Disgust propensity, fear of contamination and underlying dimensions of obsessive-compulsive symptoms

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An exploratory study was conducted to investigate the mediating role of harm avoidance and incompleteness, the proposed underlying motivational factors of obsessive-compulsive disorder (OCD), in the relationship between disgust and fear of contamination. In total, 170 undergraduate students at the University of Iceland answered questionnaires and data from 148 participants was analysed using linear regression. The mediating effects of harm avoidance and incompleteness was tested using three different self-report measures, a measure of these two underlying motivational dimensions (OC-TCDQ) and a measure of symptoms of not-just-right experiences (NJRE-Q-R) and beliefs related to overestimation of threat and responsibility (OBQ-44). Results showed that disgust was associated with fear of contamination and that neither harm avoidance (OC-TCDQ) nor overestimation of threat (OBQ-44) significantly mediated the relationship between disgust and fear of contamination. However, incompleteness and the number of not-just-right experiences (NJRE-Q-R) were significant mediators. This indicates that contamination-related OCD symptoms may be more emotion or sensation-based rather than a result of cognitive distortions in people whose contamination symptoms are related to the emotion of disgust. Such patients may engage in compulsions when feeling disgusted not because they need to avoid possible future harm but rather because they cannot get rid of feelings of incompleteness if they do not perform their compulsions.
The nature of obsessive-compulsive disorder

Anxiety and fear are basic emotions that people universally experience in daily life. Sometimes people’s own thoughts are the source of anxiety and/or fear leading to distress and people may develop habitual or ritual ways of responding to those emotions to relieve the distress. In such cases an individual might be diagnosed with obsessive-compulsive disorder (OCD) (Clark, 2004).

Obsessions are defined as "persistent ideas, thoughts, impulses, or images that are experienced as intrusive and inappropriate and that cause marked anxiety or distress." (APA, 2000, p. 457). People may have one primary obsession or multiple different obsessions (Clark, 2004). Obsessions are not voluntarily produced and they are not wanted nor welcomed by a person and they can be triggered by something external (i.e. something in the environment) or internal (e.g. a thought that an individual has) (de Silva & Rachman, 1992). Obsessions are often followed by efforts to suppress or to ignore the thought altogether although individuals can have a sense of a lack of control over the occurrence of obsessions (APA, 2000). People with obsessions know that the obsessions are a product of their own minds. In OCD, obsessions should be distinguished from the delusion of "thought insertion" observed in psychotic disorders where the individual thinks that thoughts have been planted in his or her head from outside (de Silva & Rachman, 1992). Although the content of obsessions is variable there are some frequently observed themes in obsession, including, contamination and dirt, disease and illness, death, violence and aggression, harm and danger, and moral and religious topics. Obsessions concerning sex or senseless or trivial things (e.g. advertising jingles) are observed but not as common (de Silva & Rachman, 1992). The content of obsessions can be affected by culture or gender (Clark, 2004).

The DMS-IV-TR (APA, 2000) defines compulsions as repetitive behaviours or mental acts intended to achieve something, either to prevent an event from happening or create a situation in which distress or anxiety is reduced. Compulsions are not performed to achieve pleasure or gratification (APA, 2000). In contrast to obsessions, compulsions are voluntary actions that the person feels driven to perform. An individual feels an irresistible urge to engage in compulsions (Clark, 2004). This is to differentiate compulsions from
automatic behaviour such as tics, which occur automatically. Obsessions invoke discomfort, which leads to an urge to carry out a particular behaviour, the compulsion (de Silva & Rachman, 1992).

**Diagnostic criteria and prevalence of obsessive-compulsive disorder**

Obsessive-compulsive disorder is categorised as one of the anxiety disorders in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (APA, 2000). This is because the disorder shares a similar symptom profile with some of the other anxiety disorders (Clark, 2004). Other anxiety disorders in the DSM-IV-TR are panic disorder, agoraphobia, simple phobia, social phobia and posttraumatic stress disorder.

According to the DSM-IV-TR (APA, 2000), to receive a diagnosis of obsessive-compulsive disorder an individual needs to have recurrent obsessions or compulsions. The obsessions cannot be excessive worries about real-life problems, the individual needs to try to ignore or suppress the obsessions or neutralise them with some other thought or action and the individual must recognise that the obsession is a product of his or her own mind. In the case of compulsions, an individual must feel driven to perform them in response to an obsession or according to rules that must be followed rigidly and the compulsions are aimed at preventing or reducing distress or preventing some dreaded event from happening or to avoid a situation. The compulsions have to be either excessive in nature or not related in any logical way to what they are intended to prevent. In addition to these criteria concerning the characteristics of obsessions and compulsions, at some point of the disorder the individual needs to have recognised that the obsessions or compulsions are excessive or unreasonable and the individual must suffer marked distress due to obsessions or compulsions. The obsessions or compulsions have to be time-consuming (take more than 1 hour a day) or they have to significantly interfere with the person’s normal routine, occupational or academic, functioning, or usual social activities or relationships. If an individual has another Axis I disorder the content of the obsessions or compulsions must not be restricted to that disorder and the obsessions or compulsions cannot be due to direct physiological effects of substances or a general medical condition (APA, 2000).
Studies have shown that the lifetime prevalence of OCD in adults is 2.5% and 1% to 2.3% in children/adolescents. The 1-year prevalence for OCD in adults and children/adolescents are 0.5% to 2.1% and 0.7%, respectively (APA, 2000). In a recent study investigating the prevalence of OCD in the United States, the lifetime prevalence was estimated to be 2.3% and the 1-year prevalence 1.2% (Ruscio, Stein, Chiu & Kessler, 2010). In general, the onset of OCD is earlier for males. For females the onset appears to be between ages 20 and 29 whereas for males it is between ages 6 and 15 (APA, 2000).

**Heterogeneity of OCD symptoms**

Symptoms of OCD are much more heterogenous in nature than the symptoms of other anxiety disorders (Clark, 2004). This has led researchers to challenge the view of OCD as an unitary diagnostic category with a common etiology. Instead it can be seen as a condition comprising distinct subtypes (Clark, 2004; McKay, Abramowitz, Calamari et al., 2004). Two approaches have been proposed: a symptom subtype approach and a symptom dimension approach (Clark, 2004).

