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GENDER DIFFERENCES IN ENVIRONMENTALISM: THE MEDIATING ROLE OF EMOTIONAL EMPATHY

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ABSTRACT

The present study tested whether a greater level of emotional empathy in women mediates the commonly reported relationship between gender and environmental concern and action. In an undergraduate sample (N=202), it was found that gender differences existed in altruistic environmental concerns as well as in willingness to cooperate and compete for resources in a self-report commons dilemma. It was found that gender differences were fully mediated (i.e., reduced to non-significance) by emotional empathy.. Implications and suggestions for future study of this issue are offered.

INTRODUCTION

Researchers have identified a phenomenon whereby women report greater concern for the natural environment than men (see Kopelman, Weber, & Messick, 2002; Mohai, 1992; Zelezny, Chua, & Aldrich, 2000). Yet surprisingly little empirical work has attempted to identify potential determinants of this gender difference (Dietz, Kalof, & Stern, 2002), leaving unanswered the question of why women seem to care more for the environment.

Empathy is the experiencing of a vicarious response to the perceived emotional state of others (Eisenberg & Strayer, 1990), which Empathizing-Systemizing Theory suggests is an important aspect of social functioning that is based on socialization and biological structure, and importantly, is expressed more often by women than men (Baron-Cohen, 2002, 2008, 2009; Lawson, Baron-Cohen, & Wheelwright, 2004). Research has established empathy as being important to the expression of environmentalism. Generally, empathy induction has been shown to increase altruism (Batson, 1991; Batson, Chang, Orr, & Rowlan, 2002). More specifically, recent studies have found that environmental behaviours and attitudes can be improved through empathy induction (Berenguer, 2007; Schultz, 2000; Sevillano, Aragonés, & Schultz, 2007;

Dietz, Kalof, & Stern, 2002; Blocker & Eckberg, 1997). Importantly, empathy is understood as being expressed more frequently by females, and thus might account for gender differences in environmentalism (e.g., Karniol, Gabay, Ochion, & Harari, 1998; Mehrabian, Young, & Sato, 1988; Monahan, 1989).

Gender Differences in Environmental Concern and Behavior

A meta-analysis of the literature on gender and environmentalism indicated females are more concerned than men for the natural environment. Zelezny, et al., (2000) reported 6 of 9 studies found significant gender differences in environmental concern (assessed utilizing New Environmental/Ecological Paradigm), where women expressed greater concern than men. While previous reviews have been less compelling (Hines, Hungerford, & Tomera, 1986-87; Van Liere & Dunlap, 1980, see also Mcstay & Dunlap, 1983 a critique of previous null findings). The authors found the hypothesized gender difference in *environmental behaviour* in 9 of 13 studies, and demonstrated evidence for these differences in samples gathered across 14 countries. More recently, Karpiak and Baril (2008) found that women reported greater environmental concern and less apathy toward the environment in a study of 158 college students.

Gender differences also exist between priorities of environmental concern, which can be described as being *egoistic* (environmental concern centered on the self), *social-altruistic* (environmental concern centered on other humans, e.g., children) and *biospheric* (environmental concern centered on the biosphere, e.g., plants, animals) (Schultz & Zelezny, 1999; Schultz et al., 2005). Schultz (2001) reported significant gender differences with women scoring higher than men on all three concerns.

Gender Differences in the Commons Dilemma

Similar gender differences have been identified in commons dilemma research (see Kopelman et al., 2002 for review). A commons dilemma is a situation in which one competes or cooperates with others to obtain maximal resources (Hardin, 1968). If all players cooperate by "harvesting" fewer resources on each turn, this results in greater accumulation of resources for each player. However, if players compete with one another by harvesting the full amount possible, the resource supply depletes at a greater rate leaving each player with a minimal accumulation of resources (Hardin, 1968).

