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An Insecure Base: Attachment Style and Orienting Response to Positive Stimuli

Claire I. Yee & Michelle N. Shiota

Arizona State University

Date of Submission: January 29, 2015

Corresponding Author:

Claire I. Yee
Department of Psychology
Arizona State University
P.O. Box 871104
Tempe, AZ 85287-1104
Tel: (480) 727-8628
Fax: (480) 965-8544
Email: ciyee@asu.edu

Word count: 3238 (main text + authors' note) plus 123-word abstract, 34 references, and 2 tables

Abstract (123 words)

In adults as in infants, psychological attachment to close others provides a “secure base” for exploration and pursuit of opportunities. Insecure attachment is likely to interfere with this function. The present study examined the association of individual differences in adult attachment style with peripheral physiological measures of automatic orienting to several kinds of positive, rewarding stimuli. Attachment style was largely unrelated to extent of heart rate deceleration in response to the appearance of positive emotion-eliciting images. However, attachment avoidance was associated with reduced skin conductance responding to the onset of several kinds of positive stimuli. These findings suggest that working models of relationships with close others have complex implications for the early stages of responding to opportunities for reward presented by the environment.

Keywords: Adult attachment, physiological orienting, autonomic nervous system, reward, emotion

An Insecure Base: Attachment Style and Orienting Response to Positive Stimuli

From infancy through adulthood, emotional attachments to caregivers and close relationship partners support our development, achievement, and well-being (Ainsworth, 1989). An innate “attachment system” is thought to help newly mobile infants manage the tradeoff between their drive to explore the environment and their need to remain close to caregivers’ protection (Bowlby, 1969; Hamburg, 1969). Among adults, attachments to committed romantic partners and intimate friends are thought to reflect engagement of this same system (Hazan & Shaver, 1994). Like children, adults seek to maintain proximity to their attachment figures, who provide both a “secure base” for exploration and a “safe haven” in times of stress (Fraley & Shaver, 2000; Mikulincer & Florian, 1998).

A rich body of research has documented the proximity-seeking and safe haven aspects of attachment in adulthood (e.g., Collins & Feeney, 2000; Feeney & Kirkpatrick, 1996; Fraley & Shaver, 1998; McGowan, 2002; Mikulincer, Gillath, & Shaver, 2002). The secure base aspect has received somewhat less attention. However, research suggests that secure attachments do facilitate adults’ pleasurable approach of their environment (e.g., Feeney, 2004; Mikulincer, Hirschberger, Nachmias, & Gillath, 2001). The extent of this effect depends on the individual’s “attachment style,” or mental model of relationships with close others. Those with a secure attachment style, or positive expectation of close others’ accessibility and responsiveness, show stronger secure base behavior than those who experience strong and frequent fear of abandonment (attachment anxiety) and/or who are uncomfortable depending on others at all (attachment avoidance; Hazan & Shaver, 1987). Just as securely attached children engage more eagerly with new toys and playmates when assured of their caregivers’ proximity (Main, 1983), adults with a more secure attachment style show higher levels of sociability and confidence in

approaching work-related challenges (Hazan & Shaver, 1990). In contrast, individuals with insecure attachment styles show less exploration, pursuit of opportunities, and even reward-related neural responding to positive social stimuli (Ainsworth, Bell, & Stayton, 1972; Mikulincer, 1997; Mikulincer & Sheffi, 2000; Vrticka, Andersson, Grandjean, Sander & Vuilleumier, 2008).

Does insecure attachment compromise automatic attention toward opportunities for reward in the environment, as well as overt tendency to approach such opportunities? This question is difficult to address with either self-report or behavioral measures. Self-report measures require participants to have a degree of insight about their own attentional tendencies relative to others that they are unlikely to possess, and behavioral measures may not be able to tease these two processes apart. The present study addressed this question by examining peripheral psychophysiological responses of individuals varying in trait attachment security to positive visual stimuli. The autonomic “orienting response” is observed in the first few seconds after onset of a novel, motivationally salient stimulus and includes two components: cardiac deceleration mediated primarily by parasympathetic nervous system influence on the heart, and a skin conductance response mediated by sympathetic nervous system influence on the sweat glands (Barry, 1982; Bradley, 2009; Lacey & Lacey, 1978). We asked whether dispositional attachment anxiety and/or avoidance was associated with extent of cardiac deceleration and/or skin conductance responding in response to the onset of several kinds of positive, rewarding stimuli. Because both anxiety and avoidance should compromise the secure base aspect of attachment, we expected that either aspect of insecurity might be associated with weaker orienting responses to rewarding images. Our aim was to assess the aspects of orienting toward opportunities that might characterize an insecure base.