From the perspective of symptom subtypes, individuals are categorised as being part of one of the symptom subtypes which are mutually exclusive, that is, patients can manifest symptoms from only one of the symptom categories. For example, an individual either has contamination-related obsessions and engages in washing or has to compulsively check doors and windows in response to an obsessive doubt about having closed them, but cannot have both types of obsessions and compulsions. This perspective considers patients having one primary type of obsessive or compulsive symptom. Symptom subtyping is based on attempts to arrange the most common symptoms into logical clusters (Summerfeldt, Richter, Antony & Swinson, 1999). The symptom subtypes perspective incorporates the notion of distinct etiological factors for each symptom subtype (Clark, 2004). In contrast, the symptom dimensions perspective does not view individuals as belonging to only one symptom category but rather that individuals vary to a different degree on different symptom dimensions. For example, a person can have primary obsessions related to contamination but also obsesses about having closed doors and
windows but spends more time engaging in washing behaviour than checking (Clark, 2004). This perspective is based on examining large collections of various OCD symptoms and attempting to find structural similarities among the symptoms (Summerfeldt et al., 1999).

Both approaches have been employed in studies. Rasmussen and Eisen (1992, 1998, in Clark, 2004) reported seven OCD subtypes based on more than 1000 patients with OCD: fear of contamination and washing and cleaning; pathologic doubt and checking; sex or aggression and the need to ask or confess; somatic; need for symmetry/precision and symmetry and precision; compulsive hoarding; and obsessions with religious content. Of these, compulsive washing and checking are the most common in patients with OCD and these have also received the most support in research (Clark, 2004). Despite of symptom subtyping being widely accepted, the method has its limitations. This perspective ignores the fact that many individuals suffering from OCD have multiple obsessions and compulsions and that the symptoms may change over time. The dimensional approach is based on factor analyses of obsessive-compulsive symptom measures (Clark, 2004). Summerfeldt et al. (1999) and Summerfeldt, Kloosterman, Antony, Richter and Swinson (2004) found evidence for four distinct symptom dimensions of obsessions and compulsions: obsessions and checking compulsions, symmetry and ordering, contamination and washing/cleaning compulsions and hoarding. Other studies have shown similar results although there have been some inconsistencies across studies (Clark, 2004). Studies conducted from both perspectives have found the most support for compulsive washing and checking subtypes and washing and checking dimensions (Clark, 2004). In addition, a review by McKay, Abramowitz, Calamari et al. (2004) that evaluated OCD symptom subtypes found that the strongest support can be found for four subtypes: contamination/washing, checking, hoarding and symmetry/ordering. Pure obsessions has been found as a symptom subtype in some studies and consists of sexual obsessions, religious obsessions and obsessions related to aggression (McKay et al., 2004).

Distinct motivational factors may underlie different symptom dimensions or subtypes. This should be considered when the two approaches to OCD
symptom heterogeneity are examined. The symptom subtype perspective might categorise two individuals who have an overt washing compulsion into the same category although they might have different motivations for engaging in the behaviour (Summerfeldt, 2004).

**Cognitive models of OCD**

Several cognitive models of OCD have been proposed but two have received the most attention and guide majority of research in clinical psychology today. Both are based on the premise that intrusive thoughts are naturally occurring and universally experienced. What transforms the intrusive cognitions to obsessions is people’s interpretation and evaluation of their occurrence and their content (Rachman, 1998; Salkovskis, 1999). Salkovskis (1985, 1989) proposes that what is central to the maintenance of obsessive-compulsive disorder is that obsessions are appraised in a way that emphasises the personal responsibility of an individual. According to Salkovskis, the negative interpretations have to do with the idea that if the person does or does not engage in a given behaviour, the consequence might be harmful to the self or to others. Given the occurrence of such a harmful event or consequences, the person having the obsession would feel responsible for the harm had he or she not engaged in behaviour to avoid the situation or prevented the event from happening. The person believes that preventing possible harm or a dreaded event is his or her responsibility. Consequences that follow from this kind of appraisals are, for example, selective attention to threat, neutralizing behaviour and increased negative mood, can serve to maintain negative beliefs and appraisals and the obsessive-compulsive disorder (Salkovskis, 1999).

According to Rachman (1997, 1998) appraisals of thoughts as being of great importance to the individual, is a central feature in obsessional problems in OCD. Intrusive thoughts are appraised as being personally significant, meaningful and threatening, which can turn these thoughts into a powerful source of anxiety and distress. Taken together, these two cognitive theories of Rachman and Salkovskis, postulate that underlying dysfunctional beliefs and assumptions regarding intrusive and obsessional thoughts, lead to the development of obsessional problems in OCD and maintain the disorder. This is
important for both the mood experienced and the motivation to engage in compulsive behaviour.

More recently, several other types of dysfunctional beliefs in OCD have been proposed. The Obsessive-Compulsive Cognitions Work Group (1997, 2001, 2003 & 2005) has proposed six main types of beliefs relevant to the development of OCD and its exacerbation. These types of beliefs are: (1) overestimation of threat (2) intolerance of uncertainty (3) importance of thoughts (4) control of thoughts (5) inflated responsibility and (6) perfectionism. These beliefs correspond to dysfunctional assumptions that may underlie OCD.

There is evidence that patients with obsessions are more likely to experience as sense of "inflated responsibility" for possible harm than non-obsessionals in association with intrusive thoughts (Salkovskis, Wroe, Glendhill, Morrison et al., 2000). In addition, obsessional patients were more likely to make responsibility-related appraisals of intrusive thoughts about possible harm and there was an association between responsibility cognitions and engaging in compulsive behaviour and neutralization. Number of studies show that these beliefs associated with OCD predict OCD symptoms (Abramowitz, Khandker, Nelson, Deacon & Rygwall, 2006; Abramowitz, Nelson, Rygwall & Khandker, 2007; Taylor, McKay & Abramowitz, 2005; Tolin, Worhunsky, Brady & Maltby, 2007; Tolin, Worhunsky & Maltby, 2006). There is evidence for a specific association between the different OCD related beliefs and symptom subtypes or dimensions (Abramowitz, Lackey & Wheaton, 2009). Contamination-related OCD symptoms have most consistently been associated with overestimation of threat in both non-clinical (Tolin, Woods & Abramowitz, 2003) and clinical samples (OCCWG, 2005; Tolin, Brady & Hannan, 2008). Overall, the evidence from many studies point to the potent and multiple roles of these beliefs in OCD. Based on evidence that obsessive beliefs have a prominent role in OCD it may be assumed that both obsessive beliefs and emotional distress can play a role in contamination fear (Cisler, Brady, Olatunji & Lohr, 2010). Although anxiety and fear are clearly related to contamination-related symptoms in OCD, disgust is an emotion that has also been linked with the fear of being contaminated.
Disgust

