Self-disgust, loneliness and mental health outcomes in older adults: An eye-tracking study

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Self-disgust, Loneliness and Mental Health Outcomes in Older Adults: An eye-tracking study

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Abstract

Background: Self-disgust has been associated with loneliness and mental health difficulties in clinical and non-clinical populations, but there is limited research on the role of self-disgust in loneliness and mental health outcomes in older adults.

Methods: In Study 1 ($N = 102$; M age = 68.4 years, $SD = 10.9$, 68% females) we used a cross-sectional survey to explore the association between loneliness, self-disgust and mental health outcomes. In Study 2 ($N = 80$; M age = 68.8 years, $SD = 11.4$, 57% females) we used eye-tracking to investigate attentional vigilance, maintenance and avoidance in individuals with high (Vs low) self-disgust.

Results: In study 1 we found that self-disgust mediated the associations between loneliness and anxiety and depressive symptoms and in study 2 is was demonstrated that older adults with high (vs. low) self-disgust displayed attentional avoidance of their own faces, compared to the faces of unknown others, a process that may perpetuate loneliness.

Limitations: The cross-sectional design used in Study 1, limits our potential to make causal inferences and both of our studies included a wide age range of older adults.

Conclusions: Our findings are novel and highlight the importance of self-disgust experiences in the context of loneliness and mental health outcomes in older adults. Implications for practice and interventions against loneliness in this age group are discussed.

Keywords: Loneliness; self-disgust; depression; anxiety; eye-tracking; attentional avoidance

Introduction

According to the World Health Organization (2015), the number of people aged over 60 will nearly double in the next 35 years and will represent roughly one quarter of the world's population. Efforts to promote healthy and active aging have become of upmost importance, and this has spawned increased research on the psychological and social determinants of health and quality of life in older adults (e.g., Diener, & Chan, 2011; Gabriel, & Bowling, 2004; Pinquart, & Sörensen, 2000). Loneliness represents one of the most important risk factors for broad-based morbidity and mortality in this age group (Hawkley & Cacioppo, 2010). Loneliness is defined as a subjective psychological state (i.e., *feeling* lonely) and people may experience loneliness even if they are not socially isolated (Heinrich & Gullone, 2006). So defined, loneliness represents the perceived discrepancy between a person's desired social interactions and the degree to which these are met through meaningful social relationships (Cacioppo & Hawkley, 2009). Approximately 25% of older adults in the USA and more than 20% in the UK have self-reported persistent feelings of loneliness (Ong, Uchino, & Wethington, 2016; Victor & Bowling, 2012). Chronic and persistent loneliness in this age group has been associated with poor psychological functioning and quality of life (Jakobsson, & Hallberg, 2005; Hawkley & Cacioppo, 2010), sleep problems (Cacioppo, Hawkley, Crawford, et al., 2002), risk factors for cardiovascular disease, such as high systolic blood pressure (Hawkley, Masi, Berry, & Cacioppo, 2006), and suicidality (Goldsmith, Pellmar, Kleinman, & Bunney, 2002).

Self-disgust and Loneliness

Self-disgust is a negative self-conscious emotion schema which involves a lasting appraisal of aspect(s) of the self as disgusting (Overton et al., 2008; Powell, Simpson, & Overton, 2015). Self-disgust is said to result from an interaction between an evolved

predisposition to experience disgust; social comparison processes, which are initiated early in development (i.e., how other people see me) and gradually become internalized (Whelton & Greenberg, 2005); and any changes in the self-concept that occur over time that activate an individual's disgust repertoire (Powell et al., 2015), which include the changes that can occur with aging (Bassett & Sonntag, 2010). As such, self-disgust requires self-awareness and self-reflection, as well as cognitive complexity, two elements that are necessary for the experience of other self-conscious emotions, such as shame and guilt (Power & Dalgeish, 2008; Tracey & Robins, 2004). Nevertheless, Powell et al. (2015) have argued that self-disgust has unique identifying properties compared to other self-conscious emotions, such as the phenomenological state of revulsion, a discrete expressive profile (e.g., facial expression), links with contamination and the laws of contagion and similarity, and specific appraisals (e.g., "Yuck, I'm repulsive"). A recent study (Laffan, Millar, Salkovskis, & Whitby, 2017) showed that self-disgust experiences were evident in older adults living in residential homes, especially among those with higher scores in disgust sensitivity - a trait characterized by heightened disgust responses to specific disgust-eliciting stimuli.

Given that people with higher self-reported loneliness tend to engage in self-blaming and self-loathing to a greater extent than people with lower loneliness scores (e.g., Heinrich & Gullone, 2006), it is theoretically plausible that loneliness is also associated with self-disgust. So far, only one study has assessed this relationship using a sample with a wide age range and showed that that self-disgust scores were higher in lonely individuals compared to non-lonely ones (Ypsilanti, Lazuras, Powell & Overton, 2019). Similarly, preliminary findings have shown that older adults with higher loneliness scores tend to also experience higher self-disgust as compared to non-lonely older adults (Ypsilanti, 2018). Nevertheless, more research is needed to better understand how loneliness and self-disgust are associated

with each other in older adults, and the consequences of that association for the psychological wellbeing of this age group.

