



Relating sex differences in aggression to three forms of empathy

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ABSTRACT

Men commit violent crime at substantially higher rates than women. One proposed mediator of this relation is empathy, as men consistently score lower than women on measures of empathy and empathy deficits are thought to characterize violent crime and disorders of aggression. However, recent research suggests that traditional empathy measures are only weakly related to aggression, whereas a new form of “anti-empathy” exhibits much stronger relations. The goal of this study was to investigate the extent to which empathy and anti-empathy indirectly account for sex differences in aggression and antisocial behavior, and whether these relations differ by sex. The current study ($N = 369$) employed a multifaceted measure of empathy to show that sex differences in aggression were indirectly accounted for by affective empathy and anti-empathy, but not cognitive empathy. The effects of empathy deficits were equivalent for men and women. These findings provide support for empathy as an important and generalizable trait in the sex-aggression association and highlight the usefulness of a focus on specific affective forms.

1. Introduction

Most violent crimes are committed by men, including 92% of homicides, 71% of major assaults, and 97% of sexual assaults (Brennan & Taylor-Butts, 2008; Carson & Golinelli, 2012; Miladinovic & Mulligan, 2015). This sex difference is consistent across time and measurement method, although the underlying reason for it is unclear (Archer, 2004; Bunge, Johnson, & Baldé, 2005). As such, researchers are continuously on the search for explanatory mechanisms of the sex difference in aggression. The purpose of the current study is to determine the extent to which sex differences in specific forms of empathy account for sex differences in aggression using traditional and novel conceptualizations of the empathy construct.

Theories of sex differences in aggression vary widely in focus, proximity, and specificity, ranging from biologically-focused (e.g., neurological, hormonal, or evolutionary perspectives; see Archer, 2006; Blair, 2013) to socio-cultural explanations (e.g., attachment, socialization, or feminist perspectives; see Archer, 2004; Eagly & Steffen, 1986). A particularly useful level of analysis for individual variation in aggression is personality, which acts as a stable nexus through which biological and social forces converge. Although various personality traits are associated with crime and antisocial behaviour, at the broadest level the most predictive traits are (low) Agreeableness and (low) Conscientiousness—two trait domains from the Five Factor Model of Personality (FFM; Jones, Miller, & Lynam, 2011; Samuel & Widiger,

2008; Vachon, Lynam, Miller, & Krueger, 2018).

1.1. Empathy and aggression

At the level of specific facet traits, most theories of aggression focus on deficits in empathy and similar traits, such as sympathy and tender-mindedness (Jolliffe & Farrington, 2004). Furthermore, empathy deficits are a core diagnostic feature of externalizing disorders related to aggression in children and adults, including antisocial personality disorder, narcissistic personality disorder, conduct disorder, and psychopathy (American Psychiatric Association, 2013; Hare, 2003). For this reason, empathy is a primary target of anti-violence interventions. Programs that focus on empathy include those aimed at those who violently offend (Ross & Ross, 1995), sexually offend (McGrath, Cumming, Burchard, Zeoli, & Ellerby, 2010), engage in domestic abuse (Fruzzetti & Levensky, 2000), and bully (Grossman et al., 1997). Empathy is believed to prevent violence, and programs based on this belief have been implemented widely and at great cost; each year in the United States, over \$500 million dollars is spent on empathy training programs for sex offenders alone (McGrath et al., 2010).

Although empathy-focused programming is widespread, the empirical evidence for its effectiveness for violence reduction is mixed (e.g., Day, Casey, & Gerace, 2010). In line with this, a recent meta-analysis found that aggression and empathy are weakly associated in adult samples ($r = -0.11$ for cognitive empathy, $r = -0.11$ for

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affective empathy; Vachon, Lynam, & Johnson, 2014). Other meta-analytic investigations yield similar findings, including a meta-analysis of bullying in youth samples ($r = -0.08$ for cognitive empathy, $r = -0.16$ for affective empathy) and two meta-analyses of offending in mixed samples of youth and adults ($r = -0.21$ and -0.23 for cognitive empathy, $r = -0.09$ and -0.05 for affective empathy, respectively; van Langen, Wissink, van Vugt, Van der Stouwe, & Stams, 2014; Jolliffe & Farrington, 2004). Therefore, in contrast to common assumptions regarding the role of empathy in inhibiting aggression, research has found little support for a focus on this trait.