Methods

Participants

Participants were 43 undergraduates enrolled in an Introductory Psychology course at a large Arizona university, who received course credit plus \$25 (including an unexpected \$10 – see Procedures) for their participation. The study was advertised through the Psychology department “subject pool,” and interested students contacted the laboratory by email or telephone for screening and scheduling. Potential participants were excluded from the study if they were under age 18 years; aware of any cardiovascular disorder such as atherosclerosis, high blood pressure, or heart murmur; and/or allergic or sensitive to the adhesive tape used to attach sensors to participants’ skin. Participants were not screened for or selectively recruited based on attachment style. Four participants’ physiological data could not be used due to extreme signal noise (e.g., coughing) or experimenter error. Mean age of the remaining 39 participants was 18.84 years (range = 18-23); 74.4% were female, 59% European-American, 23% Latino, 10% African-American, 5% Asian-American, and 3% another ethnicity. With respect to mean age and gender distribution, this sample is comparable to those in other widely cited studies of attachment style, which commonly involve disproportionately female samples of undergraduate students (e.g., Feeney & Noller, 1990; Fraley, Vicary, Brumbaugh, Chloe, & Roisman, 2011; Mikulincer, Birnbaum, Woddis, & Nachmias, 2000).

Procedures

After consent and physiology sensor attachment, participants completed nine blocks of slide-viewing trials. Within each block, a 42” wall-mounted LCD monitor displayed an “X” for 60 seconds, followed by six consecutive slides shown for 15 seconds each. The first block of slides presented affectively neutral photos of household objects, used to acquaint participants

with the procedures; the remaining blocks were presented in a random order. Physiological data from five blocks are used in the present analyses: (1) a “lottery” game in which an initial slide shows five target numbers and a reward scheme, and the subsequent five slides show a growing set of matching “balls” leading to the maximum reward (\$10); (2) images of positive fictional childhood figures (e.g., Big Bird, Winnie the Pooh), pilot tested for appropriateness with this cohort; (3) photos of baby animals; (4) *Far Side* cartoons – single-panel comic images created by artist Gary Larson; and (5) panoramic nature photos.

All images were bitmap files scaled to the 640x480 pixel size, brightly colored and showing a foreground figure against a background (except the panoramic nature photos, which show only a complex background). Images presented in each block of slides were selected for this study based upon construct definitions for and previous research on five positive emotions that have been differentiated in recent studies – anticipatory enthusiasm, attachment love, nurturant love, amusement, and awe, respectively (e.g., Campos, Shiota, Keltner, Gonzaga, & Goetz, 2013; Griskevicius, Shiota, & Neufeld, 2010). For the present study, this set of emotions is of interest because the stimuli eliciting these emotions range from opportunities for material gain (lottery slides), opportunities for pleasant engagement with others (childhood figures and baby animals), and opportunities for intellectual/aesthetic reward (humor, panoramic views).

Because the current research question emphasizes the secure base aspect of attachment, for which only responses to positive, rewarding stimuli are relevant, and because the implications of attachment style for attentional and emotional responses to negative stimuli has already received research attention (e.g., attachment anxiety is associated with hypervigilance to threats; Shaver & Mikulincer, 2007), data from the neutral slide block and the three negative blocks (frightening, sad, disgusting images) were not included in the present analyses.

Measures

Cardiac Interbeat Interval (IBI). Physiological data were collected at a sampling frequency of 1000 Hz, using equipment supplied by Biopac and Mindware Technologies Inc., and Biopac's Acquisition software. The electrocardiograph (ECG) trace was acquired using a 3-lead configuration with electrodes on the left rib and right clavicle, and ground on the right rib. Mindware's IMP software module (version 2.51) was used to identify R-peaks on the ECG waveform and measure peak-to-peak intervals in milliseconds. Cardiac deceleration to the onset of each new slide was calculated by identifying the longest complete IBI occurring within 0-4 seconds of slide onset, excluding the IBI during which slide onset took place, and then subtracting the full IBI immediately preceding slide onset. Thus, more positive values indicate greater cardiac deceleration. Slide-level cardiac deceleration values were averaged across the six slides within each block, producing a block-level mean for subsequent analyses. Mean cardiac deceleration values are presented in Table 1. Given a starting mean heart rate of approximately 70 beats per minute, as was typical during these trials, the mean IBI change scores observed in the present study correspond to cardiac deceleration of approximately 1-3 beats per minute, consistent with the magnitude of the cardiac orienting response reported in prior research (Bradley, 2009).