Previous research has shown that anxiety and depression are highly prevalent in older adults and their comorbidity suggests that they may share common underlying causes (Goldberg & Huxley, 1992). In support of this, previous research has indicated that loneliness represents a significant risk factor for both anxiety and depression (Cacioppo et al., 2006; Cacioppo et al., 2010; Luo et al., 2012; Neeleman and Power, 1994; Weeks et al., 1980) in older adults. The observed association between loneliness and mental health outcomes, such as anxiety and depression symptoms in older adults may be mediated by self-disgust for the following reasons. Firstly, research has shown that self-disgust is associated with anxiety-related disorders, including PTSD (Brake, Rojas, Badour, Dutton, & Feldner, 2017), social anxiety (e.g., Amir, Najmi, Bomyea, & Burns, 2010), and obsessive-compulsive disorder (Olatunji et al., 2015). Secondly, research has demonstrated that self-disgust plays an important role in the genesis of depression, by mediating the role of dysfunctional thoughts on depressive symptoms in both cross-sectional and cross-lagged longitudinal studies (Overton, Markland, Taggart, Bagshaw, & Simpson, 2008; Powell, Simpson, & Overton, 2013; Simpson, Hillman, Crawford, & Overton, 2010). Thirdly, Ypsilanti et al. (2019) showed that self-disgust mediated the association between loneliness and depression in a group that was predominantly comprised of younger adults.

Based on these findings, the present research has a twofold objective, that is to better understand the role of self-disgust in the association between self-reported loneliness and mental health difficulties in older adults (Study 1), and to empirically examine, for the first time, whether people with higher self-disgust scores tend to avoid stimuli that increase salience of the "self" concept. Accordingly, to further extend the findings by Ypsilanti et al. 2019), in Study 1, we hypothesized that self-disgust will mediate the association between

loneliness and symptoms of anxiety and depression in older adults. Furthermore, Study 2 explored the avoidance hypothesis of self-disgust, which suggests that participants with high levels of self-disgust report avoiding their own reflection in the mirror (Powell et al., 2014). If this is the case, then levels of self-disgust may cause and/or maintain loneliness via avoidance, as the person avoids inflicting their presence on others. As a consequence, people with high levels of self-disgust may display different responses to the faces of themselves and other people, as compared to people with lower self-disgust, and this effect can be better captured with an eye-tracking task than self-reports.

Study 1

Method

Participants

One hundred and two participants were recruited on a voluntary basis in an opportunity sample from areas of Birmingham and Sheffield, United Kingdom. The participants' ages ranged from 55-90 years ($M = 68.49$, $SD = 10.67$) and 68% were women. Inclusion criteria were the absence of a serious medical condition; dementia; learning difficulties; and brain injury or mental health disorders, such as diagnosed anxiety and depression, including the use of antidepressants or anxiolytics, as self-reported by the participants. We also used the Montreal Cognitive Assessment (MoCA; Nasreddine, 2005) to screen participants for cognitive impairment. We used a cut-off score of <21 for individuals with lowest education (i.e. Elementary school or lower, up to 10 years of education) and <24 for highly educated individuals (i.e., Graduation from high school/Advanced level including any additional courses and/or University degree (Borland et al., 2017). Four participants did not meet the criteria and were excluded from the analysis, and two more cases were removed because of missing data in the loneliness measure.

Measures

Demographic characteristics were assessed using open-ended questions about age, gender, education, marital status and employment.

Self-disgust. Self-disgust was assessed with the Self-Disgust Scale (SDS; Overton et al., 2008), an 18-item measure reflecting disgust directed to the self. Six items are filler items (e.g., "*I enjoy the company of others*") and 12 items reflect self-disgust towards the self (e.g., "*I find myself repulsive*"), and towards one's behaviour/actions (e.g., "*I often do things I find revolting*"). Responses are coded on a 7-point Likert scale (1 = strongly agree, 7 = strongly disagree), and after reverse scoring 9 items a total sum score is computed. Higher scores indicate higher levels of self-disgust. Reliability and validity of this measure has been reported elsewhere (Overton et al., 2008). In the present study, the internal consistency was acceptable for the total self-disgust scale (α = .73),

Loneliness. Loneliness was measured using the UCLA Loneliness Scale (version 3; Russell, 1996). The measure consists of 20 items (*e.g., How often do you feel left out?*) and responses are recorded using a 4-point Likert scale (1 = never, 4 = often). The total score is calculated by summing all items and ranges from 20-80. The measure demonstrated acceptable internal consistency in the current study (a = .84).

