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Examining the time-course of vigilant and avoidant attentional biases in repressors:
Testing the robustness of Vigilance-Avoidance Theory.

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May 2016

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Abstract

Repressors are a group of individuals characterised by a lack of cognitive awareness of their own elevations in physiology, in response to anxiety and stress. Due to this, repressors typically report lower levels of subjective distress via self-report measures, in conjunction with elevations in physiological responding (Myers, 2010). Resultantly, repressors are at an increased risk of developing a number of negative, stress-related illnesses (e.g. coronary heart disease and cancers, Myers, 2010). In an attempt to explain the discrepant responses of repressors Derakshan, Eysenck & Myers (2007), proposed the Vigilance-Avoidance Theory of Repressive Coping. The theory states, that repressors engage in initial rapid processing of threat stimuli which triggers their elevations in physiology. In the second stage that follows, repressors engage in avoidant attentional biases, inhibiting their conscious experience of stress or anxiety. The current study investigated the robustness of the theory as an explanation of repressive coping through the use of the dot-probe paradigm. Participants ($N=68$) completed a dot-probe task in which they were shown angry, fearful and neutral facial expressions for short (200ms) and long (2000ms) exposure durations. Unlike previous studies the current study used two alternative methods to define repressors; Weinberger, Schwartz and Davison's (1979) method involving measures of trait-anxiety (STAI-trait, Spielberger, Gorsuch, Lushene & Vagg, 1983) and defensiveness (MC SDS, Crowne & Marlowe, 1960); as well as the Mainz Coping Inventory (MCI, Krohne et al., 2000). Results indicate that there were no significant effects of either fearful or angry faces, at either 200ms or 2000ms, on the attentional biases of repressors. These findings contradict the predications of vigilance-avoidance theory.

Key Words: Repressors, Coping Styles, Vigilance-Avoidance, Attentional Bias, Health Outcomes

Introduction

The repressive coping style is a style of coping adopted by some individuals (repressors) in response to anxiety or stress, characterised by low levels of self-reported anxiety in conjunction with elevated physiological responses (Myers, 2010). In response to these discrepancies a number of authors have developed methods to identify repressors. The most influential approach to defining repressors is that of Weinberger, Schwartz and Davidson (1979). In their early research into coping styles and anxiety, they devised a way to operationalise the concept and established a four-fold classification of coping styles. Classification by this method is done by comparing an individual's scores of 'defensiveness' (measured by the Marlowe-Crowne Social Desirability Scale; MCSDS, Crowne & Marlowe, 1960) and trait-anxiety (measured by the State-Trait Anxiety Inventory; STAI, Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983). Subsequently, participants are divided into four coping groups dependent on whether they score high or low on each measure. The combination of these scores corresponds to one of the four coping groups: high-anxious (HA; high trait-anxiety, low defensiveness), low-anxious (LA; low trait-anxiety, low defensiveness), Repressor (REP; low trait-anxiety, high defensiveness) and Defensive High-anxious (DHA; high trait-anxiety, high defensiveness) (Derakshan & Eysenck, 1997a). This categorical approach allows those who are genuinely low on anxiety (LA), to be differentiated from repressors, who physiologically display high levels of anxiety. In Weinberger et al.'s (1979) study, participants were also exposed to a laboratory stressor whilst their physiology was monitored. Results of the physiological analysis provided support for this method of classifying repressors via the comparable scores on questionnaire measures; LA participants displayed low levels of physiological responding, consistent with low self-reported trait-anxiety, while REPs displayed elevated levels of physiology, discrepant with their low levels of self-reported anxiety, after presentation of the stressor. Furthermore, the physiological responses of REPs were often as high as, or higher than, those of HA and DHA participants, who self-reported high levels of trait-anxiety.

Although the Weinberger et al. (1979) method has been used by the majority of researchers to operationalise repressive coping, others have suggested that the Mainz Coping Inventory (MCI; Krohne et al., 2000) is also appropriate for defining repressors. The MCI is based on the model of coping modes (MCM; Krohne, 1993 as cited in Krohne et al., 2000) which describes variations between individuals in their behaviour regulation under stressful conditions. The MCM, considers vigilance and avoidance to be classes of coping strategies which can be assessed by the MCI. The MCI is a stimulus-response inventory that assesses two independent dimensions: cognitive-avoidance (CAV) and vigilance (VIG) with regard to stressful situations. To assess both CAV and VIG, the MCI is comprised of eight hypothetical anxiety-evoking scenarios which correspond to two subsets of questions: ego-threats and physical-threats. Each of the eight scenarios contains ten questions with five corresponding to CAV and five to VIG. An individual's score on each dimension is used to classify them into one of four coping modes: consistent-vigilance (high-VIG, low-CAV), consistent-avoidance (low-VIG, high-CAV), high-anxiety (high-VIG, high-CAV) and low-anxiety (low-VIG, low-CAV). Krohne et al. (2000), found a considerable overlap between the MCI ego-threat subset and the

Weinberger et al. (1979) approach, with 'consistent-avoiders', as defined by the MCI, corresponding to the 'repressor' group of the Weinberger classification system. Resultantly, the MCI has been used as an alternative method to define repressors. Additionally, the MCI has several strengths over the Weinberger method of classification. Firstly, the MCI focuses on processes of attention orientation that can be observed when individuals are confronted with threat-related cues (i.e. stressors). Furthermore, an individual's coping mode is assigned on the basis of their scores on two dimensions, of a singular measure whereas, the Weinberger method (most commonly used) involves comparing scores on two independently formulated measures, that were not designed to be used in conjunction with one another (Cohen, 1983).

A defining feature of repressors is their low levels of self-reported anxiety in conjunction with high levels of physiological responding. Numerous research studies have provided evidence for these discrepancies, demonstrating that these are robust among repressors. Asendorpf and Scherer (1983 as cited in Derakshan, Eysenck & Myers, 2007) found that in the presence of a laboratory stressor, repressors reported the lowest levels of state-anxiety combined with the greatest increases in physiology, compared to LA and HA participants. Moreover, Gudjonsson (1981), using a polygraph, found that repressors exhibited elevated skin-conductance in conjunction with low levels of self-reported anxiety. Similarly, Newton and Contrada (1992) asked a group of participants to complete a public speaking task, as well as self-report measures of anxiety. Results of the study showed that repressors reported the lowest levels of subjective anxiety, in conjunction with the largest increases in physiology, compared to LA and HA participants. Due to the robustness of these findings, it is clear that repressors can be characterised by these discrepancies. However, it is important to highlight that non-of these studies included DHA participants.

Due to the low levels of reported anxiety in repressors it seems as though they have a decreased awareness of their own physiological states, and resultantly are at an increased risk of developing a number of stress-related illnesses (Myers, 2010). Several studies have provided support for this claim, by showing that repressors are at an increased risk of developing cancers (Kneier & Temoshok, 1984; Phipps & Srivastava, 1997), coronary heart disease (Myers, 2010), high-blood pressure (Mund & Mitte, 2012), and chronic illnesses (Phipps, Steele, Hall & Leigh, 2001), due to their avoidance of internal states of arousal. Additionally, Giese-Davis, DiMiceli, Sephton and Spiegel (2006) found that repressors also have impaired recovery from illness. It has been argued that these negative health outcomes result from the attenuated responsivity repressors have to their own bodily changes (Schwerdtfeger, Schmukle, & Egloff, 2006). Therefore, it is crucial that a theoretical understanding of the mechanisms underlying repressive coping and the discrepant responses is developed to facilitate interventions, which could improve their health.