Disgust is one of the basic emotions with distinct characteristics that differentiates it from other basic emotions such as fear (Ekman, 1992; Rozin & Fallon, 1987). Many definitions of disgust have been proposed, most of them defining disgust in relation to intake of food (Rozin, Haidt & McCauley, 1993). Rozin and Fallon (1987) defined disgust as a food-related emotion in which revulsion follows from the prospect of oral incorporation of offensive substances to the self. The primary route for integration of offensive substances to the body is the mouth and the characteristic facial expression and the physiological reaction (nausea) can be seen as functional considering that route. The behavioural component of disgust is distancing oneself from the elicitor of disgust and thus rejection of that object. These three characteristics of disgust have probably been quite stable through cultural evolution but the elicitors and the meaning of disgust have changed (Rozin, Haidt & McCauley, 1993).

Animal and human body products and objects that have been in contact with them have been considered as the main disgust elicitors. A major source for such contact is interpersonal in nature, as objects that have been in contact with people who are disliked or seen as being potentially contaminating can elicit disgust (Rozin & Fallon, 1987). Such contact may be direct or indirect. Other domains of disgust elicitors have been found such as sexual acts and poor hygiene. These additional domains spread the focus of threat from the mouth to contact with the body in general (Rozin, Haidt & McCauley, 1993). There are of course both cultural and individual differences in the type of stimuli that elicit disgust (Phillips, Senior, Fahy & David, 1998).

An abnormal perception of disgust has been indicated to be an underlying factor in several mental illnesses and there has been increased interest in the role disgust may play in psychopathology (Olantuji & McKay, 2007; Phillips et al., 1998). McNally (2002) declared that “disgust has arrived” in the field of clinical psychology as an independent field of study.

Fear of contamination

Fear of contamination is most often affiliated with OCD in which the content of obsessions revolves around dirt, disease, or general uncleanliness. The
associated compulsions are washing and cleaning rituals. Rachman (2004) defines contamination fear as an “intense and persisting feeling of having been polluted or infected or endangered as a result of contact, direct or indirect, with a person/place/object that is perceived to be soiled, impure, infectious or harmful” (p. 1229). The fear of contamination is often very persistent, excessive and commanding. Contamination can move from object to object, from person to person, from objects to persons and vice versa. A feeling of contamination is accompanied by negative emotions including fear and an often a sense of dirtiness. The behaviour related to the feeling of being contaminated is most often cleaning in attempt to remove the contaminant or “isolating” the infected part of the body to avoid contact with other parts of the body to prevent the perceived infection from spreading. This kind of compulsive behaviour is negatively reinforcing as the distress caused by the feeling of contamination is diminished (Rachman, 1994). Feelings of contamination can also arise without a physical contact with a contaminant. This phenomenon is referred to as mental contamination or mental pollution. The feeling of dirtiness is the same in both types of contamination and both types can induce the urge to clean oneself or the environment in which an individual is in (Herba & Rachman, 2007; Rachman, 1994). A study by Fairbrother, Newth and Rachman (2005) examined whether it is in fact possible to induce feelings of contamination without having participants getting in contact with a contaminant. Their results supported the existence of the phenomenon of mental contamination.

The fear of contamination can be defined as a continuum, ranging from mild and circumscribed fear to abnormally intense fear. Individuals with contamination-related OCD symptoms would have fear at the severe end of the continuum (Olatunji, Lohr, Sawchuk & Tolin, 2007). Fear of contamination and disgust share the functional value of keeping an individual away from possible contaminants, protecting the individual from contact and infection (Woody & Teachman, 2000). Disgust elicits the body’s natural physiological response, facial expression, and withdrawal or avoidance reactions whereas contamination fear is related to the evaluative or interpretive process that can occur due to actual or anticipated exposure to disgust (Olatunji, Cisler, McKay & Phillips, 2010).
Anxiety disorders, disgust and fear of contamination

The anxiety disorders have traditionally been linked with two emotions, fear and anxiety (Barlow, 2002). In recent years it has been suggested that disgust, might play a significant role in the etiology of some anxiety disorders, including contamination-related OCD (Cisler, Olantunji & Lohr, 2009; Olantunji et al., 2010; Phillips et al., 1998). Interest in the role of disgust in contamination-related OCD has increased because patients with washing compulsions often report threat-relevant objects as "disgusting" rather than "frightening" and score high on measures of contamination-related fear. Also, OCD patients with other kinds of compulsions do not report feelings of disgust (Tolin, Worhunsky & Maltby, 2004) and evidence for the role of disgust in other subtypes of OCD is not convincing (Berle & Phillips, 2006).

Olatunji, Sawchuk, Lohr and de Jong (2004) investigated the relationship between different disgust elicitor domains (e.g. food, hygiene, sex) and contamination fear in a sample of undergraduate students. They found that seven distinct domains of disgust were related to fear of contamination and concluded that it is therefore disgust in general that is associated with fear of contamination, rather than specific domains of disgust. Domains in the study, that were most strongly associated with contamination concerns, were all considered to be more contagious than other domains. Questionnaire items that measure disgust in association with body products, foods and animals were more strongly correlated with fear of contamination than items that measure mutilation and sex.

Several lines of evidence indicate that a tendency towards experiencing disgust may contribute to contamination-related OCD. Disgust sensitivity refers to the intensity of unpleasantness that is experienced by an individual due to the emotion of disgust. This is to be distinguished from disgust propensity which is defined as a general tendency to respond with the emotion of disgust to any given situation or the ease with which an individual experiences disgust (van Overveld, de Jong, Peters, Cavanagh & Davey, 2006). Disgust propensity is viewed as a trait-like tendency that applies to a number of situations and stimuli (Woody & Tolin, 2002) and most of the research of disgust's role in OCD has focused on investigating disgust propensity (Berle & Phillips, 2006).
The relationship between disgust and fear of contamination has been increasingly studied in recent years and results from this line of studies indicate that there is a strong link between the two (Cisler et al., 2010; Olatunji & Sawchuk, 2005; Woody & Teachman, 2000). Self-report measures of disgust propensity have been shown to correlate positively with self-report measures of contamination fear (Morezt & McKay, 2008; Thorpe, Patel & Simons, 2003) and obsessive-compulsive symptoms, especially cleaning, in non-clinical samples (Muris, Merckelbach, Nederkoorn, Rassin, Candel & Horselenberg, 2000). Mancini, Gragnani and D’Olimpio (2001) found in a non-clinical sample that disgust propensity predicted obsessions and compulsions. Disgust propensity was positively correlated with fear of contamination. The researchers suggest that in OCD patients, disgust may not evoke fear, anxiety or reducing those emotions but rather that compulsions may be performed to get rid of the emotion of disgust itself.

