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Attention allocation to attachment-related and general emotional words: An event-related brain potential investigation of the effects of attachment-style and relationship status

Laura M. Lathrop, Isabel A. Davis, Michael A. Kisley

ABSTRACT

Aims: Adult attachment style influences attention towards emotional information. The goal of this study was to evaluate the allocation of attention in the context of attachment anxiety, attachment avoidance, and relationship status, using the late positive potential (LPP) component of event related potentials to track attention towards words isolated by emotional valence (positive and negative) and word type (general and attachment-related). Methods: Thirty-three participants (M = 21.24 years; SD = 3.51) categorized emotional words while their electrophysiological responses were recorded, tracking attention with the LPP component. Behavioral, subjective, and electrophysiological measures were analyzed separately. Standardized multiple regression and hierarchical multiple regression were performed to evaluate relationships between variables. Results: Adult attachment style and relationship status combined to predicted attention allocation (LPP amplitude) to attachment-related words ($\Delta R^2 = 0.28$, $\Delta F(2, 26) = 2.71$, $p = 0.008$) but not to general emotional words ($\Delta R^2 = 0.04$, $\Delta F(2, 26) = 0.57$, $p > 0.05$). The interaction between attachment anxiety and relationship status was a statistically significant predictor of attention allocation to attachment-related words ($\beta = 0.60$, $p = 0.003$), whereas the interaction including attachment avoidance was not ($\beta = 0.10$, $p > 0.05$). Specifically, as attachment anxiety increased, individuals in a relationship allocated more attentional resources to the negative attachment-related words, while individuals who were not in a relationship demonstrated heightened attention to the positive attachment-related words. Conclusion: Relationship status (single or partnered) influences the amount of attention directed towards positive and negative attachment-related words for individuals higher in attachment anxiety.

Keywords: Attachment style, Attention, Event-related potential, Relationship status

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INTRODUCTION

Attachment theory was originally proposed by Bowlby to explain children's proximity seeking behavior towards their primary caregiver when distressed [1–3]. Bowlby postulated the existence of an attachment behavioral system that was activated by physical or psychological threat in the child's environment. He posited that activation of the attachment behavioral system motivated children to seek proximity with their primary caregiver in order to attain safety, comfort, and feelings of security, thus deactivating the system. Attachment theory describes three types of attachment: secure, anxious, and avoidant [1–4]. Originally categorical descriptors, further research suggests these descriptors are best conceptualized on a continuum of two independent dimensions: attachment anxiety and attachment avoidance [5]. While attachment is best described on continuums, the categorical labels of the attachment styles remain for ease of discussion. Though initially applied to children, attachment theory is now employed to explain individual differences in adult romantic relationships [5, 6]. The present study was designed to investigate the manner in which adult individuals with different attachment styles allocate attention to emotional stimuli, including importantly words that can be considered to indicate threat to relationship security.

When the attachment system is functioning optimally, individuals develop a secure attachment style in which they are low in both attachment anxiety and attachment avoidance. When the attachment system is functioning sub-optimally, individuals can exhibit higher levels of attachment anxiety, attachment avoidance, or both. Individuals higher in attachment anxiety tend to be dissatisfied with romantic relationships [5]. They can be easily overwhelmed by interpersonal stressors and have difficulty inhibiting rejection thoughts [5, 7]. Tending to have a strong desire for closeness, preoccupation with intimacy, and a fear of being alone, they are inclined to worry intensely about the availability of their partner and the degree to which their partner values them [5, 8]. As a result, they are apt to be hyper-vigilant and extra-sensitive towards possible relationship threats and tend to exaggerate physical and psychological threats [5, 7]. In contrast, individuals higher in attachment avoidance are frequently uncomfortable with physical and emotional intimacy [9]. Often, they do not completely trust close others, preferring to depend on themselves [5, 10]. Fearing that bids for proximity, comfort, and support will result in rejection or punishment from close others, these individuals tend to consider support seeking as counterproductive to reducing distress [11]. Therefore, they tend to withdraw from others when distressed and are inclined to avoid attending to emotional information [5, 10]. These tendencies in anxious and avoidant individuals can be subconscious and often influence an individual's interactions with social information [5].