The discrepant responses of repressors, were first assumed to result from social desirability pressures and a need to appear less anxious to others (Derakshan et al., 2007). Consequently, repressors were assumed provide dishonest responses to self-report measures of anxiety. However, further research has indicated that this assumption

is incorrect and repressors are instead genuinely unaware of their own bodily responses. Derakshan and Eysenck (1999 as cited in Derakshan et al., 2007) investigated the responses of repressors to self-report measures using the bogus pipeline technique. This involved leading a group of participants to believe that a sophisticated electronic device (the bogus pipeline) had the ability to detect honesty. Since a robust body of research has shown that participants respond more truthfully under the bogus pipeline conditions, it was predicted that if repressors were attempting to deceive others, they would report higher levels of anxiety, compared to control groups, in the presence of the bogus pipeline. However, in contrast to the predictions, repressors continued to report low levels of anxiety, suggesting that they were not consciously attempting to deceive others, but instead unaware of their own physiological responses.

Resultantly, several theories have been proposed in attempts to explain the mechanisms that determine these discrepancies in repressors. One of the most influential theories is Eysenck's four-factor theory (Derakshan & Eysenck, 1997a), in which it was proposed that repressors use cognitive biases in response to threatening information from four sources: environmental stimuli, their own physiological state and behaviour, and information from long-term memory. In response to threat from one of these sources, cognitive biases are used which enable repressors to inhibit any conscious experience of anxiety. Specifically, repressors are thought to utilise opposite attentional bias (i.e. avoid attending to potentially threatening information) and opposite interpretative bias (i.e. interpret ambiguous information as non-threatening), by which they avoid attending to threatening information (internal and external) (Derakshan & Eysenck, 1997b). These biases are proposed to in turn minimise their conscious experience of anxiety and stress.

To examine four-factor theory (Derakshan & Eysenck, 1997a), several paradigms have been used. Firstly, the stroop paradigm which involves presenting participants with pairs of words, which they are then required colour-name, has been used in a number of studies. Generally, one word will be emotionally-neutral, while the other is emotionally-threatening. Assuming that participants are attending to the word's meaning, as opposed to its colour, they will experience interference and take longer to name the colour of the word. Therefore, faster reaction times (RTs) indicate avoidance, while longer RTs indicate vigilance (Derakshan et al., 2007). Consistent with these predictions, Mogg et al. (2000) found that repressors displayed significantly less interference and were faster to colour-name threat words than neutral words, compared to LA or HA participants, suggesting avoidance of threat words. Alternatively, Dawkins and Furnham (1989 as cited in Derakshan et al., 2007), found that repressors showed greater interference in response to threat words, while LA participants showed no signs of interference. However, although the opposite finding was obtained it was also attributed to avoidance; the researchers assumed avoidance required additional processing, therefore increasing levels of interference. As a result of the mixed findings that have been obtained, it is clear that there are some interpretative difficulties with stroop tasks since some authors consider greater interference to indicate avoidance, while others assume less interference is indicative of avoidance. Resultantly, Brosschot, de Ruiter and Kindt (1999) suggest that stroop tasks are not an appropriate means of examining the attentional biases of repressors. Therefore,

support for four-factor theory obtained using this paradigm should be interpreted with caution.

Resulting from the mixed findings from stroop tasks, several studies have utilised more direct measures of attention such as dot-probe tasks. The dot-probe paradigm directly examines allocation of attention, rather than interference, therefore allowing more accurate discrimination between which of two stimuli participants are attending to. Additionally, the paradigm assumes that a faster response to a particular probe implies that more attention was being given to the stimulus preceding it (vigilance), while longer RTs indicate avoidance (MacLeod, Matthews & Tata, 1986). Accordingly, dot-probes allow the effects of external threats on the attention of repressors to be investigated. Fox (1993), using a single-exposure dot-probe, presented participants with pairs of socially threatening and neutral words for 500ms. She found that repressors took significantly longer to respond to probes that replaced social threat words compared to neutral words. These findings are consistent with the predictions of Eysenck's theory since they show attentional avoidance of threats in repressors. Additionally, Mogg et al. (2000) presented participants with threat words (social and physical) and neutral words using a dot-probe. Results showed that repressors (defined by the Weinberger method) were faster at responding to probes that replaced neutral words, compared to socially threatening words, again suggesting attentional avoidance of threats. Interestingly, this attentional avoidance did not extend to physically threatening words, suggesting that avoidance may be exclusive to socially threatening information. In contrast to these findings, Brosschot et al. (1999), found no evidence for attentional avoidance of threats in repressors when using a dot-probe task.

Although four-factor theory has been highly influential within repressive coping research, it has also received a considerable amount of critique due to the mixed findings that have been obtained. Additionally, although the theory is able to suggest how cognitive biases are used to avoid threats, it fails to provide an explanation for what causes the elevations in physiology among repressors. If repressors are so apt at avoiding threatening stimuli, then why do they still show physiological changes indicative of anxiety and stress? Resultantly, it has been suggested that there must be additional, unconscious processing, which enables repressors to distinguish threats from non-threats (Derakshan et al., 2007).

In response to the limitations of Eysenck's (1997a) theory, Derakshan, Eysenck and Myers (2007) proposed their Vigilance-Avoidance Theory of Repressive Coping. The theory proposes that there are two sequential stages of processing in which repressors engage. Firstly, repressors engage in the vigilance stage. During which they are thought to engage readily and rapidly with threatening information through attentional and interpretative biases towards threats. This stage occurs subconsciously, meaning that repressors are unaware that they have engaged with threatening information (Derakshan et al., 2007). However, since unconscious processing of threat information has occurred, both behavioural and physiological reactions are activated. It is this initial stage of vigilance which allows vigilance-avoidance theory to account for how the elevations in physiology occur in the absence of conscious awareness (Derakshan et al., 2007), something that four-factor theory was not able to do.

Succeeding the vigilance stage, there is a second stage of avoidance, wherein repressors utilize types of avoidant attentional, interpretative and memory biases, (initially proposed by Derakshan & Eysenck, 1997a) and resultantly any conscious experience of anxiety is prevented (Derakshan et al., 2007). Moreover, the theory proposes that these vigilant and avoidant attentional patterns occur specifically in response to self-relevant threats, i.e. those that have the potential to harm an individual's psychological or physical health.

Accordingly, vigilance-avoidance theory has successfully accounted for the mechanisms which cause the discrepancies between subjective, and objective measures of anxiety in repressors. Something which earlier theories (e.g. Derakshan & Eysenck, 1997a) failed to address. Additionally, since vigilance-avoidance theory proposes that the attentional patterns of repressors vary across the two stages of processing, it provides a possible explanation for why studies examining avoidance alone have obtained mixed findings; the paradigms used did not examine the time-course of attentional processing.

Although vigilance-avoidance theory has a number of strengths over Eysenck's (1997a) theory, few studies have directly tested the theory in research. Those that have done will be discussed in the following section.

Rauch et al. (2007) in a neuroimaging study, presented participants (HA and REP, defined using the MCI) with a visual-cueing task containing happy, fearful, and neutral faces whilst measuring brain activity using an fMRI. Results from the fMRI showed that repressors exhibited stronger prefrontal cortex activation in response to fearful and happy faces, indicative of vigilance. Additionally, repressors also showed evidence of top-down emotional control, possibly reflecting later avoidance of potential threats (Schwerdtfeger & Derakshan, 2010). Therefore, supporting the predictions of vigilance-avoidance theory. However, results from this investigation should be interpreted with caution since there was no inclusion of LA or DHA participants in the investigation; therefore, it is not clear whether the increased visual processing is exclusive to repressors (Derakshan et al., 2007). Furthermore, repressors showed increased vigilance to both threatening and non-threatening stimuli, implying that the attentional bias may not be exclusive to threats, as vigilance-avoidance theory suggests. However, the findings do provide important empirical support for vigilance-avoidance theory, since few studies have directly tested the theory by examining repressors' responses to external threats.