Anxiety. The short form of the State and Trait Anxiety Index for Adults (STAI-AD short; Spielberger, 1983) was used to measure anxiety symptoms. The measure consists of 20 questions equally divided to reflect state and trait anxiety, and responses are recorded on a 4-point continuous scale (1= almost never, 4 = almost always). In the present study, we focused on trait anxiety and the respective dimension is reported in subsequent analysis. A summative score was computed, higher scores reflecting higher trait anxiety symptoms (Cronbach's α = .88).

Depression. Depression was assessed with the short form of the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986). The GDS short form includes 15 yes/no questions (e.g. "*do you often get bored*") and requires participants to report how they felt over the past week, and answers reflecting depressive state are assigned one point. The GDS short from was selected over other measures in the present study because it was specifically developed for use with older adults and has shown good sensitivity and specificity in geriatric depression studies (for a review see Pocklington, Gilbody, Manea, & McMillan, 2016). The measures showed acceptable internal consistency (Cronbach's $\alpha = .82$).

Design and Procedure

A cross-sectional, correlational, survey-based design was used to measure the associations between loneliness, self-disgust, and mental health outcomes (anxiety and depression), after controlling for demographic factors and cognitive ability (MoCA). During data collection, the order of the measures was randomised between participants to control for order effects. No time restrictions were applied and survey completion required approximately 30 min, including time to complete the screening measures. In accordance with the research ethics guidelines of the British Psychological Society, all participants were duly informed about the aims and purposes of the study, their participation rights, and their right to withdraw at any stage during data collection without prior notice or penalties for doing so. Written informed consent was provided. Ethics approval was granted by the University Research Ethics committee.

Data analysis

Pearson's (*r*) correlations were used to assess the associations among the study variables. Bootstrapped path analysis was also used to assess the direct and indirect associations of loneliness with depression and anxiety symptoms and the mediating effects of

self-disgust in this relationship, after controlling for demographic factors and cognitive ability

(MoCA). As recommended (e.g., Hayes 2009; Hayes & Scharkow 2013), we used bias-

corrected and accelerated bootstrapping to obtain confidence intervals (and associated

probability values) for all direct and indirect effects in the path model. All data were analysed

in SPSS v. 22 (IBM Corp., Armonk, NT, USA), and AMOS v. 24 (IBM Corp., Armonk, NT,

USA). In the path analysis, probability values and confidence intervals (CIs) were based on

10,000 bias-corrected and accelerated (BCa) bootstrapped resamples (Mallinckrodt et al.,

2006).

Results

Descriptive statistics (means and *SD*), internal reliability coefficients and inter-

correlations among the study variables are presented in Table 1.

The path analysis assessed if self-disgust mediated the association of loneliness with

depression and anxiety after controlling for gender, age, and MoCA scores. Error terms for

symptoms of anxiety and depression were correlated. Loneliness had a significant indirect

effect on symptoms of anxiety, $\beta = .08$, BCa 95% CI [.01, .20], $p = .016$, and a near-

significant indirect effect on depression, $\beta = .07$, BCa 95% CI [.00, .18], $p = .051$, via self-

disgust. However, the direct effect of self-disgust on depression was not statistically

significant. The predictors in the path model accounted for 14% of the variance in self-

disgust, $R^2 = .14$, BCa 95% CI [.02, .26], $p = .004$, 37% of the variance in symptoms of

anxiety, $R^2 = .37$, BCa 95% CI [.19, .49], $p = .003$, and 33% of the variance in symptoms of

depression, $R^2 = .33$, BCa 95% CI [.14, .44], $p = .004$. Full results are presented in Figure 2.

Study 1 Discussion

In Study 1 we demonstrated that self-disgust was positively associated with loneliness, anxiety and depression symptoms in older adults. These findings further extend previous research that showed a positive association between self-disgust and loneliness in older adults (Laffan et al., 2017; Ypsilanti, 2019), and a positive association between self-disgust and anxiety symptoms in the general population (for a review see Clarke et al., 2019). Most importantly, our study demonstrated, for the first time, that self-disgust significantly mediated the loneliness-anxiety relationship. This is an important addition to the extant literature because it indicates the kinds of affective processes that may be implicated in the experience of anxiety symptoms among older adults with higher loneliness scores. However, in contrast with previous research that included a younger age group (e.g., Ypsilanti et al., 2019), in our study self-disgust only had a marginally significant mediation effect between loneliness and depression. Furthermore, despite a statistically significant bivariate correlation, the direct effect of self-disgust on depression was marginally non-significant ($p = .051$) in the multivariate path model. One possible explanation for this finding is that negative self-directed affective experiences are higher among younger adults but tend to decrease by the age of 60 - a finding that has been used to support the "positivity bias" effect in older adults (Carstensen, Isaacowitz, & Charles, 1999; Carstensen & Mikels, 2005). In the context of the present study, this may indicate that a positivity bias mechanism attenuates the effects of self-disgust on the relationship between loneliness and depression in older adults. Nevertheless, this assumption requires further empirical investigation. Study 1 demonstrated the critical role for self-disgust in the relationship between loneliness and psychological well-being. However, there are some notable limitations that need to be considered; firstly, self-report questionnaires can be subject to social desirability biases and secondly, the cross-sectional nature of the study does not allow for meaningful interpretations of the association between

self-disgust and loneliness. In Study 2 we explored this relationship using a

psychophysiological paradigm, employing eye-tracking methodology to explore self-disgust

and attentional avoidance in older adults in the context of loneliness.