Studies have found the percentage of women who cooperate is greater than with men, and the percentage of men who compete is greater than with women (e.g., Van Lange, Otten, De Bruin & Joireman, 1997; Walters, Stuhlmacher, & Meyer, 1998). Groups comprised of only women cooperated at a rate significantly greater than groups comprised of only men or mixed gender groups (Nowell & Tinker, 1994). Further, Stockard, Van De Kragt, and Dodge (1988) found that women were more likely to cooperate than men when participants were allowed to discuss strategy.

The Role of Empathy in Environmental Concern

What might account for these gender differences? The priority of environmental concern is suggested as being a derivation of a value orientation – where values pertaining to the self, others and the biosphere affect the expression of environmental concern for living things beyond the individual (Schultz et al., 2005; Stern, Dietz, & Kalof, 1993). Thus systematic differences in values or the experience of empathy toward other living things might account for gender differences. For instance, Schultz (2000) induced empathic concern for the natural environment in participants through a perspective-taking task. A significant interaction was found where images of animals being harmed in nature prompted the greatest levels of biospheric concern in the perspective-taking condition versus the objective condition (see also Sevillano et al., 2007).

The Role of Empathy in the Commons Dilemma

Empathy is also considered fundamental to helping behaviour (e.g. Mehrabian & Epstein, 1972). Thus, it is logical to expect that empathy may too be important to cooperation in an environmental commons dilemma. Empathy is an important aspect of cooperation (Astin, 1987) and is influential in social dilemma performance (Batson & Moran, 1999), whereby resources are allocated to sources of empathy. A lack of empathy is detrimental to performance in the commons. Campbell, Bush, Brunell, & Shelton (2005) found that high levels of narcissism characterized by a lack of empathy felt toward others related to greater harvesting of natural resources in a commons dilemma. The more narcissists that existed within a group of four, or within a dyad, the fewer total resources were ultimately available for harvest.

Gender Role Socialization and Emotional Empathy

Women often report greater emotional empathy (e.g., Karniol, Gabay, Ochion, & Harari, 1998; Mehrabian, Young, & Sato, 1988; Monahan, 1989). *Emotional empathy* is a basic, rather than intellectual level of interpersonal process (Mehrabian, Young, & Sato, 1988). In this way emotional empathy differs conceptually from (but is related to) cognitive perspective taking (Eisenberg & Strayer, 1990; Shamay-Tsoory, Aharon-Peretz, & Perry, 2009; Singer et al., 2008; Stotland, 1969).

According to social role theory of gender differences (Eagly, 1987), emotional empathy is fundamental to the stereotypical role of women. This theory suggests that men and women are socialized differently vis-à-vis emotion (e.g., Dunn, Bretherton & Munn, 1987; Kuebli, Butler & Fivush, 1995). Young boys and girls are exposed to different socialization experiences, with girls' oriented toward an ethic of caring as opposed to an ethic of justice, with the ethic of caring promoting empathic concern (Gilligan & Wiggins, 1988). Karniol et al. (1998) noted that although caring and justice orientations are not necessarily gender-specific, they are strongly related to gender (e.g., Gilligan & Attanucci, 1988). The socialization of gender roles suggests that women are socialized to behave in a more compassionate, nurturing, and cooperative manner, whereas males are generally socialized to be competitive and independent (Chodrow, 1974; Keller, 1985). The tendency of women to be more socially responsible and oriented towards others (e.g., Eagly, 1987; Eisenberg, 2002; Gilligan, 1982; Howard & Hollander, 1996; Myyry & Helkama, 2001; Wilkinson & Kitzinger, 1996) should enable them to more easily experience environmental concerns that extend beyond the self. From this perspective, we tested

the hypotheses that 1) gender differences exist in the self-reported environmental concerns, cooperativeness, and behaviours of university students, and that 2) emotional empathy would mediate the gender-environmentalism relationship.

METHOD

Participants

Undergraduate students (N=202) from a university in Ontario were recruited as participants. The sample consisted of primarily Caucasians (83.4%), 63 of whom were male and 139 of whom were female. Age ranged from 17 to 30 years, (*M*= 20, *SD*=3.8). Participants were compensated with course credit. Table 1 provides descriptive statistics (*n, M, and SD*).