However, these findings may not reflect a true disassociation between empathy and aggression; rather, they may reflect a reliance on overly narrow conceptions of empathy, particularly the affective empathy component (Vachon & Lynam, 2016). Because most measures of affective empathy tap into relatively mild affective content, the role of pathological deficits in affective empathy remain largely unexplored. In order to test this theory, a new measure was developed: the Affective and Cognitive Measure of Empathy (ACME; Vachon & Lynam, 2016) preserves the two traditional factors of empathy—cognitive and affective—but also expands measurement of the affective factor by splitting it into an affective resonance factor (vicariously experiencing a similar emotion) and an affective dissonance factor (vicariously experiencing a contradictory emotion). The affective dissonance (or “anti-empathy”) factor captures the tendency to feel a contradictory response to others’ emotions – such as feeling pain at others’ pleasure, or pleasure at others’ pain. Unlike affective resonance, which produces patterns of vicarious learning that increase prosocial behavior and decrease antisocial behavior, affective dissonance does the opposite, increasing motivation to harm rather than help. In line with this, evidence shows the affective dissonance factor provides substantial prediction of aggression and antisocial behavior (ASB) incremental to other measures of empathy, bridging traditional and pathological conceptions of the empathy construct (Vachon & Lynam, 2016).

1.2. Sex differences in empathy and aggression

Whereas the association between empathy and aggression is more nuanced than previously thought, the evidence for sex differences in empathy is consistent. The personality literature shows robust cross-cultural sex differences in personality traits related to empathy from major models including the FFM (Costa, McCrae, & Dye, 1991; Costa, Terracciano, & McCrae, 2001) and the HEXACO (Lee & Ashton, 2004). Men consistently score substantially lower on the “tender-mindedness” facet of FFM Agreeableness—a trait akin to empathy (Costa et al., 2001). In the HEXACO model of personality, empathy is captured by the “Emotionality” factor, which shows the largest and most consistent sex difference of traits in this model (Ashton & Lee, 2007; Lee & Ashton, 2004). Men are also considerably more likely to meet the diagnostic criteria of personality disorders characterized by empathy deficits, such as antisocial personality disorder, narcissistic personality disorder, and psychopathy (Hare, 2003; Lynam & Widiger, 2008). Across multiple contexts and measurement approaches, men show substantially lower levels of empathy than women.

Sex differences in aggression and ASB are also consistent and begin early in development. Boys show more physical aggression than girls at various ages across childhood (e.g., Archer, 2004; Campbell, Shirley, & Caygill, 2002; Hay, Castle, & Davies, 2000), and mother-reported physical aggression is higher for boys than girls as early as 17 months (Baillargeon et al., 2007). In contrast to evidence for sex differences in physical aggression, findings on other forms of aggression are less robust. Though meta-analytic research shows men engage in more verbal aggression than women, this sex difference is smaller in magnitude than that of physical aggression (Archer, 2004). The magnitude of sex differences in verbal aggression also changes across ages of development (for a review, see Archer & Côté, 2005). Sex differences may also change as a function of the presence or absence of provocation (i.e.,

reactive or proactive aggression, Bettencourt & Miller, 1996). Because the magnitude of sex differences varies based on the type of aggression measured, the current study investigates each of these forms: physical, verbal, reactive, and proactive.

1.3. Sex differences in empathy-aggression relation

Whereas sex differences in empathy and aggression are consistent, evidence for how empathy relates to aggression across sex is unclear. In addition to only a few studies conducted, and which yield inconsistent results, much of the available research on this question focuses on youth samples. Some studies find that empathy and empathy-related constructs bear stronger relations to negative behaviour for men than women (Jolliffe & Farrington, 2007, 2011; Poy, Segarra, Esteller, López, & Moltó, 2014), and differ by sex in their relation to decision-making processes (Christov-Moore et al., 2014). In contrast, others find similar relations for men and women between empathy and antisocial behaviour (e.g., Miller, Watts, & Jones, 2011). Thus, although empathy is often used to explain individual differences in aggression, the generalizability of this effect is thus far unknown. This issue is important to resolve, as prevention and early intervention strategies may need to accommodate sex-specific effects across various types of aggression and ASB. Conversely, if the effects of empathy are consistent across sex and multiple forms of aggression, then prevention efforts may have generalizable and widespread effects. It is expected that by utilizing a newly validated measure of empathy which includes the predictive form of dissonance, we can elucidate the sex-aggression relation.