Moretz and McKay (2008) found that disgust propensity uniquely predicted contamination fear but not other symptom dimensions of OCD. Tolin, Woods and Abramowitz (2006) found that washing symptoms were most strongly related to disgust propensity. Olantunji et al. (2004) found that people with high fear of contamination had greater disgust propensity than those individuals who had low fear of contamination. The relationship between disgust and contamination-related OCD appears to be independent of anxiety and depression, that is, the relationship remains after controlling for negative affect (Mancini et al., 2001; Morezt & McKay, 2008; Olatunji, Williams, Lohr, Connolly, Cisler & Meunier, 2007).

Individuals high in contamination fear report feelings of disgust when they are exposed to contamination-related stimuli (Deacon & Olatunji, 2007). A behavioural avoidance test (BAT) is a measure of observable avoidance behaviour and includes a measure on subjective anxiety levels (Steketee, Chambless, Tran, Worden & Gillis, 1996). Studies employing BATs have found that individuals high contamination fear show increased avoidance behaviour in response to disgust on such tasks (Olatunji et al., 2007b). Tsao and McKay (2004) found that individuals high in contamination fear perform more poorly on avoidance tasks than individuals high in trait-anxiety.
The association between contamination fear and cognitive characteristics of disgust has also been investigated. Especially, disgust has been found to be associated with sympathetic magic beliefs, such as the law of contagion which is the belief that "once in contact, always in contact" (Rozin & Fallon, 1987). Tolin et al. (2004) used a "chain of contagion" task to assess participants' perceptions of transfer of contamination between objects that were uncontaminated to begin with. Participants chose an object in a building that they thought was the most contaminated and saw an experimenter then rub a new pencil on that object. The participants were asked to rate the degree to which the pencil was contaminated. This was followed by rubbing a new pencil on the previous pencil until 12 pencils had been used. The results showed that while anxiety-only and non-anxiety controls showed a nearly complete reduction in contamination perception across the pencils, patients with contamination-related OCD demonstrated only a 40% reduction. These results indicate that individuals with contamination-related OCD may evaluate objects becoming permanently and absolutely contaminated (i.e. chain of contagion) when they are in contact with other objects that are perceived to be contaminated and that such sympathetic magic beliefs are associated with contamination-related OCD. Tsao and McKay (2004) found supporting evidence for the importance of sympathetic magic beliefs in patients with contamination-related OCD and their contamination fears. In addition, obsessive beliefs have been found to predict the emergence/development of obsessions and compulsions over time (Abramowitz et al., 2006; 2007).

Cisler et al. (2010) investigated why disgust is related to contamination fear. The results showed that OCD related beliefs, especially overestimation of threat, interact with disgust propensity when predicting fear of contamination. They point out that fear and disgust might have different appraisals when it comes to threat, a difference also pointed out by Woody and Teachman (2000). If fear appraisals center around possible danger and disgust appraisals around possible contamination then it would follow that individuals who are more prone to experience the emotion of disgust would make more frequent and/or more exaggerated contamination-based appraisals. Cisler et al. (2010) propose that the degree to which disgust affects fear of contamination, and through that the
symptoms of contamination-related OCD, may be potentiated by obsessive beliefs. These beliefs may cause an individual to (1) overestimate the degree of the threat associated with contamination-based appraisals, (2) place heightened importance on contamination-based appraisals, or (3) go to extreme lengths to avoid/control unwanted contamination-based appraisals. That is, heightened disgust responding by itself does not necessarily result in contamination-related OCD but rather it may result from obsessive beliefs about the contamination-related appraisals that accompany high disgust propensity.

Functional neuroimaging studies have provided evidence for differential neural activation in response to disgust evoking stimuli in patients with OCD compared to non-OCD controls (Shapira, Liu, He et al., 2003). Patients with obsessions and compulsions that are primarily contamination-related (i.e. washers), compared to checking-related (i.e. checkers) show differential neural response to washing related disgust stimuli in areas of the brain activated by disgust. These areas were activated in washers but not in normal controls or checkers. Also, washers rated disgust evoking objects as more disgusting, anxiety evoking and frightening than checkers (Phillips, Marks, Senior et al., 2000).

**Harm avoidance and incompleteness**

Given that OCD is a heterogenous disorder in terms of symptom presentation, it might be that different motivational factors underlie the symptoms. For example, Steketee, Grayson, and Foa (1985) found that washers’ compulsions were triggered more by environmental cues in comparison to checkers whose compulsions were aimed at avoiding future harm. This indicates that different symptoms may be motivated by different factors, hence serving different functions for individuals. Tallis (1996) describes OCD cases with washing compulsions who display the compulsions in the absence of fear. Many others have emphasised the heterogeneity of motivational forces behind OCD (Calamari, Wiegartz, Riemann et al., 2004; McKay et al., 2004; Summerfeldt et al., 1999; 2004).

The majority of research on underlying motivational factors for compulsions in OCD has focused on the role of harm avoidance (HA)
(Pietrefesa & Coles, 2008). Harm avoidance is a central concept in cognitive models of OCD proposed by Salkovskis (1985, 1989) and Rachman (1997, 1998). Recently researchers have started to recognise that other factors may be at work in motivating compulsions in individuals with OCD. One such motivational factor that has been proposed is incompleteness (INC). Incompleteness is an inner sense of imperfection about behaviours performed or their consequences (Ecker & Gönner, 2008). Incompleteness leads to what has been labelled “not just right experiences” (NJREs) (Coles, Frost, Heimberg & Rhéaume, 2003; Coles, Heimberg, Frost & Steketee, 2005). From NJREs follows an urge to engage in rituals or compulsions until a subjective feeling of rightness has been achieved. Incompleteness is a more recent addition to the research literature on OCD and has not been studied as extensively as harm avoidance. Incompleteness or not just right experiences can be described to be more of an emotion/feeling based experience, or “sensation-based” perfectionism (Coles et al., 2003, p. 683) whereas harm avoidance is more related to thoughts or cognitive experience.

