BSc Psychology, Staffordshire University
Psychology Project Report

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Depression and emotional intelligence as predictors of attention to emotional images.

- I confirm that I have provided my supervisor with evidence of data collection (please tick): ___ ✓ _____
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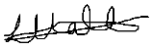
- I understand that it is my responsibility to ensure the statements above are correct. I also understand that if any of the information referred to above is missing, my project may not be given a pass mark.

Student's signature:___  ___

Supervisor: LH

Depression and emotional intelligence as predictors of attention to emotional images.

Abstract

Previous research has shown individuals with depression to demonstrate increased attention towards negative images, and decreased attention towards positive images, with these biases in attention thought to occur due to selective attention towards negative information aligning with cognitive schemas. Emotional intelligence is thought to be beneficial in relation to mental health and wellbeing, but there is limited research into how emotional intelligence may influence attention patterns. Current eye-tracking research demonstrates emotional intelligence to be associated with increased attention towards positive images (Lea et al., 2018), though other methods have demonstrated attention towards emotional stimuli regardless of valence type (Nicolet-dit-Felix et al., 2023). This current study aimed to examine whether both depression and emotional intelligence can predict attention towards emotional images, to determine whether there is attention bias towards positive or negative images. 41 participants were recruited aged between 18-50 years (M= 27.49; SD=9.89). Participants viewed 60 pairs of images freely (20 positive vs neutral, 20 negative vs neutral and 20 neutral vs neutral) whilst their eye movements were recorded, then completed the DASS-21 questionnaire (Lovibond & Lovibond, 1995) to measure depression and the TEIQue-SF (Petrides, 2009) to measure emotional intelligence. Multiple linear regressions were carried out on average dwell time on positive images and negative images. Results demonstrated that for negative images, both levels of depression and emotional intelligence were not significantly associated with dwell time. For positive images, depression was not significantly associated with dwell time, however, there was a significant positive association with dwell time for emotional intelligence. This may help explain why emotional intelligence could potentially facilitate emotional wellbeing and future research could look to consider whether those low in emotional intelligence demonstrate increased attention towards positive images following a period of emotional intelligence training. Though findings for depression were contrary to the expected, limitations of the questionnaire used, along with low participant depression scores may help explain these findings. Future research could aim to recruit high and low depression groups and conduct an ANOVA rather than regression analysis.

Introduction

i. Depression and Attention

Depression can be characterised by continuous low mood and lack of interest or enjoyment in activities, and can result in but not limited to: difficulty in concentration, feeling worthless, ruminating on negative thoughts, lethargy, sleep disruptions and changes to appetite (World Health Organisation, 2023). According to cognitive models, attentional bias towards emotional information is suggested to contribute not only towards development of depression, but also contribute towards its maintenance and recurrence (Gotlib & Joormann, 2010; Kircanski et al., 2012). It is proposed that individuals with depression exhibit mood-congruent attention bias; selectively attending to negative information which aligns with their cognitive schemas (Epp et al., 2012). In addition to increased attention towards negative stimuli, it is also proposed that attentional biases can result in decreased attention towards positive stimuli (Duque & Vazquez, 2015; Soltani et al., 2015). Gaining understanding of these attention biases in depressed individuals has important implications in the development of treatments for those with depression (Kircanski et al., 2012). For instance, it has contributed towards the development of attentional bias modification (ABM) where attention is trained away from negative information and towards positive information (Woolridge et al., 2021). Research has found this can reduce depressive symptoms (Dai et al., 2019; Hsu et al., 2021; Yang et al., 2015), though more rigorous randomised controlled trials have been deemed necessary to validate these benefits (Xia et al., 2023).

Beck (1976) proposed that cognitive schemas (or mental representations) can influence an individual's perceptions of themselves and the world, where individuals attend to information congruent to their schemas (Kwak et al., 2016). For those with depression, this results in increased attention towards negative stimuli corresponding with negative schemas (LeMoult & Gotlib, 2019). This bias in attention is thought to result from top-down processes; which also contribute towards the maintenance of depression and attention bias towards negative stimuli (Roiser et al., 2012). When examining attention bias, it has been suggested that bias towards negative information is detected for longer stimulus durations due to the individual having difficulty disengaging from the negative stimulus, rather than

initially allocating greater attentional resources (Foland-Ross & Gotlib, 2012; Gotlib & Joormann, 2010). This is thought to be a result of poorer cognitive control mechanisms (Roiser et al., 2012). This has been supported in research examining attention and depression among both clinical and non-clinical samples (e.g. Caseras et al., 2007; Foland-Ross and Gotlib, 2012; Sears et al., 2010; Suslow et al., 2020), as those with depression are not consistently found to exhibit automatic bias towards negative stimuli, but instead consistently demonstrate increased attentional engagement to negative stimuli (Kircanski et al., 2012; Sears et al., 2010).

The emotional Stroop task; a modified version of the Stroop task (Stroop, 1935), is one method which can be utilised to examine attention bias in depressed individuals. In this task, participants are required to identify the colour of words with an emotional or neutral content, with longer response times understood to be a result of greater interference of the emotional content of the words presented (Ben-Haim et al., 2016). In particular, those with depression are expected to have longer response times to negative stimuli which is congruent to their mood and corresponding with their cognitive schemas (Epp et al., 2012). Some research findings have been consistent with this, with increased response times to sad words among those with major depressive disorder compared to a control group (Lim & Kim, 2005; Mitterschiffthaler et al., 2008). Research utilising the emotional Stroop task has also demonstrated support towards attentional bias among an elderly population with depression (Broomfield et al., 2007; Dudley et al., 2002) and acute psychiatric patients, where bias in attention towards words related to suicide also predicted attempts of suicide made within the following six months (Cha et al., 2010). However, some research has found no difference in response time to negative words (Mogg et al., 1993; Yovel & Mineka, 2005). Nonetheless, there are limitations to be considered when utilising the emotional Stroop task to measure attention as it only allows for single words to be presented at a time rather than multiple stimuli (Suslow et al., 2020; Wisco, 2009), and it has been demonstrated to have poor one week test-retest reliability (Eide et al., 2002; Lazarov et al., 2018; Strauss et al., 2005).

The dot-probe task is an alternative method that can be utilised to measure attention bias which involves viewing pairs of stimuli (i.e. one emotional and one neutral) and

responding to a probe replacing one of the stimuli (Donaldson et al., 2007). Attention bias is suggested with faster response times to probes replacing emotional stimuli compared with neutral stimuli (Chapman et al., 2019). When presenting sad or happy facial expressions paired with a neutral facial expression, bias in attention has been found towards sad rather than happy faces (Joormann & Gotlib, 2007; Wong et al., 2021). Results have also shown that formerly depressed individuals display the same bias, suggesting this bias to still exist even after recovery of a depressive episode (Joormann & Gotlib, 2007). It is pertinent to note however, that when utilising the dot-probe task, attention bias is mostly only demonstrated when presenting stimuli for longer durations (Wisco, 2009), which can be explained by top-down processing which results in greater attentional engagement to negative stimuli as discussed previously (Gotlib & Joormann, 2010; Kircanski et al., 2012). When presenting word stimuli to individuals with depression in this task, Neshat-Doost et al. (2000) did not find young depressed individuals to show attention bias towards depression-related words. Though this is the opposite of what would be expected, utilising words as stimuli may yield alternative findings than faces which are more important social cues (Kircanski et al., 2012). Dot-probe tasks are limited as they are not able to provide a direct sustained measure of attention; they rely upon response times at a specific time point and cannot account for how attention may change over time or whether there is prolonged engagement with the stimuli (Duque & Vazquez, 2015; Sears et al., 2019).

Using eye-tracking measures provides a more direct and continuous measure of attention and allows for changes in attention to be examined over time (Armstrong & Olatunji, 2012; Soltani et al., 2015). It has also been demonstrated to be more reliable than measuring reaction times (Skinner et al., 2018; Waechter et al., 2014). One of the first studies to utilise eye-tracking to measure attention towards emotional images in depressed individuals required participants to scan and rescan images (with image themes: dysphoria, threat, positive and neutral) that were presented simultaneously for 10.5 seconds (Eizenman et al., 2003). They found longer total fixation time for dysphoric images, suggesting those who are depressed selectively attend to and have difficulty in disengaging from mood-congruent stimuli. Since this, research has utilised free-viewing paradigms to support a more naturalistic way of processing images, with Kellough et al. (2008) presenting 2x2 matrices including one of each image type: dysphoric, positive, threat and neutral. Though no

orienting bias towards negative stimuli was found, depressed individuals did spend a greater amount of time viewing the dysphoric images compared with healthy controls. Other research has utilised faces as stimuli, pairing happy, sad or angry faces with neutral faces, finding both bias in attention towards sad faces as well as reduced attention towards happy faces in those with major depressive disorder (Duque & Vazquez, 2015). In contrast to Duque and Vazquez's (2015) findings, Klawohn et al. (2020) found that depressed individuals demonstrated increased dwell time towards happy faces. However, those who were currently depressed dwelled on sad stimuli for longer compared with never depressed individuals which is consistent with Duque and Vazquez (2015). Further support towards attention bias towards sad stimuli in depressed individuals is presented by Lazarov et al. (2018), whereby undergraduates with higher depression levels and individuals diagnosed with major depressive disorder both dwelled longer on sad faces. In relation to dwell time on happy faces, this was only increased in those categorised as having low levels of depression. This supports the idea that there is an attention bias towards sad stimuli, which exists not only among those with clinically diagnosed depression, but also among non-clinical populations.