Study 2

Eye-tracking, Attentional Avoidance and Self-Disgust

Qualitative studies have shown that avoidance is relevant to self-disgust, with people

who experience high levels of self-disgust reporting that they avoid looking at their own

reflections in the mirror: "*I'll suddenly, um, feel quite disgusted, possibly by my appearance,*

or you know, when I look in the mirror or happen to see myself in a reflective surface"

(Powell, Overton, & Simpson, 2014, p.568). People with higher self-disgust may display

heightened reactions to others because they tend to perceive themselves as social

"contaminants": *"What am I doing with all these people and just making them feel like*

there's something horrible in the room.... I should just go home and out of the way and stop

making them look at me" (Powell et al., 2014, p.571). Based on this evidence, it is plausible

that higher levels of self-disgust may cause and/or maintain loneliness via avoidance, as the

person avoids inflicting their presence on others. As a consequence, people with high levels

of self-disgust may display different responses to the faces of themselves and other people, as

compared to people with lower self-disgust, and this effect can be better captured with an

eye-tracking task than self-reports.

Early work on attentional biases in affective disorders (see Armstrong & Olatunji,

2012 for a meta-analysis) used reaction time (RT) tasks (such as the dot-probe paradigm) to

measure vigilance and disengagement to threatening stimuli in anxiety disorders (e.g., Bar-

Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007) and depression

(e.g., Peckham, McHugh, & Otto, 2010). In the anxiety literature, it has been suggested that

attentional biases may increase state anxiety through hypersensitivity to threat (i.e., vigilance hypothesis; Wiens, Peira, Golkar, & Öhman, 2008) or by maintaining attention to threat (i.e., maintenance hypothesis/disengagement difficulty; Fox et al., 2001). In the depression literature, vigilance has not been commonly detected. Rather, it is prolonged tasks, which allow the individuals to dwell on the dysphoric stimuli and ruminate on self-relevant aspects of threats, that seem more appropriate to detect attentional biases in depression (Armstrong & Olatunji, 2012). When using prolonged viewing tasks, such as eye-tracking methodology, a phenomenon known as "attentional avoidance" may come into play at later stages of stimulus exposure (Cisler & Koster, 2010). This allows time for a more conscious, voluntary evaluation of the dysphoric stimulus and is closely related to behavioural avoidance (Mogg, Mathews, & Weinman, 1987) because the individual strategically "*decides*" to avoid directing attention to the threatening stimulus.

In free viewing tasks, in which participants are not searching for stimuli but rather view stimuli naturally, vigilance has been operationalized as orienting eye gaze at stimulus onset (i.e., time to first fixation) and reflects exogenous cuing of attention (Armstrong & Olatunji, 2012). On the other hand, fixation duration is often used to examine the maintenance hypothesis, by looking at the length of disengagement from the initial fixation (Garner et al., 2006) and reflects both exogenous and endogenous attentional control effects (Nummenmaa et al., 2006). Attentional avoidance has been studied as a function of changes in fixation duration over time (in time spans; Armstrong & Olatunji, 2012) and is thought to reflect emotion regulation strategies that emerge later in time as top-down processes (Cisler & Koster, 2010). In the present study, we examined vigilance, maintenance and avoidance using a free-viewing eye-tracking task in older adults with and high and low self-reported levels of self-disgust. We hypothesized that older adults with high (vs low) levels of self-disgust will exhibit differences in gaze duration to their own face compared to the faces of

unknown other in an eye-tracking paradigm. We also anticipated that eye gaze times to their own face will correlate with loneliness scores.

Method

Participants

Eighty older adults were recruited and were eligible for participation (see exclusion criteria below). None of these participants were included in Study 1. They were aged between 55 and 89 and were recruited on a voluntary basis in an opportunity sample in areas of Sheffield and Birmingham, UK. The mean age was 68.37 years ($SD = 11.03$) and 57% of the sample were women.