Materials and Procedures

Emotional Empathy

All self-report measures were provided in a questionnaire. The Emotional Empathic Tendency Scale (EETS - Mehrabian & Epstein, 1972) is a widely-used 33-item self-report measure of emotional empathy (Stueber, 2008). This measure assesses a tendency toward emotional arousal across scenarios including, but not limited to seeing someone in distress. Items score along a 9-point scale ranging from –4 (very strongly disagree) to +4 (very strongly agree). The measure was internally consistent, (alpha = 0.82).

Egoistic, Social Altruistic and Biospheric Concerns

Environmental concern was assessed using Schultz's (2001) 12-item self-report measure. Participants completed the sentence "I am concerned about environmental problems because of the consequences for" followed by 12 response options. Participants then attribute a score of importance of concern for each item pertaining to the self (e.g., my lifestyle, my health), to other humans (e.g., my friends, all people) or to the biosphere (e.g., plants, marine life) using a seven-point Likert-scale with response options between 1 (not important) to 7 (supreme importance). Each subscale was internally consistent- egoistic concern (alpha = 0.88), social-altruistic concern (alpha = 0.81), and biospheric concern (alpha = 0.88).

Self Report Commons Dilemma

Cooperation in a commons dilemma was measured using a self-report situational questionnaire – the Self Report Commons Dilemma (SRCD; Arnocky et al., 2007). This measure is a hypothetical situation in which participants envision they are a cattle farmer sharing grazing land with in-group (Canadian) and out-group (American) members. Each "farmer" has 10 cattle living off of the land and at these numbers the land is completely self-sustaining (zero depletion). The participant then has the option to add 5 more cattle without repercussions from the other farmers, equalling greater profit. However, if each farmer were to do so, the land would deplete rapidly. Using a 5-point scale, (1= strongly disagree, 5= strongly agree), participants rate their

willingness to compete (add 5 cattle) (*competition subscale*), cooperate (do not add cattle) for the well-being of the other farmers (*cooperation subscale*), or for the well-being of the ecosystem (*ecological cooperation subscale*). Example item are as follows: *competitive* "I would increase my number of cattle on the land without telling the others", *cooperative* "I feel responsible for the well-being of the other farmers", *ecological cooperative* "It is important to me that I practice sustainable farming". The SRCD provided acceptable reliability: competitiveness, (alpha = 0.68), cooperation for others, (alpha = 0.60), and ecological cooperation, (alpha = 0.76). It has been suggested that that moderate level of internal consistency for the cooperation with others measure may be due to the combination of both in-group and out-group cooperation in the factor structure (Arnocky et al., 2007).

Self Reported Environmental Behaviours

Pro-environmental behaviour was measured with 15 items concerning frequency of conservation behaviours such as turning off lights or the television, donating money to an environmental political cause, or using alternative modes of transportation (Arnocky et al., 2007; Schultz et al., 2005). Response options ranged from 1 (never) to 5 (very often). The measure was internally consistent, ($\alpha = 0.81$).

RESULTS

Descriptive Findings

Age was considered as a control variable, given that studies have found positive correlations between age and environmental concern and behaviour (e.g., Buttel, 1979; Cottrell, 2003; Fransson & Garling, 1999; Honnold, 1984; Howell & Laska, 1992; Van Liere & Dunlap, 1980). Age correlated only with social-altruistic concern, and was included as a control variable in relevant analyses.

Table 1. Descriptive Statistics for each measure.