Examining attention among non-clinical populations allows for important comparative data within depression research; it can be examined whether individuals with dysphoria attend to emotional images in the same way as those with diagnosed clinical depression (Arndt et al., 2014). Research examining non-clinical populations by measuring levels of dysphoria have also supported findings that dysphoric individuals demonstrate increased allocation of attention towards negative stimuli (Caseras et al., 2007; Koster et al., 2005; Leyman et al., 2011; Shane & Peterson, 2007). In addition, findings indicate that dysphoric individuals spend less time attending to positive images than those without dysphoria (Arndt et al., 2014; Leyman et al., 2011; Sears et al., 2010; Shane & Peterson, 2007). Bias towards positive words is shown by non-dysphoric individuals but this bias does not exist for dysphoric individuals (Ellis et al., 2011). Blanco et al. (2019) found that the attention bias to positive images is reduced when presenting happy vs sad faces simultaneously rather than an emotional face paired with a neutral face. This study also demonstrated dysphoric individuals to attend to positive information less than non-dysphoric individuals and found there to be a significant negative relationship between

depression and attention towards positive information (Blanco et al., 2019). These findings demonstrating increased attentional engagement with negative stimuli are consistent with research examining a clinical sample (Foland-Ross & Gotlib, 2012; Suslow et al., 2020), which therefore demonstrates attention bias to exist regardless of whether depression has been clinically diagnosed.

ii. Emotional Intelligence and Attention

Emotional intelligence (EI) was first defined in the 1990's as "the ability to monitor one's own and other's emotions, to discriminate among them and to use the information to guide one's thinking and actions" (Salovey & Mayer, 1990, p.189). Since this first conception, researchers have distinguished between two different constructs of EI: ability EI and trait EI (O'Connor et al., 2019), which have been supported as separate constructs (Brannick et al., 2009; Warwick & Nettelbeck, 2004). Ability EI is considered to be an individual's ability to perceive, understand and regulate their own emotions as well as others (Mayer et al., 2008), whereas trait EI is considered to be an individual's perception of their own emotional abilities (Petrides, 2011).

Much research within this domain has focused on how to measure trait EI vs ability EI, addressing critique of the psychometric properties of EI measurement or its association with personality and intelligence (Nicolet-dit Felix et al., 2023). However, research has also extended into the health domain, with EI found to be associated with better health (Schutte et al., 2007), and particularly associated with mental health when EI is measured as a trait (Martins et al., 2010). This demonstrates EI to be a plausible predictor of health and identifies how EI may be a useful concept in considering how mental health issues are developed and maintained (Copestake et al., 2013; Extremera & Fernández-Berrocal, 2006; Martins et al., 2010). EI has emerged as a potential predictor of depression, with low EI individuals being at higher risk of depression (Batool & Khalid, 2009) and high EI individuals at decreased risk of depression (Lloyd et al., 2012). Though this research demonstrates how higher levels of EI may be beneficial in relation to health, there is more limited insight into how EI works in relation to cognitive processes and how individuals with high compared to low levels of EI operate (Fiori, 2009; Gutiérrez-Cobo et al., 2016).

Some research suggests that those with higher levels of EI are more reactive towards both positive and negative information (Martins et al., 2010) and may prefer to allocate attentional resources to emotional stimuli (Fiori, 2009). It is thought that this is one method where EI can facilitate emotional wellbeing by buffering the effect of stress (Matthews et al., 2015; Thoern et al., 2016), though research suggests this is context dependent, with the adaptive nature of EI differing dependent upon type of stressor (Lea et al., 2019). Previous literature argues for adaptive attentional processing (e.g., Mogg & Bradley, 1998; Weierich et al., 2008), and in accordance with this, higher EI should result in decreased attention to negative emotional information in non-stressful scenarios, and increased attention to negative information in stressful scenarios, though current literature demonstrates mixed results regarding this (Gutiérrez-Cobo et al., 2016; Lea et al., 2018). Alternative to the notion of adaptive attentional processing, other researchers have developed the idea of the "hypersensitivity hypothesis", where those with high levels of EI have increased sensitivity to emotions and emotional information, regardless of valence type, compared to those with low levels of EI (Fiori & Ortony, 2016; Fiori & Ortony, 2021).

Though research is limited in examining specifically how EI affects attention towards emotional images, it has yielded interesting findings. Recently, Nicolet-dit-Felix et al. (2023) utilised a dot-probe task focusing on the hypersensitivity hypothesis (Fiori & Ortony, 2021); predicting those higher in EI would show bias in attention towards emotional stimuli. Attention bias would be determined by faster response time to a probe appearing behind an emotional face (either happy or angry) compared to a neutral face. Findings supported this hypothesis, with authors concluding that those higher in EI showed preference towards emotional information; irrespective of whether the emotion was positive or negative (Nicolet dit-Felix et al., 2023). However, this study only utilised emotional faces, limited to angry and happy emotions, and research has shown that the type of stimuli used can impact upon attention bias (Pool et al., 2016; Yiend, 2010). In addition, utilising dot-probe as measurement of attention only provides information about a specific time point and cannot determine whether there is sustained attentional engagement with the emotional stimuli (Duque & Vazquez, 2015; Sears et al., 2019).

Rather than dot-probe measures, Lea et al. (2018) utilised eye-tracking measures to examine attention towards emotional images. Their hypothesis was that those higher in trait EI would show bias towards positive stimuli. Participants completed three different tasks. Task 1 involved free-viewing of emotional faces presented simultaneously in a 2x2 matrix (happy, angry, afraid, neutral). Task 2 examined attention to emotional faces in a crowd, with matrices made up of 16 different faces, with varying ratios of happy to angry within the crowd. Finally, task 3 required participants to view emotional scenes presented simultaneously in a 2x2 matrix, which included physical threat, social threat, social positive and neutral images. Findings demonstrated positive associations between trait EI and positive emotional stimuli in task 2 and 3, with those higher in EI fixating for longer on happy faces in crowds, and preference in viewing positive social scenes (Lea et al., 2018). However, a study by Davis (2018) utilising both dot-probe task and eye-tracking measures, failed to support trait EI as adaptive. Fixation was recorded under stressful and non-stressful conditions when viewing faces (happy, sad, angry and neutral) and completing a dot-probe task. Findings demonstrated that under stressful conditions, individuals with higher trait EI looked away from sad faces, and individuals with lower trait EI looked towards sad faces. The reverse effect was found under non-stressful conditions (Davis, 2018). However, it can be noted that the facial stimuli were only presented for 500ms, and therefore findings do not provide insight into maintenance of attention.

iii. Current Study

In previous eye-tracking research, those higher in trait EI have been found to dwell for longer and show attention bias towards positive images (Lea et al., 2018), whereas those with depression dwell longer on negative images, showing attention bias towards negative images (Suslow et al., 2020). This current study aims to investigate how both depression and EI influence attention towards emotional images by utilising an eye-tracking measure of total dwell time, to examine for attention bias towards positive or negative images. In considering how depression affects attention patterns, this study will utilise a broader range of stimuli containing images of both people and objects, rather than focusing on faces as in other research (e.g., Blanco et al., 2019; Klawohn et al., 2020; Lazarov et al., 2018). This study also allows for both depression and emotional intelligence to be considered under one model.

In addition, there is currently a limited amount of research investigating how EI affects attention patterns towards emotional images; therefore, it would be beneficial to see if findings by Lea et al. (2018) are replicated with those higher in trait EI demonstrating attention bias towards positive images. It will also allow to consider whether those with higher EI also pay more attention towards negative images in relation to the hypersensitivity hypothesis (Fiori & Ortony, 2021), as the current literature is mixed in relation to increased attention towards negative stimuli and support has only been found towards increased attention towards negative images when using a dot-probe task (Nicolet-dit-Felix et al., 2023) or presenting stimuli for short durations (Davis, 2018) rather than total dwell time. To further expand on previous research, images in the current study are taken from the Nencki Affective Picture System (NAPS, Marchewka et al., 2014) which include more modern high-quality images compared to the (IAPS, Lang et al., 2005) used by Lea et al. (2018).

The research question to be tested is can depression and emotional intelligence predict attention to emotional images? Specifically, the hypotheses being tested are: i) higher levels of depression will be positively associated with attention to negative images; ii) higher levels of depression will be negatively associated with attention to positive images; ii) higher levels of EI will be positively associated with attention to positive images.

Method

Design

The predictor variables were depression and emotional intelligence scores. The total depression scores were taken from the DASS-21 questionnaire, where scores could range between 0-42 (where 0-9 = normal; 10-13 = mild; 14-20 = moderate; 21-27 = severe; 28+ = extremely severe). Emotional intelligence scores were taken from the total scores from the TEIQue-SF questionnaire, where scores could range between 30-210 (with 30 being the lowest possible score, and 210 the highest possible score). There were two outcome variables: total dwell time for negative images, and total dwell time for positive images. Dwell time was determined by the sum of the duration of all fixations on the specified interest areas (positive and negative images).

Participants

A prospective power analysis was conducted using the power table (linear regression, two predictor variables) provided by Clark-Carter (2018). Previous research examining depression (Suslow et al., 2020) has demonstrated a medium-large effect size, therefore the number of participants required was 80 to achieve a power of 0.8 (based on R^2 = .13). Previous eye-tracking research examining EI (Lea et al., 2018) demonstrated a small-medium effect size (R^2 = .071), therefore the number of participants required was 200 to achieve a power of 0.8 (based on R^2 = .05). As the suggested sample size was higher for EI, the study aimed to recruit 200 participants.

Participants were recruited using SONA (online research participation scheme), via word of mouth and internal emails and were from a variety of occupations. The study was completed at Staffordshire University within the eye-tracking laboratory. Any participants who were eligible received 2 SONA credits for taking part. No other incentives were given. Due to time constraints, the total number of participants recruited was 41, which consisted of 28 females, 12 males and 1 non-binary/third gender, aged between 18-50 years (M= 27.49; SD=9.89).

Materials

An eye-tracking laboratory at Staffordshire University with an SR Research Eyelink 1000 eye tracker was used to record the eye movements of participants. The EyeLink 1000 tracked eye location every 1ms, with typically 0.25°-0.5° spatial accuracy. To minimise head movement of the participants, a chin rest was used, which was set so participant eye to computer screen distance was 66cm. SR Research Experiment Builder was used to build the eye-tracking part of the experiment. Images were presented on a standard PC monitor and the spacebar was pressed to begin the experiment. SR Research Data Viewer was used to extract the eye-tracking data following data collection.