In another fMRI study Paul et al. (2012) found that repressors (also defined by the MCI) displayed increased neural activation compared to non-repressors, in response to angry and fearful faces, during initial, non-conscious stages of processing (vigilance). However, although these findings provide substantial support for vigilance-avoidance theory, the sample consisted of only female participants, limiting the generalizability of findings.

In addition to visual-cueing tasks, dot-probes have also been used to examine vigilance-avoidance. Differentially to the dot-probes used to investigate Eysenck's (1997a) theory, those used to test vigilance-avoidance are designed to examine the time-course of attentional biases. To do so, stimuli exposure durations are manipulated in ways that allow inferences for both vigilant and avoidant attentional biases, i.e. exposures durations are varied. This variation of the paradigm assumes that faster RTs to stimuli presented for short exposures indicates vigilance, whilst longer RTs in response to stimuli presented for longer durations indicates avoidance. Consequently, both stages can be examined.

Using a dot-probe Ioannou, Mogg and Bradley (2004), presented LA, REP, HA and DHA participants (defined using the Weinberger method) with both threatening (angry-neutral) and non-threatening (happy-neutral) emotional face pairs for either 500ms or 1250ms exposure durations. In contrast to Rauch et al.'s (2007) findings, no evidence for vigilant or avoidant attentional biases, at either exposure duration, was found in repressors. Of the few studies that have directly examined vigilance-avoidance theory the majority have assumed that 500ms exposure durations will be sufficient to induce vigilant attentional biases. However, Cooper and Langton (2006) have suggested that vigilance occurs much more rapidly, and the effects will have diminished by 500ms into processing, by which time avoidance may have taken over. Therefore, these 500ms timeframes may be more indicative of avoidance, than vigilance. Supporting their argument, Cooper and Langton (2006) found that when threatening stimuli were presented for 100ms, and 500ms exposure durations participants responded faster to probes replacing threat faces at 100ms exposures (vigilance), and this pattern was reversed at 500ms exposures (avoidance). Therefore, suggesting that exposures shorter than 500ms are required for vigilance to accurately be examined. It is important to note, that no repressors were included in this study however, the findings have important implications for research surrounding vigilance-avoidance theory since they highlight a methodological limitation which may account for the failure to obtain support for the theory. In future it is important that these limitations are taken into consideration and shorter exposures are examined.

Consistent with Cooper and Langton's (2006) findings, Mogg and Bradley (2006), have also shown that vigilance occurs significantly earlier than 500ms. In their dot-probe study it was found that in a group of spider-phobic individuals, vigilance was evident at 200ms, but the effects had diminished by 500ms. Furthermore, in a visual-cueing task conducted by Schwerdtfeger and Derakshan (2010), evidence was also found to suggest that vigilance occurs prior to 500ms. In this investigation participants were presented with happy, angry, and neutral faces for 250ms or 750ms. The results showed that 'consistent-avoiders' (i.e. repressors as defined by the MCI), exhibited rapid vigilance towards threatening faces at 250ms, followed by avoidance at 750ms. Therefore, confirming that vigilance towards threats, in repressors, occurs significantly earlier than 500ms. Accordingly, shorter exposure durations are needed to accurately test vigilance-avoidance theory.

As the literature review shows, the findings from previous studies regarding the attentional biases of repressors, even when more direct measures are used, are still mixed. Additionally, all of those studies which have provided support for vigilance-avoidance theory, have used the MCI (Krohne et al., 2000) to define repressors. Moreover, the majority of research into repressive coping has only examined angry faces as threat stimuli. Resultantly, it is important that further investigation of attentional biases in repressors is conducted using other types of self-relevant threat stimuli, for example fearful faces. Moreover, future studies should examine whether the classical Weinberger et al. (1979) definition of repressors can provide support for vigilance-avoidance theory, as well as four-factor theory, since to date only MCI definitions have provided support.

The current study aims to, examine the robustness of vigilance-avoidance theory as an explanation of repressive coping since, to date, there has been limited exploration of the theory, and the findings that have been obtained are mixed. To do so, the time-course of attentional biases in response to threat-related stimuli will be examined, using a dot-probe task. The aim is to demonstrate that the findings of Schwerdtfeger and Derakshan (2010) can be replicated, when a different attentional paradigm is used. Additionally, previous research will be extended since two types of threat stimuli (angry and fearful faces) will be used. Angry faces have been included since they are self-relevant, and known to be an old and salient signal of threat in human interaction (Cooper & Langton, 2006). Moreover, previous research studies have found them effective when examining attentional avoidance in repressors. Fearful faces, on the other hand have had limited exploration in relation to vigilance-avoidance. Therefore, it seems appropriate that since they are also self-relevant threats that they should elicit similar effects to angry faces. Furthermore, the investigation aims to address some of the methodological limitations identified in previous studies, by examining very short exposure durations (200ms) more indicative of vigilance, as well as very long (2000ms) exposures, indicative of avoidance. Finally, both the MCI (Krohne et al., 2000) and the Weinberger et al. (1979) method (STAI-trait, Spielberger et al., 1983; MCSDS; Crowne & Marlowe, 1960) will be used to define repressors. By offering two different classifications, we hope to determine whether the vigilant-avoidant pattern is robust enough to be detected when both approaches to identify repressors are used. The Weinberger et al. (1979) method was chosen, since it is a well validated and reliable measure for identifying repressors. On the other hand, the MCI offers a more direct measure for identifying repressors, therefore it seems appropriate that the usefulness of both measures should be examined.

The current study aims to answer the following research questions:

1. Can the findings that Schwerdtfeger and Derakshan (2010) obtained using the visual-cueing paradigm be replicated to demonstrate vigilant-avoidant attentional biases among repressors (defined by the MCI; Krohne et al., 2000) when a modified dot-probe paradigm, with shorter (200ms) and longer (2000ms) exposure durations to present angry faces is used?
2. Is it possible that vigilance-avoidance theory is robust enough as an explanation of repressive coping, that repressors identified by both the MCI and the Weinberger method (STAI-trait; Spielberger et al., 1983, MCSDS; Crowne & Marlow, 1960) will show vigilance-avoidance in response to angry faces?
3. Does the vigilant-avoidant processing theorised in repressors occur in response to fearful faces as well as angry faces in repressors defined by the MCI?
4. Is vigilance-avoidance theory robust enough that repressors defined by the Weinberger method also exhibit vigilance-avoidance in response to fearful faces?

In accordance with vigilance-avoidance theory, and the findings from previous research, it was predicted that (1) repressors will exhibit vigilance towards angry faces at the 200ms exposure duration, followed by avoidance at the 2000ms duration. (2) Repressors will additionally respond in a vigilant-avoidant way in response to fearful faces since they are also a self-relevant threat stimulus. (3) Repressors will display vigilance-avoidance regardless of which measure is used to define coping groups (MCI or Weinberger method).

Method

Design

To test each hypothesis, a 2 (exposure duration) x 2 (face type) x 4 (coping group) mixed design was used. Exposure duration was always on two levels: 200ms and 2000ms. When testing attentional biases for angry faces (research questions 1 & 2) face type levels were neutral and angry, while coping group involved four levels (REP, LA, HA, DHA), as defined by the MCI (research question 1) and the Weinberger. method (research question 2). When testing attentional biases for fearful faces (research question 3 & 4), face type levels were neutral and fearful. Coping group again involved four levels (REP, LA, HA, DHA), defined by the MCI (research question 3) and the Weinberger. method (research question 4). The dependent variable remained the same for all four research questions, this was the reaction times (RTs) to probes which replaced an image during the dot-probe task (measured in milliseconds; ms).