	N	Mean	Range	Std. Deviation
Age	202	20	13.00	3.82
Gender	202	-----	-----	-----
Emotional Empathy	202	1.18	8.00	0.66
Egoistic Concerns	201	5.45	6.00	1.26
Altruistic Concerns	202	5.65	5.75	1.24
Biospheric Concerns	202	6.02	6.00	0.99
Competitive	202	2.43	3.33	0.70
Cooperative	202	3.60	4.00	0.78
Ecological Cooperative	202	4.16	3.00	0.62
Environmental Behaviour	202	3.30	3.27	0.60

Sex Differences in Environmental Concern and Behaviour

We first tested which pro-environmental concerns and behaviours differ significantly on gender using point-biserial correlations (see Table 2). We found significant gender differences for social-altruistic concerns (M-men = 5.76 SD = 1.14, M-women = 6.13 SD=0.89, t (202) = -2.44, $p < 0.05$). Neither biospheric (t (202) = -1.97, r = 0.14, *ns*), nor egoistic concerns (t (201) = -0.56, r= .04, *ns*) were significantly correlated with gender. In examining gender differences in willingness to compete or cooperate for ecological resources, gender differences were found for ecological cooperation (M-men = 4.01 SD = 0.68, M-women = 4.23 SD=0.58, t (202) = -2.23, $p < 0.05$) and competitiveness (M-men = 2.68 SD = 0.78, M-women = 2.38 SD=0.69, t (202) = -0.90, $p < 0.01$). Gender did not correlate with self-reported pro-environmental behaviour.

Table 2. Pearson Product Moment Correlations.

	1	2	3	4	5	6	7	8	9
1. Age	1								
2. Gender	.05	1							
3. Emotional Empathy	.07	.50**	1						
4. Egoistic Concern	.06	.04	.02	1					
5. Altruistic Concern	.14*	.17*	.22**	.42**	1				
6. Biospheric Concern	.13	.13	.11	.05	.17*	1			
7. Competition	-.00	-.18**	-.36**	.20**	-.06	-.17*	1		
8. Cooperative Others	.11	.06	.34**	.01	.11	.21**	-.41**	1	
9. Ecological Cooperative	.06	.16*	.33**	-.05	.15*	.44**	-.40**	.49**	1
10. Behaviour	.09	-.00	.10	-.13	.10	.32**	-.39**	.30**	.47**

*p<.05 (two-tailed) **p<.01 (two-tailed)

The Mediating Role of Emotional Empathy

Standardized regression coefficients are presented. Bootstrapping procedures for testing indirect effects outlined by MacKinnon et al. (2002) were employed. Bootstrapping is a nonparametric re-sampling method. This method provides confidence intervals based upon an estimate of the sampling distribution. Preacher and Hayes (2008) suggest that utilizing a bootstrapping method is superior to alternative modalities because it does not enforce the assumption of a normally distributed sample. Importantly, bootstrapping procedures might also relate to increased power and reduced Type-I error rate (MacKinnon et al., 2002). In the present study, 1000 bootstrapping samples were derived.

We next examined the relationship between gender and empathy. Gender predicted emotional empathy, (b = 0.501, $p < .001$). When emotional empathy was entered into the model with gender predicting altruistic concern, and age as a covariate, we found that emotional empathy mediated the link between gender and altruistic concern (Sobel test: z = 2.26, $p < 0.05$, bootstrapping: 95% LL = 0.32, 95% UL = 0.34%). Emotional empathy, (b = 0.19, $p < 0.05$) significantly predicted altruistic concern, whereas the link between gender and altruistic concern

was reduced to non-significance, from *(b* = 0.169, *p* < .05) to (*b* = 0.076, *ns*). The model including emotional empathy explained 7% (adjusted R square) of the total variance, *R* squared change = 0.03.

The same procedure was performed for competitiveness and again for ecological cooperation. For competitiveness, gender was found to account for 2% (adjusted R square) of explained variance in competitiveness. When empathy was included into the model, it contributed significantly toward explained variance, *R* squared change =0.10 for a total explained variance of 12%. Moreover, empathy remained a significant predictor of competitiveness, *(b* = -0.354, *p* < 0.001), whereas gender was reduced to non-significance, *(b* = -0.003, *ns*), (Sobel test: z = 0.06, *p* < 0.001, bootstrapping: 95% LL = -0.44, 95% UL = -0.14%), suggesting that empathy mediated the relationship between gender and competitiveness in a commons dilemma.