Summerfeldt et al. (2004) suggested that OCD is characterised either “by anxious apprehension and exaggerated avoidance of potential harm” or by an attempt to reduce feelings of incompleteness, concluding that harm avoidance and incompleteness are the two core dimensions of OCD. Summerfeldt (2004) asserted that these two dimensions “may in combination underlie most manifestations” of OCD (p. 1157). Ecker and Gönner (2008) found evidence in support for this by demonstrating that some symptom dimensions were related to HA and others to INC. Their results also indicated that a large portion of OCD patients engage in compulsions to reduce feelings of incompleteness and NRJE. This is in line with research that has found that a significant proportion of OCD patients do not report fear of harm but have instead a continuing feeling of discomfort when they cannot engage in rituals (Tolin, Abramowitz, Kozak & Foa, 2001). In addition, it has been found in large clinical samples that there are groups of “low beliefs” patients with OCD, i.e. patients who report low levels of OCD specific beliefs (Calamari, Cohen, Rector et al., 2006; Taylor, Abramowitz, McKay et al., 2006). It might be possible that the role of incompleteness and NJREs might be substantial in these groups of patients.
Studies show that NRJE are also experienced by students, indicating that NJREs are natural occurring phenomena also observed in people who do not suffer from OCD (Coles et al., 2003). Coles et al. (2003, 2005) found evidence for a relationship between OCD symptoms and constructs related to OCD, such as responsibility, and NRJE in undergraduate samples. In contrast, NJREs and non-OCD-related symptoms and constructs, such as worry, social anxiety and depressive symptoms, were not significantly associated. Radomsky and Rachman (2004) demonstrated that disarray was associated with discomfort in undergraduate students and that students who reported high levels of symmetry and ordering behaviour could not report any specific threat when considering that they could not perform the behaviour.

Pietřefesa and Coles (2008) found that harm avoidance and incompleteness are separate constructs although they correlate strongly. They also found that both dimensions correlated with a range of OCD symptoms. Specifically, their results showed that incompleteness is associated with symptom subtypes that are characterised by symmetry, ordering, and arranging. Washing, checking, and neutralizing were correlated with both HA and INC. In contrast, Ecker and Gönner (2008) found that contamination/washing did not predict INC nor HA, but symmetry/ordering and checking were uniquely associated with INC. Other studies have linked INC feelings with compulsive checking but not washing (Coles et al., 2003; Summerfeldt et al., 1999).

Although both harm avoidance and incompleteness and NRJE are clearly related to OCD symptoms, more research is needed to explore and clarify their role in OCD and the heterogenous set of its symptoms.

The present research
The purpose of the present study was to investigate the relationship between disgust and fear of contamination and what might explain this relationship by investigating possible mediators between these two constructs. Such research has not been conducted previously. However, from existing studies it is expected that harm avoidance is likely a mediator of the relationship. In addition, the mediation effect of incompleteness is explored due to the scarce knowledge about its role in OCD. This was investigated by administering self-report
questionnaires that measure, among other things, disgust, contamination fear, harm avoidance and incompleteness. To expand the scope of the investigation of the role of harm avoidance and incompleteness in contamination fear, questionnaires were also administered that represent constructs that are usually considered to be related to either harm avoidance or incompleteness. These are measures of the number of NJREs, related to incompleteness, and a measure of overestimation of threat, an OCD specific belief that is related to harm avoidance.

**Method**

**Participants**
In total, 170 Icelandic undergraduate students at the University of Iceland participated in the study. Of 170 participants, 22 returned booklets that could not be used for analyses because they did not answer all of the questionnaires. Therefore, data from 148 participants was analysed in the present study. Of the 148, 100 (67.6%) were female and 44 male (29.7%). Four (2.7%) participants did not report their gender. The mean age for the sample was 25.0 years (SD = 6.6). Participants did not receive any reward for participating in the study.

**Measures**
The *Obsessional Beliefs Questionnaire (OBQ-44)* is a 44-item scale intended to assess beliefs and appraisals that characterise people with OCD. Participants indicate on a scale from 1 (disagree very much) to 7 (agree very much) how much each item describes their usual way of thinking. The OBQ-44 was constructed by the Obsessive Compulsive Cognitions Working Group (2005) and contains three factors: (1) responsibility and threat estimation (16 items), (2) perfectionism, and intolerance for uncertainty (16 items), and (3) importance, and control of thoughts (12 items). Studies show that internal consistency and criterion-related validity of the questionnaire is good in both clinical and non-clinical samples (*OCCWQ*, 2005; Tolin, Woods & Abramowitz, 2003; Tolin et al.,
2006b). Eggert Birgisson and Jakob Smári translated the questionnaire into Icelandic. Only the 16 items of the responsibility and threat estimation factor were used in the present research.

The Obsessive Compulsive Inventory (OCI-R) (Foa, Huppert, Leiberg et al., 2002) is an 18-item version of the original 42-item inventory developed by Foa, Kozak, Salkovskis, Coles and Amir (1998). The OCI-R assesses the amount of distress (i.e. severity) associated with OCD symptoms during the past month. It has 6 subscales, each containing 3 items that are answered on a five-point scale ranging from 0 (not at all) to 4 (very much). The subscales are: washing, checking, obsessing, hoarding, neutralising, and ordering. Foa et al. (2002) found the OCI-R to have good test-retest reliability, and convergent and discriminant validity in clinical and non-clinical samples. Overall, the inventory has good psychometric qualities (Abramowitz, Tolin & Diefenbach, 2005; Hajcak, Huppert, Simons & Foa, 2004). Ásdís Eyþórsdóttir and Jakob Smári made an Icelandic translation of the OCI-R that has good psychometric properties in non-clinical samples (Smári, Ólason, Eyþórsdóttir & Fróðlunde, 2007).