Individual differences in attachment style are manifest in cognitive-behavioral differences that affect the way individuals process, interpret, and respond to emotional and interpersonal information. For example, attachment-style differences can bias the way individuals interpret and explain negative interpersonal interactions [12]. Differences in attachment style can affect the type and amount of information recalled from stories of loss and the type of emotional words recalled [13–15]. In addition, attachment style differences influence sensitivity and accuracy when judging facial expressions, expression changes in face-morphing tasks, and the speed at which positive or negative words are identified [16, 17]. Attachment style also influences the type of information that captures an individual's attention.

Research has shown that attachment style and emotion interact in the context of attention, but the nature of the interactions have been mixed. For example, research using the emotional Stroop task to track reaction times to positive, neutral, and threatening words showed that individuals higher in attachment anxiety displayed longer reaction times for threatening words compared to positive and neutral words [18]. This is interpreted to mean threatening words captured anxious individuals' attention more than positive or neutral words. In contrast, a dot-probe study indicated that individuals higher in attachment anxiety or attachment avoidance inhibited attention towards negative attachment-related words [19]. However, a second study showed individuals higher in attachment anxiety attended more strongly to the names of attachment figures compared to the names of non-attachment figures, acquaintances, or strangers [8, 19]. Anxious attachment has been associated with heightened attention towards attachment-related words over nonattachment-related ("general") words under stressful and non-stressful conditions whereas secure individuals show increased attention to attachment-related words only under stressful conditions [20]. The construct of attachment avoidance has been associated with diminished or suppressed attention toward attachment related information [8, 21]. Edelstein and Gillath found the same pattern of avoidantly-attached individuals suppressing attention towards both positive and negative attachment-related material compared to general emotional material; however, this pattern held only for individuals currently in a romantic relationship [22]. In all of these studies, attention was measured indirectly by measuring distraction away from a task. Attention allocation can also be measured directly using event-related potentials (ERPs).

The ERPs are very small voltages generated by the brain in response to specific sensory, cognitive, and motor events or stimuli. They reflect electroencephalographic (EEG) changes and indicate attention, processing, or memory activity, providing information about the amount of processing resources an individual is using. Event-related potentials (ERPs) have a variety of components that are extracted from the EEG using

averaging techniques [23]. These components reflect brain activity occurring at different times (in ms) after a stimulus has been presented [23]. Various components of ERPs have been used to study assorted aspects of information processing in the context of attachment, such as semantic processing and visual processing [24, 25]. The late positive potential (LPP) component is employed to study attention allocation as a function of stimulus emotionality, with more arousing stimuli causing higher LPP amplitudes [26]. The LPP has been used to track the allocation of attention to emotional stimuli in the context of attachment [27–29]. In a study using images of people, Chavis and Kisley found that individuals higher in attachment avoidance showed stronger LPP amplitudes towards negative images compared to positive images, indicating more attention directed towards negative images [27]. On the other hand, attachment-anxious participants showed stronger LPP amplitudes towards positive images, demonstrating heightened attention towards positive pictures. Zilber, Goldstein, and Mikulincer found individuals higher in attachment anxiety had higher LPP amplitudes for negative images compared to neutral and positive images, signifying that negative images commanded more attention for individuals stronger in attachment anxiety whereas highly avoidant individuals showed no differences in LPP amplitudes [28]. These findings illustrate that mixed results also occur when using ERPs to directly measure attention allocation in the context of attachment. A possible explanation may be that the attachment-related nature of stimuli has not been well-isolated to date.