A laptop was utilised to present the information sheet (appendix A), consent form (appendix B), to collect demographic information and to complete the DASS-21 questionnaire (appendix C) and TEIQue-SF questionnaire (appendix D) on Qualtrics. The DASS-21 (Lovibond & Lovibond, 1995), the short form of the Depression Anxiety Stress Scale (DASS, Lovibond & Lovibond, 1995) was used to measure levels of everyday depression. The

DASS-21 includes 21 statements where participants indicate how much the statement applied to them over the last week on a 4-point Likert scale (0 = not at all; 3 = most of the time). The DASS-21 has been shown to be a valid scale to measure depression, anxiety and stress among a non-clinical sample (Henry & Crawford, 2005), but is not a diagnostic tool. Participants also completed the TEIQue-SF (Petrides, 2009), the short form of the TEIQue (Petrides, 2009) to measure trait emotional intelligence, replicating the scale utilised by Lea et al. (2018). The TEIQue-SF includes 30 statements using a 7-point Likert scale (1 = completely disagree; 7 = completely agree). Previous research suggests the TEIQue-SF to have good psychometric properties (Cooper & Petrides, 2010) and Lea et al. (2018) demonstrated good reliability (α = 0.80).

The images utilised consisted of both faces and objects taken from the Nencki Affective Picture System (NAPS, Marchewka et al., 2014). The paired images consisted of: 20 positive vs neutral, 20 negative vs neutral and 20 neutral vs neutral (see appendix E for images used and the mean/standard deviation valence and arousal ratings). The 20 neutral vs neutral images were included only as filler trials; data from viewing these images was not analysed as this study was only interested in the attention to emotional images and not to neutral images. The purpose of the neutral filler trials was so an emotional image was not always presented in line with previous research (e.g., Humphreys et al., 2022; Kellough et al., 2008). Some of the neutral images in the filler trials were taken from the International Affective Picture System (IAPS, Lang et al., 2005) to ensure there was an equal number of images within each set (i.e., 20 positive-neutral, 20 negative-neutral and 20 neutral-neutral).

Procedure

Participants were first provided with an information sheet (see appendix A) and consent form (see appendix B) via Qualtrics, informing them of their right to withdraw, exclusion criteria for the study and assurance that their data would be kept confidentially. Demographic information was collected via Qualtrics including age and gender, and participant number was given and input by the researcher for anonymity and in case they wished to withdraw their data. Informed consent had to be obtained by the participant before they were able to take part. Participants were then seated at the eye-tracker, and informed their eye movements would be recorded whilst viewing paired images which may contain an emotional content. Participants were reminded verbally that they were able to

withdraw at any time during the study and that the researcher was able to hear and see them from the control room, so could communicate if needed.

The first screen displayed to participants welcomed them to the experiment and requested they wait for further instruction from the researcher. Once instructed, the participants were asked to press the spacebar which then displayed the second screen informing participants that their eye movements would be calibrated. Calibration and validation using a 9-point calibration process was then carried out to ensure the eye tracker was recording where the participant was looking on the screen accurately. They were then shown an instruction screen which explained they would be viewing 60 pairs of images freely (120 images in total) and that a fixation point would be presented in the centre of the screen between image pairs, which they must focus on before the next image pair was presented. They were asked to press the spacebar when ready to begin. They were then presented with the 60 pairs of images for a duration of 6 seconds per pair. The paired images were presented in a random order, an equal distance away from the central fixation point, with one image on the left and one image on the right of the screen. Each pair of images were presented for 6 seconds, to replicate the same time utilised in other free-viewing tasks in depression (i.e. Klawohn et al., 2020; Lazarov et al., 2018). Half of the positive and negative images appeared on the right and half on the left of the screen. Two conditions were used to counterbalance which side of the screen the emotional image appeared. The participant's eye movements were recorded whilst viewing the images using an Eyelink 1000 eye tracker. A central fixation point was presented after each pair of images, which remained until the eye was static on the fixation point.

Once the eye-tracking phase was complete, participants were able to take a break prior to completing the rest of the experiment. Once ready, participants were asked to complete the DASS-21 (Lovibond & Lovibond, 1995) to measure levels of everyday depression (appendix C) and the TEIQue-SF (Petrides, 2009) to measure trait emotional intelligence (appendix D) via Qualtrics. Participants were not given a time limit to complete the questionnaires. Following completion, participants were given a debrief information sheet to read (appendix F) and were thanked for their participation.

Ethical Considerations

Ethics approval was gained from the Staffordshire University Psychology Research Ethics Committee. Potential ethical issues identified included participants being presented with emotional images which they could potentially find distressing. However, this risk was minimal as the images were not of an extreme emotional nature. Images within the emotional-neutral pairs selected from the Nencki Affective Picture System (NAPS, Marchewka et al., 2014) had been reliably rated in terms of emotional valence on a scale of 1 to 9 (1 = most negative, 9 = most positive), with average valence rating of negative images used within this experiment of 2.59 for images containing people and 2.66 for images containing objects (see appendix E). Participants were also aware prior to taking part that they would be viewing emotional images containing either negative or positive content (appendix A). Participants were not specifically told the study would be looking at depression levels as this may have affected attention patterns whilst viewing the images, but they were made aware they would be asked questions relating to depression, anxiety and stress via the information sheet and consent form (appendices A & B). They were then fully informed after study completion via the debrief form (appendix F). The DASS-21 questionnaire used to measure depression levels is regularly utilised in research and is not used for diagnostic purposes. Participants were informed on the information sheet, and verbally during the study that they could withdraw at any time during the experiment, and the debrief form (Appendix F) also contained sources of support if needed.

Results

Total scores were calculated from the TEIQue-SF questionnaire to give a global trait EI score for each participant. Total depression scores were calculated from the DASS-21 questionnaire by calculating the total score for the depression questions (Q3, Q5, Q10, Q13, Q16, Q17, Q21) and then multiplied by 2 to give the total depression score, as this is necessary with the short form of the DASS (Lovibond & Lovibond, 1995). Eye-tracking data of dwell time was extracted from the SR Research Data Viewer software, and then average dwell time was calculated for each participant for both the positive and negative images. SPSS was used to input the dataset and descriptive statistics were calculated.

Table 1 shows that the mean depression score was classified in the normal range, as normal scores for depression on the DASS-21 range between 0-9 (Lovibond & Lovibond, 1995). Table 1 also shows the mean TEIQue-SF score to be quite high (as scores can range from 30-210). Correlation coefficients were also calculated to gain an initial view of the relationship between the predictor variables and the outcome variables (Table 2). This shows that there was a weak negative correlation between depression and dwell time on both positive and negative images. For emotional intelligence, it shows there was a weak negative correlation with dwell time on negative images, but there was a moderate positive correlation with dwell time on positive images.

Table 1
Mean and Standard Deviation of Scores for Depression on DASS-21 and Scores for Emotional Intelligence on TEIQue-SF.

	Mean	Standard Deviation
DASS-21 Depression Score	9.02	8.42
TEIQue-SF Emotional Intelligence Score	140.24	27.32

Table 2
Correlation Co-efficient for Predictor and Outcome Variables.

	Positive Dwell Time	Negative Dwell Time
Depression Score	-.097	-.024
Emotional Intelligence Score	.413	-.091

Negative Images

Data was checked for multicollinearity and as tolerance was higher than .10 and VIF less than 10, this was acceptable (appendix G). Data was also checked for outliers by calculating standardised residual scores which all fell between +/- 3 (appendix H).

Histograms were also checked and found to be normally distributed (appendix I) and the scatterplot shows residuals to be randomly distributed relative to the predictive value of dwell time (appendix J). Leverage was plotted against Cook's Distance, and one case was found to be high on both variables (appendix K), however this was kept in the dataset as removing would have reduced the sample size and power of the study further.

A linear regression was conducted (appendix M), with depression score (DASS-21 depression score) and trait emotional intelligence (global score from TEIQue-SF) as predictor variables, and average dwell time on negative images as the outcome variable. The predictors depression and emotional intelligence explained 1.5% of variance in negative dwell scores (R^2 = .015, F(2, 38) = .293, p = .748). Depression (β = -.098, p = .607) and emotional intelligence (β = -.142, p = .457) did not significantly predict dwell time on negative images. According to Cohen (1988), there was a small effect size (R^2 = .015). For model validation, the PRESS statistic was calculated as R^2 = -.26 (appendix L). As this differed to the original R^2 value of R^2 = .015, the reliability of the multiple regression model can be questioned.

As the findings were non-significant, a retrospective power analysis was conducted using the power table (linear regression, two predictor variables) provided by Clark-Carter (2018). This demonstrated the power of the study to be .007. If conducted again in future, 500-1000 participants would be needed to achieve a power of 0.8.

Positive Images

Data was checked for multicollinearity and as tolerance was higher than .10 and VIF less than 10, this check was acceptable (appendix N). Data was also checked for outliers by calculating standardised residual scores which all fell between +/- 3 (appendix O). Histograms were also checked and found to be normally distributed (appendix P) and scatterplot shows residuals to be randomly distributed relative to the predictive value of dwell time (appendix Q). Leverage was plotted against Cook's Distance, and one case was found to be high on both variables (appendix R), however this was kept in the dataset as removing would have reduced the sample size and power of the study further.

A linear regression was conducted (appendix T), with depression score (DASS-21 depression score) and trait emotional intelligence (global score from TEIQue-SF) as predictor variables, and average dwell time on positive images as the outcome variable. The predictors depression and emotional intelligence explained 18.9% of variance in positive dwell scores (R^2 = .189, F(2, 38) = 4.437, *p* = .019). Depression (β = .162, *p* = .351) did not significantly predict dwell time on positive images. However, emotional intelligence (β = .497, *p* = .006) did significantly predict dwell time on positive images. According to Cohen (1988), there was a medium-large effect size (R^2 = .189). For model validation, the PRESS statistic was calculated as R^2 = .03 (appendix S). As this differed to the original R^2 value of R^2 = .189, the reliability of the multiple regression model can be questioned.