Ecological cooperation was the final variable to show significant gender differences, where gender accounted for 2.0% (adjusted R square) of explained variance. Again, when empathy was entered into the second step of the equation, explained variance increased significantly, *R* squared change = 0.08 for a total explained variance of 10%. Furthermore, empathy predicted ecological cooperation, *b* = 0.330, *p* < 0.001, whereas the effect of gender was again reduced to non-significance, (*b* = -0.009, *ns*), (Sobel test: z = 4.50, *p* < 0.001, bootstrapping: 95% LL = 0.12, 95% UL = 0.36%). Taken together, the significant mediating effect of emotional empathy on each originally significant gender difference lends support to the hypothesis that gender differences on these variables is accounted for by greater levels of empathy in women.

DISCUSSION

The study of gender differences in environmental concern and behaviour has been a contentious research topic within the field of environmental psychology (see Arcury et al., 1987; Teal & Loomis, 2000). Yet a number of studies (see Blocker & Eckberg, 1997 for review) and a meta-analysis (Zelezny et al., 2000) have confirmed that women often report greater concern for the ecosystem.

Socialization and gender-role theories suggest women are raised to value and empathize with the needs of others more than men (Stern et al., 1993), and as such behave in a more compassionate, nurturing, and cooperative manner in general (Chodrow, 1974; Keller, 1985). Indeed, empathy is fundamental to the expression of environmental concern and behavioural intention, and more broadly to altruistic behaviour (Berenguer, 2007; Sevillano et al., 2007). Thus empathy or the valuing of others (Eagly, 1987; Zelezny et al., 2000) has been suggested as influencing gender differences in environmental concern and behaviour (see Blocker and Eckberg, 1997; Dietz et al., 2002; Berenguer, 2007 for review). The present study represents a formal test of this hypothesis.

In the present study gender predicted emotional empathy in the hypothesized direction. Significant gender differences were found among altruistic concerns, self-reported cooperation for the sake of the ecosystem, and competitiveness for ecological resources. Women expressed greater levels of altruistic concern and cooperation for the sake of the ecosystem, while men

expressed more competitiveness for resources. The contribution of gender toward explained variance was relatively small for each criterion. This finding was similar to the small effect sizes reported by Zelezny et al. (2000) in their meta-analysis as well as the small effect of gender noted by Kopelman et al. (2002) to exist in the commons dilemma.

Gender differences in biospheric concerns approached significance, but did not meet inclusion criteria for examining empathy as a mediator to the potential gender difference, although women reported greater levels of environmental concern for the sake of other living things. No gender differences were found concerning egoistic concerns, or in cooperation (resource sharing) for the sake of others in the SRCD. Similar to Teal and Loomis (2000) no gender differences were found in pro-environmental behaviours. Although gender differences were not present among some criterion variables, it should be noted that empathy did correlate with cooperation for the sake of others, highlighting the potential importance of empathy to the endorsement of these behaviours. Surprisingly, emotional empathy did not correlate with biospheric concerns, but the relationship did follow the hypothesized direction. A potential explanation of this non-significant relationship is presented in the limitations section.

The hypothesis that greater emotional empathy in women would account for gender differences was strongly supported. When emotional empathy was included in the model for each criterion where a significant gender difference initially existed, the relationship between gender and that form of concern or behaviour was reduced to non-significance. For altruistic concern, competitiveness and ecological cooperation, the mediated effects were confirmed by significant Sobel tests, suggesting that emotional empathy mediated the initial relationships between gender and these outcomes. In each case, emotional empathy made a significant, albeit small contribution to explained variance.

The implication of this finding is that empathy should be considered key to explaining gender differences among priorities of environmental concern, as well as in competitiveness and cooperation in sharing common resources. Future research should consider empathy, and possibly other measures of feminine traits as factors that will likely account for gender differences among pro-environmental variables; especially when the measures of environmental concern or behaviour are generalized forms of assessment that are likely to be related to these traits and emotive tendencies. Of course, as environmental issues become more localized, specific to the individual, or more severe, the role of empathy might become less important in determining or predicting concern. The present study also speaks to the role that empathy induction can play in promoting greater environmental concern among men, and future research might benefit from exploring this area along the lines of Schultz, (2000) and Sevillano et al., (2007).