The Obsessive-Compulsive Trait Core Dimensions Questionnaire (OC-TCDQ) is a 20-item questionnaire that measures the two hypothesised core dimensions of OCD, harm avoidance and incompleteness with two 10 item subscales. Respondents rate each item on a five-point scale, from 1 (never applies to me) to 5 (always applies to me). The OC-TCDQ was developed by Summerfeldt et al. (2001) (in Pieteferesa & Coles, 2008). The OC-TCDQ has been found to have good convergent validity and although the two subscales are highly correlated, factor analytic studies support the presence of two factors (Summerfeldt et al., 2001, in Pieteferesa & Coles, 2008). In addition, the subscales have good internal consistency (Coles, et al., 2005). The Icelandic translation was made by Ragnar Pétur Ólafsson. Because the OC-TCDQ was translated for the present study, factor analysis was carried out with the data from the present study and results supported the hypothesised two-factor structure, separating harm avoidance and incompleteness (data not shown). This finding provides at least some preliminary support for the psychometric properties of the Icelandic translation.
The *Padua Inventory – Washington State University Revision (PI-WSUR)* (Burns, Formea, Keortge & Sternberger, 1996) measures obsessive and compulsive symptoms and is a revision of the original Padua Inventory. The inventory includes 39 items, each item relating to one of five different factors: checking compulsions; contamination obsessions and washing compulsions; dressing/grooming compulsions; obsessional thoughts of harm to self or others; or obsessional impulses to harm self/others. Respondents give their ratings on a five-point scale, ranging from 0 (not at all) to 4 (very much) indicating how much each item characterises them. The PI-WSUR has been found to be a reliable and valid measure of obsessions and compulsions (Burns et al., 1996; Gönner, Ecker & Leonhart, 2010; Harkness, Harris, Jones & Vaccaro, 2009; Thordason, Radomsky, Rachman et al., 2004). Sigrún Drífa Jónsdóttir and Jakob Smári made an Icelandic translation of the OCI-R that has adequate psychometric properties in non-clinical samples (Jónsdóttir & Smári, 2000). Only the 10 items of the contamination/washing subscale of the questionnaire were used in the present study.

The *Disgust Propensity and Sensitivity Scale – Revised (DPSS-R)* includes 16 statements about disgust and respondents indicate on a five-point scale (never, rarely, sometimes, often, always) how often each statement is true of them. The scale distinguishes between disgust propensity and disgust sensitivity and these constructs are measured irrespective of any specific disgust elicitors. The original DPSS had 32 items (Davey & Cavanaugh, 2000, in van Overveld et al., 2006) but it was revised by van Overveld et al. (2006). The DPSS-R has been found to have high internal consistency, acceptable test-retest reliability (van Overveld et al., 2006), predictive validity (van Overveld, de Jong & Peters, 2010) and, overall, to be a reliable and valid measure of disgust reactions (Olatunji, Cisler, Deacon, Connolly & Lohr, 2007). The scale was translated into Icelandic by Bjartmar S. Steinarsson, Pórey K. Pórisdóttir and Ragnar Pétur Ólafsson.

The *Hospital Anxiety and Depression Scale (HADS)* is a 14-item scale that measures depression and anxiety, with two seven item subscales. Each item has four alternative answers and respondents choose their answer based on their experience during the last week. The HADS was constructed by
Zigmond and Snaith (1983) (in Herrmann, 1997). The scale has been found to be both a reliable and valid measure of depression and anxiety (Bambauer, Locke, Aupont et al., 2005; Crawford, Henry, Crombie & Taylor, 2001; Herrmann, 1997) in both clinical patients and in the general population (Bjelland, Dahl, Haud & Neckelmann, 2002). Hógni Óskarsson translated the scale into Icelandic.

The Revised NJRE Questionnaire (NJRE-Q-R) is a 19-item measure that assesses feelings of incompleteness or "not just right experiences". The NJRE-Q-R was developed by Coles et al. (2003). The questionnaire includes 10 items that are examples of NJREs and respondents indicate which NJREs they have experienced in the past month. After this respondents choose the NJRE that they experienced most recently and when it took place (two items). The last seven items are questions about the nature of the most recent NJRE (e.g. intensity). A subscale measuring number of NJREs, based on the first ten items, has been shown to have acceptable internal consistency and all 19 items to have good convergent and discriminant validity (Coles et al., 2003). The psychometric qualities of the NJRE-Q-R have not otherwise been examined in more detail, but it has been successfully used in previous studies (Chik, Calamari, Rector & Riemann, 2010; Coles et al., 2005). Ragnar Pétur Ólafsson translated the questionnaire into Icelandic.

Procedure
The study was reported to the Data Protection Authority of Iceland and approved by the National Bioethics Comittee. Questionnaire booklets containing the questionnaires were administered during class hours. Four different versions of the booklets were used, each containing different ordering of the questionnaires to reduce ordering effects. Participants were told that participation was voluntary and that the study was completely anonymous. In addition, they were told that they could stop participation at any time and that they did not have to answer all of the questions in the questionnaires if they would feel uncomfortable doing so. Participants were thanked for their participation when they returned their questionnaires.
Results

1. Descriptive statistics
Table 1 displays the means, standard deviations and reliability estimates (Cronbach’s alpha) for the questionnaire measures used in the study. The reliability is acceptable or high in all cases, except for the neutralisation subscale of the OCI-R.

Table 1. Descriptive statistics and reliability of questionnaire measures used in the study.

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<th>Measure</th>
<th>Mean</th>
<th>SD</th>
<th>Cronbach’s α</th>
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<td>.68</td>
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Note. HADS<sub>anx</sub> = Hospital Anxiety and Depression Scale – Anxiety subscale; HADS<sub>dep</sub> = Hospital Anxiety and Depression Scale – Depression subscale; DPSS<sub>prop</sub> = Disgust Propensity and Sensitivity Scale – Disgust Propensity subscale; DPSS<sub>sens</sub> = Disgust Propensity and Sensitivity Scale – Disgust Sensitivity subscale; DPSS<sub>total</sub> = Disgust Propensity and Sensitivity Scale – Total Score; PI-WSUR<sub>total</sub> = Padua Inventory - Washington State University Revision; NJRE<sub>num</sub> = NJRE Questionnaire – number of NJREs subscale; NJRE<sub>sev</sub> = NJRE Questionnaire – severity of NJREs subscale; OBQ<sub>threat</sub> = Obsessional Beliefs Questionnaire – responsibility and threat subscale; HARM = OC-TCDQ – harm avoidance subscale; INC = OC-TCDQ – incompleteness subscale; OCI<sub>hoard</sub> = Obsessive Compulsive Inventory – Hoarding subscale; OCI<sub>order</sub> = Obsessive Compulsive Inventory – Ordering subscale; OCI<sub>obses</sub> = Obsessive Compulsive Inventory – Obsessing subscale; OCI<sub>check</sub> = Obsessive Compulsive Inventory – Checking subscale; OCI<sub>wash</sub> = Obsessive Compulsive Inventory – Washing subscale; OCI<sub>neutr</sub> = Obsessive Compulsive Inventory – Neutralizing subscale; OCI<sub>total</sub> = Obsessive Compulsive Inventory – Total score.
2. Correlations between measures used in the study