1.4. Hypotheses

Here we examine whether sex differences in aggression relate to differences in empathy, including traditional forms of empathy (cognitive empathy and affective resonance) and a new form of empathy (affective dissonance, a.k.a., “anti-empathy”). Two hypotheses will be tested:

1.4.1. Explanatory hypothesis

First, it is hypothesized that sex will show indirect effects on aggression through empathy; particularly, affective forms of empathy. In line with previous research, we do not expect indirect effects through cognitive empathy.

1.4.2. Equivalence hypothesis

Second, we expect mean differences in empathy and aggression between men and women. To address inconsistencies in prior research, we will explore whether the association between empathy and aggression remains constant or differs by sex.

2. Method

Full methods are described in Vachon and Lynam (2016). Briefly, a total of 369 participants (207 men, 159 women) were recruited from an introductory psychology course at a Midwest university in the United States. Informed consent was obtained before the study began. Over the course of 1 h, participants completed a battery of self-report measurements in groups, including a demographic questionnaire, the ACME, and self-report measures of empathy, aggression, and ASB. Participants were debriefed and received course credit for participating. Testing procedures followed institutional review board requirements.

2.1. Measures

2.1.1. Affective and Cognitive Measure of Empathy (ACME; Vachon & Lynam, 2016)

The ACME is a 36-item self-report empathy questionnaire that assesses three factors: Cognitive Empathy (understanding others’

emotions, e.g., “I can usually tell how people are feeling”), Affective Resonance (vicariously experiencing a similar emotion, e.g., “I feel awful when I hurt someone’s feelings”), and Affective Dissonance (vicariously experiencing a contradictory emotion, e.g., “I love watching people get upset”). Previous research indicates that Affective Resonance and Affective Dissonance load onto different factors, although these factors are highly correlated (latent correlation, $r = 0.80$). Items were rated by participants on a Likert scale from 1 (“strongly disagree”) to 5 (“strongly agree”). On each scale, higher scores indicate higher empathy (including Affective Dissonance, which was reverse coded for interpretability). Coefficient alphas were 0.87 for both affective scales, and 0.90 for the cognitive scale.

2.1.2. Aggression Questionnaire (AQ; Buss & Perry, 1992)

The AQ is a self-report questionnaire consisting of 29 items. The items are grouped into scales which measure physical and verbal aggression, anger, and hostility. The items included in the current study were the 14 that pertain to aggression (physical and verbal). Coefficient alphas were 0.82 for the 9-item physical aggression scale and 0.75 for the 5-item verbal aggression scale.

2.1.3. Reactive-Proactive Aggression Questionnaire (RPQ; Raine et al., 2006)

The RPQ is a self-report scale consisting of 23 items across the Reactive and Proactive Aggression scales. Coefficient alphas were 0.80 for the reactive scale and 0.81 for the proactive scale.

2.1.4. Self-Report Psychopathy Scale – Version III (SRP-III)

The SRP-III (Paulhus, Neumann, & Hare, in press) is a self-report scale consisting of 64 items across four subscales. The 16-item Antisocial Behaviour subscale was employed in the current study; however, 4 items were dropped because of extremely low endorsement rates: item 12 “I have assaulted a law enforcement officer,” 62 “I have close friends who served time in prison,” item 63 “I purposely tried to hit someone with a vehicle I was driving,” and item 64 “I have violated my probation from prison.” Coefficient alpha for the 12-item scale was 0.75.

3. Results

3.1. Bivariate associations

Table 1 provides Pearson correlations between all measures. At the zero-order level, Affective Resonance and Affective Dissonance were both significantly negatively correlated with all types of aggression and

antisocial behavior. These correlations were medium-to-large in size (Cohen, Cohen, West, & Aiken, 2013). In contrast, cognitive empathy was only significantly negatively related to proactive aggression and antisocial behaviour, and the effect sizes for each were small. As expected, sex was significantly related to every dependent variable, such that men were lower in all forms of empathy and higher in all forms of aggression than women.

3.2. Indirect effects analyses – explanatory test

To examine whether sex differences in empathy account for sex differences in aggression, we carried out mediation analyses using the PROCESS macro (Hayes, 2017). Separate analyses were performed with sex as the independent variable, various forms of empathy as the mediator, and various forms of aggression as the dependent variable (Table 2). Mediation is indicated by the indirect effect through the mediator (ab) or, equivalently, the total effect (c) of the independent variable on the dependent variable minus its direct effect (c'). In order to estimate the significance of the indirect effects (ab), a bias-corrected bootstrap technique was used with 5000 samples and a set 95% or 99% confidence interval (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004). As shown in Table 2, the indirect effect was consistently significant—Affective Resonance and Affective Dissonance mediated the effect of sex on every type of aggression.