Limitations and Future Directions

The present work is the first empirical step toward building a body of evidence accounting for gender differences in environmentalism. Future research should address the following limitations. Our student sample may not be representative of the general populous, especially given the restricted age range and the greater amount of women characterizing our sample.

Future research would benefit from addressing these variables in a more representative sample. The finding that biospheric concerns were not correlated with the EETS is likely due to the fact that the EETS does not distinguish between empathy felt toward other humans versus toward non-humans. While it is sensible to posit that someone who would react with great emotional empathy to seeing another human in a distressing situation would be more likely to express greater environmental concern for the sake of other humans (altruistic concern) these individuals may not feel the same way toward other living things. Because the EETS was not designed for assessing emotional-empathic reactions toward non-humans, we cannot assume that such reactions would carry over into the biospheric domain. Because the EETS taps into empathy felt toward other humans (which is also likely felt by those who empathize with all living things, as humans should theoretically be included in that construct), but does not distinguish between the two, it does not sufficiently parse those who are concerned for all living things from those concerned only for humanity. This may have lead to type-II error through a reduced level of predictive validity regarding concerns for non-human life.

It would be worthwhile to examine gender differences across more specific types of behavioural responses to a perceived environmental threat, such as in the case of acid rain, where Arcury et al. (1987) found the gendered relationship to be reversed. In the current study gender did correlate with one example of behaviour -"recycling newspapers and magazines". The limitations aside, the results of the present study suggest that gender differences commonly reported in more generalized types of environmentalism are accounted for by greater emotional empathy expressed by women.

REFERENCES

Arcury, T.A., Scollay, S., & Johnson, T.P. (1987). Sex differences in environmental concern and knowledge: The case of acid rain. *Sex Roles, 16,* 463-472.

Arnocky, S., Stroink, M., & DeCicco, T. (2007). Self-construal predicts environmental concern, conservation, and cooperation. *Journal of Environmental Psychology, 27,* 255-264.

Astin, A. (1987). Competition or cooperation? Teaching teamwork as a basic skill. *Change, 19,* 12-19.

Baron-Cohen, S. (2009). Autism: The empathizing-systemizing (E-S) theory. *Annals of the New York Academy of Sciences, 1156,* 68–80.

Baron-Cohen, S. (2008). Autism, hypersystemizing, and truth. *The Quarterly Journal of Experimental Psychology, 61,* 64-75.

Baron-Cohen S (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences, 6,* 248-254.

Batson, C. D. (1991). *The altruism question: Toward a social-psychological answer*. Hillsdale, NJ: Lawrence Erlbaum.

Batson, C. D., & Moran, T. (1999). Empathy-induced altruism in a prisoner's dilemma. *European Journal of Social Psychology, 29,* 909-924.

Batson, C. D., Chan, J., Orr, R., & Rowland, J. (2002). Empathy, attitudes, and action: Can feeling for a member of a stigmatized group motivate one to help the group? *Personality and Social Psychology Bulletin, 28,* 1656-1666.

Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behavior, 39,* 269-283.

Blocker, T. J., & Eckberg, D. L. (1997). Gender and environmentalism: Results from the 1993 general social survey. *Social Science Quarterly, 78,* 841-859.

Brown Kruse, J., & Hummels, D. (1993). Gender effects in a laboratory public goods contribution: Do individuals put their money where their mouth is? *Journal of Economic Behavior and Organization, 22,* 255-267.

Buetel, A.M., & Mooney Marini, M. (1995). Gender and values. *American Sociological Review, 60,* 436-448.

Buttel, F.H. (1979). Age and environmental concern: A multivariate analysis. *Youth and Society, 10,* 237-256.