Skin conductance response. Skin conductance responses (SCRs) were measured via a constant 0.5 V voltage passed between electrodes on the index and ring fingers of the nondominant hand, then filtered (10 Hz low-pass, DC high-pass) and amplified (gain of 5 microSiemens) by Biopac's GSR100C unit. Valid SCRs were defined using Mindware's EDA software module (version 2.51) as transient increases of .05 microSiemens or greater; prior research indicates that skin conductance orienting responses to affectively neutral stimuli are

typically in the .10 microSiemens range, thus this minimum threshold helps differentiate actual orienting responses from system noise. Orienting skin conductance response amplitude for the present study was defined as the trough-to-peak amplitude in microSiemens of the first valid SCR beginning 1-4 seconds after slide onset (Bradley, 2009). Only the first SCR over .05 was counted for each slide. Slide-level SCR amplitudes were averaged across the six slides within each block, with a “0” entered as the value when no valid SCR occurred, producing a block-level mean for subsequent analyses. Participant-level mean SCR amplitudes more than 3 standard deviations from the overall block mean were deleted and treated as missing data, in order to avoid undue influence of these outliers on tests of association with attachment style.

Descriptive statistics based on the remaining data are presented in Table 1 for both number of trials with a valid SCR per block and mean SCR amplitude. Valid SCRs to these images were low in frequency, averaging fewer than one per block of slides for all blocks except the “lottery” block; as a result, block-level mean SCR amplitudes are quite low compared to those reported in other research on the skin conductance orienting response (Bradley, 2009). However, there was a fair amount of variability in number of trials with valid SCRs across participants, and the great majority of trials with observed SCRs were in the .1-.2 microSiemens range expected based upon prior research (Bradley, 2009).

Attachment insecurity. After all slide-viewing trials, participants completed the Experiences in Close Relationships (ECR) questionnaire (Brennan, Clark, & Shaver, 1998) measuring attachment anxiety (18 items, Cronbach’s alpha = .879) and avoidance (18 items, Cronbach’s alpha = .915). Items contain statements about feelings regarding romantic relationships in general; agreement with each statement is rated on a scale from 1 (disagree strongly) to 7 (agree strongly). The anxiety subscale (mean = 3.97; SD = 1.05) measures

abandonment concern and belief that one's own feelings and desire for commitment are stronger than those of partners along a dimension of anxiety. The avoidance subscale (mean = 2.78; SD = 1.05) measures discomfort with intimacy, closeness and depending on partners on a dimension as well. In each case, higher scores reflect greater attachment insecurity; the ECR is not used to classify participants as categorically secure, anxious, or avoidant. Anxiety and avoidance ECR scores were normally distributed (skewness and kurtosis values all < 1.0) and comparable to those reported for other studies using this instrument with similar populations (e.g., Gillath, Shaver, Baek, & Chun, 2008; Shaver, Schachner, & Mikulincer, 2005; Brennan, Clark, & Shaver, 1998). Participants also completed additional questionnaire measures not relevant to the current research question.

Results

Analyses for each physiological measure of orienting (cardiac deceleration, SCR amplitude) involved three steps: (1) ECR anxiety and avoidance scores were entered simultaneously as covariates in a multivariate ANOVA with the target orienting measure from each of the five stimulus blocks entered as a dependent variable. This approach provides an omnibus test of the association of anxiety and avoidance with the orienting measure, averaged across stimulus blocks and controlling for multiple comparisons. (2) Anxiety or avoidance was entered as a covariate in a Repeated Measures ANCOVA with stimulus block treated as a within-subject variable, and the appropriate orienting measure entered as the dependent variable. This analysis provides a test of the significance of the interaction between attachment style and stimulus type in predicting orienting response amplitude. (3) Pairwise Spearman's correlations between each ECR scale and each orienting measure were calculated to examine associations of attachment anxiety and avoidance with orienting responses to specific kinds of positive stimuli

(non-parametric Spearman's correlations were used due to the modest positive skews remaining in the SCR amplitude distributions, even after outlier removal).