Participants

68 participants (29 males, 39 female), aged 18-54 years ($M = 22.15$, $SD = 6.21$) took part in the current study. Participants were recruited largely through the Leeds Beckett University research participation scheme (SONA), as well as poster advertisements (see appendix 11), emails, social media and word of mouth. Volunteers were asked not to take part if they currently, or previously, suffered from any issues related to anxiety. All participants that were Leeds Beckett University, BSc Psychology undergraduates, received 2 participations points in return for their participation.

Two methods were used to assign participants to coping groups in the current study. Firstly, the Weinberger method, which has been used in numerous previous investigations. This involved assigning participants to one of the four coping groups based on whether they scored above or below the sample median on measures of trait-anxiety (STAI-trait; Spielberger et al., 1983) and defensiveness (MCSDS; Crowne & Marlowe, 1960). For the MCSDS ($Mdn = 15$), those scoring above the median were assumed to be high on defensiveness, and those below, low on defensiveness. For trait-anxiety (STAI-trait, $Mdn = 43$), those scoring above the median were assumed to possess high trait-anxiety, and those below the median, low trait-anxiety. Participants' coping styles were defined as follows: LA (low defensiveness, low trait-anxiety), REP (low trait-anxiety, high defensiveness), HA (high trait-anxiety, low defensiveness) and DHA (high defensiveness, high trait-anxiety). The mean questionnaire scores, standard deviations and demographic information, across the four groups are summarized in table 1.

Table 1

Mean questionnaires scores, and standard deviations, for the Weinberger method (STAI-Trait and MCSDS) for each of the four coping groups identified: Low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA).

	LA <i>M(SD)</i> (<i>n</i> =13)	REP <i>M(SD)</i> (<i>n</i> =21)	HA <i>M(SD)</i> (<i>n</i> =21)	DHA <i>M(SD)</i> (<i>n</i> =12)
STAI-Trait	37.62 (5.19)	34.62 (5.44)	53.48 (7.04)	50.33 (5.16)
MCSDS	11.85 (1.95)	19.48 (2.46)	11.71 (3.24)	17.66 (1.67)
Age	26.92 (12.05)	21.28 (4.29)	20.95 (1.91)	20.75 (1.66)
Gender (M; F)	7;6	7;14	9;12	5;7

Independently, the four coping groups were also defined using the MCI-ego subset (Krohne et al., 2000), based on whether individuals fell above or below the sample median scores for vigilance (VIG-E; *Mdn* = 16) and cognitive avoidance (CAV-E; *Mdn* = 10) subscales of the MCI. Participants were assigned as follows: LA (low VIG-E, low CAV-E), REP (low VIG-E, high CAV-E), HA (high VIG-E, low CAV-E) and DHA (high VIG-E, high CAV-E). Mean questionnaire scores, standard deviations and demographic information for these groups are summarized in table 2.

Table 2

Mean questionnaires scores, and standard deviations, from the MCI Ego subset (VIG-E and CAV-E) for each of the four coping groups identified: Low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA).

	LA <i>M(SD)</i> (<i>n</i> =9)	REP <i>M(SD)</i> (<i>n</i> =19)	HA <i>M(SD)</i> (<i>n</i> =25)	DHA <i>M(SD)</i> (<i>n</i> =12)
VIG-E	12.66 (2.83)	11.53 (1.77)	17.92 (1.25)	17.83 (1.58)
CAV-E	7.44 (2.01)	13.37 (1.95)	7.32 (2.11)	14.08 (2.54)
Age	21.22 (3.23)	22.21 (4.39)	22.00 (6.65)	23.33 (9.96)
Gender (M; F)	4;5	15;4	5;20	5;7

Materials

Self-Report Measures

STAI-trait

The trait scale of the Spielberger State-Trait Anxiety Inventory (STAI-trait; Spielberger et al., 1983; see appendix 8) was used as a measure of trait anxiety. The STAI-trait is comprised of 20 items intended to examine the subjective experience of trait anxiety through assessing a number of feelings which are assumed to be characteristic of anxiety. The 20 items are rated on a four-point scale from 1 “*almost never*” to 4 “*almost always*”; respondents are asked to answer each statement in relation to how they “*generally*” feel. Ten items of the scale correspond to anti-anxiety (e.g. “*I feel satisfied with myself*”), whilst the remaining 10 items are indicative of anxiety (e.g. “*I feel inadequate*”). To calculate a total score for each participant, the responses to anti-anxiety questions were reverse coded. After reverse coding, a total score for each participant was calculated by adding together the responses from each question. This produced a single score, which describes an individual’s level of trait anxiety; scores ranged 20-80, higher scores reflected higher levels of trait anxiety. In a previous sample, the STAI-trait was found to have high internal consistency scores ($\alpha = .89$; Barnes, Harp & Jung, 2002 as cited in Gros, Antony, Simms & McCabe, 2007). In the current sample reliability estimates were also high, Cronbach’s $\alpha = .91$.

MCSDS

Respondents also completed the Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960; see appendix 7). This was intended to assess levels of defensiveness through examination of social desirability. The scale consists of 33 items related to personal attributes and traits. Eighteen of the items are indicative of social desirability (e.g. “*I am always courteous, even to people who are disagreeable*”), while the remaining fifteen are anti-social desirability (e.g. “*I sometimes feel resentful when I don’t get my way*”). Participants respond to statements by answering either ‘*true*’ or ‘*false*’ for each statement. Scoring first involved reverse coding the anti-social desirability items. After reverse scoring, a single score was computed for each participant; ranging between 0-33. Higher scores reflect higher levels of defensiveness. Crowne and Marlowe (1960), reported satisfactory internal consistency on a sample of 39 individuals (Kuder-Richardson formula 20 = .88). A re-test correlation of .89 was also obtained in this study. In the current sample, lower than expected reliability estimates were obtained (Cronbach’s $\alpha = .67$), therefore results should be interpreted with caution.

MCI

The ego-threat subset of the Mainz Coping Inventory (MCI; Krohne et al., 2000; see appendix 6), was also used as an alternative measure to define repressors. This is

because, Krohne et al. (2000) reported that the MCI-Ego threat showed a greater correspondence with Weinberger et al (1979) method, compared to the MCI-Physical threat subset. The ego-threat subset consists of four different hypothetical scenarios (e.g. *“imagine that you will have an important examination the next morning”*), each with its own set of ten statements describing ways one might respond. Participants respond by answering either ‘true’ or ‘false’ to each of these statements. For each scenario, five statements are indicative of vigilance to threat (VIG-E; e.g. *“I tell myself: I will pass this examination at any rate”*), while the remaining five indicate avoidance of threat (CAV-E; e.g. *“I try not to think about the examination and do something else”*). Two total scores were calculated, one for CAV-E and the other for VIG-E. These were calculated by adding together the number of vigilant and avoidant responses that had been endorsed across all four scenarios. Krohne et al. (2000), obtained satisfactory internal consistency and retest reliability in a sample of 348 people for the vigilance subset ego-threat (VIG-E) (Cronbach’s alpha = .74) and the avoidance subset ego-threat (CAV-E) (Cronbach’s alpha = .76). In the current investigation, reliability estimates were satisfactory: CAV-E (Cronbach’s alpha= .74) VIG-E (Cronbach’s alpha= .75).

Dot-Probe Stimuli

Stimuli consisted of 56 photograph pairs (see appendix 9 for examples) taken from the Karolinska Directed Emotional Faces database (KDEF; Lundqvist, Flykt & Öhman, 1998). Each pair consisted of two images, of the same individual, each matched as closely as possible, for all factors, other than facial expression. Photographs (79mm x 65mm) were presented 69mm apart, on a black background.