In an effort to control for the variability in attachment-related stimuli, the current study carefully isolated attachment-related and nonattachment-related (general) emotional words, controlling for valence, arousal, word length and word frequency. The allocation of attention towards these words as a function of attachment style was measured using the LPP component. The use of the LPP component of ERPs has the advantage of directly measuring the immediate allocation of attention towards a stimulus, and it has been shown to be sensitive to the emotional content of stimuli [30]. Participants viewed positive and negative general and attachment-related emotional words presented in the context of primarily neutral words, categorizing all words as positive, negative, or neutral while ERPs were recorded. We predicted individuals higher in attachment anxiety would show elevated attention (larger LPP responses) to threatening attachment-related information compared to general emotional information. Since Edelstein and Gillath found that romantic relationship status influenced responses to attachment-related stimuli, we predicted an interaction between relationship status and attachment style [22]. Given that individuals with anxious attachment tend to be particularly attentive to attachment related threats, we expected that attachment threatening material would be particularly salient to anxious individuals currently in a relationship thus garnering elevated levels of attention [5]. In general, research has not found strong effects of attention towards emotional stimuli for individuals higher in attachment avoidance. Additionally, theory suggests that avoidantly attached individuals utilize deactivating strategies when faced with emotionally distressing material in which they suppress or exclude thoughts and feelings of neediness or vulnerability from their awareness [5]. For these reasons, we did not make a directional prediction for the effect of attachment avoidance on attention allocation to emotional words.

MATERIALS AND METHODS

Participants

A total of 33 undergraduate university students received extra credit in exchange for their participation. Participants were recruited via SONA systems (SONA), a web-based software tool for participant management utilized by the University of Colorado, Colorado Springs. SONA provides psychology students with descriptions of psychology studies currently available for participation, enabling students to sign-up for studies of their choosing. Participants' ages ranged from 18–35 years (M = 21.24 years; SD = 3.51; 27 women, and 6 men). Participants were pre-screened for the use of English as their primary language and for the use of mood medications. The Snellen visual acuity chart was used to verify participants' ability to read the words presented on the computer screen. All participants tested 20/40 or better utilizing either natural or corrected-to-normal vision. Each participant rated words for subjective valence while behavioral and electrophysiological data were recorded.

Materials

Words were presented on a 17-inch LCD monitor approximately three feet from the participant. E-prime software (Psychological Software Tools, Inc., Pittsburgh, PA) was used to present the words and record behavioral responses during the task. A photosensitive diode attached to the monitor enabled precise knowledge of stimulus presentation timing within one millisecond. Electroencephalographic (EEG) data were recorded using a 74-channel sintered Ag/AgCl electrode cap from Electrode Arrays (Electrode Arrays, El Paso, TX) connected to a multi-channel amplifier under control of data acquisition software (Sensorium, Inc., Charlotte, VT). Recorded data was converted into ERP waveforms and analyzed using EMSE software (Source Signal Imaging, Inc., La Mesa, CA).

Words were chosen from the Affective Norms for English Words manual (ANEW), a list of 1033 English words rated on bipolar valence (1 = most unpleasant to 9 = most pleasant; 5 = neutral) and arousal (1 = lowest to 9 = highest) [31]. Five general positive words (GP) (sunlight, vacation, joyful, triumphant, toy), five

general negative words (GN) (poverty, pollute, bloody, addicted, prison), five attachment-related positive words (AP) (affection, snuggle, loyal, loved, kindness), and five attachment-related negative words (AN) (lonely, jealousy, quarrel, rejected, unfaithful) were chosen based on valence, arousal, frequency, and word length using the norms provided in the ANEW (Table 1). These target words were presented in the context of 83 neutral words selected from the ANEW with an average valence of 4.95 and an average arousal rating of 3.86 [31].

Participant levels of attachment anxiety and attachment avoidance were assessed using the 36-item self-report Experiences in Close Relationships, Revised Inventory (ECR-R) [32]. Participants rate their degree of agreement or disagreement with each item using a 7-point Likert-type rating scale (1 = strongly disagree, 4=neutral/mixed, 7 = strongly agree). The reliability, and convergent and discriminant validity of the ECR-R was confirmed by Sibley, Fischer, and Liu [33].

