g., Batson et al., 1997). Therefore, future studies could incorporate measures of empathy and may acquire detailed data on the participants' affiliation with cancer patients (e.g., having family member with cancer) as this could potentially influence the

results of the study (i.e., more exposure to cancer-related disgust might decrease the DP in the participants; Olatunji et al., 2011; Rozin, 2008).

5.8 Understanding disgust in cancer patients' anxious and depressive outcomes – some future directions

The use of general rather than domain-specific measures of DP in Chapter II and III potentially limits the identification of certain disgust subtypes that may be driving the overall reduction in DP observed. Future research may replicate the studies in Chapter II and III, using domain-specific measures of DP, which may tap into disgust subtypes (e.g. the Disgust Scale-Revised [DS-R], Olatunji et al., 2007). As in the experimental study from Chapter IV, it has been found that the AR disgust domain was particularly relevant in predicting avoidance- and awkwardness-based cancer stigma. There is therefore a possibility that SD in cancer patients can be internalized through certain dimensions of DP, such as AR, being heightened in their partners.

Further, a more comprehensive understanding of disgust in people with cancer could be gained if different methods of assessing disgust traits including physiological, behavioural, and questionnaire measures were combined. DP, for example, has been suggested to be measurable simultaneously using self-report and physiological tests (e.g., Smith, Oxley, Hibbing, Alford, & Hibbing, 2011). Different methods of measuring disgust (i.e., physiological & self-report measures) may very well separately pick up distinct elements of responses to disgusting stimuli and therefore may be independently useful (Smith et al., 2011), particularly in understanding the psychological wellbeing in people with cancer. Finally, as previously mentioned, temporal-longitudinal data might be helpful in the future, which may allow for the establishment of causality (Scandura & Williams, 2000).

5.9 Clinical implications

The significance of different disgust traits that were attributed to people who were involved with cancer (patients and partners), and people who are not involved in cancer that were discussed throughout the thesis suggest that effects on cancer patients' wellbeing may operate through multiple channels and/or differently for general populations. Focusing therapeutically on disgust responses, particularly SD in cancer patients, and DS in both cancer patients and their partners, could well be beneficial for improving cancer patients' psychological wellbeing, whereas targeting DP in people without cancer, potentially may improve acceptance and reduce awkwardness- and avoidance- based stigma towards people with cancer. The results also suggest that it may be crucial to involve both cancer patients and their partners in (e.g., disgust-focused) psychological interventions, rather than the patient alone.

5.10 Conclusion

The current thesis was written in an attempt to illuminate the psychological phenomenon of disgust as a disease avoidance mechanism as a predictor of anxiety, depression, and stigma from others in people with cancer. In Chapter I, a comprehensive review of the literature was presented, and an outline summary of three related research questions were described. In an effort to provide data to address these queries: in Chapter II the relationship between participants' disgust traits, SD, and their anxiety and depression were statistically modelled; in Chapter III the dyadic relationship between partners' disgust traits, and cancer patients' SD and psychological wellbeing (anxiety and depression) were statistically demonstrated; in Chapter IV an experiment was conducted involving exposure to emotive cancer-related stimuli as a mechanism of inducing disgust and negative emotion, and the causal effect of DP as a moderator of the link between exposure and stigma, through negative emotion, was

examined. As reviewed in the current chapter, the findings inform and address important issues, comprising: the role of disgust in predicting psychological wellbeing (anxiety and depression); the relationship between disgust traits in cancer partners and patients; the role of disgust in predicting stigma towards people with cancer; the dysfunction of a disease avoidance mechanism in explaining the anxiety, depression, and stigma related to cancer; and the validity of disgust trait constructs utilized in this thesis.

Three conclusions may be drawn from the findings of the present thesis. One conclusion is that it has clearly been shown that there is a significant role for disgust in understanding anxiety and depression in people with cancer. Second, there is a relationship between cancer partners' disgust traits (i.e., DS) with the levels of cancer patients' SD, and subsequently their anxiety and depression. Third, the findings confirm that there are causal effects of DP as a moderator of the link between exposure to emotive cancer-relevant stimuli and negative emotional reactions, which then lead to heightened levels of stigma.