Measures

Loneliness. Loneliness was measured using the UCLA Loneliness scale (version 3; Russell, 1996). The measure consists of 20 items (*e.g., How often do you feel left out?*) and responses are recorded using a 4-point Likert scale (1 = never, 4 = often). The total score is calculated by summing all items and ranges from 20-80. The measure demonstrated medium internal consistency in the current study (a=.84)

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

al., 2008). In the present study, the internal consistency was acceptable for the total self-disgust scale ($\alpha = 0.73$),

Eye-tracking task

A Tobii TX300 mobile eye tracker was used to obtain data on eye-gaze from all participants. The Tobii TX300 provides high quality fixation data through a non-invasive method (Tobii manual, 2016). The TX300 Eye Tracker is an integrated eye tracker that is unobtrusive and suitable for detailed research of natural gaze behaviour. Eye movements such as saccades and short fixations can be studied without using a chinrest at a binocular sampling rate of 300Hz. The TX300 has a built in user camera which allows for recording of subjects' gaze reactions to stimuli. Stimuli were selected from the IAPS (Bradley, Cuthbert & Lang, 1999); and included 8 pictures of neutral faces (4 females, 4 males). The selected faces were coloured, varied in age and race, and were cropped in an oval shape (330x500mm) to include only the face (hair and ears were included in the stimulus) with no surrounding objects and were presented on a black background (an example stimulus is presented in figure 1). Each picture was presented 6 times for 5 seconds each time. The pictures were presented in a random order after a fixation cross, which changed position randomly on the screen before each trial, to ensure eye gaze was not always focused at the centre of the screen. The stimuli also included a photo of the "self" (i.e., each participant's own photo), with a neutral expression, which was taken at the beginning of the task and was cropped in the same way as the "other" faces and always inserted in the same positions within the presentation sequence. The photo of the "self" was also presented 6 times and for 5 seconds each time, in the same position in the stimulus sequence for all participants (positions 09, 55, 61, 75, 83, 107).

Procedure

All participants were provided with an information sheet and written informed consent prior to participation. Ethics approval was granted by the University Research Ethics committee. Upon arrival, participants were asked if they would be willing to have their picture taken for the purposes of the research. No prior notice was given to the participants to avoid preparation and beautification. Participants wearing reading or distance glasses were asked to keep them on throughout the task as they do affect eye gaze recordings. Multifocal glasses were removed due to their adherent reflections that prohibit eye gaze recordings. Each participant completed demographics and the questionnaires in random order to avoid any priming effects. During that time the picture of the participant was uploaded from the digital camera and added into the eye tracker stimulus sequence at the same positions for all participants. Once they completed the questionnaires, they were kindly asked to sit in front of a computer screen. Task instructions were presented in writing on screen and explained verbally, if necessary. Calibration was initially performed to ensure accurate recordings. Participants were told that they would see a series of faces and they should gaze at them naturally. Once eye gaze recording were completed participants were debriefed.

Data analysis

Vigilance, Maintenance and Avoidance from Self-Relevant Stimuli

Self-disgust groups were determined by taking the upper and lower quartiles of the distribution. A similar method has been previously used in research on loneliness to determine high and low loneliness groups (e.g., Cacioppo and Hawkley, 2003). Following previous qualitative reports we anticipated that avoidance of their own reflection would be more evident in individuals with high self-disgust in which the "dysphoric" nature of the self would be more profound. The low self-disgust group was used as a comparison group. To

examine vigilance, maintenance and avoidance we defined the whole face (oval shape) as the area of interest. We used ANOVA's to compare the two groups on attentional vigilance, maintenance and avoidance (Armstrong and Olatunji, 2012).

Results

Attentional vigilance was measured using time to first fixation as the dependent variable (DV) following previous research (Armstrong & Olatunji, 2012). We employed a 2(group: high/low self-disgust) × 2(stimulus: self/other) repeated measures ANOVA and found no significant differences between the groups on time to first fixation of their own photo compared to the photo of an unknown other. We used first fixation duration for the first second of stimulus exposure to examine the maintenance hypothesis by looking at the length of disengagement from the initial fixation (Garner et al., 2006). We employed a 2(group: high/low self-disgust) × 2(stimulus: self/other) repeated measures ANOVA and found no significant differences between the groups on first fixation duration to their own photo compared to the photo of an unknown other. To examine attentional avoidance we compared changes in fixation duration over time (in time spans), which is thought to reflect regulatory strategies that emerge later in time (see Armstrong & Olatunji, 2012). We used a 2 (group: high/low self-disgust) × 2 (stimulus: self/other) × 4 (time: 2000ms, 3000ms, 4000ms and 5000ms) repeated measures ANOVA with fixation duration as the dependent variable. Means and standard deviations are presented in Table 2. The results indicated a significant main effect of stimulus, [$F(1,33) = 4.735$, $p = .037$, $\eta_p^2 = 0.12$], with overall fixation duration being higher for the pictures of others compared to pictures of the self. Also, there was a significant interaction group × time [$F(1,33) = 4.140$, $p = .022$, $\eta_p^2 = 0.11$]. Finally, there was a significant three-way interaction of 2 (group: high/low self-disgust) × 2 (stimulus: self/other) × 4 (time: 2000ms, 3000ms, 4000ms and 5000ms), [$F(1,99) = 4.014$, $p = .029$, $\eta_p^2 = 0.10$];

see Figure 3). To further examine the three-way interaction we ran two repeated measures

