Running Head: EMPATHY-RELATED RESPONDING

Empathy-related responses to moving film stimuli depicting human and non-human animal targets in negative circumstances.

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Abstract

Research supports an "ingroup empathy hypothesis" of higher empathy-related psychophysiological responses towards individuals of the same ethnicity. However, little research has investigated empathy-related responses to non-human targets graded for phylogenetic relatedness. Participants ($N = 73$) were presented with film stimuli depicting humans, primates, quadruped mammals and birds in victimized circumstances. Phasic skin conductance responses (SCR) and subjective empathy-related ratings to the film clips increased as phylogenetic similarity to humans increased across animal groups, revealing an empathic bias towards human stimuli. Participants also completed a trait empathy scale. High trait empathy participants gave higher subjective empathy ratings than moderate and low trait empathy participants. Low trait empathy participants showed less corrugator electromyographic activity than moderate and high empathy participants. The moderate trait empathy participants showed higher SCR than the high group. The results confirm an effect of phylogenetic similarity in subjective self-report and psychophysiological measures of empathy-related responses. Additionally, convergence between subjective and objective measures of empathy-related responses was observed.

Empathy-related responses to moving film stimuli depicting human and non-human animal targets in negative circumstances.

The link between inter-human and human-animal violence suggests that a lack of empathy demonstrated by some individuals is a general deficit not simply restricted to its expression towards other human beings (Ascione, 2001; Baldry, 2005; Beirne, 2004). Criminal record studies reveal that offenders with a history of animal abuse are also more likely to have a history of violent behavior (Merz-Perez, Heide, & Silverman, 2001) and concomitant anti-social behaviors, such as drug, public disorder and property offenses (Arluke, Levin, Luke, & Ascione, 1999). Given the growing volume of literature in this field, it appears that the amount of empathy shown towards animals may indicate a more general capacity for empathy and related prosocial behavior (Thompson & Gullone, 2003). Preliminary self-report empathy research currently supports a relationship between human-orientated and animal-orientated empathy (Paul, 2000). However, there is a need for improved objectivity in measures. Importantly, the theoretical link between inter-human empathy and empathy towards non-human animals highlights an opportunity for extended psychological research into empathic processes.

Empathy is argued to be an inductive affective and cognitively evaluative process (Hoffman, 2007) affording individuals a vicarious experience of others feeling states that informs and augments subsequent responses. Empathy as a general construct, however, has been difficult to quantify due to variations in definition and measurement (Duan & Hill, 1996; Preston & de Waal, 2002). The distinction between affective and cognitive components of empathy, and the role each plays, poses a continuing problem for researchers and theorists (Chlopan, McCain, Carbonell, & Hagen, 1985; Davis, 1994; Duan & Hill, 1996; Eisenberg & Strayer, 1987; Preston & de Waal, 2002). Despite this challenge, it is accepted that empathy-related emotional responses influence

outcomes in both autonomic nervous system activity (Bradley & Lang, 2000; Levenson & Ruef, 1992) and overt behavior (Eisenberg et al., 1989) that are subject to affective intensity and cognitive accuracy (Plutchik, 1990). Further, sympathy and pro-social behavior may be facilitated by the meta-processes of empathy as a core motivational component (Eisenberg et al., 1989; Thompson & Gullone, 2003).

The Perception-Action Model (PAM) of empathy (for full review, see Preston & de Waal, 2002) provides a broadly inclusive core model that affords a logical approach for the present research. The theoretical construct of "proximal" empathic processes posited by the PAM (considered biologically oriented and automatic in nature) suggest a focus on empathy-related "feeling states" as appropriate for some empathy investigations. Further support has been lent to this theory with the recent discovery of the mirror-neuron system and the role it may play in producing empathy-related responses (Carr, Iacoboni, Dubeau, & Mazziotta, 2003; Iacoboni & Dapretto, 2006). Additionally, the PAM of empathy outlines several other factors that may mediate empathy-related responding in people. One of these factors, "similarity", appears to be highly relevant when examining empathy directed towards both humans and animals.