The correlations between the questionnaire measures used in the study are presented in table 2. The majority of the correlations were significant at the 0.05 level, some were significant at the 0.01 level and a few were not significant. Disgust (total score on the DPSS-R) was moderately related to fear of contamination \( (r = .46) \) and similarly related to symptoms of obsessing \( (r = .46) \) but to a lesser degree related to symptoms of hoarding, ordering, checking, washing and neutralizing \( (r \text{ ranging from .28 to .39}) \). Disgust propensity/sensitivity had moderate correlations with number of NJREs \( (r = .38) \), overestimation of threat \( (r = .32) \), harm avoidance \( (r = .49) \) and incompleteness \( (r = .39) \). The subscales of OC-TCDQ, harm avoidance and incompleteness, were highly correlated \( (r = .74) \), which is in line with previous studies (Pietrefesa and Coles, 2008). This supports the successfulness of the Icelandic translation of the OC-TCDQ.
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*Note.* ns non significant; * = p < 0.01; ** = p < 0.05.
3. Mediation of the relationship between disgust and fear of contamination

It was tested whether harm avoidance and incompleteness are mediators of the relationship between disgust and fear of contamination. Mediation was tested using two different approaches: first using the measures of harm avoidance and incompleteness that were obtained with the OC-TCDQ; and second, choosing constructs that are related to those underlying dimensions, namely overestimation of threat and number of NJREs. Four separate analyses were conducted. General negative affectivity (i.e. anxiety and depression) was controlled for in all analyses. In order to demonstrate statistical mediation four conditions must be satisfied (Baron & Kenny, 1986): (1) the predictor must be associated with the proposed mediator; (2) the predictor must be associated with the outcome; (3) the proposed mediator must be associated with the outcome; and (4) there has to be weaker association between the predictor and the outcome when the proposed mediator is controlled for. In the present analyses disgust was the predictor and fear of contamination was the outcome.

A linear regression analysis showed, after controlling for anxiety and depression, that disgust was a significant predictor of fear of contamination scores, $\beta = 0.330$, $t = 4.398$, $p < 0.01$. Thus condition two was met in all analyses.

3.1. Mediating effect of harm avoidance and incompleteness

A linear regression analysis showed that harm avoidance (proposed mediator) significantly predicted fear of contamination ($\beta = 0.149$, $t = 1.661$, $p < 0.05$) and that disgust significantly predicted harm avoidance ($\beta = 0.307$, $t = 4.465$, $p < 0.01$). Thus, conditions one and three were met. Results of linear regression analysis testing harm avoidance as a mediator in the relationship between disgust and fear of contamination (the fourth condition) can be seen in table 3. Disgust and harm avoidance were entered simultaneously as predictors of fear of contamination (in addition to the negative affect variables). There it can be seen that the mediator is no longer significant, indicating that the indirect effect of disgust on fear of contamination through harm avoidance is not significant. This was further confirmed by a non-significant Sobel test for this indirect effect,
Sobel = 1.56, \( p = .12 \). Therefore, harm avoidance did not mediate the relationship between disgust and fear of contamination.

Table 3. Results from a linear regression with harm avoidance as the proposed mediator.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>( B )</th>
<th>SE</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS\text{anx}</td>
<td>0.631</td>
<td>0.164</td>
<td>0.385**</td>
</tr>
<tr>
<td>HADS\text{dep}</td>
<td>-0.313</td>
<td>0.191</td>
<td>-0.316\text{ns}</td>
</tr>
<tr>
<td>DPSS\text{tot}</td>
<td>0.226</td>
<td>0.056</td>
<td>0.323\text{**}</td>
</tr>
<tr>
<td>HARM</td>
<td>0.024</td>
<td>0.101</td>
<td>0.021\text{ns}</td>
</tr>
</tbody>
</table>

*Note. HADS\text{anx} = Hospital Anxiety and Depression Scale – Anxiety subscale; HADS\text{dep} = Hospital Anxiety and Depression Scale – Depression subscale; DPSS\text{-R} = Disgust Propensity and Sensitivity Scale; HARM = OC-TCDQ – harm avoidance subscale; \( \text{ns} \) non significant; ** \( p < 0.01 \).

A linear regression analysis showed that incompleteness (proposed mediator) significantly predicted fear of contamination (\( \beta = 0.260, t = 3.236, p < 0.01 \)) and that disgust significantly predicted incompleteness (\( \beta = 0.249, t = 3.219, p < 0.01 \)). Thus, conditions one and three were met. Results of linear regression analysis testing incompleteness as a mediator in the relationship between disgust and fear of contamination (the fourth condition), can be seen in table 4. Disgust and incompleteness were entered simultaneously as predictors of fear of contamination (in addition to the negative affect variables) and were both significant in the final equation. To test whether incompleteness was a significant mediator, a Sobel test was computed and was significant, Sobel = 2.28, \( p < 0.05 \). Therefore, incompleteness partially mediates the relationship between disgust and fear of contamination.

Table 4. Results from a linear regression with incompleteness as the proposed mediator.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>( B )</th>
<th>SE</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS\text{anx}</td>
<td>0.521</td>
<td>0.153</td>
<td>0.318**</td>
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<tr>
<td>HADS\text{dep}</td>
<td>-0.264</td>
<td>0.188</td>
<td>-0.115\text{ns}</td>
</tr>
<tr>
<td>DPSS\text{tot}</td>
<td>0.199</td>
<td>0.054</td>
<td>0.284\text{**}</td>
</tr>
<tr>
<td>INC</td>
<td>0.160</td>
<td>0.070</td>
<td>0.183\text{***}</td>
</tr>
</tbody>
</table>

*Note. HADS\text{anx} = Hospital Anxiety and Depression Scale – Anxiety subscale; HADS\text{dep} = Hospital Anxiety and Depression Scale – Depression subscale; DPSS\text{-R} = Disgust Propensity and Sensitivity Scale; INC = OC-TCDQ – incompleteness subscale; \( \text{ns} \) non significant; ** \( p < 0.01 \); *** \( p < 0.05 \).
3.2. Mediating effect of overestimation of threat and not-just-right experiences

A linear regression analysis showed that disgust significantly predicted overestimation of threat ($\beta = 0.307$, $t = 4.465$, $p < 0.01$) but overestimation of threat (proposed moderator) did not predict fear of contamination ($\beta = 0.097$, $t = 1.211$, $p = 0.228$). Thus although conditions one and two were met, the third condition was not and therefore the mediating effect of overestimation of threat could not be examined.