Campbell, W.K., Bush, C.P., Brunell, A.B., & Shelton, J. (2005). Understanding the social costs of narcissism: The case of the tragedy of the commons. *Personality and Social Psychology Bulletin, 31,* 1358-1368.

Chodorow, N. (1974). Family structure and feminine perspective. In M. Rosaldo & L. Lamphere (Eds.), *Women in culture and society* (pp. 41–48). Stanford, CA: Stanford University Press.

Clayton Smith, D. (2001). Environmentalism, feminism, and gender. *Sociological Inquiry, 71,* 314-334.

Cottrell, S. P. (2003). Influence of sociodemographic and environmental attitudes on general responsible environmental behavior among recreational boaters. *Environment and Behavior, 35,* 347-375.

Davis, M.H. (1983). Measuring individual differences in empathy: evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 1*, pp. 113- 126.

Dietz, T., Kalof, L., & Stern, P. C. (2002). Gender, values, and environmentalism. *Social Science Quarterly, 83,* 353-364.

Duan, C, & Geen, T. (1995). *The relationship between cultural values and empathic dispositions.* Unpublished manuscript, University of Missouri-Columbia.

Dunn, J., Bretherton, I., & Munn, P. (1987). Conversations about feeling states between mothers and their children. *Developmental Psychology*, *23*, 132-139.

Eagly, A. (1987). *Sex differences in social behavior: A social role interpretation*. Hillsdale, N.J.: Erlbaum.

Eisenberg, N. (2002). Empathy-related emotional responses, altruism, and their socialization. In R. J. Davidson & A. Harrington (Eds.), Visions of compassion: Western scientists and Tibetan Buddhists examine human nature (pp. 131–164).

Eisenberg, N. & Strayer, J. (ed.) (1987). *Empathy and its development.* Cambridge, UK: Cambridge University Press.

Fransson, N., & Garling, T. (1999). Environmental concern: Conceptual definitions, Measurement methods, and research findings. *Journal of Environmental Psychology, 19,* 369-392.

Gilligan, C. (1982). *In a different voice*. Cambridge, MA: Harvard University Press.

Hardin, G. (1968). The tragedy of the commons. *Science, 162,* 1243-1248.

Hines, J., Hungerford, H., & Tomera, A. (1986–87). Analysis and synthesis of research on responsible environmental behavior. *Journal of Environmental Education*, *18*, 1–8.

Hoffman, M.L. (1977). Empathy, its development and prosocial implications, in: C.B. Keasy (Ed.) *Nebraska Symposium on Motivation*, vol. 25 (pp. 169- 217) Lincoln: Nebraska University Press.

Honnold, J. A. (1984). Age and environmental concern some specification effects. *Journal of Environmental Education, 16*, 4-9.

Howard, J. A., & Hollander, J. A. (1996). *Gendered situations, gendered selves*. Thousand Oaks, CA: Sage.

Howell, S. E. & Laska, S. B. (1992). The changing face of the environmental coalition: A research note. *Environment and Behavior, 24,* 134-144

Karniol, R., Gabay, R., Ochion, Y., & Harari, Y. (1998). Is gender or gender-role orientation a better predictor of empathy in adolescence? *Sex Roles, 39,* 45-59.

Karpiak, C. P., & Baril, G. L. (2008). Moral reasoning and concern for the environment. *Journal of Environmental Psychology, 28,* 203-208.

Keller, E. (1985). *Reflections on gender and science*. New Haven, CT: Yale University Press.

Kellert, S. R., & Berry, J. K. (1987). Attitudes, knowledge and behaviors toward wildlife as affected by gender. Wildlife Society Buletin, 15, 363–371.

Kopelman, S., J. M. Weber, and D. M. Messick. (2002). Factors influencing cooperation in commons dilemmas: a review of experimental psychological research. In The Drama of the Commons, edited by E. Ostrom, T. Dietz, N. Dolsak, P. C. Stern, S. Stonich and E. U. Weber. Washington, D.C.: National Academy Press.