Similarity influences empathic responding through the tendency of an observer to identify more closely with others who appear to be more similar to themselves in features such as personality (Gruen & Mendelsohn, 1986) and appearance (Brown, Bradley, & Lang, 2006). It may also apply to factors that increase the perception of similarity such as cultural likeness, sentience or social circumstance. Psychophysiological research focusing on inter-human empathic responding in a normal population has found support for a similarity effect (Brown et al., 2006) due to ingroup versus outgroup identification bias (Tajfel & Turner, 1979). Brown and colleagues (2006) showed African American and European American participants still pictures of

people of the same, or different, skin color. It was hypothesized that an "ingroup empathetic response" would be reflected in heightened skin conductance, increased startle blink magnitude, and increased corrugator supercilii muscle activity towards unpleasant same ethnicity pictures. Conversely, same ethnicity pleasant pictures should elicit heightened skin conductance and reduced startle blink magnitude and corrugator supercilli muscle activity. Consistent with the ingroup empathy hypothesis, African American participants showed increased corrugator activity to pictures of same ethnicity unpleasant pictures, while European American participants showed elevated skin conductance in response to same ethnicity pleasant and unpleasant pictures. Taken together, the results reported by Brown et al. (2006) provided some support for the conclusion that people show exaggerated affective (i.e., both pleasant and unpleasant) responses to more similar ingroup members than to less similar outgroup members. This finding implies that responses to aversive picture stimuli may be less affected by higher cognitive processing, but instead evoke the more affective proximal mechanisms of empathy-related responding as outlined in the PAM of empathy (Preston & de Waal, 2002).

Similarity effects may also be present in psychophysiological measures when non-human animal stimuli are graded along a continuum for phylogenetic similarity and compared with human stimuli. For example, psychophysiological affective responses towards birds, quadruped mammals, primates (non-human bipeds) and humans should increase accordingly as a function of similarity, if the similarity theory holds across species. Hills (1995) investigated the relationship between empathy towards animals and a belief in animal mind (BAM), which refers to the belief that an animal is capable of thinking and feeling to some extent. She hypothesised a positive relationship based on perceived similarity through the process of identification, which is seen to contribute

to empathic feelings. Six different emotion-eliciting scenarios were administered via printed text to farmers, urban dwellers, and animal rights activists. Evidence emerged of a similarity effect that appeared related to the evolutionary distance between humans and other species. Animals that were closer phylogenetically to humans (mammals) were rated higher in BAM than animals that were phylogenetically more distant (cold-blooded animals and invertebrates) (Hills, 1995). Further, perceived similarity contributed most towards empathy in the absence of instrumentality (i.e., the instrumental use of animals for human needs). For example, the farmers' empathic responses were higher for scenarios involving rhinoceros poaching than they were for those involving chickens or sheep. The similarity hypothesis as applied to different animal species remains untested in a psychophysiological experimental context.

The present research examined how indices related to human empathic responding vary across empathy eliciting scenarios depicting different groups of animals. Male and female participants were exposed to real-life film clips depicting victimized circumstances that were distressing, violent or oppressive. Moving film clips were used in order to maximize engagement with the targets and minimize ambiguity in facial expressions (Simons, Detenber, Reiss, & Shults, 2000; Simons, Detenber, Roedema, & Reiss, 1999; Weyers, Muhlberger, Hefele, & Pauli, 2006). The human-animal empathy link was tested using human stimuli alongside three classes of vertebrate non-human animals (birds, quadruped mammals, and primates), representing increasing degrees of similarity. It was hypothesized that a linear pattern of responses across increasing phylogenetic relatedness would be found for each of the subjective and psychophysiological measures of empathic responding, consistent with a similarity hypothesis. In addition, two groups were formed (companion and utilitarian) within the quadruped animal class to expose any possible effect of instrumentality. Dispositional

emotional empathic tendency was also investigated, consistent with Preston and de Waal's (2002) interpretation of proximal empathic mechanisms. Individuals classified as high in trait emotional empathy were expected to show generally higher responsiveness on all measures of empathic-related responding than individuals classified as moderate in trait empathy, who in turn, were expected to show greater responses than individuals classified as low in trait empathy. Finally, relationships between subjective and psychophysiological measures were assessed by correlational analyses, as they were expected to provide some convergent validity.

Experiment 1

Method

Participants

The sample of 73 participants ($M = 22.5$ years, $SD = 6.9$ years) consisted of 36 male and 37 female first year psychology and health science students over the age of 18 years who participated in return for partial course credit. All participants reported English as their first language and met pre-screening criteria for below moderate levels of depression, anxiety and stress according to the abbreviated version of the Depression Anxiety Stress Scale (DASS-21: Lovibond & Lovibond, 1995). Demographic characteristics reflected a relatively homogeneous sample with most participants reporting that they grew up in a semi-rural (30.1%) or suburban (49.3%) locale in contrast to a rural (15.1%) or urban (5.5%) locale. Similarly, most participants reported companion animal experience, either during childhood (27.4%) or adulthood only (5.5%), or throughout both childhood and adulthood (63%).