The sizes of the indirect effects were large; as an example, the ratio of the indirect effect to the total effect (or the mediation ratio; P_M ; see MacKinnon, 2008) was $P_M = 0.62$ for Affective Dissonance accounting for the effect of sex on proactive aggression. This ratio was larger across analyses of affective dissonance (0.42–0.62) and resonance (0.28–0.84), than for both analyses of cognitive empathy (0.05; analyses were not performed when cognitive empathy was not significantly associated with the dependent variable; MacKinnon, 2008). In the case of affective dissonance accounting for the effect of sex on verbal aggression, the indirect effect was actually larger than the total effect, resulting in a P_M larger than 1.0 (though caution is warranted in interpreting the exact magnitude in cases of full mediation such as these; Wen & Fan, 2015). Although there are limits to the interpretation of this statistic, it is useful in evaluating the magnitude of the mediation effect in the context of the total effect (Preacher & Kelley, 2011).

An alternative approach to interpreting the mediation is by examining the magnitude the indirect effect itself (ab). This statistic represents the number of units that the dependent variable increases indirectly through the mediator for each unit change of the independent variable (Preacher & Kelley, 2011). For example, our results show that as we move from men to women, there is a decrease of 0.19 standard

Table 1
Descriptive and bivariate relations of independent variables, mediators, and dependent variables.

	2	3	4	5	6	7	8	9	Overall		Men		Women	
									M	SD	M	SD	M	SD
1. Sex	0.12*	0.40**	0.41**	-0.45**	-0.15**	-0.30**	-0.30**	-0.30**	-	-	-	-	-	-
2. Cog	(0.90)	0.39**	0.22**	-0.06	0.03	-0.15**	-0.04	-0.17**	46.67	7.27	45.88	7.54	47.68	6.80
3. Res	-	(0.87)	0.66**	-0.44**	-0.33**	-0.43**	-0.30**	-0.46**	49.71	6.89	47.32	6.81	52.86	5.53
4. Dis (r)	-	-	(0.87)	-0.56**	-0.38**	-0.50**	-0.46**	-0.51**	48.05	8.06	45.18	7.62	51.77	6.97
5. Physical	-	-	-	(0.82)	0.43**	0.51**	0.65**	0.52**	23.05	7.46	26.00	6.50	19.26	6.89
6. Verbal	-	-	-	-	(0.75)	0.20*	0.47**	0.20*	15.37	4.03	15.94	3.58	14.71	4.44
7. Proactive	-	-	-	-	-	(0.81)	0.55**	0.64**	14.93	3.19	15.75	3.43	13.85	2.44
8. Reactive	-	-	-	-	-	-	(0.80)	0.46**	20.05	2.92	21.11	3.95	18.74	3.43
9. Antisocial	-	-	-	-	-	-	-	(0.75)	21.40	7.40	23.35	7.67	18.84	6.15

Note. Bivariate relations and descriptive statistics for all variables, including cognitive empathy (Cog), affective resonance (Res), and affective dissonance (Dis), and the outcome variables of aggression (Physical, Verbal, Proactive, Reactive), and Antisocial Behaviour. Affective Dissonance items are reverse scored (r) so that for all three empathy scales higher scores indicate greater empathy. Bracketed values represent the Cronbach’s alpha of each scale. Means (M) and standard deviations (SD) for each variable are provided.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level; 0 = men, 1 = women.

Table 2
Summary of mediation analyses.