Discussion

The aim of this study was to examine whether levels of depression and EI were associated with dwell time for positive and negative images, to determine whether there is an attention bias towards emotional images. For negative images, results showed that both levels of depression and EI were not significantly associated with dwell time. For positive images, depression was not significantly associated with dwell time, however, for emotional intelligence, there was a significant positive association with dwell time. Therefore, the findings are in support of the third hypothesis that higher levels of EI are positively associated with attention towards positive images, however, both the first and second hypotheses relating to depression and attention were not supported. These findings will in turn be discussed in further detail.

i. Depression

Findings from this current study were not as expected in accordance with previous literature examining attention and depression towards emotional images in a non-clinical population. Previous eye-tracking research has demonstrated higher levels of depression to be associated with increased dwell time on negative images (Caseras et al., 2007; Koster et al., 2005; Leyman et al., 2011; Shane & Peterson, 2007), and also decreased dwell time on positive images (Arndt et al., 2014; Leyman et al., 2011; Sears et al., 2010; Shane & Peterson,

2007). This study demonstrated very little effect of depression on attention towards negative images, with a very weak negative correlation between the two. In addition, there was a very weak negative correlation between depression and dwell time on positive images. It is pertinent to note that according to the scoring of the DASS-21 questionnaire (0-9 = normal; 10-13 = mild; 14-20 = moderate; 21-27 = severe; 28+ = extremely severe), the overall mean depression score for participants in this study was classified within normal levels of depression. Therefore, this may provide a possible explanation as to why no association was found between levels of depression and dwell time on negative images as hypothesised. It could be possible that depression scores may not have been severe enough to elicit attention bias towards negative stimuli as demonstrated in previous eye-tracking literature with significant findings (e.g. Caseras et al., 2007; Koster et al., 2005; Leyman et al., 2011; Shane & Peterson, 2007).

A further consideration to be made relates to the scale used in the current study to measure levels of depression. The DASS-21 (Lovibond & Lovibond, 1995) contains 21 questions covering depression, stress and anxiety, with only seven of these questions relating to depression, therefore only answers from these seven questions were calculated. It may be pertinent for future research to consider utilising an alternative scale to measure depression, to provide a more comprehensive measure of participant depression levels and to also replicate scales used within previous depression and attention research. For example, future research could utilise scales such as the Beck Depression Inventory (BDI-II; Beck et al., 1996), which has been used in a large amount of previous research examining attention bias in depression (e.g. Arndt et al., 2014; Blanco et al., 2019; Duque & Vazquez, 2015; Klawohn et al., 2020; Sears et al., 2010).

Additionally, when considering how emotional information is processed, prior literature has demonstrated there to be gender differences (Donges et al., 2012; Kemp et al., 2004; Montagne et al., 2005), as well as gender differences in the likelihood of experiencing depression, with females more likely to experience depression than males (Girgus & Yang, 2015; Grigoriadis & Robinson, 2007). The sample of this current study consisted largely of females, therefore to examine the possible gender differences which may affect the overall

findings in attention, future research could consider including gender as an additional predictor. Previous literature has demonstrated attention bias among female-only samples (Arndt et al., 2014; Sears et al., 2010; Sears et al., 2011; Soltani et al., 2015), but those employing mixed gender samples have still found significant results, with increased dwell time on negative images (e.g. Akram et al., 2021; Kellough et al., 2008; Lazarov et al., 2018;), therefore, exploring gender as an additional variable in future research could be beneficial.

As previously discussed, conducting research examining the effect of depression on attention is imperative to understand depression, and has important implications in its application through development of treatments to improve symptoms and quality of life for those suffering from depression. Though this current study did not find a significant effect of depression on attention towards negative images as hypothesised and in accordance with previous literature, retrospective power analysis demonstrated the study to have very low power, with 500-1000 participants needed in future research. However, this is due to the small effect size obtained which may be due to the depression levels of the sample. As discussed, the overall mean depression score for participants in this study was classified within normal levels of depression. Future research could aim to recruit high and low depression groups and conduct an ANOVA rather than a regression, which would allow for manipulation of depression levels and to establish a cause and effect relationship.

It may also be pertinent for future research to consider utilising different positive and negative stimuli to examine whether attention bias exists among alternative images. For example, previous research has examined attention towards negative vs neutral internet memes and found those with depression to have a significantly higher number of fixations on depressive compared with neutral memes (Akram et al., 2021). Alternatively, utilising more complex images may help to improve ecological validity (Lazarov et al., 2018). For example, within the emotional intelligence research, Lea et al. (2018) used a more complex “faces in the crowd” paradigm, and it may be beneficial to replicate this task among a sample with depression to ascertain if attention bias is found with more complex visual stimuli.

ii. Emotional Intelligence

Results from this study demonstrated positive associations between trait EI and positive images, with a moderate positive correlation between EI and dwell time on positive images, therefore these findings are in support of those by Lea et al. (2018). The findings support the notion of EI being adaptive, with those higher in EI showing preference towards positive images in non-stressful situations (Lea et al., 2018). In contrast, the findings do differ from Nicolet-dit-Felix et al. (2023), who found support towards the "hypersensitivity hypothesis" with increased attention towards both positive and negative stimuli and Davis (2018) where those higher in trait EI looked towards negative stimuli under non-stressful conditions. It is possible that the differences in findings could be due to the methods utilised to measure attention. Both Nicolet-dit-Felix et al. (2023) and Davis (2018) measured reaction times from a dot-probe task, and the nature of this task means it can only provide insight into attention at a specific time point, and cannot measure sustained attention (Duque & Vazquez, 2015; Sears et al., 2019). Though Davis (2018) also employed eye-tracking measures as well as utilising the dot-probe task, the emotional facial stimuli were only presented for 500ms, and therefore this again does not provide a measure of sustained attention. In contrast, the current study presented stimuli for 6000ms and measured attentional engagement. It could be possible that bias towards only positive stimuli occurs with attentional engagement as opposed to initial orienting bias, however, due to the limited amount of research specifically examining emotional intelligence and attention towards emotional stimuli, further research would be needed to clarify this.

The findings are supportive of the idea that those with higher EI are more likely to attend to positive stimuli. It is possible that this could facilitate and support mental wellbeing, with previous research identifying positive associations between EI and an individual's perception of their own wellbeing including positive affect, happiness and life satisfaction (Sánchez-Álvarez et al., 2016). Emotional intelligence is also associated with risk factors for depression; with EI as a possible predictor in identifying individuals at risk of developing depression (Downey et al., 2008). EI research has demonstrated its value in both the maintenance and promotion of mental health (Batool & Khalid, 2009; Lloyd et al., 2012). Given that higher EI has been demonstrated to be associated with attention towards positive images, which may be one way that emotional wellbeing is facilitated and maintained (Lea et

al., 2018), it may be pertinent for future research to consider how individuals could improve their level of emotional intelligence, which may then have a beneficial impact on their own wellbeing. Previous research has suggested that emotional intelligence can be trained (Hodzic et al., 2018; Mattingly & Kraiger, 2019), and EI training interventions have been shown not only to improve an individual's level of EI but also improve their health and wellbeing (Slaski & Cartwright, 2003). In this case, there is potential for future research to consider whether those identified as being low in EI have increased attention towards positive images following a period of EI training, with attention measured pre- and post-intervention, as this may elicit potential benefits to an individual's emotional wellbeing.

One consideration to be made regarding the current study is that trait EI was measured using self-report measures. Though this is the standard type of measure used when measuring trait EI (Petrides, 2011), it can be a disadvantage as previous research has demonstrated that judgments about one's own emotional tendencies are not always accurate (Brackett et al., 2006). Participants may also answer questions and appear high in EI due to answering in a way that is socially desirable (O'Connor et al., 2019). However, this is not normally detrimental when providing answers for research purposes and is mainly problematic if the participant believes someone such as a prospective employer will have access to their scores (Tett et al., 2012). In addition, consideration should be given to how reliable this current study's regression model is in predicting attention towards positive images. During analysis, the PRESS statistic was calculated for model validation and was found to differ to the original R^2 value, therefore the reliability of the multiple regression model could be questioned.

Future research could also consider examining eye-tracking measures of first fixation time, to determine whether there is an initial orienting bias towards positive or negative images. As found by Nicolet-dit-Felix et al. (2023), those higher in emotional intelligence were more vigilant towards emotional images regardless of their valence. Utilising eye-tracking measures to also examine time to first fixation would address the limitations associated with the dot-probe task used by Nicolet-dit-Felix et al. (2023), as eye-tracking measures have been found to provide more reliable measures compared with reaction times (Skinner et al., 2018; Waechter et al., 2014). This would provide further insight as to whether

higher emotional intelligence and attention bias towards positive images only relates to the sustained attentional engagement of the stimuli, or whether they are first drawn towards positive or negative images. It may also be useful to present a positive and negative image simultaneously, rather than the current study which presented an emotional image alongside a neutral image to determine whether this influences attention, or to adapt tasks used by Lea et al. (2018) with the more ecologically valid "faces in the crowd" paradigm, but utilising different expressions such as happy and sad faces rather than happy and angry.

iii. Final Conclusions

This study found that depression was not associated with increased attention towards negative images or decreased attention towards positive images. However, this could be due to the study being underpowered, and perhaps more importantly, due to the levels of depression in the current sample. Future research would benefit in re-examining among a larger clinical sample, to address whether the low depression scores resulted in lack of attention bias, and could aim to recruit high and low depression groups and conduct an ANOVA rather than a regression analysis. Emotional intelligence was found to be associated with increased attention towards positive images, which supports previous research by Lea et al. (2018), and may help to explain why EI could potentially facilitate emotional wellbeing (Batool & Khalid, 2009; Lloyd et al., 2012; Sánchez-Álvarez et al., 2016). Directions for future research may consider examining attention patterns before and after EI training; if training improves EI and increases attention towards positive images, it may be beneficial for these interventions to be implemented among those with lower emotional intelligence to potentially improve emotional wellbeing.