Apparatus

Participants completed the experiment individually in a sound attenuated room (Neumann & Waters, 2006). A Dell Optiplex Model GX270 computer presented the

task stimuli through a Panasonic Model PT-L557E LCD projector and recorded the subjective empathy ratings. Participants used the computer keyboard to enter subjective empathy ratings. A second Dell Optiplex Model GX270 computer interfaced with the first recorded physiological responses using Powerlab Model 4/20 (ADInstruments, Sydney) hardware and software and a 1000 Hz sampling rate.

Skin conductance responses, respiration, and corrugator muscle activity were recorded continuously throughout the experiment. Skin conductance responses were measured by attaching ADInstruments MLT116F electrodes to the distal phalanges of the first and second fingers of participants' non-preferred hand. The electrodes were connected to an ADInstruments Model ML116 GSR Amp. Respiratory influences on skin conductance were monitored via an ADInstruments Model MLT1132 Piezo Respiratory Belt Transducer placed around the participants' lower chest. Corrugator responses were recorded using a pair of 4-mm-diameter Ag/AgCl domed electrodes filled with Surgicon E10 electrolyte paste. The electrodes were placed over the *corrugator supercilii* (for corrugator) muscle in accordance with established guidelines for psychophysiological research (Blumenthal et al., 2005; Fridlund & Cacioppo, 1986; Stern, Ray, & Quigley, 2001). The set of electrodes was connected to an ADInstruments Bioamplifier and readings were acquired using a band pass setting of 500 to 30 Hz.

Trait empathy was measured using the Balanced Emotional Empathy Scale (BEES: Mehrabian, 1996) that utilized a nine point scale ranging from +4 to -4 (where -4 = "very strong agreement" and -4 = "very strong disagreement") to assess participants' level of agreement with statements of situations that are likely to elicit empathic emotions. Sample items from the scale include[1]: "I cannot feel much sorrow for those who are responsible for their own misery" and "Unhappy movie endings haunt me for hours afterwards".

The empathy-eliciting stimuli consisted of 10 s video vignettes of five animal groups (humans, primates, companion mammals, utilitarian mammals, and chickens) in distressing situations. Four clips for each of the five target groups, depicting as closely analogous situations as possible resulted in 20 clips. Each target group contained a scene showing a close up of a face (in pain), a scene of injury, a scene of confinement, and a scene of a victim being struck or roughly handled. These 60 cm high by 70 cm wide clips were projected onto a screen 2 m in front of participants. The clips were sourced from the internet and documentary video. From the same sources as the edited video clips, five color stills were produced and printed as 5 x 7 inch glossy photographs for use in the informed consent procedure. The images used as stills depicted analogous, but different, scenes to those in the main experimental stimuli. Five pleasant color pictures (1463, 1670, 811, 2091, and 1710) were sourced from the International Affective Picture System (IAPS: Center for the Study of Emotion and Attention (CSEA MIMH), 2001) and used as a visual debriefing tool in order to help ameliorate any lingering effects of viewing the potentially distressing images during the experiment.

Procedure

After providing informed consent, participants completed the DASS-21 and the BEES scales. Physiological recording sensors for corrugator EMG, skin conductance, and respiration were attached. After completing a three minute rest period, a definition of empathic ability was displayed as follows: *"What is Empathy? It is the capacity to which one is able to objectively enter into another's feelings and situation. This allows a vicarious experience and understanding of another's predicament."* Participants were visually cued on the screen with the written instruction "Please make rating now" after each film clip presentation to rate their level of empathic feeling using a scale of 0 to 9

(where 0 = *none* and 9 = *maximal response*) using a computer keyboard. Participants were instructed to separate any feelings of disgust from their ratings.

Film clips were presented in two blocks with each block containing one set of the 20 clips (i.e., 4 different vignettes of each of the 5 stimulus groups). All stimuli were presented in randomized order within each block, with the nature of the animal type depicted in the first clip in each block counterbalanced across participants. After viewing and entering an empathy rating response, a 20 to 25 s intertrial-interval elapsed, in which the screen was blank. Upon experiment completion, participants were visually debriefed by asking them to spend a few minutes viewing the IAPS pictures.

Data scoring

Subjective empathy ratings were averaged across the four film clips presented in each block, separately for each animal stimulus group. An unanticipated programming error resulted in a systematic pattern of missing data in that some participants did not receive all trial presentations. In most cases, this resulted in some participants only receiving one presentation of one or more film clips. No participant was missing more than 8 of the 40 clips presentations. Due to the error, extra participants were recruited, and analyses were performed to assess whether the ratings differed between the first and second presentations of each film clip in participants with complete data sets. Repeated measures t-tests with Bonferroni corrected $\alpha = .0025$ revealed no differences. This result is consistent with the research literature into the effects of repeated presentations of aversive/unpleasant picture stimuli (Bradley, Kolchakian, Cuthbert, & Lang, 1997). On this basis, missing ratings were replaced with those given for the same clips on a subsequent or previous presentation. This allowed means to be calculated that were weighted for each specific film clip within each animal type grouping while preserving individual integrity of participants' scores. The same process was applied for the

psychophysiological data. In the final sample, 67% of participants had complete data sets. The remaining portion of participants had data sets with some replaced data, the majority (80.3%) of which had one (10.7%), two (34.8%), or four (34.8%) replaced values from the total of 40 presentations. Only seven participants (24.9%) had between six and eight values replaced. Each set of data was then collapsed into a mean score for that animal group.