Mediating variable	Dependent variable (Aggression type)	Effect of IV (Sex) on mediator		Unique effect of mediator on DV	Total effect	Direct effect	Indirect effect [CI]	R-squared mediation effect size
		a	b					
Affective dissonance	Physical	0.41**	-0.45**	-0.45**	-0.26**	-0.19**	[-0.26, -0.13]	0.15 [0.10, 0.20]
	Verbal	0.41**	-0.37**	-0.15**	0.01	-0.15**	[-0.23, -0.09]	0.02 [-0.01, 0.06]
	Proactive	0.41**	-0.45**	-0.30**	-0.11	-0.18**	[-0.26, -0.12]	0.08 [0.04, 0.12]
Affective resonance	Reactive	0.41**	-0.40**	-0.30**	-0.13**	-0.16**	[-0.24, -0.10]	0.07 [0.04, 0.12]
	Antisocial Behaviour	0.41**	-0.45**	-0.31**	-0.12	-0.18**	[-0.26, -0.12]	0.08 [0.04, 0.12]
	Physical	0.40**	-0.30**	-0.45**	-0.32**	-0.12**	[-0.19, -0.07]	0.11 [0.07, 0.16]
Cognitive empathy	Verbal	0.40**	-0.32**	-0.15**	-0.02	-0.13**	[-0.20, -0.07]	0.02 [0.00, 0.05]
	Proactive	0.40**	-0.36**	-0.29**	-0.15	-0.14**	[-0.23, -0.17]	0.07 [0.04, 0.11]
	Reactive	0.40**	-0.21**	-0.30**	-0.21**	-0.08**	[-0.15, -0.02]	0.05 [0.03, 0.08]
Antisocial Behaviour	Physical	0.40**	-0.39**	-0.30**	-0.15**	-0.16**	[-0.23, -0.10]	0.07 [0.04, 0.11]
	Verbal	-	-	-	-	-	-	-
	Proactive	0.12*	-0.11*	-0.30**	-0.28**	-0.01*	[-0.04, 0.001]	0.01 [0.00, 0.03]
Antisocial Behaviour	Reactive	-	-	-	-	-	-	-
	Antisocial Behaviour	0.12*	-0.13**	-0.30**	-0.29**	-0.02	[-0.04, -0.002]	0.01 [0.00, 0.03]

Note: Mediation results reported with standardized (β) coefficients and confidence intervals (CI). Each analysis was performed with sex as independent variable, forms of empathy as mediators, and forms of aggression as dependent variables. Mediation analysis was not conducted for any empathy/aggression relation that was not significant to begin with, as there was no variance to explain.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level; 0 = men, 1 = women.

units in physical aggression that can be accounted for indirectly by empathy (Table 2). As men reported an average of 0.41 standardized units higher on the physical aggression measure than women, empathy accounts for a large amount of the sex difference in reported physical aggression (nearly half).

3.3. Moderation analyses – equivalence test

To test whether the effect of empathy on aggression differed for men and women, 15 hierarchical regression analyses were conducted. For each analysis, aggression scores were regressed onto sex and centered empathy scores in Step 1, and onto a sex-by-empathy interaction term at Step 2 (Table 3). At Step 1, sex, Affective Resonance, and Affective Dissonance significantly predicted every form of aggression and ASB measured. In contrast, cognitive empathy only significantly predicted proactive aggression and ASB. At Step 2, there were no significant interaction terms, suggesting the association between empathy and aggression was similar across sex. A single exception was a small effect for affective resonance as a moderator of the effect of sex on verbal aggression, but only at an uncorrected *p*-value of 0.05; any correction for multiple testing reduces this to non-significance. Although it is important to interpret the post-hoc analyses with caution, a simple slopes analysis using PROCESS indicates that the effect of affective resonance on aggression is significant for both sexes, but may diverge slightly across men (*b* = -0.137, 95% CI [-0.214, -0.061], *t* = -3.54, *p* < .001) and women (*b* = -0.282, 95% CI [-0.3897, -0.1737], *t* = -5.13, *p* < .001).

4. Discussion

As expected, our study replicated three fundamental associations: (1) women were less aggressive than men across various measures, (2) women had more empathy than men across various measures, and (3) aggression was associated with deficient affective empathy. Replicating these fundamental main effects provided a foundation for our exploration of indirect effects (explanatory) and moderation (equivalence) tests.

Overall, sex differences in aggression were indirectly accounted for by empathy, particularly both affective forms. Affective Resonance indirectly accounted for sex differences in all forms of aggression—29% of the effect of sex on physical aggression, 83% on verbal, 49% on proactive, 28% on reactive, and 52% on ASB. Affective Dissonance accounted for even more of the sex differences in aggression—42% of the effect of sex on physical aggression, nearly 100% on verbal, 62% on proactive, 55% on reactive, and 60% on ASB. In contrast, Cognitive Empathy failed to indirectly account for sex differences in three of five dependent variables and only accounted for 5% of the total effect on the others (proactive aggression and ASB).

Despite specific forms of empathy indirectly accounting for the effects of sex on aggression, there was little evidence of an interaction between sex and empathy. There was a lack of evidence for differing associations between sex and aggression across different levels of empathy (or, equivalently, for differing associations between empathy and aggression across sex). Fig. 1 displays both main effects and the lack of interaction using the example of Affective Dissonance and Physical Aggression: empathy is lower in men than women (empathy main effect) and aggression is higher in men than women (aggression main effect), whereas the lack of interaction between sex and empathy is represented by the consistent ratio of the low-to-high empathy bars for both sexes in Fig. 1a, and by the parallel empathy-aggression slopes in Fig. 1b.