Word Count: 7665

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Appendices

Appendix A: Information Sheet

INFORMATION SHEET

The effect of mental wellbeing and emotional intelligence on cognitive processing of emotional images.

Researcher: Lauren Hall
h022768k@student.staffs.ac.uk

Supervisor: Louise Humphreys
l.humphreys@staffs.ac.uk

INVITATION PARAGRAPH

I would like to invite you to participate in this research project, which forms part of my undergraduate psychology degree at Staffordshire University. The research will be conducted by Lauren Hall. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully.

What is the purpose of the study?

I am conducting a study looking at the effect of mental wellbeing and emotional intelligence on the cognitive processing of emotional images. The objective is to record and assess eye-tracking measures whilst viewing emotional images.

Who has given approval for this study?

Approval for this study has been granted by the Staffordshire University Psychology Department Psychology Ethics Committee.

TAKING PART

Why have I been invited to take part?

I am recruiting participants over 18 years of age to take part in this study. If you have a positive COVID-19 test result, please follow NHS and Government guidance and try to stay home. Participants must meet the following criteria: have normal/corrected normal vision and have full colour vision. You must not take part if: you have photosensitive epilepsy/experiences of epileptic seizures or symptoms as exposure to the light sources can trigger epileptic responses. You must stop using the eye tracker if you experience any epilepsy related symptoms or unusual sensations. You must also not take part if: you have an illness or medical condition which may be adversely affected by the experimental procedure or if you think you are pregnant.

What will happen if I take part?

I am asking you to take part in a study lasting approximately 30 minutes. This will involve your eye movements being recorded whilst viewing a series of paired images. The images which will be presented consist of both people and objects, some of which may have an emotional content consisting of both positive and negative images. Following the eye-tracking phase, you will be asked to complete questions measuring everyday levels of depression, anxiety and stress and questions measuring emotional intelligence.

The experiment will take place at Staffordshire University, in the eye-tracking cubicle on the third floor of the Science Centre.

Do I have to take part?

Participation is completely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in anyway. Once you have read this information sheet, please feel free to ask any questions that will help you decide about taking part. If you decide to take part, we will ask you to sign a consent form.

Incentives

If you are an undergraduate psychology student at Staffordshire University, you will receive 2 SONA credits for taking part in the study. If you are not a psychology student, there are no incentives for taking part.

What are the possible risks of taking part?

There is a risk that you could find some of the images presented upsetting, therefore you may wish to take this into consideration when deciding whether to participate. However, you can withdraw at any time during the experiment if you become uncomfortable or upset. As your eye movements will be recorded, there is also a risk of experiencing dry eyes, particularly if you wear contact lenses. You must stop using the eye tracker if you experience any epilepsy related symptoms or unusual sensations, please notify the researcher.

What if I am upset by anything during the course of the study?

If this happens you might like to take a break or, if you prefer, you can withdraw from the study at any point. If you decide to withdraw, you will be shown a copy of the debriefing sheet, which contains information about sources of support you can access if there is anything you wish to talk about in confidence.

What are the possible benefits of taking part?

Aside from any incentives discussed above, there are no direct benefits to you as a participant. However, the research may help us to better understand how mental wellbeing and emotional intelligence influence cognitive processes when viewing emotional images.

What if I change my mind about taking part?

You are free to withdraw at any point of the study, without having to give a reason. Withdrawing from the study will not affect you in any way.

You can also withdraw your data from the study after you have finished participating, up to two weeks after participation, after which withdrawal of your data will no longer be possible as the data will already have been processed. To withdraw from the study, please email the researcher and provide the unique participant number given to you (these details can be found on the debrief sheet given at the end of the study/after withdrawing from the study. If you choose to withdraw from the study, we will not retain any information you have provided us.

What if I don't want to answer any particular questions?

You are free to skip any questions you would prefer not to answer, without penalty.

DATA HANDLING AND CONFIDENTIALITY

Will the information I give you be kept confidential?

The information obtained will be treated with the strictest confidence throughout the study and the data will be stored safely in a secure location to which only the researcher and their supervisor has access. Your data will be processed in accordance with data protection law and will comply with the General Data Protection Regulation 2018 (GDPR).

Data Protection Statement

The data controller for this project will be Staffordshire University. The University will process your personal data for the purpose of the research outlined above. The legal basis for processing your personal data for research purposes under data protection law is a 'task in the public interest'. You can provide your consent for the use of your personal data in this study by completing the consent form that will be provided to you.

Who will have access to my data?

Only the researcher and the researcher's supervisor will have access to the raw data. You have the right to access information held about you. Your right of access can be exercised in accordance with the General Data Protection Regulation. You also have other rights including rights of correction, erasure, objection, and data portability. Questions, comments, and requests about your personal data can also be sent to the Staffordshire University Data Protection Officer. If you wish to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk

Who will see the finished report?

All data in the finished report will be presented in the form of group statistics. The final report will be seen by the researcher's supervisor and a second marker from the Psychology department, and possibly by an external examiner. In addition, the completed report may also be made available to future Staffordshire University students for teaching/reference purposes.

What will happen to my responses to the study?

All data will be kept in secure storage (to which only the researcher has access) for ten years, according to departmental policy, and it will be destroyed after that.

What will happen to the results of the study?

The results of the study will be disseminated in the final written report and in a student conference presentation. There is a possibility that results might be disseminated more widely, for example at a research conference or in an article published in a research journal. If the research is written up for academic journal publication your anonymised data may be stored permanently in an online research data repository.

FURTHER QUESTIONS

Is there anyone I can talk to about the study before I take part?

You can speak with me directly and ask any questions you may have or via the details provided at the top of this form. If you wish to talk to someone else about my study before taking part, please feel free to contact my project supervisor (contact details also available at the top of this form).

What if I have further questions, or if something goes wrong?

If this study has harmed you in any way, or if you wish to make a complaint about the conduct of the study, you can contact the study supervisor or the Chair of the Staffordshire University Ethics Committee for further advice and information:

Prof. Nachiappan Chockalingam
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ST4 2DE
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I know a friend who may be interested; can they participate in your study?
Yes, as long as your friend meets the criteria mentioned above. Your friend can contact the researcher via email to make arrangements: h022768k@student.staffs.ac.uk or sign up via timeslots on SONA.

If you have any further questions, please feel free to ask. Thank you for your time.

Thank you for reading this information sheet and for considering taking part in this research.

Appendix B: Consent Form

CONSENT FORM

Researcher: Lauren Hall
h022768k@student.staffs.ac.uk

Supervisor: Louise Humphreys
l.humphreys@staffs.ac.uk

I am over 18 years of age and I voluntarily agree to participate in a research project conducted as part of a psychology undergraduate degree by Lauren Hall, an Undergraduate Psychology student at Staffordshire University.	Yes/No
I understand that I am being asked to participate in a study lasting approximately 30 minutes and my eye movements will be recorded whilst viewing paired images.	Yes/No
I understand that I will be asked to answer questions about my levels of depression, anxiety, stress and emotional intelligence.	Yes/No
I understand that, if I wish, I may withdraw from participating at any time and my data will be destroyed. I have been informed that withdrawal after two weeks of taking part will not be possible.	Yes/No
I understand that I will be fully protected in accordance with the Data Protection Act of 2018, and in compliance with the British Psychological Society ethical guidelines, and that any personal details will be kept confidential.	Yes/No
I understand that in the case that a report is published based on this study, the fully anonymised data may be made available for the use of other researchers for an indefinite period of time. Otherwise, they will be kept until ten years after the article has been published, and then destroyed.	Yes/No
I understand that any personal details will be anonymised in any report based on this study and if the research is written up for academic journal publication my anonymised data may be stored permanently in an online research data repository.	Yes/No

If you have any further questions about this study, please contact the researcher or the Project Supervisor (details above).

Unique Identifier
As we are not collecting your name or other identifying information, we will give you a participant number in order to be able to identify your data if you wish to withdraw after participation. Your participant number will be written on the debrief information sheet which you will be provided with, please keep this page or make a note of your participant number in case you wish to withdraw your data.

Appendix C: DASS-21 Questionnaire

DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Appendix D: TEIQue-SF Questionnaire

TEIQue-SF

Instructions: Please answer each statement below by putting a circle around the number that best reflects your degree of agreement or disagreement with that statement. Do not think too long about the exact meaning of the statements. Work quickly and try to answer as accurately as possible. There are no right or wrong answers. There are seven possible responses to each statement ranging from 'Completely Disagree' (number 1) to 'Completely Agree' (number 7).