Corrugator EMG responses were scored as the difference between mean rectified corrugator supercilii signals present during the 10 s presentation of the film clip and the mean rectified signal level in the 1 s prior to film clip onset for non-probed vignettes. A positive change score indicates that corrugator activity was greater during the film clips than during the baseline period. A logarithmic transformation was applied [log10 (corrugator EMG + 3)] to normalize the positively skewed distributions prior to further analysis. Equipment failure resulted in missing corrugator EMG data for seven participants, thus, these participants were excluded from EMG analyses. The phasic skin conductance (SCR) response was scored as the magnitude of the distance between the trough and the peak of the curve to responses that began within 1 to 4 s after non-probed film clip presentations. Skin conductance responses were subjected to a square root transformation [SQRT (SCR + 1)] to normalize the distributions before statistical analyses (Venables & Christie, 1980). Respiration artifacts were examined during the scoring of skin conductance to control for spurious effects of throat clearing and coughing that may interfere with data integrity. Skin conductance was scored as missing if gross artifacts were present (e.g., Neumann, Lipp, & McHugh, 2004). According to this criterion, missing scores were negligible (.1 %).

Design

This experiment utilized a 3 x 5 (Empathy Group x Animal Type) mixed quasi-experimental factorial design. The between groups independent variable was Empathy Group (low: $M = 10.75$, $SD = 7.13$; moderate: $M = 39.42$, $SD = 7.13$; or high: $M = 67.32$, $SD = 12.17$) formed post hoc using a tertile division of BEES scores ($M = 39.55$, $SD = 25.89$, *Min-Max* = -20 – 89). The within groups independent variable was Animal Type (bird, utilitarian mammal, companion mammal, primate, and human). Dependent variables were subjective ratings of empathic feelings experienced, corrugator EMG level of change and phasic SCR. Preliminary comparisons to check for any effect of instrumentality on each dependent measure revealed no differences between companion mammals and utilitarian mammals (all p's > .077). Thus, these groups were collapsed into one new variable, "quadruped mammals", to simplify the statistical analyses. To determine the effects of empathy level (low, moderate, high) and type of animal stimulus (bird, quadruped mammal, primate or human) on the dependent measures, a series of 3 x 4 (Empathy Group x Animal Type) mixed factorial ANOVA's were conducted. Huynh-Feldt corrections were applied where sphericity violations were present. All hypothesis tests were evaluated against an α-level of .05.

Results

Data Screening

Correlations were calculated between BEES scores, DASS-21 subscale scores and absolute baseline skin conductivity in order to screen for any effect of sub-clinical influences of depression, anxiety, stress or physiological arousal, which may confound the interpretation of subsequent analyses. BEES scores were unrelated to levels of depression, anxiety, stress, or to baseline skin conductivity, all *r*'s < ± .14, all *p*'s > .23.

Effects of Empathy Group Membership and Animal Stimulus Type

Subjective empathy ratings. As shown in Figure 1, a main effect was present for animal stimulus type on subjective empathy ratings, $F(3, 182) = 25.62$, $p < .0005$, $\eta^2_P = .27$, and consistent with prediction, an increasing linear trend in subjective empathy ratings as animal groups became more similar to humans was supported, $F(1, 70) = 29.49$, $p < .0005$, $\eta^2_P = .3$. Subjective empathy ratings also differed between the low, moderate, and high empathy groups, as confirmed by a significant main effect for empathy group, $F(2, 70) = 13.94$, $p < .0005$, $\eta^2_P = .29$. Inspection of the 95% confidence intervals (CI) indicated that the high empathy group (95% *CI*: $6.19 < M = 6.7 < 7.26$) made significantly higher ratings than both the moderate (95% *CI*: $4.99 < M = 5.52 < 6.06$) and low groups (95% *CI*: $4.2 < M = 4.74 < 5.28$), which did not significantly differ.