General state and trait anxiety was assessed using the State Trait Anxiety Inventory (STAI) [34]. Participants indicated how strongly they were experiencing a particular feeling at the moment (state anxiety) and how often they experienced a particular feeling in general (trait anxiety) using a 4 point Likert scale. For state anxiety, 1 = not at all, 2 = somewhat, 3 = moderately so, and 4 = very much so. For trait anxiety, 1 = almost never, 2 = sometimes, 3 = often, and 4 = almost always. Spielberger et al. have demonstrated acceptable test-retest reliability (Chronbach's alpha from 0.76 to 0.86) and internal consistency (0.86 to 0.95) for the trait anxiety subscale for a period of 20 days and (0.73 to 0.77) for a period of 104 days [34].

After completing the recording paradigm, participants rated each of the 20 target words using the Self Assessment Manikin instrument (SAM), a Likert-type scale using graphic figures to represent ratings of emotional valence and arousal [35].

Procedure

Part one of this two-part study occurred on-line. Participants completed an informed consent and demographics form. They then completed the Experiences in Close Relationships, Revised (ECR-R) questionnaire followed by a distractor task and then the State Trait Anxiety Inventory for adults (STAI). Upon completion of these questionnaires, participants were directed to sign up for part two, the laboratory portion of the study.

Prior to beginning the laboratory task, an electrode cap was fitted to the participant's head and each metal electrode was filled with conductive gel to facilitate electrical conductance between the electrodes and the scalp. In addition to standard electrode positions from the International 10-20 system, electrodes were also directly applied to positions lateral and superior to the eyes to record eye movements and blinks, which can corrupt ERP signals of interest. Impedances were kept below 10 kΩ to reduce recording artifacts, and all channels were referenced to the left mastoid. Electrophysiological data and stimulus presentation timing data were continuously recorded at a rate of 2000 Hz.

Participants completed a word rating task using a three-button computer mouse while seated in a recliner. On each trial, an asterisk appeared on the screen for 1 s, then a word appeared for 1 s followed by a response screen containing cues reminding the participant of the three category choices (positive, negative, or neutral). Participants indicated whether they considered the word of interest as positive, neutral, or negative using a three-button mouse. If no response was provided within 5s, the paradigm progressed to the next word. Words were shown in blocks of five words consisting of four neutral words with a target word in the third, fourth, or fifth position. Blocks were separated by pauses, with the pause duration controlled by the participant. Blocks were presented in a predetermined pseudo-random order. The sequence of blocks appeared twice for a grand total of 120 blocks. Each word category (GP, GN, AP, AN) contained five target words, and each target was presented a total of 6 times during the task, resulting in 30 presentations of each word type.

Analysis

Behavioral, subjective, and ERP measures were analyzed separately. Behavioral measures included button-press accuracy and response time. Analysis of subjective ratings confirmed successful manipulation of word emotionality. For the ERP analysis, four separate average waveforms were computed for each participant based on the four word categories (GP, GN, AP, AN). Single trial waveforms greater than ±150 μV were excluded from the average waveform computation because they are indicative of excessive artifact (movement or eye blinks). A minimum of 5 acceptable single trials for every target word category was necessary for a participant to be included in further analysis. The peak LPP amplitudes were measured by noting the highest amplitude occurring between 400 ms and 700 ms after stimulus onset. The LPP waveform is typically measured at PZ, the central parietal electrode, where it is maximal, and is associated with attention allocation [36].

RESULTS

Behavioral and Subjective Measures

Behavioral ratings (button-press accuracy and response time) collected during the experiment, and subjective ratings (SAM arousal and valance ratings) collected after the experiment were analyzed to ensure successful task performance and to act as a manipulation check (mean values in Table 2). Button-press accuracy analysis indicates a high overall accuracy rate (above 90% for all word types) confirming successful task

performance. There was a significant interaction between emotion and attachment, $F(1, 32) = 4.55$, $p = 0.041$, partial $\eta^2 = 0.125$, where the button-press accuracy for attachment positive words reached 98%. Response time analysis showed no main or interaction effects. Analysis of subjective ratings confirmed successful manipulation of word emotionality. For word valence, there was a main effect for emotion, $F(1,31) = 634.23$, $p < 0.001$, $\eta^2 = 0.952$, with positive words rated as significantly different from negative words. There was also an interaction effect for emotion by attachment, $F(1,32) = 7.03$, $p=0.012$, $\eta^2 = 0.180$, with positive attachment-related words rated as more positively valenced than general positive words. Arousal ratings showed a main effect for emotion, $F(1, 31) = 13.61$, $p = 0.001$, partial $\eta^2 = 0.298$, with positive words rated as more arousing than negative words.