1 . . . . . 2 . . . . . 3 . . . . . 4 . . . . . 5 . . . . . 6 7
Completely Disagree **Completely Agree**

1. Expressing my emotions with words is not a problem for me.	1	2	3	4	5	6	7
2. I often find it difficult to see things from another person's viewpoint.	1	2	3	4	5	6	7
3. On the whole, I'm a highly motivated person.	1	2	3	4	5	6	7
4. I usually find it difficult to regulate my emotions.	1	2	3	4	5	6	7
5. I generally don't find life enjoyable.	1	2	3	4	5	6	7
6. I can deal effectively with people.	1	2	3	4	5	6	7
7. I tend to change my mind frequently.	1	2	3	4	5	6	7
8. Many times, I can't figure out what emotion I'm feeling.	1	2	3	4	5	6	7
9. I feel that I have a number of good qualities.	1	2	3	4	5	6	7
10. I often find it difficult to stand up for my rights.	1	2	3	4	5	6	7
11. I'm usually able to influence the way other people feel.	1	2	3	4	5	6	7
12. On the whole, I have a gloomy perspective on most things.	1	2	3	4	5	6	7
13. Those close to me often complain that I don't treat them right.	1	2	3	4	5	6	7
14. I often find it difficult to adjust my life according to the circumstances.	1	2	3	4	5	6	7
15. On the whole, I'm able to deal with stress.	1	2	3	4	5	6	7
16. I often find it difficult to show my affection to those close to me.	1	2	3	4	5	6	7
17. I'm normally able to "get into someone's shoes" and experience their emotions.	1	2	3	4	5	6	7
18. I normally find it difficult to keep myself motivated.	1	2	3	4	5	6	7
19. I'm usually able to find ways to control my emotions when I want to.	1	2	3	4	5	6	7
20. On the whole, I'm pleased with my life.	1	2	3	4	5	6	7
21. I would describe myself as a good negotiator.	1	2	3	4	5	6	7
22. I tend to get involved in things I later wish I could get out of.	1	2	3	4	5	6	7
23. I often pause and think about my feelings.	1	2	3	4	5	6	7
24. I believe I'm full of personal strengths.	1	2	3	4	5	6	7
25. I tend to "back down" even if I know I'm right.	1	2	3	4	5	6	7
26. I don't seem to have any power at all over other people's feelings.	1	2	3	4	5	6	7
27. I generally believe that things will work out fine in my life.	1	2	3	4	5	6	7
28. I find it difficult to bond well even with those close to me.	1	2	3	4	5	6	7
29. Generally, I'm able to adapt to new environments.	1	2	3	4	5	6	7
30. Others admire me for being relaxed.	1	2	3	4	5	6	7

Appendix E: Images and valence and arousal ratings

Negative and neutral pairs consisting of people (negative image on the left of each pair)


Faces_283_h


Faces_220_h


Faces_290_h


Faces_305_h


Faces_293_h


Faces_060_h


Faces_170_h


Faces_190_h


Faces_172_h


Faces_026_h


People_225_h


People_097_h


Faces_028_h


Faces_276_h


People_235_h


People_122_h


Faces_284_h


Faces_024_h


People_125_h


People_159_h

Negative neutral pairs consisting of objects (negative image on the left of each pair)


Objects_139_h


Objects_230_h


Objects_285_h


Objects_299_h


Objects_003_h


Objects_296_h


Objects_132_h


Objects_247_h


Objects_283_h


Objects_311_h


Objects_157_h


Objects_194_h


Objects_002_h


Objects_293_h


Objects_111_h


Objects_222_h


Objects_001_h


Objects_310_h


Objects_149_h


Objects_231_h

Positive and neutral pairs consisting of people (positive image on the left of each pair)


Faces_342_h

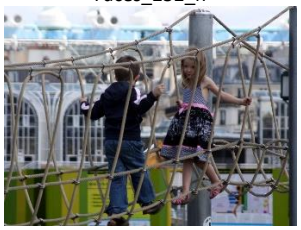

Faces_212_h


Faces_232_h


Faces_198_h


Faces_140_h


Faces_309_h


Faces_050_h


Faces_286_h


Faces_116_h


Faces_194_h


People_026_h


People_150_h


Faces_135_h


Faces_023_h


People_191_h


People_146_h


Faces_080_h

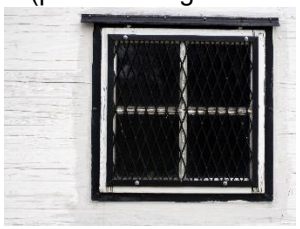

People_035_h


People_182_h


People_095_h

Positive neutral pairs consisting of objects (positive image on the left of each pair)


Objects_262_h


Objects_210_h


Objects_081_h


Objects_223_h


Objects_052_h


Objects_216_h

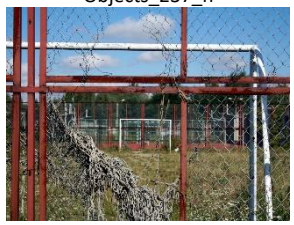

Objects_097_h


Objects_237_h


Objects_171_h


Objects_226_h


Objects_325_h


Objects_213_h


Objects_272_h


Objects_185_h


Objects_080_h


Objects_071_h


Objects_086_h


Objects_189_h


Objects_077_h


Objects_238_h

Neutral fillers (taken from the NAPS)


Objects_162_h


Objects_279_h


Objects_308_h

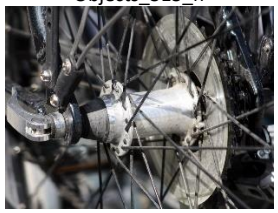

Objects_314_h

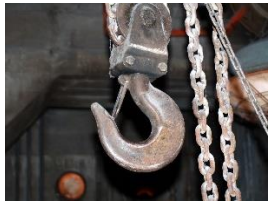

Objects_313_h


Objects_276_h


Objects_204_h


Objects_208_h


Objects_211_h


Objects_224_h


Objects_177_h


Objects_244_h


Objects_246_h


Objects_245_h


Objects_130_h


Objects_115_h


Objects_277_h


Objects_228_h


Objects_281_h


Objects_312_h

Neutral fillers (taken from the IAPS)

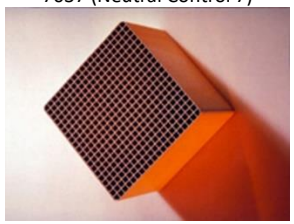

7560 (Pos Control 12)

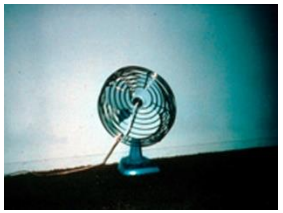

7037 (Neutral Control 7)


7100 (Neutral Control 10)


7060 (Neutral Control 2)


7010 (Pos Control 5)


7185 (Neutral 20)


7020 (Pos Control 7)


7211 (Pos Control 9)


7002 (Neutral 17)


7009 (Neutral 15)


7038 (Neutral 2)


7090 (Neutral Control 20)

5390 (Neutral 16)

7491 (Neutral Control 8)

5120 (Neutral Control 5)

5740 (Neutral Control 6)

5500 (Neutral 5)

5520 (Pos Control 11)

7080 (Neutral Control 1)

7034 (Neutral 1)

Means and Standard Deviations of Valence and Arousal Ratings*

	Valence	App/Avoid	Arousal	Luminance	Contrast	Complexity	LABL	LABA	LABB	Entropy
Neg Face	**2.59**	**3.35**	**6.74**	**118.91**	**69.98**	**3161.17**	**49.01**	**2.77**	**6.97**	**7.77**
	0.14	0.37	0.34	11.88	9.42	1155.13	4.84	5.31	9.43	0.17
Neut Neg Face	**5.07**	**5.11**	**5.04**	**110.68**	**64.65**	**2819.18**	**45.65**	**2.05**	**6.92**	**7.66**
	0.34	0.22	0.40	27.98	10.14	1142.38	11.19	2.96	5.79	0.18
Pos Face	**7.41**	**6.92**	**4.90**	**118.33**	**66.10**	**3161.78**	**48.83**	**1.96**	**2.86**	**7.72**
	0.21	0.36	0.25	23.82	8.38	1134.88	9.37	4.12	6.14	0.22
Neut Pos Face	**4.94**	**5.02**	**5.09**	**116.64**	**67.09**	**2911.14**	**48.08**	**1.38**	**3.05**	**7.67**
	0.30	0.42	0.36	29.78	7.18	8825.8	12.00	4.12	5.66	0.15
Neg Object	**2.66**	**3.28**	**6.61**	**107.67**	**65.43**	**3425.45**	**44.30**	**1.99**	**4.86**	**7.46**
	0.35	0.54	0.44	24.04	14.14	9402.4	9.82	2.70	5.04	0.50
Neut Neg Object	**5.04**	**5.04**	**4.94**	**111.39**	**66.58**	**3347.71**	**45.79**	**1.76**	**3.07**	**7.68**
	0.24	0.21	0.19	26.42	8.81	8556.2	10.44	3.31	2.82	0.17
Pos Object	**7.21**	**7.02**	**4.74**	**105.24**	**64.61**	**3244.16**	**43.81**	**4.08**	**10.84**	**7.55**
	0.27	0.33	0.44	30.24	10.10	8663.4	12.20	6.84	5.96	0.38
Neut Pos Object	**5.00**	**4.97**	**4.95**	**119.33**	**66.47**	**3252.24**	**49.50**	**6.16**	**5.86**	**7.59**
	0.26	0.31	0.31	18.85	16.08	1037.59	7.03	7.65	9.95	0.28
NAPS neutral filler 1	**4.97**	**5.10**	**4.83**	**116.03**	**68.70**	**3009.71**	**47.70**	**0.58**	**4.20**	**7.60**
	0.33	0.38	0.23	28.92	9.80	1005.56	12.00	7.41	5.84	0.30
NAPS neutral filler 2	**5.05**	**5.01**	**4.90**	**115.33**	**70.50**	**3298.07**	**47.14**	**2.07**	**1.75**	**7.71**
	0.28	0.31	0.19	26.21	8.05	7375.1	10.57	4.45	7.00	0.18
IAPS neutral filler 1	**5.01**		**2.95**	**100.25**						
	0.39		0.93	27.01						
IAPS neutral filler 2	**4.95**		**2.97**	**106.00**						
	0.26		0.57	41.68						

*Valence can range from 1 = very negative to 9 = very positive, and arousal from 1 = relaxed to 9 = aroused

Appendix F: Debrief Form

Participant Debrief

Project Title: The effect of depression and emotional intelligence on attention towards emotional images.