Neither attachment anxiety ($F[5,25] = .76, n.s.$) nor avoidance ($F[5,25] = .58, n.s.$) emerged as a significant predictor of cardiac deceleration magnitude in multivariate ANOVA. Repeated Measures ANOVAs also did not reveal significant interactions of stimulus block with attachment anxiety ($F[3.53,109.42] = .76$ with Greenhouse-Geisser correction, $n.s.$) or avoidance ($F[3.51,105.27] = .40, n.s.$) in predicting cardiac deceleration. In pairwise correlations (see Table 2), attachment anxiety was negatively associated with cardiac deceleration magnitude in response to the lottery game slides in a significant effect, and avoidance was negatively associated in effects that approached with cardiac deceleration to the lottery ($p = .081$) and childhood character slides ($p = .103$).

Attachment avoidance ($F[5,23] = 3.01, p = .031$), but not anxiety ($F[5,23] = .59, n.s.$), emerged as a significant omnibus predictor of SCR amplitude in multivariate ANOVA. Repeated Measures ANOVA also uncovered a significant interaction of stimulus block (i.e., slide type) with attachment avoidance ($F[1.92,53.82] = 5.63$ with Greenhouse-Geisser correction, $p = .007$), but not with anxiety ($F[1.80,52.11] = 1.26, n.s.$) in predicting SCR amplitude. The negative pairwise correlations of attachment avoidance with mean SCR amplitude were significant for lottery game slides and panoramic nature views, and approached significance for baby animals ($p = .080$) and *Far Side* comic cartoons ($p = .106$), but were near zero for childhood figures (see Table 2).¹ No correlation of attachment anxiety with SCR amplitude was significant or approached significance.

¹ Correlations of attachment avoidance with total number of SCRs, rather than mean SCR amplitude, show a highly similar pattern although effects do not reach significance using this less precise measure.

Discussion

Prior studies have demonstrated that individuals with insecure attachment styles show less behavioral exploration and pursuit of opportunities than individuals with more secure styles. This association is consistent with the proposal that attachments to close others provide a secure base supporting active engagement with potential rewards in the environment. The present study examined psychophysiological orienting to several types of positive stimuli, asking whether attachment anxiety and/or avoidance would predict low levels of orienting response. This hypothesized effect would highlight implications of attachment insecurity not only for overt behavior toward potential rewards, but also for the automatic attention and motivation processes the orienting response is thought to reflect (Barry, 1982; Bradley, 2009; Graham, 1979; Lacey & Lacey, 1978).

Results were partially consistent with this hypothesis. Multivariate analyses did not reveal significant omnibus effects of either attachment anxiety or avoidance on cardiac deceleration to various positive stimuli, nor was a consistent pattern of such associations observed in the pairwise correlations for specific stimulus blocks. The only correlations that were significant or marginally significant were those of both anxiety and avoidance with cardiac deceleration to the lottery game slides. Based on comments from participants during debriefing, we suspect that attachment-insecure participants were less likely to believe that they would actually receive the money promised by these slides, so their attention was less fully engaged.

Attachment insecurity did show the hypothesized negative association with amplitude of skin conductance responding to the onset of positive emotional stimuli, but this effect was limited to attachment avoidance. Higher levels of avoidance predicted significantly lower SCR amplitudes overall in multivariate analyses. While the significant interaction between avoidance

and stimulus block indicated that the predictive value of avoidance varied across different types of positive stimuli, pairwise correlations were significant or approached significance for four of the five blocks – lottery game, baby animals, humorous cartoons, and panoramic nature views – indicating an effect that generalized across material, affiliative, and aesthetic reward types. Scatterplots depicting these correlations show a consistent pattern in which participants low on attachment avoidance show the most skin conductance responding, while more avoidant participants show little or none. This effect was not observed for attachment anxiety.

It should be noted that these effects occurred despite the fact that the majority of slides within each emotion block failed to elicit a valid SCR response. The largest SCR amplitudes and number of trials with a response occurred in response to the “lottery” slides. The relatively strong SCR effects seen in the lottery game may have occurred because the stimulus represented an opportunity for an actual reward that the participant would acquire in the lab. SCR responding to the other blocks of slides was less frequent. Based on the study design, it is not yet clear whether this was because some types of positive stimuli (e.g., panoramic views, baby animals) inherently elicit less approach-oriented positive emotion than others (e.g., financial reward), or simply because the former opportunities are less attainable in the lab setting. Future research using should consider the possibility of an inherent range in SCR reactivity, depending on the type of positive stimuli presented.