Electrophysiological Measures and Statistical Analysis

Participant attention towards words was tracked using the LPP component of ERPs. The across-participants averaged LPP response to each word type is illustrated in Figure 1. Regression analysis was employed to determine the relationship between LPP amplitude and attachment variables. Prior to analysis, the criterion variables, attachment bias and general bias, were calculated by subtracting the peak amplitude for the negative attachment words from the peak amplitude for the positive attachment words and the peak amplitude for general negative words from the peak amplitude for general positive words, respectively. For both calculated variables, a positive value indicates increased attention allocation to the positive words and a negative value indicates increased attention allocation to the negative words. Descriptive statistics of the variables are given in Table 3. Correlations were conducted between participants' scores on the two sub-scales of the STAI and the two subscales of the ECR-R (Table 4). Since trait anxiety and attachment anxiety were significantly correlated, trait anxiety was included in the analyses.

Relationship status was dummy-coded so that "0" indicated the participant was in a relationship and "1" indicated the participant was not in a relationship. The continuous variables, trait anxiety (as measured with the STAI), and attachment anxiety and attachment avoidance (both measured with the ECR-R) were centered at their means. Since evidence indicates adult attachment style has more relevance and effect on various outcome variables when people are in a relationship, interaction terms were then calculated by multiplying participants' attachment anxiety score by their relationship status and their attachment avoidance score by their relationship status [22]. Table 5 is the correlation matrix of the continuous variables that were analyzed.

Two hierarchical multiple regressions (one with the criterion variable of attachment bias and the other with the criterion variable of general bias) were performed testing the main effects of relationship status, attachment anxiety, attachment avoidance, and trait anxiety in the first step and the effects of the interaction terms in the second step. Table 6 and Table 7 depict the output from the hierarchical regressions for general bias and attachment bias, respectively. The first model containing relationship status, trait anxiety, and attachment anxiety and avoidance only explained about 2% of the variance in general bias, $F(4, 28) = 0.12$, $p = 0.98$. Addition of the interaction terms resulted in a model that accounted for about 6% of the variance in general bias, $F(6, 26) = 0.27$, $p = 0.95$. Eleven percent of the variance in the attachment bias could be accounted for by the first model, $F(4, 28) = 0.83$, $p = 0.52$. The model resulting from the inclusion of the interaction terms accounted for 39% of the variance in attachment bias, $F(6, 26) = 2.71$, $p = 0.035$. Adding the two interaction terms in step 2 resulted in an increase in R^2 of $\Delta R^2 = 0.28$, $F(2, 26) = 5.91$, $p = 0.008$.

Standardized multiple regression coefficients for the six predictors of attachment bias can be seen in Table 7. The only predictor variable that had a beta weight that was significantly different from zero was the attachment anxiety by relationship status interaction, $\beta = 0.60$, $p = 0.003$. To further understand this significant interaction, regression lines depicting the attachment anxiety and LPP amplitude relation were plotted for individuals in a relationship and individuals who were not in a relationship (Figure 2) [37]. As attachment anxiety increased, individuals in a relationship had greater LPP amplitude for the negative attachment-related words, while single individuals had greater LPP amplitude for the positive attachment-related words.