ANOVAs 2 (stimulus: self/other) $\times$ 4 (time: 2000ms, 3000ms, 4000ms and 5000ms) for each

group separately. For the low-self-disgust group there were neither significant main effects

nor a significant interaction. For the high self-disgust group we found a significant main

effect of time [F (3,57) = 3.47, p = .022, η_p^2 = 0.115] and a significant interaction [F (3,57) =

5.64, p = .002, η_p^2 = 0.229]. Post hoc analysis with *Tukey* indicated in the high self-disgust

group, a marginally significant difference in fixation duration between a photo of the self and

a photo of an unknown other at 4000ms (t = 1.933, df = 21, p = .06), and a significant

difference at 5000ms (t = 2.795, df = 21, p = .01). More specifically, people with high self-

disgust scores displayed higher fixation duration when exposed to a picture of others (M =

0.23, SD = 0.12) compared to a picture of the self (M = 0.20, SD = 0.08) at 4000ms, and

higher fixation duration when exposed to a picture of others (M = 0.24, SD = 0.12) compared

to a picture of the self (M = 0.18, SD = 0.07) at 5000ms. We also found significant reduction

in visit duration to a photo of the self across time spans from second 2 to second 4 with a

mean difference 0.054 (t = 3.295, df = 19, p = .02), from second 2 to 5 with a mean

difference 0.070 (t = 4.276, df = 19, p = .001) and from second 3 to 5 with a mean difference

0.052 (t = 3.178, df = 19, p = .039) (Figure 3).

We conducted bivariate Pearson's correlations to further examine whether the

observed avoidance was related to self-disgust and loneliness scores (self-reports) across the

whole exposure time (5 seconds) for both groups (high/low self-disgust) together and

separately. We correlated self-disgust scores and loneliness scores with time to first fixation

and total fixation duration (TFD, which reflects the total duration of all fixations towards the

stimulus during the 5 second exposure) with the pictures of their own face. We found a

significant negative correlation between self-disgust scores and TFD in the high self-disgust

group (r = -.482, p<0.05), which indicated that those scoring higher in self-disgust showed

less fixation duration to their own face. No other significant correlations were observed (Table 3).

Study 2 Discussion

This is the first study to examine attentional vigilance, maintenance and avoidance in high and low self-disgust groups in older adults using an eye-tracking methodology. We hypothesized that individuals with high self-disgust scores (i.e., scoring in the upper quartile of the distribution) would exhibit avoidance (low fixation duration) to their own picture (face) as *"dysphoric"* (Powell, Simpson & Overton, 2013 Tracy & Robins, 2004) compared to the picture of other unknown faces. Indeed, avoidance of self-reflection has been reported in a qualitative study on self-disgust (Powell et al., 2014). As this is the first study to examine attentional biases in self-disgust no predictions were made about vigilance and maintenance. Vigilance was operationalized as orienting attention at stimulus onset and measured with time to first fixation (Armstrong & Olatunji, 2012), while maintenance was operationalized as the length of disengagement from the initial fixation (Garner et al., 2006) and measured with first fixation duration. The findings showed that there were no differences between high and low self-disgust groups (upper and lower quartiles of the distribution respectively) on vigilance (measured as time to first fixation) and maintenance (measured as fixation duration at 1000ms).

Attentional avoidance to pictures of participants' own faces was measured as a function of changes in fixation duration over time (Armstrong & Olatunji, 2012). We therefore analysed fixation duration per second from 2000ms to 5000ms to see if individuals with high self-disgust displayed an avoidant viewing style compared to those with low self-disgust when looking at pictures of themselves and others. Our findings from the three-way interaction suggested that individuals with high self-disgust scores (not the low self-disgust

group) initiated avoidant viewing at 4000ms and 5000ms, indicating that as time passes, the picture depicting their own face may induce dysphoric feelings or dysphoric thoughts representing a negatively valenced schematic representation of the self. Avoidance eye-gaze patterns have previously been observed in lonely individuals' responses to pictures depicting social stimuli (perceived as threatening) after the 2s of exposure (Bangee, Harris, Bridges, Rotenberg & Qualter, 2014). In our study, older adults' avoidance patterns were evident later in time (4s and 5s) suggesting that in this age group the deployment of attentional avoidance may initiate later in time. In future research it would be interesting to increase exposure times to 10s to determine whether the avoidance pattern initiated in 4s will be sustained after 5s.