Findings from the current study help clarify inconsistencies in past research. Whereas some research suggests that empathy relates more strongly to aggression for men than women (e.g., Jolliffe & Farrington, 2007, 2011; Poy et al., 2014), other research finds no evidence for this sex difference (e.g., Miller et al., 2011). The reason for this

Table 3
Summary of results of moderation analyses (at Step 2).

Step		IVs		Physical aggression		Verbal aggression		Proactive aggression		Reactive aggression		Antisocial behaviour	
		B [CI]	β	B [CI]	β	B [CI]	β	B [CI]	β	B [CI]	β	B [CI]	β
DVs													
Analysis 1: Sex x Affective Dissonance													
1	Sex	-3.89 [-5.25, -2.52]	-0.26**	0.04 [-0.81, -0.90]	0	-0.73 [-1.36, -0.10]	-0.11*	-1.05 [-1.84, -0.26]	-0.13**	-1.82 [-3.27, -0.36]	-0.12*		
	Dis	-0.42 [-0.51, -0.34]	-0.45**	-0.19 [-0.24, -0.13]	-0.37**	-0.18 [-0.22, -0.14]	-0.45**	-0.19 [-0.24, -0.15]	-0.40**	-0.42 [-0.51, -0.33]	-0.45**		
	ΔR^2	0.37**		0.14**		0.26**		0.22**		0.26**			
2	Sex	-3.73 [-5.11, -2.35]	-0.25**	0.11 [-0.75, 0.98]	0.01	-0.79 [-1.42, -0.15]	-0.12*	-1.03 [-1.83, -0.24]	-0.13*	-1.83 [-3.30, -0.36]	-0.12*		
	Dis	-0.38 [-0.49, -0.27]	-0.41**	-0.16 [-0.23, -0.10]	-0.32**	-0.20 [-0.25, -0.15]	-0.50**	-0.19 [-0.25, -0.13]	-0.39**	-0.42 [-0.54, -0.31]	-0.46**		
	Sex X Dis	-0.12 [-0.30, 0.06]	-0.08	-0.06 [-0.17, 0.05]	-0.08	0.05 [-0.03, 0.13]	0.07	-0.02 [-0.12, 0.08]	-0.02	0.01 [-0.17, 0.20]	0.01		
	ΔR^2	0		0		0		0		0			
Analysis 2: Sex X Affective Resonance													
1	Sex	-4.81 [-6.26, -3.36]	-0.32**	-0.20 [-1.06, 0.67]	-0.02	-0.96 [-1.61, -0.31]	-0.15**	-1.67 [-2.50, -0.84]	-0.21**	-2.16 [-3.66, -0.67]	-0.15**		
	Res	-0.33 [-0.44, -0.23]	-0.30**	-0.19 [-0.25, -0.12]	-0.32	-0.17 [-0.21, -0.12]	-0.36**	-0.12 [-0.18, -0.06]	-0.21**	-0.42 [-0.53, -0.31]	-0.39**		
	ΔR^2	0.28**		0.11**		0.20**		0.12**		0.22**			
2	Sex	-4.66 [-6.15, -3.17]	-0.31**	-0.01 [-0.89, 0.87]	0	-0.96 [-1.62, -0.29]	-0.15**	-1.62 [-2.46, -0.77]	-0.21**	-2.25 [-3.77, -0.72]	-0.15**		
	Res	-0.30 [-0.43, -0.17]	-0.27**	-0.14 [-0.21, -0.06]	-0.23**	-0.17 [-0.22, -0.1]	-0.36**	-0.10 [-0.18, -0.03]	-0.18**	-0.44 [-0.57, -0.31]	-0.41**		
	Sex X Res	-0.11 [-0.33, 0.12]	-0.06	-0.14 [-0.28, -0.01]	-0.14	0 [-0.10, 0.10]	-0.01	-0.04 [-0.17, 0.09]	-0.04	0.06 [-0.17, 0.29]	0.03		
	ΔR^2	0		0.01*		0		0		0			
Analysis 3: Sex X Cognitive Empathy													
1	Sex	-6.78 [-8.19, -5.38]	-0.45**	-1.29 [-2.12, -0.45]	-0.16**	-1.81 [-2.44, -1.18]	-0.28**	-2.38 [-3.16, -1.60]	-0.30**	-4.26 [-5.73, -2.79]	-0.27**		
	Cog	0 [-0.09, 0.09]	0	0.03 [-0.03, 0.09]	0.06	-0.05 [-0.09, -0.01]	-0.11*	0 [-0.05, 0.05]	0	-0.14 [-0.24, -0.04]	-0.13**		
	ΔR^2	0.20**		0.03**		0.10**		0.09**		0.11**			
2	Sex	-6.79 [-8.19, -5.38]	-0.45**	-1.29 [-2.13, -0.46]	-0.16**	-1.83 [-2.47, -1.20]	-0.29**	-2.38 [-3.17, -1.60]	-0.30**	-4.30 [-5.77, -2.84]	-0.29**		
	Cog	0 [-0.13, 0.12]	0	0.02 [-0.05, 0.09]	0.04	-0.08 [-0.13, -0.02]	-0.18**	0 [-0.07, 0.07]	0	-0.19 [-0.32, -0.06]	-0.19**		
	Sex X Cog	0.02 [-0.18, 0.22]	0.01	0.03 [-0.09, 0.15]	0.03	0.08 [-0.01, 0.17]	0.11	0 [-0.12, 0.11]	0.01	0.14 [-0.06, 0.35]	0.09		
	ΔR^2	0		0		0.01		0		0.01			