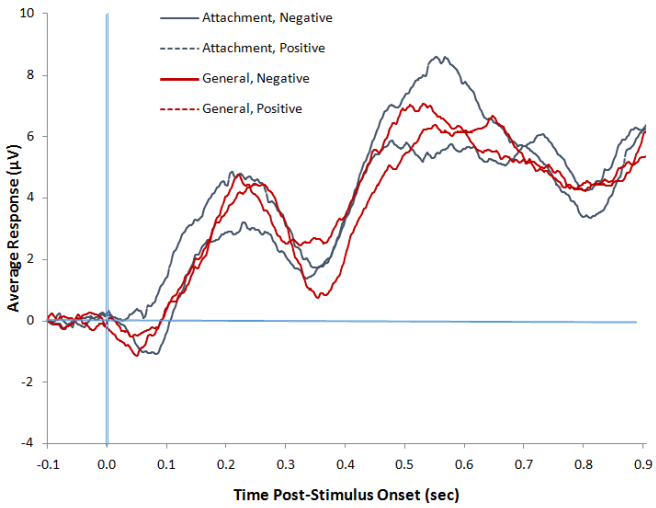

Figure 1: Grand-average (across-participants) average ERP waveforms separated by valence (positive and negative) and word-type (attachment and general). Word stimulus onset was at time 0 sec. These averaged waveforms are presented for illustrative purposes, but were not analyzed further. Peak LPP amplitudes subjected to regression analysis were measured from the individual ERP waveform for each participant separately.

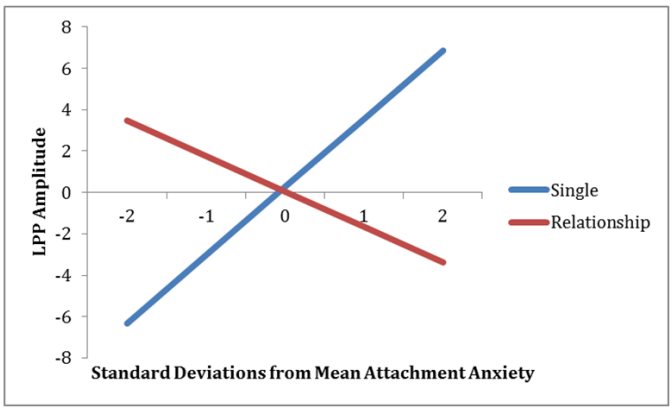

Figure 2: The relationship between attachment anxiety and LPP amplitude for attachment-related words.

DISCUSSION

The current study sought to explore individual differences in attention allocation to attachment-related and general emotional words in persons with differing levels of attachment anxiety and attachment avoidance. Results from hierarchical regression showed that adult attachment style and relationship status interact to predict attention (as measured by LPP amplitudes) to attachment-related words but not to general emotional words (the regression controlled for STAI trait anxiety). The interaction between attachment anxiety and relationship status was statistically significant, allowing prediction of attention allocation toward attachment-related words, whereas the interaction between avoidance

Table 1: Means (SD) for ANEW valence, arousal, frequency, and word length

Word Category	Valence M (SD)	Arousal M (SD)	Frequency M (SD)	Word Length M (SD)
General Positive	7.99(0.672)	5.92(0.614)	14.8(19.0)	7.00(2.65)
General Negative	2.20(0.503)	5.57(0.716)	14.8(16.9)	6.80(0.837)
Attachment Positive	8.06(0.442)	5.33(1.58)	28.0(26.6)	6.80(1.79)
Attachment Negative	2.23(0.533)	5.95(0.806)	16.6(13.7)	7.80(1.48)

Note. The norms for these words were taken from the ANEW [31].
Abbreviations: Mean (M); Standard Deviation (SD)

Table 2: Means (M) and standard deviations (SD) for LPP amplitude, behavioral, and subjective ratings for attachment-related and nonattachment-related words

Variable	Emotion	Attachment-Related M (SD)	Nonattachment-Related M (SD)
LPP amplitude (μv)	Positive	13.67 (6.97)	12.63 (6.62)
	Negative	13.32 (6.80)	12.63 (5.86)
Button-press accuracy (%)	Positive	98.08 (3.91)	90.61 (14.01)
	Negative	90.71 (15.02)	91.52 (16.37)
Response times (ms)	Positive	590.69 (249.62)	640.43 (243.01)
	Negative	629.49 (258.45)	633.44 (243.36)
SAM Arousal	Positive	6.07 (1.89)	6.23 (1.71)
	Negative	5.18 (1.38)	4.79 (1.47)
SAM Valence	Positive	8.22 (0.78)	7.73 (0.86)
	Negative	2.13 (0.96)	2.27 (1.06)