The selectivity of association between attachment avoidance (and not anxiety) with the skin conductance responding (but not cardiac deceleration) aspect of the orienting response to positive stimuli raises interesting questions for future research. Previous research suggests that attachment-avoidant individuals engage positively with and rely on their relationship partners to a lesser degree than securely attached individuals (Collins & Feeney, 2000; Fraley & Shaver,

1998). The current findings suggest that this disengagement extends beyond close relationships to other kinds of potential rewards as well. It may be that attachment anxiety, while associated with hypervigilance to threat (Shaver & Mikulincer, 2007), does not interfere with engagement with positive, rewarding stimuli in the same way.

The limitation of most attachment style effects to skin conductance responding is also striking. While cardiac and SCR measures of orienting are commonly used together, and there is debate over their differential psychological significance, some theorists have proposed that they reflect somewhat distinct aspects of orienting. Cardiac deceleration may serve as a stronger marker of the intake of information, reflecting extent of attentional engagement with the stimulus (Barry, 1982; Bradley, 2009; Graham, 1979; Lacey & Lacey, 1978). Skin conductance responding is observed more consistently when preparation for action is required by the task (Barry, 1977; Bradley, 2009; Bradley, Lang, & Cuthbert, 1993), suggesting that it may be a stronger marker of action orientation or motivational significance.

Taking this distinction as a starting point, one possible explanation of our findings is that attachment-avoidant individuals attend automatically to positive stimuli but are less likely to appraise them as opportunities for reward, and therefore experience them as less motivationally salient. Another possibility is that more avoidant individuals attend to positive stimuli but experience greater ambivalence about the likely results of approaching these opportunities, Future studies might use implicit measures of attitudes to address this question.

Both the skewed gender distribution of the present sample and the young age of participants may limit generalizability of the findings. In particular, although like the present study the great majority of research on attachment style is conducted with young adults, more research is needed on how attachment style and its implications for psychosocial functioning

may change across adulthood. However, the present study takes an important step in examining where, specifically, the response to opportunities may be derailed among those lacking a secure attachment base.

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Authors' Note

Claire I. Yee and Michelle N. Shiota, Department of Psychology, Arizona State University.

Correspondence concerning this article should be addressed to Claire I. Yee, Department of Psychology, Arizona State University, P.O. Box 871104, Tempe, Arizona 85287. Email: ciyee@asu.edu

The authors offer heartfelt thanks to Samantha Neufeld, Stephanie Moser, Wan Heung “Ellen” Yeung, Elaine Perea, and Makenzie O’Neil for their extensive contributions to data collection and processing.

Table 1

Descriptive Statistics for Cardiac Deceleration, Number of Valid Orienting Skin Conductance Responses, and Skin Conductance Response Amplitude by Stimulus Block

Stimulus Block	Cardiac Deceleration mean (SD)	Number of Slides with Valid SCR mean (SD)	SCR Amplitude mean (SD)
Lottery Game	47.24 (36.87)	1.21 (1.44)	.030 (.047)
Childhood Characters	21.69 (41.87)	.74 (1.29)	.014 (.024)
Baby Animals	36.78 (37.00)	.53 (0.92)	.008 (.015)
<i>Far Side</i> Cartoons	45.69 (31.70)	.50 (0.76)	.008 (.017)
Panoramic Nature Views	36.79 (28.31)	.34 (0.78)	.004 (.009)

Note: Cardiac deceleration = (longest full IBI in first four seconds after slide onset) – (full IBI immediately preceding slide onset) in milliseconds. Number of Slides with a Valid SCR = total number of slides across the six slides in each stimulus block for which an SCR greater than or equal to .05 microSiemens occurred, starting 1-4 seconds after slide onset. SCR amplitude = mean trough-to-peak amplitude of SCRs starting 1-4 seconds after slide onset for each slide in the stimulus block, with “0” entered as value for slides without a SCR meeting the minimum .05 microSiemens threshold.

Table 2

Correlations of Attachment Anxiety and Avoidance with Mean Cardiac Deceleration and Amplitude of Skin Conductance Responses Across Slides in Each Block of Stimuli

Stimulus Block	Cardiac Deceleration		Skin Conductance Response Amplitude	
	Correlation With Anxiety	Correlation With Avoidance	Correlation With Anxiety	Correlation With Avoidance
Lottery Game	-.335*	-.295+	-.233	-.351*
Childhood Characters	-.225	-.284	.032	-.060
Baby Animals	.129	-.165	-.004	-.295+
<i>Far Side</i> Cartoons	-.087	-.004	-.166	-.278
Panoramic Nature Views	-.205	-.131	-.063	-.380*

⁺ $p < .10$; * $p < .05$; ** $p < .01$