Practice Block

The 16 practice trials, were comprised of 16 photo pairs (6 angry-neutral, 6 fearful – neutral, 4 neutral-neutral pairs). 8 pairs were presented for 200ms while the remaining 8 were presented for 2000ms, with an equal number of male and female faces for both angry and fearful face-pairs at each exposure. For the practice trials, angry and fearful faces were presented to the left and right of the screen with equal frequency. For both angry and fearful trials, probes replaced the neutral and threat faces with equal frequency.

Main Block

Following the practice trials, there was a main block of 128 critical trials and 32 filler trials. For critical trials, each photograph was obtained from series A of the KDEF (Lundqvist, et al., 1998), while filler pairs included one photo from series A, and one from series B. The main block was composed of 40 photo pairs, with an equal number of fearful and angry face pairs; 16 angry-neutral pairs and 16 fearful-neutral pairs. Additionally, there were 8 neutral-neutral photo pairs. These 40 face pairs were used to create both critical and filler trials. Angry-neutral and fear-neutral pairs were each presented four times while neutral-neutral pairs were presented twice. In total, there were 64 angry-neutral, 64 fearful-neutral and 32 filler trials. For angry, fearful, and filler trials there were an equal number of trials at each exposure duration, with an equal number of female and male faces at both 200ms

and 2000ms. Moreover, across the critical trials, angry and fearful faces were equally presented to the left and right side of the screen. Additionally, probes replaced neutral and threat (angry or fearful) faces with equal frequency.

There were two versions of the dot-probe task (A/B), each version of the task was counter-balanced so that different face-pairs were presented at 200ms and 2000ms, in each version.

Procedure

Testing

The study involved one testing session which lasted approximately 30 minutes. Participants were then given an information sheet (see appendix 2) which outlined the nature of the study, along with some examples of the style of questions that the questionnaires would contain. In addition, they were made aware of their right to withdraw their data from the study. If happy to proceed, participants then signed a consent form (see appendix 3).

Firstly, participants completed a short demographic questionnaire (see appendix 5) asking their age and gender. Following this they were seated approximately 35cm away from the computer monitor, with their eye-gaze resting in the centre of the screen. The first half of the study consisted of the dot-probe task (using the E-Prime computer software). Participants were asked to move the computer keyboard to a position that was most comfortable to press the '1' and '2' keys, with their dominant hand. Participants read a set of on-screen instructions and were given an opportunity to ask any questions before completing the practice trials. Following the practice trials, participants were asked if they understood the task and any questions were answered. The main block of the dot-probe task (for details see materials section) was then completed. Each trial began with the presentation of a white fixation cross, in the centre of the screen, for 500ms. Following this, a face-pair replaced the cross for either 200ms or 2000ms. After the given duration, a white dot instantaneously replaced the position of one of the two images. Participants were required to indicate the location of the probe, using the computer keyboard (1= Left; 2= Right).

After completing the dot-probe task, participants completed three written questionnaire measures in the following order: MCI (Krohne et al., 2000), MCSDS (Crowne & Marlowe, 1960) and STAI-trait (Spielberger et al., 1983) (for full questionnaires see appendices 6, 7 & 8 respectively). Once complete, participants were debriefed (see appendix 4) and their right to withdraw their data up until 20th April 2016, was reiterated. Prior to conducting the investigation, ethical approval was granted by the Leeds Beckett University, Research Ethics Committee (see appendix 1).

Data Analysis

The RTs of participants, and any errors, were transferred from E-Prime into Microsoft Excel. Any trials with incorrect responses, RTs greater than 2000ms or less than 200ms,

were discarded. Once the RT data had been transferred to Excel, eight means were computed for each participant (RTs to probes replacing angry and neutral faces for both 200ms and 2000ms, and fearful and neutral faces for both 200ms and 200ms). The resultant means, and raw questionnaire data, were entered into SPSS.22. From the raw questionnaire data, total scores were computed for each measure (MCSDS, STAI-trait, VIG-E and CAV-E), so coping groups could be assigned (see participant and materials sections for details). After coping groups had been identified, and reliability estimates had been calculated, the data was analysed. No normality checks were performed, since the sample size was sufficient for the normality of means to be assumed, alongside the recommendations of Pallant (2010). Prior to analysis, the homogeneity of variances was checked, using Levene's tests. Subsequently, four, 2 (face type) x 2 (exposure duration) x 4 (coping style) three-way ANOVAs were conducted, to examine all four research questions.

Results

Research Question 1: *can evidence of vigilance-avoidance be found in response to angry faces when repressors are defined by the MCI?*

Descriptive statistics displaying the reaction times to probes replacing neutral and angry faces, as a function of exposure duration and MCI coping groups, are summarised in Table 3.

Table 3

Summary of reaction times in response to angry and neutral faces at 200ms and 2000ms for the four coping groups: Low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA), when coping group was defined by the MCI

	200ms		2000ms	
	Neutral <i>M(SD)</i>	Angry <i>M(SD)</i>	Neutral <i>M(SD)</i>	Angry <i>M(SD)</i>
LA	412.57 (56.45)	421.45 (47.44)	417.78 (54.65)	412.95 (60.93)
REP	393.83 (59.95)	387.15 (48.21)	409.58 (47.15)	404.99 (52.02)
HA	420.88 (111.59)	421.55 (104.12)	452.37 (114.23)	448.15(120.89)
DHA	486.55 (126.43)	441.52 (114.40)	465.09 (103.58)	457.82 (91.12)

These indicate that on average, repressors responded faster to probes replacing angry faces, compared to those replacing neutral faces, at 200ms. The same pattern was

seen in this group at 2000ms. Thus, contradicting the prediction that repressors would be avoidant of threats at longer exposure durations. However, it is important to note that these differences are only very small and therefore may not result from attentional biases towards threats. Further analysis of the data was performed by means of a 2 (exposure duration) x 2 (face type) x 4 (coping group) three-way mixed ANOVA. Coping groups on this occasion were defined by the MCI.

Prior to conducting the ANOVA, homogeneity of variance checks were performed. Levene's tests for homogeneity indicated that the assumptions were violated, since a significant effect was evident for the neutral-200ms condition, $F(3, 61) = 3.30, p = .03$. Consequently, equal variances could not be assumed and the criteria for statistical significance for the ANOVA effects was adjusted to $p < .01$ to compensate.

The ANOVA revealed that, regarding exposure there was a significant main effect, Wilks' $\Lambda = .89, F(1, 61) = 7.41, p < .01$, partial $\eta^2 = .11$, indicating that on average, responses were quicker to probes replacing photographs at the 200ms than 2000ms exposure duration. However, the main effects for face type (Wilks' $\Lambda = .94, F(1, 61) = 3.82, p = .05$, partial $\eta^2 = .06$), and coping group ($F(3, 61) = 1.27, p = .29$, partial $\eta^2 = .06$), were found to be non-significant. In addition, no significant two-way interactions were found; exposure x coping group (Wilks' $\Lambda = .90, F(3, 61) = 2.24, p = .09$, partial $\eta^2 = .09$), face x coping group (Wilks' $\Lambda = .92, F(3, 61) = 1.79, p = .16$, partial $\eta^2 = .08$), exposure x face (Wilks' $\Lambda = 1.00, F(1, 61) = .01, p = .91$, partial $\eta^2 < .001$). Crucially, the three-way interaction was also found to be non-significant, Wilks' $\Lambda = .96, F(3, 61) = .83, p = .48$, partial $\eta^2 = .04$.

Research Question 2: can evidence of vigilance-avoidance be found in response to angry faces, when repressors are defined by the Weinberger method?

Descriptive statistics displaying the reaction times to probes replacing neutral and angry faces, as a function of exposure duration, and Weinberger coping groups, are summarized in Table 4. These indicate that, on average, repressors responded faster to probes replacing angry faces, compared to those replacing neutral faces at 200ms and 2000ms, therefore showing the opposite pattern to what was expected. Importantly, these differences were only small, especially at the 2000ms exposure duration, so may not result from attentional biases in response to threat stimuli. Additionally, further analysis showed them to be non-significant.