Taken together our findings suggest that individuals with high and low self-disgust scores did not display differences in orienting attention (vigilance) or disengagement (maintenance). However, the high self-disgust group displayed statistically significant differences in attentional avoidance in later viewing times by looking away from pictures depicting their own faces (vs. the faces of unknown others). This pattern was specific only to the high self-disgust group, and not in older adults in the low self-disgust group. We also found that there is a significant relationship between total fixation duration to the self (i.e., eye gaze to their own photo) and self-disgust scores in the high self-disgust group, but there was no significant correlation with loneliness. Although these are only preliminary findings, they may suggest that attentional avoidance to their own image is directly linked to self-disgust and not self-report loneliness. Indeed, given the small sample size of this study and the nature of the analysis (i.e. correlations) these results must be interpreted with caution. Further research will be required to disentangle the role of self-disgust and loneliness in attentional avoidance in non-clinical older adults.

General Discussion

The present research examined the association of self-disgust with loneliness and mental health outcomes, and whether self-disgust is characterised by attentional avoidance, vigilance or disengagement processes in older adults. Study 1 showed that higher self-disgust scores were positively associated with higher scores in loneliness, anxiety and depression symptoms. Furthermore, self-disgust significantly mediated the association between loneliness and anxiety, and had a marginally non-significant mediation effect on the association between loneliness and depression. Study 2 further showed that higher self-disgust scores in older adults were associated with attentional avoidance towards pictures depicting their own faces as compared to the faces of others.

These findings are important for research on the mental health and psychological well-being of older adults in the following respects. Firstly, we found that self-disgust is significantly associated with mental health difficulties (anxiety and depression symptoms) in older adults. Previous studies measuring negative affect across the life-span from early adulthood to old age have shown a curvilinear relationship across age groups, with increased levels of negative affect in early adulthood, a slight decrease in middle adulthood and increase again in older age (Bethany, 2006). This increase may be partly explained by individual differences in marital status, physical health and emotion regulation however, these factors do not affect the curvilinear relationship, particularly in the very old age (i.e., (Bethany, 2006). Negative self-conscious emotional schema such as self-disgust may explain these pronounced changes in negative affectivity in older adults. Moreover, our findings highlight the importance of self-disgust, in the context of geriatric loneliness and associated mental health difficulties. A substantial number of studies have shown that loneliness induces negative emotions directed towards the self, including self-deprecation, self-loathing, and self-criticism (Heinrich & Gullone, 2006). Similar findings were reported from other studies in which lonely people were more likely to experience feelings of worthlessness (Paloutzian

& Ellison, 1982), and low self-esteem (Cutrona, 1982). Cacioppo, Hawkley, and Berntson

(2003) further supported these findings by showing that perceived loneliness may induce

further social rejection, which, in turn, leads to greater negative affect directed to the self,

such as low self-worth. In this context our findings suggest that interventions for lonely older

adults should address issues surrounding self-perceptions and feelings of worthlessness that

may contribute to the development of self-disgust. So far, interventions to tackle loneliness

have emphasized the importance of social networks and social engagement as a way to

alleviate feelings of loneliness but paid little attention to self-directed negative emotional

schemas, such as self-disgust (Ypsilanti, 2018).

The present findings also advance existing research on self-disgust in the following

ways. Using an eye-tracking methodology (Study2) we provided initial evidence that people

with higher self-disgust may avoid attending to aspects and stimuli that serve as reminders of

the "self", such as pictures of their own faces. This hypothesis was previously supported by

qualitative analysis of the narratives of people with higher self-disgust (Powell et al., 2014)

but has never been examined using a quantitative research design. Attentional avoidance is

thought to reflect emotion regulation strategies that emerge later in time (Cisler & Koster,

2010) and, in the present study, it may reflect a voluntary decision to avoid gazing at the

pictures of the self.

Strengths, limitations and future directions

A major strength of the current study is the use of a psychophysiological paradigm

(i.e., eye tracking methodology), to explore self-disgust and attentional avoidance in older

adults. This allowed us to investigate, for the first time, both early (vigilance and

maintenance) and later (avoidance) attentional processing in older adults with high and low

self-disgust scores. The task itself is novel in that it exposes participants to their own face

(among other unknown faces) simulating exposure to a mirror, which can be dysphoric to people with high levels of self-disgust (Powell et al., 2013). The novelty of this task was also that we used coloured pictures of faces of other unknown people and included faces of different age, gender and race. One of the limitations of the task was that the majority of the participants completed a series of questionnaires (in random order) approximately 30 minutes before the eye-tracking task, which may have triggered negative emotions towards the self. In future research it would be good to ask participants to complete questionnaires after the eye-tracking task. Another strength is that we used quartiles to determine high and low self-disgust groups and to capture (if possible) extreme scores on self-disgust in a non-clinical population. This is particularly relevant for interventions because self-disgust is seen as a rather stable emotional schema that may be present in non-clinical populations and may precede depression through dysfunctional thoughts (Overton et al., 2008; Powell et al., 2013). If this is the case, it's of vital importance to understand the avoidance mechanism of self-disgust in a non-clinical population. Although there is merit in using group analyses for the purposes of this study (i.e., low and high self-disgust groups), we also acknowledge that we excluded a large number of data from older participants that fell in the middle of the self-disgust distribution. We also acknowledge several other limitations that could be improved in future research; firstly, the cross-sectional design used in Study 1, limits our potential to make causal inferences about the association between loneliness, self-disgust, and mental health outcomes in older adults. Longitudinal studies could potentially determine the temporal association between these variables and indicate whether loneliness precedes self-disgust in the genesis of anxiety and depression. Another limitation is that both of our studies included a wide age range of older adults. According to socio-emotional selectivity theory (Carsensten et al., 1999), there is a shift in motivational priorities as people grow older that reflects the time limitation that accompanies aging. This may explain the age-related changes