-----------------------------Insert Figure 1 -----------------------------------

Corrugator EMG activity. Figure 2 shows that corrugator EMG activity significantly differed across the three empathy groups, $F(2, 64) = 3.46$, $p = .04$, $\eta^2_P = .1$. Subsequent inspection of 95% CI's revealed that the low empathy group (95% *CI*: $.55 < M = .62 < .69$) exhibited significantly less corrugator activity than the high group (95% *CI*: $.67 < M = .74 < .81$), but not the moderate group (95% *CI*: $.65 < M = .72 < .8$). Although an Empathy Group x Animal Type interaction was found, $F(5, 147) = 2.8$, $p = .02$, $\eta^2_P = .08$, no main effect of animal type was evident in corrugator activity, $F(2, 147) = 2.54$, $p = .07$, $\eta^2_P = 0.04$. As suggested graphically, simple effects analysis confirmed that the only animal group upon which no differences were found between the empathy groups was the primate group, $F(2, 64) = 2.34$, $p = .1$.

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

Phasic skin conductance response. As can be seen in Figure 3, there was a main effect for animal stimulus type on SCRs, $F(3, 187) = 11.88$, $p < .0005$, $\eta^2_P = .15$. Consistent with the hypothesis for a linear trend, higher SCRs were evident as phylogenetic similarity to humans increased, $F(1, 70) = 19.05$, $p < .0005$, $\eta^2_P = .21$. However, an unexpected pattern emerged with this measure in that responses tended to be similar in the low and high empathy groups and largest in the moderate empathy group. A main effect of empathy group, $F(2, 70) = 4.6$, $p = .01$, $\eta^2_P = .12$, confirmed this impression. The Games-Howell (Games & Howell, 1976) post hoc comparisons for groups with unequal variance indicated that no significant difference existed between the high and low groups (95% $CI_{(diff)}$: $-.14 < M_{(diff)} = .04 < .06$) or the moderate and low groups (95% $CI_{(diff)}$: $-.02 < M_{(diff)} = .01 < .21$). However, the moderate group showed significantly larger responses than the high empathy group (95% $CI_{(diff)}$: $.02 < M_{(diff)} = .13 < .25$).

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

Relationships Between Measures. BEES scores were positively correlated with overall subjective empathy ratings ($r = .6$, $p < .0005$) and corrugator activity ($r = .35$, $p = .004$) as expected, however no relationship was evident with SCR ($r = -.19$, $p = .11$). Additionally, subjective empathy ratings were positively correlated with corrugator activity ($r = .41$, $p = .001$). BEES scores, subjective empathy ratings and corrugator activity thus converged meaningfully.

Discussion

The present study examined subjective self-reported empathy ratings, corrugator EMG activity and phasic SCRs during film clips depicting humans and non-humans in oppressive circumstances. Significant linear trends indicating higher subjective empathy ratings of empathy and larger SCRs were found as the stimuli became closer in

phylogenetic relatedness to humans. The effect of animal type interacted with the trait empathy group for corrugator EMG activity. Taken together, the results suggest that empathic responding towards humans is generalized to other species. The greater the similarity of the species towards humans, the larger is the empathic response. The findings support the notion that there is a relationship between human empathy directed towards other humans and human empathy directed towards non-human animals (Paul, 2000). In the subjective empathy measure, it remains a possibility that demand characteristics influenced the ratings that were given and that these demand characteristics were not limited to the human stimuli. The finding of a similar linear trend across animal groups with the objective psychophysiological measure of SCRs, however, renders this explanation unlikely.

The subjective and psychophysiological measures during the film stimuli were also related to the level of trait empathy obtained from the BEES (Mehrabian, 1996). Subjective empathy ratings were higher and corrugator activity was greater for individuals classified as high in trait empathy than in individuals classified as low. In both cases, individuals with moderate levels of trait empathy yielded responses that were in between the high and low groups. The results are consistent with prior research findings showing increased corrugator activation to unpleasant stimuli (Dimberg, 1982) and with the complex nature of empathy related responding to unpleasant stimuli (Brown et al., 2006). Taken together with the subjective trait measures of empathy, the results suggest that the high empathy group was consistently more responsive to the film clips than the low empathy group. Since human film clips only accounted for one fifth of the clips in the present study, it is difficult to attribute the difference between empathy groups as reflecting only the human portion of stimuli. The relationship

between trait empathy and subjective and corrugator EMG responses across the stimuli further suggests that the human empathic response is not exclusively anthropocentric.