A linear regression analysis showed that number of NJREs (proposed mediator) significantly predicted fear of contamination ($\beta = 0.278$, $t = 3.612$, $p < 0.01$) and that disgust significantly predicted number of NJREs ($\beta = 0.262$, $t = 3.276$, $p < 0.01$). Thus, conditions one and three were met. Results of linear regression analysis testing number of NJREs as a mediator in the relationship between disgust and fear of contamination (the fourth condition), can be seen in table 5. Disgust and number of NJREs were entered simultaneously as predictors of fear of contamination (in addition to the negative affect variables) and were both significant. The Sobel test for the indirect effect of disgust on fear of contamination through NJREs was significant, Sobel = 2.41, $p < 0.05$, indicating that number of NJREs partially mediates the relationship between disgust and fear of contamination.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>HADS$_{anx}$</td>
<td>0.545</td>
<td>0.147</td>
<td>0.333*</td>
</tr>
<tr>
<td>HADS$_{dep}$</td>
<td>-0.310</td>
<td>0.186</td>
<td>-0.135 ns</td>
</tr>
<tr>
<td>DPSS$_{tot}$</td>
<td>0.193</td>
<td>0.053</td>
<td>0.276**</td>
</tr>
<tr>
<td>NJRE$_{numb}$</td>
<td>0.532</td>
<td>0.199</td>
<td>0.205**</td>
</tr>
</tbody>
</table>

Note. HADS$_{anx}$ = Hospital Anxiety and Depression Scale – Anxiety subscale; HADS$_{dep}$ = Hospital Anxiety and Depression Scale – Depression subscale; DPSS-R = Disgust Propensity and Sensitivity Scale; NJRE$_{numb}$ = NJRE Questionnaire – number of NJREs subscale; ns non significant; * $p < 0.01$. 
Discussion

The results from the present study show that there is a relationship between disgust and fear of contamination. Disgust explained a moderate amount of the variation in fear of contamination scores in linear regression analysis, over and above that was accounted for by general negative affectivity (i.e. symptoms of anxiety and depression). This finding is in line with results from previous research that has shown that disgust and fear of contamination are strongly linked (Cisler et al., 2010; Olatunji & Sawchuk, 2005; Woody & Teachman, 2000) and that the two correlate positively (Mancini et al., 2001; Morezt & McKay, 2008; Thorpe et al., 2003). This indicates that disgust may contribute to contamination fear and consequently to symptoms of contamination-related OCD.

The purpose of this study was to investigate what factors related to OCD can possibly explain the relationship between disgust and fear of contamination. Mediation analyses conducted in this study show that the feeling of incompleteness and number of NJREs partially mediated the relationship between disgust and fear of contamination, but harm avoidance and the obsessive beliefs around overestimation of threat did not. It is possible that people with contamination-related OCD may not perform their compulsions in order to avoid possible harm but rather to reduce a feeling of incompleteness. In a more general sense, it can be proposed that the symptoms of contamination-related OCD may not be the result of so much cognitive appraisals but may rather be sensation/feeling based. The findings from the present study indicate that this might be true for people with contamination-related OCD symptoms that result from heightened responding to disgust. The analyses in this study provide evidence for mediation effects of incompleteness and the experience of not-just-right feelings in the relationship between disgust and fear of contamination. Other emotions such as anxiety may affect fear of contamination and it can be that fear of contamination may be motivated by harm avoidance rather than incompleteness in the case of anxiety. What is interesting about the present results is that it may be that disgust leads to fear of contamination not through
erroneous cognitions, such as overestimation of threat, but rather through emotions or sensations that lead to a state of incompleteness.

The present findings add confidence in results of previous studies that have shown that there are individuals who perform compulsions in order to get rid of feelings of incompleteness and NJREs (Ecker & Gönner, 2008). They do not report fear of harm as the main reason for their compulsive behavior but rather discomfort resulting from not being able to carry out compulsions (Tolin, Abramowitz, Kozak & Foa, 2001). In addition, although studies have shown that there is an association between overestimation of threat and the symptom dimension of contamination-related OCD in both non-clinical (Tolin et al., 2003) and clinical samples (OCCWG, 2005; Tolin et al., 2008), the results from this study indicate that overestimation of threat might not play any role in these symptoms in individuals whose symptoms are related to disgust. This supports previous findings that there may be OCD patients groups that are characterised by low scores on measures of OCD related beliefs and appraisals (Calamari et al., 2006; Taylor et al., 2006). It has not been examined if such patient groups are characterised by heightened disgust propensity but it would be interesting to investigate whether this is the case and whether their fear of contamination is a result of disgust or other emotions, for example anxiety.

The results add to the knowledge of incompleteness and harm avoidance as being motivational factors that may underlie OCD symptoms, the motivational dichotomy first proposed by Summerfeldt et al., (2004). The emphasis in studies on harm avoidance as a primary motivational factor underlying OCD symptoms (Pietrefesa & Coles, 2008) should possibly be reconsidered to also include investigation of the role of incompleteness, at least when considering contamination-related OCD. There is some disagreement between the present results and results from studies conducted previously. Incompleteness has not been uniquely associated with contamination and washing but rather with symptoms involving symmetry, ordering, checking and arranging (Coles et al., 2003; Ecker & Gönner, 2008; Pietrefesa & Coles, 2008; Summerfeldt et al., 1999). Despite these differences between the present findings and previous research, the present results do provide support for the role of incompleteness and NJREs in OCD and motivational heterogeneity of OCD symptoms. In
addition, the contribution of incompleteness to the symptoms of contamination-related OCD has clearly not been investigated in detail and further investigation is necessary.

The present study employed a moderately sized student sample. It is important to investigate in future studies whether the present results can be replicated in other samples. The generalizability of the present findings to the population of patients with contamination-related OCD will be particularly important to investigate. In addition, self-report measures are susceptible to biases. The present findings should also be interpreted with caution given that mediation analysis does not confirm causation. Therefore, although there is an association between disgust and fear of contamination the present findings do not provide evidence that heightened responding to disgust leads to fear of contamination. Such causation will have to be investigated in experimental studies.
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