in emotion regulation and behaviour as a function of a motivation to focus more on present-oriented goals and attend to and recall more positive information. In this context, a negative self-directed emotion, such as self-disgust, could be decreased with age with people attending more to what they do well rather than what makes them self-disgusted. However, evidence from a longitudinal study indicated that negative affect decreased until the age of 60 years and then remained relatively unchanged - but still significantly lower than younger adults - until the age of 88 years (Charles, Reynolds & Gatz, 2001). Similar findings were reported in a cross sectional study measuring negative affect in people aged between 18 and 94 years (Carstensen et al., 2000). For these reasons, we controlled for the effects of age in study 1 which demonstrated non-significant age effects, including a non-significant correlation between age and self-disgust. Possibly, therefore, there seems to be relative stability of self-disgust in our participants independently of their age. This supports the validity of our findings across a wider age group of older adults.

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Table 1.

Mean, Standard Deviation Scores, Reliability coefficients and Inter-Correlations among the Study Variables (Study 1)

	1	2	3	4	5	6	7
1. Depression	-	.55***	.36***	.37***	-.37***	.19*	.023
2. Anxiety		-	.41***	.47***	-.17	.04	.18
3. Self-disgust			-	.30**	.05	-.02	.05
4. Loneliness				-	-.13	.09	-.08
5. MoCA					-	-.48***	.05
6. Age						-	-.08
7. Gender‡							-
M	2.25	17.00	23.52	62.30	25.07	69.15	-
SD	2.60	5.34	9.31	9.43	2.80	10.97	-
Cronbach's α	0.73	0.88	0.81	0.89	-	-	-

Note. *$p \leq$ .05; **$p \leq$ .005; ***$p \leq$ .001; ‡Point-biserial correlations are reported for gender.

Table 2.

Means and Standard Deviations of fixation duration at different time frames for pictures of the "self" and "others" in high and low self-disgust groups

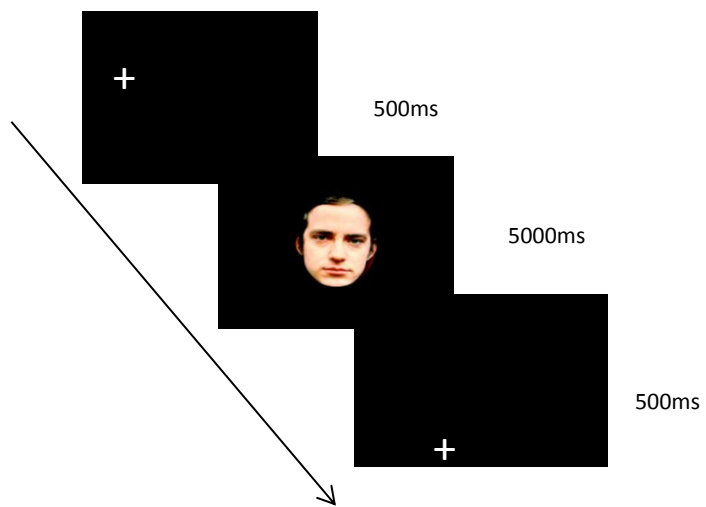| Time	Stimulus	High self-disgust (N=20)		Low self-disgust (N=15)	
		M	*SD*	*M*	*SD*
2000ms	self	.266	.174	.177	.074
	other	.245	.129	.197	.083
3000ms	self	.248	.125	.175	.073
	other	.267	.180	.223	.103
4000ms	self	.211	.079	.184	.049
	other	.245	.130	.213	.081
5000ms	self	.195	.077	.202	.065
	other	.253	.128	.217	.089

Table 3

Correlation between self-disgust, loneliness, first fixation and total fixation duration to
pictures of the self in the high self-disgust group (n = 23)

	1	2	3	4
1. Loneliness	-	.30	-.01	.08
2. Self-disgust		-	-.12	-.48*
3. First fixation			-	-.36
4. Total fixation duration				-
M	36.78	36.00	0.79	14.20
SD	7.81	5.23	3.22	8.69

Note. *p ≤ .05.

Figure 1.

Sample face from IAPS and the sequence of stimulus presentation in the eye-tracking task

--------------------------------------- Insert Figure 2 ---------------------------------------

--------------------------------------- Insert Figure 3 ---------------------------------------