An exception to the general pattern of higher corrugator EMG activity for the high trait empathy group was found for the primate film stimuli, for which the low, moderate and high empathy groups exhibited a marked similarity in corrugator EMG responses. This suggests the presence of some qualitative difference in the primate stimuli that elicited unexpected and uniform responses across all participants. Frowning is a facial activity that is associated with responses to unpleasant stimuli and outwardly expressed disgust, anger, distress and concerned attention (Bradley, Codispoti, Cuthbert, & Lang, 2001; Dimberg, 1990; Eisenberg et al., 1994). It could be the case that the corrugator EMG activity during the primate stimuli was reflecting one of these psychological states that shows some independence from empathy. The primate film clips consisted largely of scenes from vivisection experiments, as these were the only stimuli that could be ethically sourced. Comments and questions by participants during debriefing suggested some degree of curiosity or uncertainty associated with the primate stimuli. For instance, some participants asked questions such as "What was that on the monkey's head?" If the primate stimuli were less clear or more confusing than the other stimuli, they may have elicited a corrugator EMG response that was uniform across trait empathy groups due to frowning, rather than an emotional response related to empathy. Moreover, low corrugator activity for the most part in the low empathy group may represent a categorical difference in affective valence in that people low in trait empathy may not experience stimuli in the same way as those who are moderate or high in empathy. Thus, if the low empathy group construe stimuli that is distressing to others as simply neutral instead, then the same activation of corrugator activity would not be likely to occur. While EMG data are continuous by their very nature, further

interpretation may include corrugator as an indicator of a shift in valence (in this case

from negative to neutral) (e.g., Bradley et al., 2001; Davis et al., 1995; Lang,

Greenwald, Bradley, & Hamm, 1993). Video-recordings of participant facial responses

will help clarify the nature of the corrugator response in future research, although subtle

expressions may be harder to detect with the naked eye than with electrophysiological

recordings.

Skin conductance responses reflect sympathetic arousal which is generally

interpreted as an orienting response to salient or novel stimuli (Dawson, Schell, &

Filion, 2000) and can indicate emotional arousal, independent of stimulus valence (Lang

et al., 1993). The SCR responses were greater in the moderate empathy group, than in

the high empathy groups. Moreover, the difference in skin conductance activity between

the moderate and low empathy groups approached significance. The pattern across

empathy groups is unexpected because those higher in emotional trait empathy would

be expected to be more affectively reactive to, and oriented towards, empathy eliciting

scenes. However, it cannot be ruled out that those in the high empathy group may have

diverted their gaze away from the film clip to avoid distress, resulting in the expected

corrugator activity, but not the anticipated skin conductance reactivity. Future research

could employ video recordings to rule out this possibility. Alternatively, the recording

of heart rate may be used to determine whether the film clip elicited an acceleratory

response that is characteristic of a defensive reaction (Ekman, Levenson, & Friesen,

1983).

Experiment 2

The results of Experiment 1 generally support the notion of an increase in

subjective and psychophysiological empathy-related responses across species of

increasing phylogenetic relatedness to humans. Moreover, empathy-related responses

to all classes of animals were higher in individuals with higher levels of trait empathy. An exception to the latter pattern of results was observed during the primate stimuli. It could not be determined whether the similarity in corrugator EMG activity across the three trait empathy groups reflected the unique nature of the species group or whether it was an artifact of the film clip clarity and/or the curiosity elicited by the clips. A second experiment was thus conducted to obtain subjective ratings on clarity and interest for each film clip. A second unusual finding obtained in Experiment 1 was the unexpected low phasic SCR in the high trait empathy group relative to the moderate trait empathy group. One explanation for this finding could be that it reflected a defensive distress reaction in the high trait empathy participants. To examine this issue further, additional ratings of all stimuli were taken for empathy, sympathy, and distress. Analyses were conducted that examined to what degree trait empathy as measured by the BEES were related each of these constructs.

Method

Participants

Participants were 33 ($M = 24.6$ years, $SD = 9.1$ years) English first language speaking male ($n = 12$) and female ($n = 21$) undergraduate students over 18 years of age. The demographic characteristics of the participants showed that most reported that they grew up in a semi-rural (24.2%) or suburban (66.7%) locale in contrast to relatively few from a rural (3%) or urban (6.1%) locale. Similarly, most participants reported companion animal experience, either during childhood (15.2%) or adulthood only (15.2%), or throughout both childhood and adulthood (60.6%).