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APPENDICES

Appendix A Demographics questions

Please complete the questions below:

Gender

- ○ Male
- ○ Female

Q2 Age:

Q3 Which of the following are applicable to your living situation? (Check all that apply)

- ☐ I live alone
- ☐ I live with a husband/wife/domestic partner/significant other
- ☐ I live with my child/children.
- ☐ I live with parents(s), relative(s), or guardian(s).
- ☐ None of the above - Please specify:

Q4 Number of Children

Q5 Type of employment

- ○ Semi-skilled (admin assistant, waiter etc.)
- ○ Skilled (architects, chemists)
- ○ Intermediate (teacher, officer)
- ○ Professional (doctor, lawyer)
- ○ Prefer not to disclose

Q6 **Which of the following best describes your sexual orientation?**

- ○ Heterosexual / straight (opposite sex)
- ○ Bisexual (both sexes)
- ○ Gay or Lesbian (same sex)
- ○ Other
- ○ Prefer not to answer

Q7 **Years since diagnosis:**

Q8 **Years since onset symptoms:**

Q9 **How has your cancer responded to treatment?**

- ○ My cancer has responded fully to treatment (I have no signs or symptoms of cancer)
- ○ My cancer has been treated but is still present
- ○ My cancer has not been treated at all
- ○ My cancer has come back after it was originally treated
- ○ My original cancer responded but I now have a new cancer
- ○ I am not certain what is happening with my cancer

Q10 **Do you have any of the following longstanding conditions?**

- ○ Deafness or severe hearing impairment
- ○ Blindness or partially sighted
- ○ A long-standing physical condition
- ○ A learning disability

- ○ A mental health condition
- ○ A long-standing illness (e.g. diabetes or chronic heart disease)
- ○ No, I do not have a long-standing condition

Q11 **How would you describe your ethnicity?**

- ○ White British
- ○ Asian British
- ○ Asian Other
- ○ Black Other
- ○ White Irish
- ○ Indian
- ○ Black British
- ○ Chinese
- ○ White European
- ○ Pakistani
- ○ Black Caribbean
- ○ Other ethnic group
- ○ White Other
- ○ Bangladeshi
- ○ Black African

Q12 **Have you ever been diagnosed with depression (including bipolar disorder)?**

- ○ Yes
- ○ No
- ○ Prefer not to disclose

Q13 **If YES are you currently diagnosed as depressed?**

- ○ Yes
- ○ No
- ○ Prefer not to disclose

Q14 **Have you ever been diagnosed with an anxiety disorder (e.g. generalised anxiety disorder, specific phobia, obsessive-compulsive disorder, post-traumatic stress disorder)?**

- ○ Yes
- ○ No
- ○ Prefer not to disclose

Q15 **If YES are you currently diagnosed as having an anxiety disorder?**

- ○ Yes
- ○ No
- ○ Prefer not to disclose

Q16 **Are you currently taking any medication for depression and/or an anxiety disorder?**

- ○ Yes
- ○ No
- ○ Prefer not to disclose

Q17 **What type of primary cancer have you been diagnosed with?:**

Q18 **How was your cancer diagnosed?**

- ○ I went for routine screening and cancer was detected
- ○ I went to my GP with symptoms
- ○ I went to my GP for something unrelated
- ○ I went to the accident and emergency department with symptoms
- ○ Unsure
- ○ None of the above - Please specify:

Q20 **When your diagnosis of cancer was confirmed, what stage was the cancer at? (If you are unsure please move on to the next question)**

- ○ Stage 0: carcinoma in situ. An early form of cancer that is defined by the absence of invasion of tumor cells into the surrounding tissue, usually before penetration through the basement membrane.
- ○ Stage I: cancers are localized to one part of the body. Stage I cancer can be surgically removed if small enough.
- ○ Stage II: cancers are locally advanced. Stage II cancer can be treated by chemo, radiation, or surgery.
- ○ Stage III: cancers are also locally advanced. Whether a cancer is designated as Stage II or Stage III can depend on the specific type of cancer; for example, in Hodgkin's Disease, Stage II indicates affected lymph nodes on only one side of the diaphragm, whereas Stage III indicates affected lymph nodes above and below the diaphragm. The specific criteria for Stages II and III therefore differ according to diagnosis. Stage III can be treated by chemo, radiation, or surgery.