Table 4

Summary of reaction times in response to angry and neutral faces for the four coping groups: low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA), when coping group was defined by the Weinberger method

	200ms		2000ms	
	Neutral <i>M(SD)</i>	Angry <i>M(SD)</i>	Neutral <i>M(SD)</i>	Angry <i>M(SD)</i>
LA	428.86(134.35)	427.06 (134.88)	468.95 (123.46)	452.31 (96.43)
REP	427.90 (89.49)	418.72 (83.82)	431.16 (83.93)	430.50 (113.39)
HA	426.81 (94.72)	421.86 (66.27)	444.20 (83.51)	442.88 (82.70)
DHA	395.98 (64.59)	394.39 (58.51)	414.29 (65.27)	411.61 (66.10)

Further analysis of the data was again performed by means of a 2 (exposure duration) x 2 (face type) x 4 (coping group) three-way mixed ANOVA. On this occasion, coping groups were defined by the Weinberger method. Levene's tests showed that the assumptions of homogeneity of variances, were satisfied for all four conditions and therefore equal variances could be assumed.

The ANOVA showed that there was a significant main effect for exposure, Wilks' $\Lambda = .78$, $F(1, 63) = 17.87$, $p < .0001$, partial $\eta^2 = .22$, indicating that, on average, responses were quicker to probes replacing photographs at the 200ms, than 2000ms exposure duration. However, no significant main effect was found for face type (Wilks' $\Lambda = .96$, $F(1, 63) = 2.99$, $p = .09$, partial $\eta^2 = .05$) or coping group ($F(3, 63) = .47$, $p = .71$, partial $\eta^2 = .02$). Additionally, no significant two-way interactions were found; exposure x coping group (Wilks' $\Lambda = .94$, $F(3, 63) = 1.31$, $p = .28$, partial $\eta^2 = .06$), face x coping group (Wilks' $\Lambda = .99$, $F(3, 63) = .27$, $p = .85$, partial $\eta^2 = .01$), exposure x face (Wilks' $\Lambda = 1.00$, $F(1, 63) = .02$, $p = .89$, partial $\eta^2 = .000$). The critical three-way interaction was also non-significant, Wilks' $\Lambda = .98$, $F(3, 63) = .54$, $p = .65$, partial $\eta^2 = .03$.

Research Question 3: *can evidence for vigilance-avoidance be found in response to fearful faces when repressors are defined by the MCI?*

Descriptive statistics displaying the reaction times to probes replacing neutral and fearful faces, as a function of exposure duration and MCI coping groups are summarised in Table 5.

Table 5

Summary of reaction times in response to fearful and neutral faces for the four coping groups: low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA), when coping group was defined by the MCI.

	200ms		2000ms	
	Neutral <i>M(SD)</i>	Fear <i>M(SD)</i>	Neutral <i>M(SD)</i>	Fear <i>M(SD)</i>
LA	402.22 (59.72)	401.72 (49.64)	408.09 (50.81)	401.69 (41.29)
REP	396.15 (64.22)	391.64 (52.03)	409.45 (50.94)	413.40 (46.22)
HA	424.66 (96.68)	431.21 (106.71)	468.35 (118.32)	45.58 (97.99)
DHA	444.82 (122.31)	447.09 (104.86)	470.19 (101.89)	474.42 (116.86)

These indicate that on average repressors were quicker to respond to probes replacing fearful faces at 200ms, but to probes replacing neutral faces at 2000ms. These findings are in line with the predictions of the study. However, it is important to note that subsequent analysis indicated that these differences were non-significant.

Additional analysis of the data was performed by means of a 2 (exposure duration) x 2 (face type) x 4 (coping group) three-way mixed ANOVA. On this occasion, coping groups were defined by MCI. Homogeneity of variance checks were conducted using Levene's tests. These indicated that the assumptions had been violated, since significant effects were found for both Fear-2000ms ($F(3, 61) = 3.24, p=.03$) and Neutral-2000ms ($F(3, 61) = 3.16, p=.03$) conditions. Resultantly, equal variances could not be assumed, and the criteria for statistical significance for the ANOVA effects was adjusted to $p<.01$ to compensate.

The ANOVA revealed that there was a significant main effect for exposure, Wilks' $\Lambda = .78, F(1, 61) = 17.16, p < .001$, partial $\eta^2 = .22$, indicating that on average, responses were quicker to probes replacing photographs at the 200ms than 2000ms. However, the main effects for face, (Wilks' $\Lambda = .993, F(1, 61) = .45, p = .50$, partial $\eta^2 = .01$), and coping group ($F(3, 61) = 1.61, p = .19$, partial $\eta^2 = .07$) were non-significant. Furthermore, no significant two-way interactions were found; exposure x coping group (Wilks' $\Lambda = .93, F(3, 61) = 1.46, p = .24$, partial $\eta^2 = .07$), face x coping group (Wilks' $\Lambda = .97, F(3, 61) = .74, p = .53$, partial $\eta^2 = .04$), exposure x face (Wilks' $\Lambda = .98, F(1, 61) = .83, p=.37$, partial $\eta^2 = .01$). Additionally, the essential three-way interaction was also found to be non-significant, Wilks' $\Lambda = .89, F(3, 61) = 2.29, p=.09$, partial $\eta^2 = .10$.

Research question 4: *can evidence for vigilance-avoidance be found in response to fearful faces when repressors are defined by the Weinberger method?*

Descriptive statistics displaying the reaction times to probes replacing neutral and fearful faces, as a function of exposure duration and the Weinberger coping groups, are summarised in table 6. These show that repressors were quicker to respond to probes replacing neutral faces at 200ms, but to probes replacing fearful faces, at 2000ms. Showing the opposite pattern to what was hypothesised. Importantly, these effects were small and further analysis indicated they were non-significant.

Table 6

Summary of reaction times in response to fearful and neutral faces for the four coping groups: low-anxious (LA), repressor (REP), high-anxious (HA) and defensive high-anxious (DHA), when coping group was defined by the Weinberger method.

	200ms		2000ms	
	Neutral <i>M(SD)</i>	Fear <i>M(SD)</i>	Neutral <i>M(SD)</i>	Fear <i>M(SD)</i>
LA	460.42 (142.71)	455.64 (128.89)	471.49 (118.41)	461.69 (118.44)
REP	406.99 (69.58)	422.77 (64.31)	445.31 (100.65)	435.87 (86.25)
HA	418.09 (63.03)	417.12 (65.34)	442.87 (78.54)	444.59 (71.22)
DHA	392.83 (59.44)	392.18 (58.28)	426.51 (82.23)	401.53 (51.89)

Further analysis of the data was performed by means of a 2 (exposure duration) x 2 (face type) x 4 (coping group) three-way mixed ANOVA. On this occasion, coping groups were defined by the Weinberger method.

Levene's tests for the homogeneity of variances were carried out on the data prior to the ANOVAs. These indicated that the assumptions had been violated, since a significant effect was found for the neutral-200ms, $F(3, 63) = 3.19, p = .03$. Therefore, equal variances could not be assumed and so the criteria for statistical significance for the ANOVA effects was adjusted to $p < .01$ to account for this.