Apparatus and Procedure

The experiment was conducted in the same laboratory using the same stimulus presentation equipment as the first study. Once again, the DASS-21 was administered

for screening purposes and the BEES Scale was administered. Rating response sheets contained a series of nine-point scales that varied from 0 to 8. The dimensions were empathy, sympathy, distress, interest and clarity. Participants were given verbal instructions and definitions of the meaning for each of the five dimensions. Empathy was defined as "to what degree you are able to imagine feeling and experiencing what the target is experiencing, in other words, your ability to put yourself in the others' situation." and had the anchors of *low empathy* and *high empathy*. Sympathy was defined as "the degree you feel sorry for, or pity the target" and used the anchors of *low sympathy* and *high sympathy*. The dimension of distress used the anchors of *not distressing* and *very distressing* and was defined as "the degree you are feeling emotionally distressed in response to the clip". Interest was defined as "how curious or interested you are towards what is being shown in the clip" and was rated on a scale with the anchors of *very boring* and *very interesting*. Finally, clarity used the anchors of *not very clear* and *very clear* and the definition of "what degree you are able to see clearly and comprehend the nature of the clip". Participants were instructed to watch the clip for the full duration, paying attention to their feelings and thoughts and to complete each rating sheet for each video clip when prompted. When ratings were completed, they used the computer mouse to play the next clip immediately, and so on.

Design

The experiment utilized a repeated measures design with Animal Type as the five-level repeated independent variable (human, primate, companion mammal, utilitarian mammal, and bird). The dependent variables were subjective ratings of "interest" and "clarity". Additional dependant variables measured for a correlational analysis were self-reported ratings of "empathy", "sympathy" and "distress". All hypothesis tests were evaluated against an α-level of .05.

Results

Preliminary analyses once again ruled out any relationship between BEES scores and sub-scales on the DASS-21, all *r*'s < ± .29, all *p*'s > .11. All ratings scores were multiplied 1.1 times in order to adjust for the difference between the ten point scale utlised in Experiment 1 and the nine-point scale used in Experiment 2. Subsequently, a series of *t*-tests evaluated at a Bonferroni corrected α-level of .006, confirmed no differences existed between these participants and those in the previous study on BEES scores (*M* = 40.52, *SD* = 25.9, *Min-Max* = -29 – 80), age, mean ratings for each animal group, or overall mean ratings, all *t*'s > ± 1.3, all *p*'s > .012. The second sample of participants was thus adequately representative of the sample used in Experiment 1.

Interest and Clarity Ratings

To assess whether the primate stimuli differed from all other animal types on ratings of interest and clarity, the bird, companion mammal, utilitarian mammal and human stimuli ratings were collapsed into one "non-primate" set of stimuli. A repeated measures *t*-test on mean interest ratings for the primate (*M* = 5.05, *SD* = 1.67) and non-primate (*M* = 4.83, *SD* = 1.37) stimuli was non-significant, *t* = 1.23, *p* = .266, indicating that interest levels did not significantly differ towards the primate stimuli compared to the other stimuli. However, the mean clarity ratings for the primate and non-primate stimuli was significant, *t* = 4.76, *p* < .005. Inspection of means confirmed that the primate stimuli (*M* = 5.24, *SD* = 1.68) was rated significantly lower on clarity than the non-primate stimuli (*M* = 6.23, *SD* = 1.39).

Relationship of BEES to Empathy, Sympathy and Distress Ratings

A correlational analysis was carried out to assess the degree that Trait Empathy, as measured by the BEES, was related to self-reported empathy, sympathy and distress scores. Trait empathy as measured by the BEES was positively related to self-reported

ratings of empathy ($r = .43$, $p = .012$), sympathy ($r = .49$, $p = .004$) and distress ($r = .51$, $p = .002$). BEES scores were most strongly related to distress, followed by sympathy and empathy. However, even stronger relationships were found between the self-reported ratings given to the film clip stimuli between empathy and sympathy ($r = .66$, $p < .0005$), empathy and distress ($r = .59$, $p = .001$), and sympathy and distress ($r = .91$, $p < .0005$).

Discussion

The present experiment was conducted to clarify two key questions raised by results from Experiment 1. The first was the query related to an almost identical pattern of corrugator EMG activity across all levels of trait empathy groups for the primate stimuli. The results from the ratings study confirmed that the primate stimuli was rated as less clear than non-primate stimuli, which conceivably impacted on corrugator EMG activity across all groups. People tend to frown in concentration when presented with a visual stimulus that is unclear or ambiguous. It is noteworthy that the primate stimuli were not rated differently on interest than the non-primate stimuli. Future research efforts using this framework will need to source better quality primate footage in order to avoid problems associated with clarity which may influence facial EMG recordings.

The second query related to whether the BEES trait empathy scale was a more accurate measure of state empathy or other related constructs of sympathy and distress. The strongest relationship was found between the BEES trait scores and distress ratings, followed by sympathy and empathy, suggesting that the BEES scale is strongly associated with distress. However, as the BEES was designed to measure the affective component of empathy, this result is not necessarily unexpected since highly empathic people may be more predisposed to distress responses. It appears that the BEES may be utilized dependably for research focusing on emotional aspects of the empathic process.