○ Stage IV: cancers have often metastasized, or spread to other organs or throughout the body. Stage IV cancer can be treated by chemo, radiation, or surgery.

○ unsure/prefer not to disclose

Q21 **What stage is your cancer at now? (If you are unsure please move on to the next question)**

○ Stage 0

○ Stage I

○ Stage II

○ Stage III

○ Stage IV

○ unsure/prefer not to disclose

Q22 **Have you received treatment for your cancer?**

○ Yes

○ No

Q23 **Which form of treatment have you received? (Select all that apply)**

☐ Chemotherapy

☐ Hormonal therapy

☐ Stem cell /bone marrow transplant

☐ Surgery

☐ Gene therapy

- [ ] Radiotherapy
- [ ] Unsure
- [ ] None of the above* Please specify:

Q24 **Did this treatment cause any side-effects?**

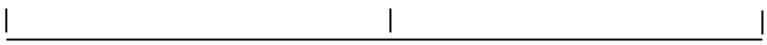
- ○ Yes
- ○ No

Q25 **If yes, please list the side-effects:**

Appendix B Visual Analogue Scale Avoidance- and awkwardness-based stigma - Adapted (Cancer Stigma Scale, CASS; from Marlow, & Wardle, 2014)

Please indicate your answer by placing a cross along the 0 – 100 scale.

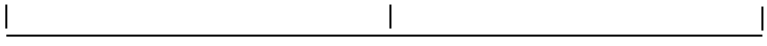
Responding honestly, I would try to avoid a person with cancer



0 **50** **100**

Not agree at all **completely agree**

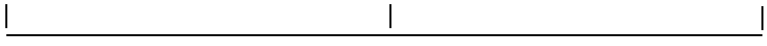
I would find it difficult being around someone with cancer



0 **50** **100**

Not agree at all **completely agree**

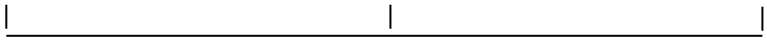
I would find it hard to talk to someone with cancer



0 **50** **100**

Not agree at all **completely agree**

I would distance myself physically from someone with cancer



0 **50** **100**

Not agree at all **completely agree**

Appendix C Factor loadings and communalities based on principal component analysis with varimax rotation for the Visual Analogue Scale Avoidance- and awkwardness-based stigma

Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
Q33_12 - I would feel comfortable around someone with cancer.	-.886						
Q33_11 - I would feel at ease around someone with cancer.	-.837						
Q33_16 - I would find it hard to talk to someone with cancer.	**.705**					.331	
Q33_13 - I would try to avoid a person with cancer.	**.678**		.368				
Q33_15 - I would find it difficult being around someone with cancer.	**.658**					.438	
Q33_19 - I would distance myself physically from someone with cancer.	**.568**		.483				.320
Q33_20 - If a colleague had cancer, I would try to avoid them.	.530		.525				.378
Q33_18 - I would feel embarrassed discussing cancer with someone who had it.	.444					.399	
Q33_9 - A person with cancer is liable for their condition.		.897					
Q33_5 - A person with cancer is accountable for their condition.		.865					
Q33_10 - If a person has cancer, it's probably their fault.		.817					
Q33_3 - A person with cancer is to blame for their condition.		.734					
Q33_17 - I would feel irritated by someone with cancer.			.826				
Q33_14 - I would feel angered by someone with cancer.			.806				
Q33_23 - More government funding should be spent on the care and treatment of those...				.854			
Q33_24 - We have a responsibility to provide the best possible care for people with...				.792			
Q33_22 - The needs of people with cancer should be given top priority.				.766			
Q33_25 - Banks should be allowed to refuse mortgage applications for cancer related...					.851		
Q33_21 - It is acceptable for banks to refuse to make loans to people with cancer.					.765		
Q33_26 - It is acceptable for insurance companies to reconsider a policy if someone...					.717		
Q33_4 - Having cancer usually ruins a person's career.						.715	
Q33_8 - Cancer devastates the lives of those it touches.						.701	
Q33_7 - Cancer usually ruins close personal relationships.						.547	
Q33_1 - Once you've had cancer you can never be 'normal' again.							.741
Q33_2 - Getting cancer means having to mentally prepare oneself for death.						.336	.649

Notes. $N = 141$. Factor loadings < .3 are suppressed.