Abbreviations: Microvolt (μV); Millisecond (ms); Mean (M); Standard Deviation (SD)

Table 3: Means and standard deviations of analyzed variables

Variable	M	SD
STAI Trait	40.85	11.07
ECR-R Anxiety	3.17	1.09
ECR-R Avoidance	2.59	1.01
Attachment Bias	0.35	4.29
General Bias	0.005	3.97

Note: Bias measures were obtained by subtracting the peak amplitude for the negative words of each type (general or attachment) from the peak amplitude for the corresponding positive words.
Abbreviations: Mean (M); Standard Deviation (SD); State-Trait Anxiety Inventory (STAI); Experiences in Close Relationships-Revised (ECR-R)

Table 4: Correlations among the STAI and ECR-R variables

Variable	1	2	3	4
STAI State	1			
STAI Trait	0.67**	1		
ECR-R Anxiety	0.30	0.56**	1	
ECR-R Avoidance	0.26	0.16	0.12	1

Note. $N = 33$. $^{**}p < 0.01$.
Abbreviations: State-Trait Anxiety Inventory (STAI); Experiences in Close Relationships-Revised (ECR-R)

Table 5: Correlations for the variables used in the regressions

Variable	1	2	3	4	5	6	7
STAI Trait	1						
ECR-R Anxiety	0.56**	1					
ECR-R Avoidance	0.16	0.12	1				
Anxious * Relationship	0.20	0.51**	0.1	1			
Avoidance * Relationship	0.07	0.10	0.59**	0.18	1		
Attachment Bias	-0.29	-0.20	-0.18	0.36**	0.03	1	
General Bias	-0.06	-0.12	-0.6	-0.03	0.11	0.14	1

Note: $N = 33$. STAI Trait, ECR-R Anxiety and Avoidance are centered at their means. $^{**}p < 0.01$
Abbreviations: State-Trait Anxiety Inventory (STAI); Experiences in Close Relationships-Revised (ECR-R)

and relationship status was not significant. Evaluation of the significant interaction showed that individuals higher in attachment anxiety who were currently in a romantic relationship (partnered) allocated more attention to negative attachment-related words while individuals higher in attachment anxiety who were not in a romantic relationship (single) directed more attentional resources toward positive attachment-related words.

The result for partnered individuals higher in attachment anxiety supported our prediction and accords with current literature indicating that anxiously attached individuals tend to direct more attention toward threatening material. Bailey and colleagues demonstrated this result in their study using the emotional Stroop, while Zilber, Goldstein, and Mikulincer's use of the LPP showed that general negative images garner more

Table 6: Results from hierarchical multiple regression: Predicting attention allocation to general words

				Model 1		Model 2	
Step	**Predictors Added**	**Model R^2**	**ΔR^2**	**β**	***p***	**β**	***p***
1		0.02	0.02				
	Relationship Status			-0.02	0.94	-0.10	0.68
	STAI Trait			0.02	0.95	0.01	0.96
	ECR-R Anxiety			-0.12	0.60	-0.13	0.63
	ECR-R Avoidance			-0.04	0.84	-0.17	0.49
2		0.06	0.04				
	Avoid x Relationship					0.27	0.30
	Anxious x Relationship					0.004	0.99

Note: STAI, ECR-R Anxiety, and ECR-R Avoidance were all centered at their mean
Abbreviations: β = Standardized multiple regression coefficient; State-Trait Anxiety Inventory (STAI); Experiences in Close Relationships-Revised (ECR-R)

Table 7: Results from hierarchical multiple regression: Predicting attention allocation to attachment-related words