Note. Unstandardized regression coefficients (B) with confidence intervals (CI) and standardized coefficients (β) of moderation analyses for affective dissonance (Dis), affective resonance (Res), and cognitive empathy (Cog). Separate hierarchical regression analyses were conducted with aggression scores regressed onto sex and empathy at Step 1, and the Sex x Empathy interaction term at Step 2. IVS = independent variables, DVs = dependent variables.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level; 0 = men, 1 = women.

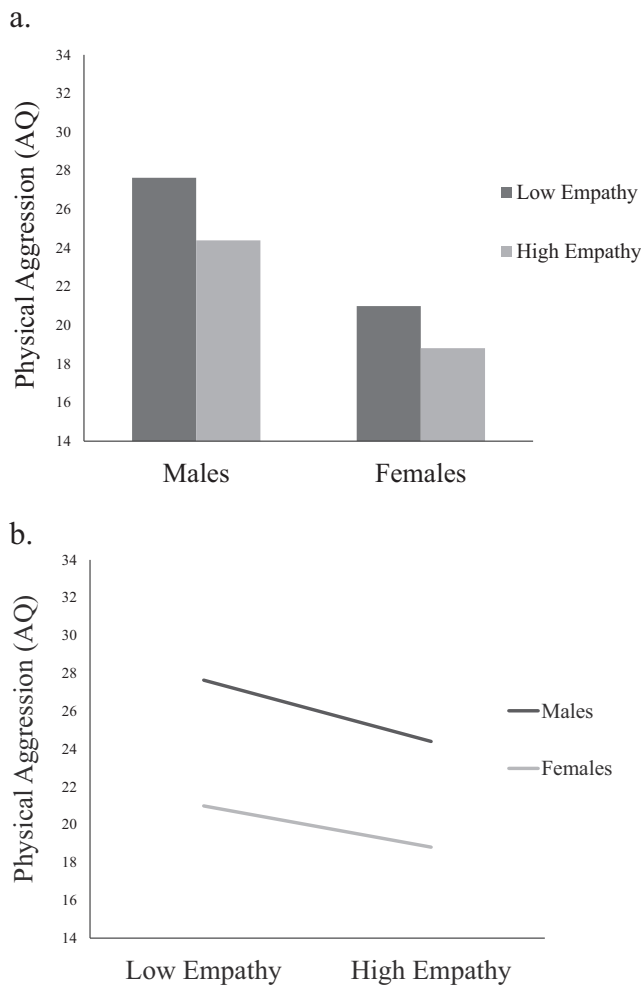


Fig. 1. Moderation analyses results. Panel 1a depicts the first possible interpretation: affective dissonance (reversed scored) moderates the relation between sex (1 = women, 0 = men) and physical aggression (as measured by the AQ). Panel 1b depicts the second possible interpretation: sex moderates the relation between affective dissonance and physical aggression. Panel 1a reflects our focus on empathy as the moderator of the sex-aggression relation; however, equivalence is more easily seen in panel 1b.

inconsistency appears to be a reliance on restricted measures of the empathy construct. By using a measure that involves a predictive expansion of the empathy trait, our results support the notion that empathy performs in a similar manner for men and women. Though we can draw limited conclusions from non-significant findings, our results do suggest that future research will benefit from elucidating how external correlates of empathy – and specifically, dissonant empathy – vary in relation to individual characteristics such as sex.