Appendix D Visual Analogue Scale Basic Emotion - Adapted (VAS; from Powell et al., 2015)

Please indicate your answer by placing a cross along the 0 – 100 scale.

After watching the video, I am feeling…

|_____|_____|

0 **50** **100**

Not at all disgusted **extremely disgusted**

|_____|_____|

0 **50** **100**

Not at all angry **extremely angry**

|_____|_____|

0 **50** **100**

Not at all sad **extremely sad**

|_____|_____|

0 **50** **100**

Not at all fear **extremely fear**

|_____|_____|

0 **50** **100**

Not at all happy **extremely happy**

Appendix E Factor loadings and communalities based on principal component analysis for the negative emotion composite

	Component
	1
Vas sad	.813
Vas afraid	.793
Vas disgust	.719
Vas angry	.553

Notes. $N = 141$. All 4 negative emotions loaded onto one latent factor. Only one component was extracted. The solution cannot be rotated.

List of Publications

Published Papers

Azlan, H. A., Overton, P. G., Simpson, J., & Powell, P. A. (2017). Differential disgust responding in people with cancer and implications for psychological wellbeing. *Psychology & health*, *32*(1), 19–37. doi:10.1080/08870446.2016.1235165.

Azlan, H. A., Overton, P. G., Simpson, J., & Powell, P. A. (2017). Effect of Partners' Disgust Responses on Psychological Wellbeing in Cancer Patients. *Journal of clinical psychology in medical settings*, *24*(3-4), 355-364. doi:10.1007/s10880-017-9521-z.

Powell, P. A., Azlan, H. A., Simpson, J., & Overton, P. G. (2016). The effect of disgust-related side-effects on symptoms of depression and anxiety in people treated for cancer: A moderated mediation model. *Journal of Behavioral Medicine*, *4*, 560–573. doi:10.1007/s10865-016-9731-0.

Conference Presentations Oral

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2016). Effects of patient-partner dyadic disgust responses on psychological wellbeing in cancer patients. *Consortium of European Research on Emotion2016, July 6 -7 2016, Leiden, Netherlands.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2016). Effects of patient-partner dyadic disgust responses on psychological wellbeing in cancer patients. *Psychology Postgraduate Conference, 16, 18, 19 May 2016, Department of Psychology, University of Sheffield, United Kingdom.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2015). Examining the implications of three distinct disgust orientations on psychological wellbeing in cancer. *Emotions 2015, October25-27 2015, Tilburg, Netherlands.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2015). Examining the implications of three distinct disgust orientations in cancer. *30th Annual PsyPAG Postgraduate Student Conference, 22-24 July 2015, University of Glasgow, United Kingdom.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2014). Examining the role of self-disgust in depression among cancer patients: a quantitative investigation. *29th Annual PsyPAG Postgraduate Student Conference 2014, 23-25 July 2014, Cardiff Metropolitan University, United Kingdom.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2014). Examining self-disgust in cancer patients. *Psychology Postgraduate Conference, 12, 14, 15 May 2014, Department of Psychology, University of Sheffield, United Kingdom.*

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2014). Examining the role of self-disgust in depression among cancer patients: a quantitative investigation. *Leeds Social Science Institute Seminar Series, 14 February 2014, University of Leeds, United Kingdom.*

Conference Presentations Poster

Azlan, H. A., Powell, P. A., Simpson, J., & Overton, P. G. (2015). Examining the implications of three distinct disgust orientations in cancer. *Fourth Annual Spring Conference 2015: 'Getting Published', 6 May 2015, University of York, United Kingdom.*

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