The ANOVA showed that for exposure, there was a significant main effect, Wilks' $\Lambda = .74$, $F(1, 61) = 22.03, p < .0001$, partial $\eta^2 = .26$, indicating that, on average, participants responded faster to probes replacing photographs at the 200ms than 2000ms exposure duration. However, the main effects for face (Wilks' $\Lambda = .97, F(1, 63) = 1.89, p = .17$, partial $\eta^2 = .03$) and coping group ($F(3, 63) = 1.03, p = .39$, partial $\eta^2 = .05$) were non-significant. Furthermore, no significant two-way interactions were found; exposure x coping group (Wilks' $\Lambda = .96, F(3, 63) = .84, p = .48$, partial $\eta^2 = .04$), face x coping group (Wilks' $\Lambda = .93, F(3, 63) = 1.42, p = .25$, partial $\eta^2 = .06$), exposure x face (Wilks' $\Lambda = .95, F(3, 63)$

= 3.38, $p = .07$, partial $\eta^2 = .51$). Importantly, the three-way interaction was also non-significant, Wilks' $\Lambda = .95$, $F(3, 63) = 1.14$, $p = .34$, partial $\eta^2 = .05$.

Discussion

The current investigation was unable to replicate the findings of Schewerdtfger and Derakshan (2010), nor provide any support for Derakshan et al's. (2007) vigilance-avoidance theory. Contrary to the hypotheses, no statistically significant effects of face type or coping group were found. Crucially, no interactions between these factors and exposure was found to be statistically significant. Therefore, no support was found for vigilance-avoidance theory.

Despite this, there was a significant main effect of exposure duration on RTs of participants, in each analysis. The main findings are as follows: (1) exposure duration significantly affected the RTs of participants in all four analyses, with participants being significantly quicker to respond to probes replacing pictures that has been displayed for 200ms than 2000ms. (2) Repressors defined by the MCI did not exhibit significant vigilance at 200ms or significant avoidance at 2000ms in response to fearful or angry faces. (3) Repressors defined by the Weinberger method also showed no significant vigilance at 200ms, or subsequent significant avoidance at 2000ms towards either angry or fearful faces. (4) There were no differences in the patterns found when coping style definitions followed the Weinberger method vs the MCI. Although these findings do not satisfy the hypotheses, they are consistent with other studies that have also failed to demonstrate any support for vigilance-avoidance theory (e.g. Ioannou et al., 2004). The possible explanations for these findings will be discussed in the following paragraphs.

The findings of the current investigation have a number of theoretical implications with regard to vigilance-avoidance theory. The theory proposes that there are two successive stages of processing of threat information that repressors engage in. Firstly, repressors are thought to engage in vigilant attentional biases towards threat-related material, followed by avoidant attentional biases at later stages of processing. However, no significant attentional biases following this pattern were found in repressors in the current sample. Moreover, the theory predicts that these patterns of attention will specifically arise in response to self-relevant threats. However, the current study examined two types of self-relevant threats, neither of which had a significant effect on the RTs of repressors. Therefore, it seems that although the theory provides a detailed explanation of the discrepant responses of repressors, in practice these attentional biases are difficult to investigate. Since other studies have also not been able to provide support for both vigilant and avoidant attentional biases, it seems the theory is limited in its ability to explain repressive coping. However, it is also possible that the inability to provide support for the theory may result from methodological limitations.

It is possible that no significant effects of coping groups on RTs were obtained due to the use of the median split procedure used to assign participants to coping groups (see methods section for details). Gelbhart, Rose & Mitte (2014), argue that this approach is problematic in several ways: (1) median scores for each measure are exclusive to the

sample, and therefore comparisons between samples are problematic. (2) Often a number of participants will obtain scores equivalent to the median value, therefore scoring neither high nor low on that measure. Resultantly, the experimenter arbitrarily assigns these participants to a position above or below the median in a way which seems most appropriate for the given sample. Thus, the allocation of coping groups is arbitrarily influenced by the experimenter. Consequently, the same individual may be defined as a repressor in one sample, but not in another. Importantly, there is also no differentiation between borderline repressors and those who obtain more extreme scores (Myers, 2010). To overcome this in future, alternative methods such as quartile or tertiary splits should be used to eliminate those only scoring borderline for being defined as a repressor. Moreover, previous studies that have used extreme scoring methods to identify repressors (e.g. Rauch et al., 2007) have provided support for vigilance-avoidance theory, suggesting that this may be a more appropriate approach to assigning coping groups. However, approaches such as these would require much larger samples than that of the current study due to the significant amount of data that is lost.

A limitation of both the current study, and repressive coping research more generally, is the assumption that either the classical Weinberger et al. (1979) method or the MCI (Krohne et al., 2000) will be able to accurately identify repressors. The majority of studies have utilised the Weinberger method thus giving it credibility as an appropriate method to define repressors. However, Cohen (1983) has argued that it is unlikely that two independently developed measures (MCSDS; Crowne & Marlowe, 1960, STAI-trait; Spielberger et al., 1983), intended to measure entirely different concepts, when combined will sufficiently examine the singular variable of repressive coping. Moreover, others have highlighted that both the MCSDS and the STAI-trait themselves are limited in several ways. Firstly, Barger (2002) in an evaluation of the MCSDS concluded that the measure does not examine social desirability as a unitary construct, but rather as a heterogeneous set of smaller clusters. Additionally, Seol (2007) has suggested that the MCSDS may in fact assess levels of impression management, as opposed to the more holistic construct of social desirability. Therefore, assuming that the MCSDS can be used to accurately examine defensiveness is problematic since several items on the scale may measure different constructs entirely.

Likewise, the STAI-trait (Spielberger et al., 1983) has been criticised since a number of items relate more closely to depression, and negative affect, than trait anxiety itself (Watson et al., 1995 as cited in Bradley et al., 1998). Since the validity has been questioned, using this scale to examine trait anxiety is problematic, despite its frequent use in research. In future perhaps alternative measures of trait-anxiety could be used for example, the trait version of the Profile of Mood States (POMS; McNair, Lorr & Droppleman, 1981 as cited in Bradley Mogg, Falla & Hamilton, 1998) as recommended by Bradley et al. (1998) since they found it to be a more accurate measure of trait anxiety than the STAI-trait.

The current investigation utilised the MCI, in addition to the Weinberger method, to define repressors since it has been found to be a more direct measure of repressive coping. Nevertheless, there were no significant effects of these definitions on the RTs of participants in response angry or fearful faces. These null findings may have been

obtained since although the MCI is a more direct measure, it was also not designed to define repressors, but rather four coping-modes one of which (consistent-avoiders), closely mirrors Weinberger's definition of repressors. Therefore, it is essential that a unitary measure for defining repressors is developed so that the mechanisms underlying the coping style can be understood in more detail.

A crucial limitation of the current study and previous studies, is the failure to directly examine physiological indicators of stress, despite the fact that it is the discrepancies between physiological and subjective levels of stress that characterises repressors. Although there is a robust body of evidence to suggest that the Weinberger et al (1979) classification method closely maps onto physiological and SR discrepancies, without objective measurement of physiology no certain conclusions can be made. Resultantly, it is crucial that future studies examine both physiological and self-reported levels of stress, since this would provide a more accurate indication of how repressors respond to stress. Moreover, this may facilitate the development of a more universal definition of what constitutes a repressor.

In relation to this, Coifman, Bonanno, Ray and Gross (2007), have proposed an alternative, and more direct method for defining repressors: affect-autonomic response discrepancy (AARD). The AARD is a continuous measure shown to overlap with the questionnaire measures used by Weinberger et al. (1979). However, unlike the Weinberger method the AARD directly examines both objective and subjective anxiety. Perhaps in future, research examining vigilance-avoidance theory should use measures such as the AARD to define repressors and subsequently more evidence for vigilance-avoidance theory may be obtained. Moreover, since the AARD is more objective it provides a more unified way of defining repressors, therefore addressing some of the limitations with current methods having no unified consensus on what constitutes a repressor (Myers, 2010).