Lawson J, Baron-Cohen S, Wheelwright S (2004). Empathising and systemising in adults with and without Asperger Syndrome. *Journal of Autism and Developmental Disorders, 34,* 301-310.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods, 7*, 83–104.

McStay, J.R., & Dunlap, R.E. (1983). Male-female differences in concern for environmental quality. *International Journal of Women's Studies, 6,* 291-301.

Mehrabian, A. & Epstein, N. (1972). A measurement of emotional empathy. *Journal of Personality, 4*, pp. 525- 543.

Mehrabian, A., Young, A.L., & Sato, S. (1988). Emotional empathy and associated individual differences. *Current Psychology: Research and Reviews, 7,* 221-240.

Merchant, C. (1992). *Radical Ecology: The Search for a Livable World*. New York: Routledge.

Mohai, P. (1992). Men, women, and the environment. *Society and Natural Resources, 5,* 1-9.

Monahan, M.J. (1989, August). Gender differences in empathy: Are women really more empathic than men? Paper presented at the Annual Convention of the American Psychological Association (97th, New Orleans, LA).

Myyry, L., & Helkama, K. (2001). University students' value priorities and emotional empathy. *Educational Psychology, 21,* 25-40.

Nowell, C., & S. Tinker. (1994). The influence of gender on the provision of a public good. *Journal of Economic Behavior and Organization, 25,* 25–36.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*, 879–891.

Schultz, P.W. (2000). Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues, 56,* 391-406.

Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. Journal of Environmental Psychology, 21, 327–339.

Schultz, P.W., & Zelezny, L.C. (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology, 19,* 255-265.

Schultz, P.W., Gouveia, V., Cameron, L., Tankha, G., Schmuk, P., & Franek, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross Cultural Psychology, 36.4,* 457-455.

Sevillano, V., Aragonés, J. I., & Schultz, P.W. (2007). Perspective taking, environmental concern, and the moderating role of dispositional empathy. *Environment and Behavior, 39,* 685-705.

Shamay-Tsoory, S.G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: A double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain, 132,* 617-627.

Singer, T., Seynour, B., O'Doherty, J., Kaube, H., Dolan, R.J., & Frith, C.D. (2004). Empathy for pain involves the affective but not sensory components of pain. *Science, 303,* 1157-1162.

Snelgar, R.S. (2006). Egoistic, altruistic, and biospheric environmental concerns: Measurement and structure. *Journal of Environmental Psychology, 26,* 87-99.

Stern, P., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior*, *25*, 322–348.

Stockard, J., Van De Kragt, A. J., & Dodge, P. J. (1988). Gender roles and behavior in social dilemmas: Are there sex differences in cooperation and in its justification? *Social Psychology Quarterly, 51,* 154-163.

Stotland, E. (1969). Exploratory investigations of empathy, in: L. Berkowitz (Ed.) *Advances in experimental social psychology*, vol. 4 (pp. 271- 314). London: Academic Press.

Stueber, K. (2008). Empathy. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (http://plato.stanford.edu/entries/empathy/). Stanford: The Metaphysics Research Lab, Stanford University.

Teal, G., & Loomis, J. B. (2000). Effects of gender and parental status on the economic valuation of increasing wetlands, reducing wildlife contamination and increasing salmon populations. *Society and Natural Resources 13,* 1 -14.

Van Lange, P. A. M., Otten,W., De Bruin, E. N. M. & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of Personality and Social Psychology, 73,* 733-746.

Van Liere, K. D. & Dunlap, R. E. (1980). A review of studies that measured environmental attitudes and behaviors. *Environment and Behavior*, *11*, 22–38.

Walters, A. L., Stuhlmacher, A. F., & Meyer, L. L. (1998). Gender and negotiator competitiveness: A meta-analysis. *Organizational behavior and human decision processes, 76,* 1-29.

Wilkinson, S., & Kitzinger, C. (Eds.). (1996). *Representing the other: A feminist and psychology reader*. Thousand Oaks, CA: Sage.

Zelezny, L.C., Chua, P.P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues, 56,* 443-457.