				Model 1		Model 2	
Step	**Predictors Added**	**Model R^2**	**ΔR^2**	**β**	***p***	**β**	***p***
1		0.11	0.11				
	Relationship Status			0.04	0.86	0.02	0.9
	STAI Trait			-0.24	0.30	-0.15	0.43
	ECR-R Anxiety			-0.05	0.83	-0.40	0.07
	ECR-R Avoidance			-0.15	0.46	-0.24	0.24
2		0.39*	0.28**				
	Avoid x Relationship					0.10	0.63
	Anxious x Relationship					0.60	0.003

Note: STAI, ECR-R Anxiety, and ECR-R Avoidance were all centered at their mean. *$p < 0.05$, **$p < 0.01$
Abbreviations: β = Standardized multiple regression coefficient; State-Trait Anxiety Inventory (STAI); Experiences in Close Relationships-Revised (ECR-R).

attention than positive images from anxiously attached individuals [18, 28]. However, this result is not universal, as shown by Chavis and Kisley, where anxiously attached individuals did not attend more to one type of image (negative or positive) over another [27]. Both Chavis and Kisley, and Zilber et al. used general positive and negative images; however, Chavis and Kisley's images included more complex images, and images of people, which makes it difficult to know precisely what specifics of the image content influenced individual responses [27, 28]. The current study was designed to separate general from attachment-relative information using words to focus content and meaning rather than images. Results from this study confirmed attachment theory predictions and current literature findings that individuals higher in attachment anxiety allocate more attention to threatening material. In addition, the careful isolation of stimulus type showed that this finding is specific to attachment-related threatening material rather than general threatening material in anxiously attached individuals currently in a relationship. This finding concurs with Mikulincer and Shaver who explain that anxiously attached individuals

tend to be hyper-vigilant towards attachment-related threat [5].

The result for single individuals showing that individuals higher in attachment anxiety directed significantly more attention towards positive attachment-related words was not predicted. The relationship between single individuals, attachment anxiety, and an attentional preference for positive attachment-related material has not been noted in research to date. This result may be explained by keeping in mind that personally relevant information or information that carries a strong emotional content for an individual captures that individual's attention. Mikulincer and Shaver state that anxiously attached individuals tend to have a strong desire for closeness and protection [5]. It is possible that single individuals higher in attachment anxiety may be overly preoccupied with the desire for a relationship that will provide them with an emotionally supportive partner, and are, therefore, particularly attentive to positive attachment material. Since they are not currently in a relationship, negative attachment material may not be particularly relevant to them, they may feel less threat by it, and therefore do not give it an elevated amount of attention.

These results must be considered in light of several study limitations. Importantly, the sample size (33) was somewhat small (68 participants would have been necessary to achieve a level of power equal to 0.80 with an alpha level of 0.05 and an expected moderate effect size of R^2= 0.15 as calculated using G*Power [38]). Additionally, the research sample was fairly narrow, reflecting primarily females (80%) with an average age of 21 years (standard deviation of 3.5 years). Hence, the results are not necessarily generalizable for men in a similar age group, and results give little information about attachment and attention allocation in middle aged and older adults. The number of single individuals in the study sample was small. An additional limitation concerns the words considered as having attachment-related content. In order that emotional valence and arousal could be controlled, word choices were restricted to words falling within specific parameters in the ANEW word list [31]. Not all words used in previous attachment research were present in the ANEW, and so the word choices for attachment content were limited for the present study. Pilot studies assessing the valence and arousal of additional attachment-related words would benefit future research focused on attentional responses to carefully controlled word choices.

CONCLUSION

In conclusion, the present study sought to explore the relationship between attachment style, relationship status, and attention to emotional words. Results showed that attachment style, specifically anxious attachment and relationship status interact, yielding unique attentional patterns to attachment-related words, with single anxious individuals attending more to the positive attachment words whereas partnered anxious individuals attended more to negative attachment words. This implies that the relationship between attachment style and cognitive-behavioral processing appears to depend on whether or not an individual is currently in a romantic relationship.

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Laura M. Lathrop – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published
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Conflict of Interest
Authors declare no conflict of interest.

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