Another important point for consideration is that only mildly threatening stimuli were used to examine the attentional biases of repressors in the current study. Although negative facial stimuli such as the angry and fearful faces used, are agreed to be robust indicators of threat (Cooper & Langton, 2006), it seems they may not have been aversive enough to induce either vigilant or avoidant attentional biases. Consistent with this, Ioannou et al. (2004) have suggested that the use of inappropriately threatening stimuli may prevent evidence for avoidant attentional biases from being obtained. Moreover, Mogg, Bradley, Miles and Dixon (2004) using a dot-probe task presented HA participants with highly aversive stimuli (images of violence, injury and death) and demonstrated significant vigilance at short exposures. Additionally, these effects diminished overtime, suggesting subsequent avoidance. Since, HA and REP individuals both exhibit high physiological anxiety in response to threats, it is important that future research examines how more highly aversive stimuli may influence the attentional biases of repressors. Consequently, support for vigilance-avoidance may be obtained.

Additionally, Cooper and Langton (2006) have suggested, the images in the dot-probe are irrelevant to the task itself; regardless of what the photos contain, participant's main focus is on indicating the location of the probe. Therefore, more attention may be given to the probe, as opposed to the images themselves. Therefore, it may not be responses

to threats that are actually being measured. Moreover, the stimuli used are designed to only examine basic attentional processing. Although this allows close examination of responses to threat stimuli, it is unlikely that they correspond accurately with stimuli encountered in the real-world. Yet, on the other hand, the study is at a strength since the facial stimuli used were taken from the KDEF (Lundqvist et al., 1998) which is known to be a reliable and valid source for facial expressions of emotion (Calvo & Lundqvist, 2008).

An essential factor to consider in relation to the non-significant findings, is the appropriateness of the dot-probe paradigm. Although dot-probe tasks allow for the examination of the attentional patterns, the ecological validity is limited; due to the artificial nature of the task. Subsequently, the findings from dot-probe studies should be interpreted with caution, since the attentional patterns obtained in the experimental setting, may not be representative of those outside of the laboratory. In line with this, Weierich, Treat, and Hollingworth (2008) have suggested that it is unlikely that in real-world contexts repressors will be presented with just two potential stimuli for attention. Consequently, they proposed that visual-search tasks may be better suited to examining the attentional biases, compared to dot-probes, as they allow participants to be presented with a variety of stimuli. Vigilant and avoidant attentional biases would then be inferred as a consequence of the RTs of participants to locate the target (threat) stimuli. If these methods were used in conjunction with continuous measures of attention (e.g. eye-tracking) methods, they could provide a valuable insight into the attentional processing of repressors.

Secondly, the variation of the task used in the current study, required forced-choice responses, since the probe remained on the screen until participants provided a response. Consequently, some participants may have been inclined to press either button (1/2) in order to proceed to the next trial, regardless of where their attention had previously been allocated, therefore altering the results. However, it is important to note that, since repressors score higher on social desirability, they may be less likely to do so compared to other participants.

Moreover, unsatisfactory internal consistency and retest reliability have also been found in association with the dot-probe paradigm. In a systematic review of dot-probe studies, Schmukle (2005), found that internal consistency was generally low (Cronbach alpha .00 - .30). Additionally, retest reliability was often non-significant among the studies that were reviewed. Thus, findings from dot-probe studies must be interpreted with caution, since reliability of the task is rarely reported.

Finally, the dot-probe task used in the current study only examined two very brief snapshots of attention therefore giving no indication of attentional allocation before or after these given time frames. Future investigations must utilize continuous measures of attention such as eye-tracking methods, in order for attentional biases to be more accurately examined, the advantageous of such method will be discussed in the following section.

As mentioned previously, a possible avenue for future research is to use of eye-tracking methods to examine the attentional biases of repressors. Eye-tracking studies would significantly contribute to the understanding of repressors' responses to threats, as they would provide continuous measurement of attention, across a given time-frame.

Therefore, providing a more detailed understanding of the attentional processes of repressors, compared to the brief snapshots provided by dot-probe tasks. Moreover, these methods would provide an improved indication of initial attentional processing since eye-movements often occur much faster than conscious processing of information (Bradley, Mogg & Millar, 2000). Additionally, eye-tracking methods would increase the ecological validity and generalisability of research since eye-movements are a more naturalistic indication of attentional allocation than the manual key-pressing required by dot-probe tasks (Bradley et al., 2000), which is susceptible to disruption effects (Mogg & Bradley, 2006).

Supporting this claim, Broomfield and Turpin (2005), found that repressors made significantly fewer eye-movements towards threat words presented for 500ms, compared to LA and HA participants, thus suggesting attentional avoidance of threats. Consequently, these methods should be applied to research testing vigilance-avoidance theory since it would allow for an improved means of examining the attentional patterns of repressors. However, it is important to note that eye-movements are not necessarily consistent with covert attention. Bradley et al., (2000) found that over half of the participants in their study only made eye-movements on 10% of the trials, suggesting that eye-movements alone cannot accurately assess covert attention, since vision can operate without overt eye-movements (Weierich et al., 2008). Therefore, it may be more appropriate to use these methods in conjunction with neuroimaging methods such as those used by Rauch et al. (2007). Resultantly, both covert and overt attention could be examined. In relation to repressors this is of great importance since repressors are known to display physiological and subjective discrepancies in response to threats, therefore they may also exhibit discrepancies in overt and covert attention in response to these same threats.

In addition to the methodological limitations of the current investigation, the sample was also unrepresentative of the general population. The sample was relatively small ($N = 68$) and consisted of a self-selected group of participants, the majority of whom were psychology undergraduates. Resultantly, participants may have been familiar with self-report measures and dot-probe tasks, thus influencing the results that were obtained. As a result, the findings of the study should be generalized to wider populations with caution. Yet, despite having a small sample the current investigation is at a strength since it included participants from all four coping groups (LA, REP, HA & DHA), something that many previous studies have failed to do (e.g. neither Rauch et al., 2007 or Newton & Contrada, 1992 included DHA participants) therefore limiting the generalisability of their findings. Nevertheless, it is essential that in future replications of the study, a larger and more representative sample is used, and therefore evidence for vigilance-avoidance theory may be obtained.

With regard to the repressive coping literature as a whole, the widespread assumption that the coping style is maladaptive and detrimental to health is also problematic since the possibility that there may be some adaptive benefits has rarely been explored. Moreover, Coifman et al. (2007) using the more objective AARD to define repressors, found that repressors exhibited greater psychological adjustment after bereavement compared to non-repressors. To account for these findings Coifman et al. (2007) suggested that by their inherent avoidance of negative stimuli, repressors are able to

divert their attention towards more positive and productive behaviours. Likewise, Phipps and Srivastava (1997) found that repressor children suffering from cancers displayed lower levels of depressive symptoms, further suggesting the repressive coping has a several adaptive benefits. In consideration of these findings it is important that future studies investigate how vigilant-avoidant attentional biases may have both positive and negative effects on health.

In summary, the current investigation failed to find evidence in support of vigilance-avoidance theory, nor replicate the findings of Schwertdfeger and Derakshan (2010). However, it is possible to point out that although the inability to provide support for the theory may result from methodological limitations, it is also possible that vigilance-avoidance theory itself may be an insufficient explanation of repressive coping. This may explain why several other studies have also not been able to provide any support for the theory. Resultantly, it is essential that further investigations are conducted to establish a clear conclusion as to whether vigilance-avoidance theory is an appropriate explanation of repressive coping. These studies should consider using more aversive stimuli in combination with eye-tracking methods and more objective methods to define repressors (e.g. AARD) in order for attentional biases to be examined more accurately. Additionally, studies should aim to examine both the positive and negative effects that repressive coping may have on health rather than assuming that the coping style is inherently maladaptive. Resultantly, a more detailed understanding of repressive coping may be developed.

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