As such, the results are consistent with the notion that the high trait participants in

Experiment 1 experienced distress when viewing the film clips. The high level of

distress may have elicited defensive behaviors or strategies of affective flattening in

order to reduce the affective impact of the film clips. This may have thus been reflected

in the unexpected low level of SCRs in the high trait empathy group. As noted earlier,

future psychophysiological research should employ either video recording or heart rate

measures to determine the extent of the defensive response elicited in participants. The

fact that the present experiment also found a strong relationship between distress and

sympathy which was not reflected to the same degree in the relationships of these to the

BEES scale, highlights the complex nature of empathy-related responding.

General Discussion

The predicted linear pattern of empathy-related responses as a function of

increasing phylogenetic similarity was generally supported in the results for subjective

empathy ratings and SCR. Bird stimuli tended to elicit less self-reported empathy, than

the mammalian stimuli. Skin conductance response showed a clear bias in response to

human stimuli, declining as a function of phylogenetic distance.   This result is

consistent with the perceived similarity effect proposed by the PAM of empathy

(Preston & de Waal, 2002) and with the findings of Hills (1995). Less directly, it is also

consistent with findings of an ingroup empathy hypothesis in human participants

exposed to same or different ethnicity in pictures of human faces (Brown et al., 2006),

thus extending observations of this effect beyond the realms of human stimuli. This

provides evidence that the human capacity for subjectively rated feelings of empathy

tends to generalize easily towards other mammals, but starts to decline in response to

non-mammals. The consistency of these results with previous research supports the

view that a similarity effect exists in empathy-related responding due to perceived

evolutionary similarity (Hills, 1995). Future research may focus on age groups of interest, such as adolescents or older adults, in order to examine developmental differences in human-animal interactions across the lifespan. Additionally, more detailed exploration of the quality of relationships with companion animals and to what degree people have a general like or dislike of animals may aid interpretation of prospective studies.

The second ratings study allowed a closer examination of the interaction effect found for corrugator activity in the original results. It can be cautiously suggested that had the primate stimuli been of better quality, this interaction may not have occurred. Examining the pattern of results for the other animal groups indicated that people with lower levels of emotional trait empathy characteristics are less inclined to be facially expressive than those with higher levels. This also highlights some challenges faced by researchers wishing to employ moving film stimuli. On the one hand, moving stimuli is engaging for participants, thus making it an attractive option for researchers wishing to elicit emotional responses. On the other hand, the use of film stimuli can introduce difficulties in controlling for context and visual quality, especially for the type of film used in the present experiment. Future investigations may benefit from an extended ratings study focused on attempting to standardise film clips on dimensions such as clarity, in addition to the more traditional ratings related to affective responding.

Finally, it appears that the ongoing debate on what constitutes an empathic response is far from settled. The measure of trait empathy that was used appeared to be aligned with distress and sympathy during the film clips. Nevertheless, subjective empathy ratings during the film clips were also highly correlated with the trait empathy measure. It may be that the self-reported ratings were tapping a variation or combination of empathy-related factors than those measured by the BEES, thus

reflecting differences in trait versus state measures of empathy. In short, a future study should focus on improving the present methodology and attempt to discover why SCRs were lower for people scoring highly on trait affective empathy.

Several aspects of the present results indicated that the scope of human empathic responding is not restricted to other humans. It has been theorized by many philosophers that humane treatment of non-human animals is an indictor of general moral propensity and ethical conduct. Furthermore, the link between inter-human and human-animal violence is being given ever increasing attention by empirical researchers (e.g., Ascione, 2001; Beirne, 2004; Dadds, Whiting, & Hawes, 2006; Merz-Perez et al., 2001). This study attempted to explore the markers of human empathic responding empirically, using an extended methodology. While caveats are noted, the general conclusion is that the study of human empathy-related responding towards human and non-human stimuli provided useful insights about these processes. In turn, it afforded a methodology from which to assess a range of affective variables theoretically linked to empathic responding. Human beings are capable of generalizing empathic-type responses, as shown by both subjective and objective measures in the present study, to non-human targets, if not to the same degree. Moreover, the methodology employed in the present study offered some insightful and intriguing findings relative to differing levels of trait capacity for empathy-related emotional responses.

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Footnotes

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Figures

Figure 1. Mean subjective empathy ratings as a function of empathy group and animal type. Ratings were made on a scale ranging from 1 to 9, where 1 = no empathic reaction and 9 = maximal empathic reaction. Error bars depict the standard error of the mean.

Figure 2. Mean log transformed corrugator electromyographic (EMG μV) activity as a function of empathy group by animal stimulus type, showing standard errors of the mean.

Figure 3. Effects of animal stimulus type and empathy group on mean phasic skin conductance responses [SCR (SQRT μS)] responses. Error bars depict standard error of the mean.