Researcher: Lauren Hall
h022768k@student.staffs.ac.uk

Supervisor: Louise Humphreys
l.humphreys@staffs.ac.uk

Participant Number: _____

Thank you for taking part in this study. The purpose of this study was to examine how levels of depression and emotional intelligence affect attention towards positive and negative images. The study was testing whether those with higher levels of depression pay more attention towards the negative images, and those with higher levels of emotional intelligence pay more attention towards the positive images. It was also examining whether attention differs in depressed individuals with high and low levels of emotional intelligence. It was not specifically mentioned that this study was measuring attention towards the positive and negative images, as this may have affected attention patterns whilst viewing the images. The scores from the depression, anxiety and stress scale used will not and cannot be used for diagnostic purposes.

For more detailed explanations, or if you wish to know the results of the study, please contact the researcher using the contact details above.

Your details will be kept confidential at all times, and complete anonymity will be maintained. Raw data will be kept on a password-protected computer, which will only be accessible to me and my supervisor. Raw data will be destroyed after ten years. In the case that a report is published based on this study, the fully anonymised data may be made available for the use of other researchers for an indefinite period of time. Otherwise, they will be kept by Staffordshire University until ten years after the article has been published, and then destroyed.

If you wish to withdraw your data you need to contact the researcher using the contact details above, quoting your participant number at the top of this page. Please keep this page or make a note of your participant number in case you wish to withdraw. You can withdraw your data from the study up to two weeks after participation. No other information is required, and you will not be asked to provide a reason.

If you have been affected by any of the issues raised in this study, and would like to talk to someone in confidence about it, you may wish to contact the following organisation(s):
Staffordshire University student counselling service: counsellingreception@staffs.ac.uk
Samaritans: www.samaritans.org
Mind: www.mind.org.uk/help/advice_lines

Thank you again for your participation.

Appendix G: Multicollinearity Check – Tolerance and VIF (Negative Dwell Time)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3181.940	399.999		7.955	<.001		
	Depression_Group	-4.231	8.159	-.098	-.519	.607	.729	1.371
	EI_Score	-1.887	2.513	-.142	-.751	.457	.729	1.371

a. Dependent Variable: Dwell_Negative

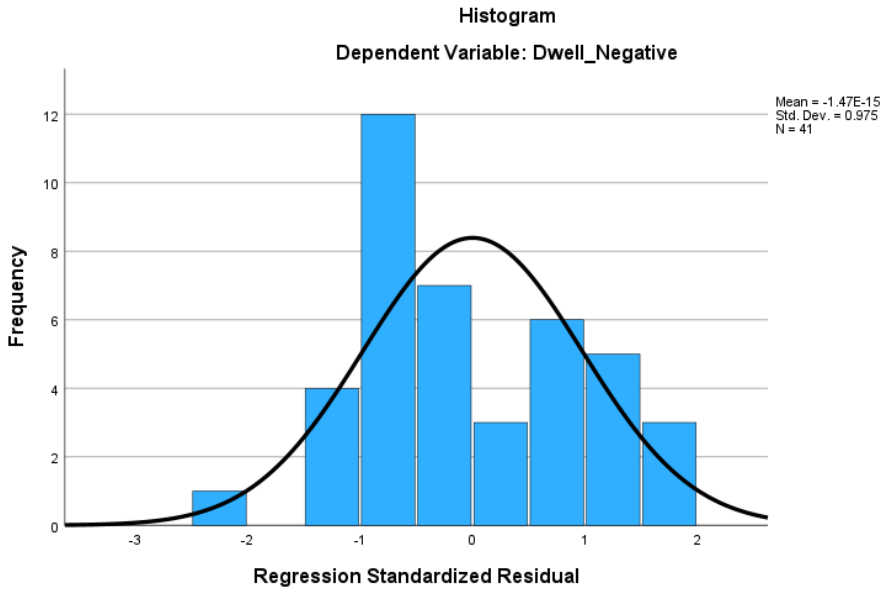
Appendix H: Residuals Statistics (Negative Dwell Time)

Residuals Statistics[a]

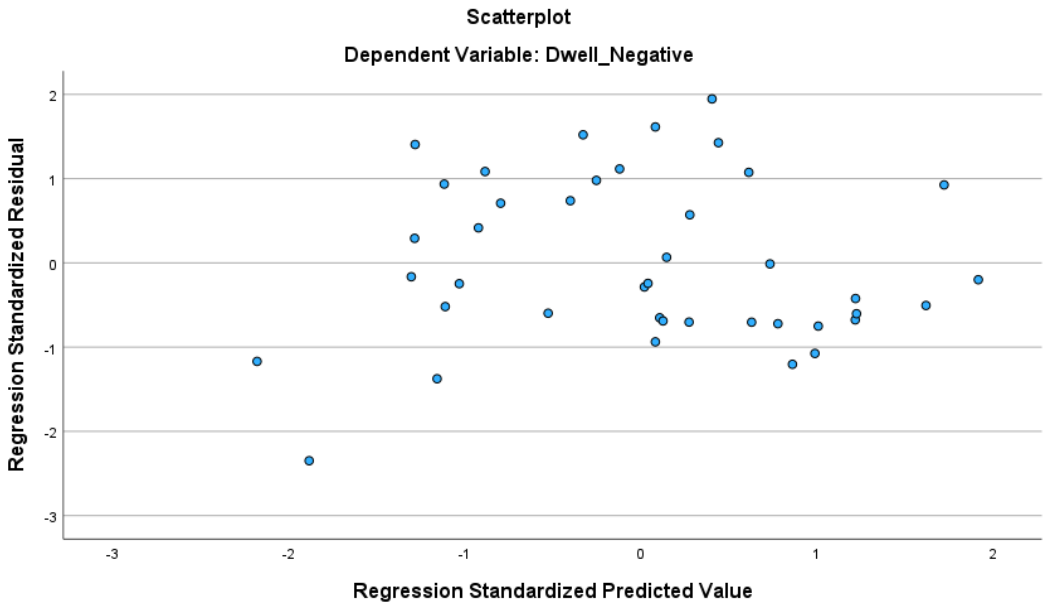
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2781.2695	2965.1377	2879.0537	44.90099	41
Std. Predicted Value	-2.178	1.917	.000	1.000	41
Standard Error of Predicted Value	60.252	177.957	96.183	28.824	41
Adjusted Predicted Value	2740.3259	3055.1553	2883.0858	61.08855	41
Residual	-870.99609	721.64716	.00000	361.43370	41
Std. Residual	-2.349	1.946	.000	.975	41
Stud. Residual	-2.677	2.027	-.005	1.030	41
Deleted Residual	-1131.60522	782.89655	-4.03216	404.74375	41
Stud. Deleted Residual	-2.933	2.118	-.005	1.057	41
Mahal. Distance	.080	8.236	1.951	1.923	41
Cook's Distance	.000	.715	.043	.115	41
Centered Leverage Value	.002	.206	.049	.048	41

a. Dependent Variable: Dwell_Negative

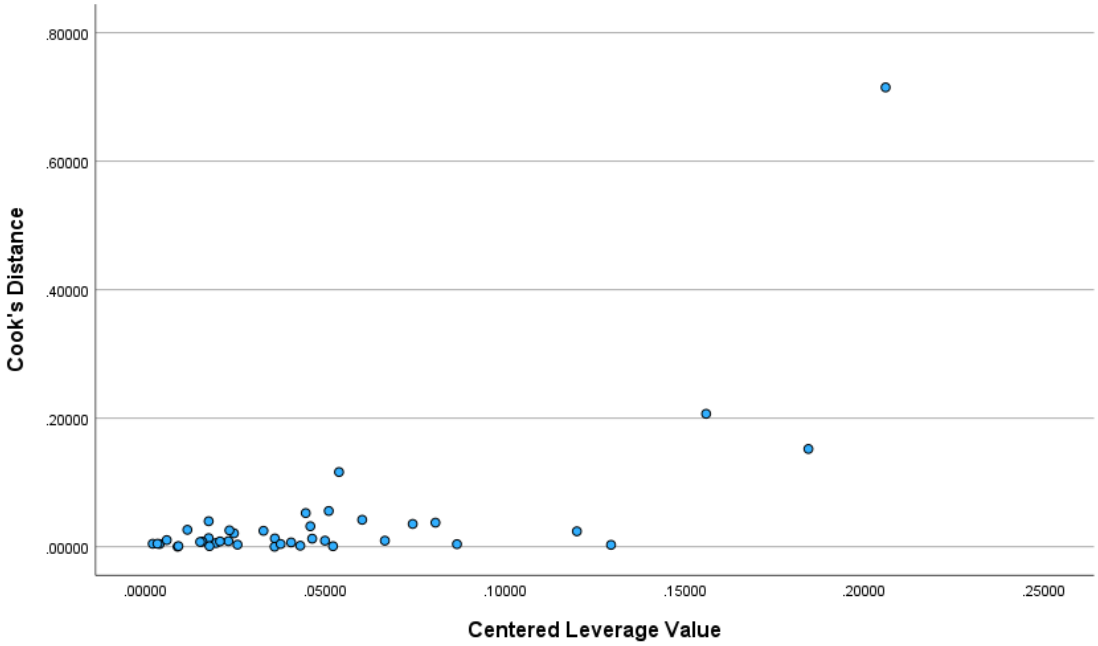
Appendix I: Residuals Histogram (Negative Dwell Time)



Appendix J: Residuals Scatterplot (Negative Dwell Time)



Appendix K: Leverage vs Cook's Distance (Negative Dwell Time)



Appendix L: Calculation of PRESS statistic (Negative Dwell Time)

R^2_{PRESS} = 1 – (PRESS/Total sum of squares)

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
PRESS	41	24.29	1280530.30	6553366.71	159838.2125	226428.49612
Valid N (listwise)	41					

Model		Sum of Squares
1	Regression	80643.966
	Residual	5225372.871
	Total	5306016.837

PRESS = 6553366.71

Total sum of squares = 5306016.837

R^2_{PRESS} = 1 – (6553366.71/5306016.837)