4.1. Empathy as a complementary mediator

An important aspect of our findings is that they complement various models of aggression, such as Social Information Process theory, Internal Control Theory, and the General Aggression Model. For example, according to *Social Information Processing* theory, individual differences in aggression are due to biases in attending, interpreting, and responding to social cues, as well as differences in evaluating and caring about the efficacy of responses (Crick & Dodge, 1994; Dodge & Crick, 1990). Biases in interpreting and experiencing cues, as well as in the social processing feedback loop, may depend on characterological differences in cognitive and affective empathy (e.g., Lockwood, Bird, Bridge, & Viding, 2013). According to *Internal Control Theory*,

aggression is common in psychopaths because they lack internal controls, or “inner policemen” (Hare, 1993). From this perspective, affective empathy is an essential internal control that prevents aggression even in the absence of external controls such as punishment. Our results validate this idea for affective resonance and extend the idea for affective dissonance, which reflects not only an absence of internal controls but a tendency to interpret and respond in a sadistic way to the emotions of others. Finally, according to the *General Aggression Model*, personological (aspects of the person) and situational (aspects of the context) factors combine to influence aggression (Anderson & Bushman, 2002; DeWall, Anderson, & Bushman, 2011). Our results suggest that empathy is an important personological variable for clarifying the effect of sex on aggression. Future research might investigate the extent to which empathy moderates a range of situational factors that influence aggression.

4.2. Limitations

One limitation of our study is that it did not employ a longitudinal design. Although longitudinal designs are preferable in the context of exploring indirect effects because they use temporal ordering to strengthen causal inference, our model has a theoretical sequential justification: biological sex precedes personality, and various studies and theories suggest the development of empathy precedes purposeful aggression, particularly the types measured here (Hastings, Zahn-Waxler, Robinson, Usher, & Bridges, 2000). Some indicators of empathic concern have even been found in infants as young as 8 months (Roth-Hanania, Davidov, & Zahn-Waxler, 2011). Thus, the sex-empathy-aggression developmental sequence partially mitigates our temporal limitation. Such strong theoretical bases for the temporality of variables may mitigate the need for longitudinal designs (Kline, 2015). Despite this supporting information, our claims would certainly be strengthened by a longitudinal replication, as would the exact magnitude of the effect sizes (Preacher & Kelley, 2011).

A second limitation of this study is the focus on certain aggression types: physical, verbal, proactive, and reactive aggression and anti-social behaviour. A focus on these types was consistent with our study aim – to investigate the relation of empathy to forms of aggression and ASB distinguished by large sex differences. However, sex differences other types of aggression, such as relational aggression and online aggression, may differ, and the role of empathy deficits in these forms of aggression is less established. Furthermore, some types of aggression may be more common among women (e.g., social aggression); if so, it is difficult to predict how empathy might explain these differences. Future research would benefit from an examination of these questions.

Finally, it is worth noting that our sample was limited to a university population. Given the “WEIRD” (Western, Educated, Industrialized, Rich, and Democratic; Henrich, Heine, & Norenzayan, 2010) nature of our sample, the generalizability and range of scores we obtained are likely restricted. Future research should examine these associations in other societies and cultures, across various demographic characteristics, and in samples with more extreme scores on these measures (e.g., incarcerated samples).

4.3. Implications

If our findings continue to replicate and generalize, empathy may be a specific and powerful mediator of the sex-aggression association. Importantly, this pathway from sex to aggression may be particularly malleable, given relatively low heritability estimates (approximately 25%) relative to other traits (approximately 50%; Davis, Luce, & Kraus, 1994; Jang, Livesley, & Vernon, 1996). As such, it is important to identify key environmental factors and developmental windows that may affect empathy and its relation to aggression. Furthermore, most empathy training programs in children and adults currently focus on improving cognitive empathy skills, despite the lack of evidence that

cognitive empathy impacts aggressive behavior. It is therefore important to determine when and how affective empathy—particularly affective dissonance—develops. Identifying sensitive periods and isolating key developmental and cultural influences may help inform prevention and early intervention efforts aimed at reducing aggression.

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Declaration of Competing Interest

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