R^2_{PRESS} = 1 – 1.235082155092679

R^2_{PRESS} = -0.26

Appendix M: Multiple Regression Output (Negative Dwell Time)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.123[a]	.015	-.037	370.82316

a. Predictors: (Constant), EI_Score, Depression_Group

b. Dependent Variable: Dwell_Negative

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80643.966	2	40321.983	.293	.748[b]
	Residual	5225372.871	38	137509.812		
	Total	5306016.837	40			

a. Dependent Variable: Dwell_Negative

b. Predictors: (Constant), EI_Score, Depression_Group

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3181.940	399.999		7.955	<.001		
	Depression_Group	-4.231	8.159	-.098	-.519	.607	.729	1.371
	EI_Score	-1.887	2.513	-.142	-.751	.457	.729	1.371

a. Dependent Variable: Dwell_Negative

Appendix N: Multicollinearity Check – Tolerance and VIF (Positive Dwell Time)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1813.767	327.973		5.530	<.001		
	Depression_Group	6.319	6.690	.162	.945	.351	.729	1.371
	EI_Score	5.984	2.061	.497	2.904	.006	.729	1.371

a. Dependent Variable: Dwell_Positive

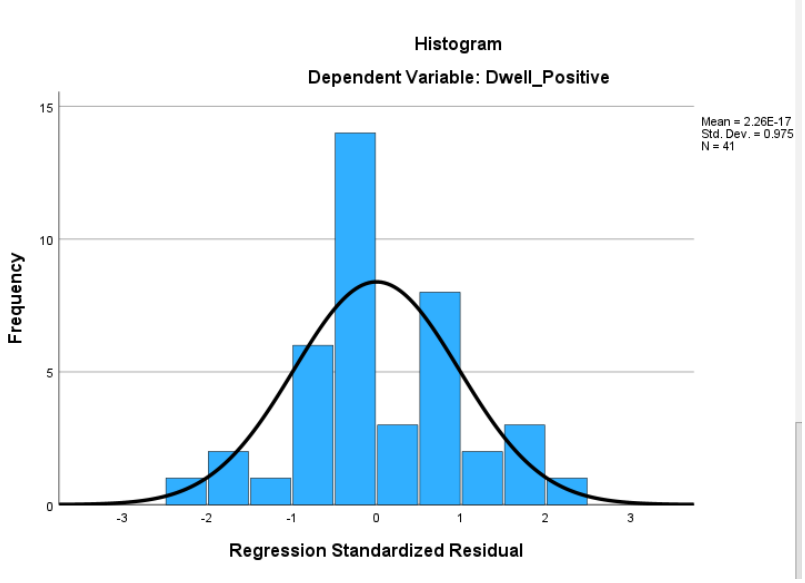
Appendix O: Residuals Statistics (Positive Dwell Time)

Residuals Statistics[a]

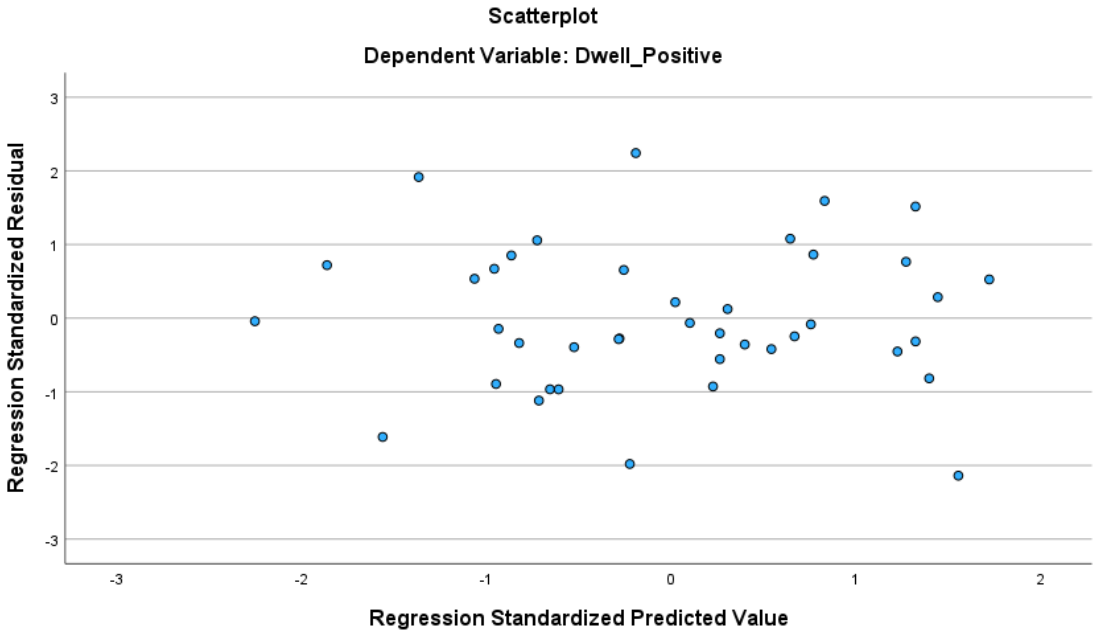
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2387.5813	2956.6584	2709.9707	143.20432	41
Std. Predicted Value	-2.251	1.723	.000	1.000	41
Standard Error of Predicted Value	49.403	145.913	78.864	23.634	41
Adjusted Predicted Value	2389.9063	3003.9744	2708.7209	146.43571	41
Residual	-650.37341	681.65289	.00000	296.35270	41
Std. Residual	-2.139	2.242	.000	.975	41
Stud. Residual	-2.253	2.283	.002	1.018	41
Deleted Residual	-721.62439	707.14349	1.24979	324.11894	41
Stud. Deleted Residual	-2.389	2.426	.004	1.048	41
Mahal. Distance	.080	8.236	1.951	1.923	41
Cook's Distance	.000	.329	.032	.063	41
Centered Leverage Value	.002	.206	.049	.048	41

a. Dependent Variable: Dwell_Positive

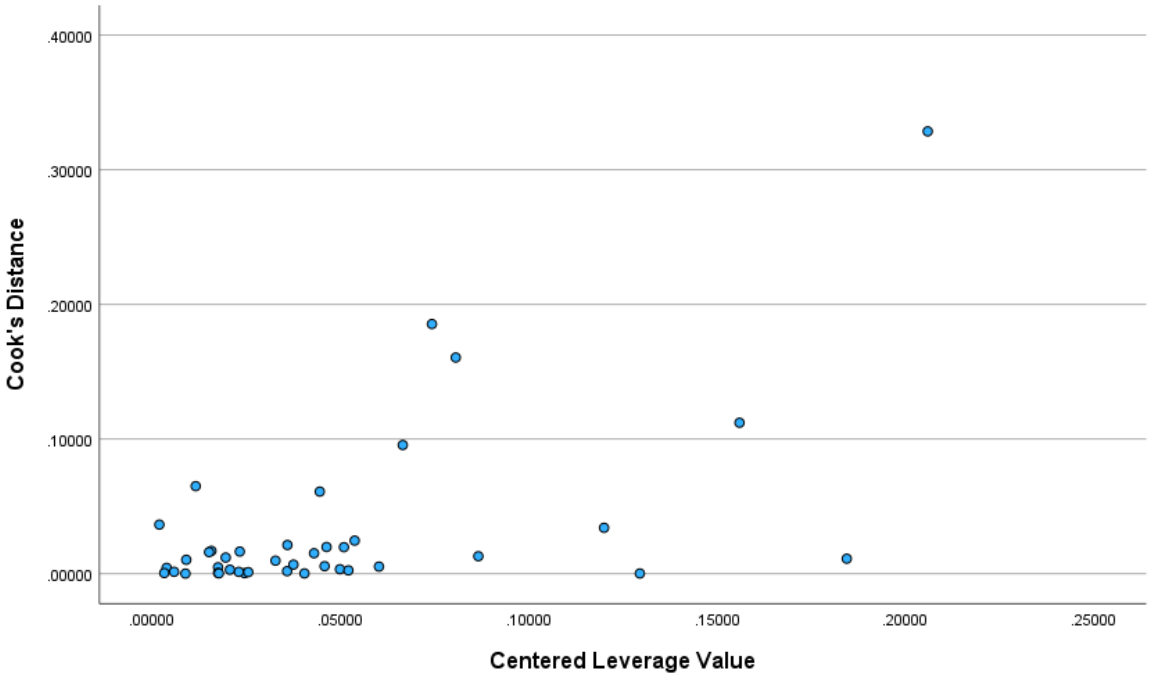
Appendix P: Residuals Histogram (Positive Dwell Time)



Appendix Q: Residuals Scatterplot (Positive Dwell Time)



Appendix R: Leverage vs Cook's Distance (Positive Dwell Time)



Appendix S: Calculation of PRESS statistic (Positive Dwell Time)

R^2_{PRESS} = 1 – (PRESS/Total sum of squares)

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
PRESS	41	228.20	520741.76	4202187.64	102492.3815	144990.53670
Valid N (listwise)	41					

Model		Sum of Squares
1	Regression	820299.131
	Residual	3512997.029
	Total	4333296.160

a. Dependent Variable: Dwell_Positive

Total sum of squares = 4333296.160
PRESS = 4202187.64

R^2_{PRESS} = 1 – (4202187.64/4333296.160)
R^2_{PRESS} = 1 – 0.969743928141759
R^2_{PRESS} = 0.03

Appendix T: Multiple Regression Output (Positive Dwell Time)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.435[a]	.189	.147	304.05146

a. Predictors: (Constant), EI_Score, Depression_Group

b. Dependent Variable: Dwell_Positive

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	820299.131	2	410149.566	4.437	.019[b]
	Residual	3512997.029	38	92447.290		
	Total	4333296.160	40			

a. Dependent Variable: Dwell_Positive

b. Predictors: (Constant), EI_Score, Depression_Group

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	1813.767	327.973		5.530	<.001		
	Depression_Group	6.319	6.690	.162	.945	.351	.729	1.371
	EI_Score	5.984	2.061	.497	2.904	.006	.729	1.371

a. Dependent Variable: Dwell_Positive