



The Role of Gender in the Relationship Between Reinforcement Sensitivity and Aggression among Adolescents

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This study focuses on the relationship between reinforcement sensitivity and aggression according to the combination of forms and functions of aggression (i.e. proactive overt, proactive relational, reactive overt and reactive relational), and on the moderating role of gender in this relationship. The survey included 656 adolescents (55.33% male) from the city of Zagreb, Croatia. The results show that reward sensitivity has the highest relation with proactive overt aggression, while punishment sensitivity has the highest relation with reactive relational aggression. A moderator analysis shows that boys with high reward sensitivity manifest higher level of proactive overt aggression than girls with high reward sensitivity. Also, boys with high punishment sensitivity manifest higher level of reactive relational aggression than girls with high punishment sensitivity. The findings can help to improve the treatment of aggressive behaviour in adolescence by focusing on reward sensitivity in relation to punishment sensitivity.

Keywords: aggression, reinforcement sensitivity, gender, adolescence, moderation analysis

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Introduction

According to biological psychologists, personality reflects a variation in the functioning of two biologically based systems of motivation and emotion, namely, approach and avoidance systems (Smillie, 2008). One of the most influential theories in this field is the Reinforcement Sensitivity Theory (RST, Gray, 1970; Gray & McNaughton, 2000) which postulates three major brain subsystems that underlie the main personality dimensions. Accordingly, the approach system concerns sensitivity to reward, and is represented by the Behavioural Approach System (BAS). BAS mediates reactions to appetitive stimuli. It is associated with

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positive emotions of elation and optimism. The avoidance system concerns sensitivity to punishment and is represented by the Fight/Flight/Freeze System (FFFS) and the Behavioural Inhibition System (BIS). FFFS mediates reactions to aversive stimuli and is posited to be the neural substrate for the emotion of fear. BIS resolves conflicts among competing goals (e.g. approach-avoidance conflict) and is proposed to be the neural substrate for the emotion of anxiety. Past studies show that various types of psychopathology can be explained by different constellations of sensitivity to reward and sensitivity to punishment (Muris et al., 2005). The occurrence of aggressive behaviour is influenced by certain personality traits (Komasi et al., 2016).

Although consistent associations have been determined between reinforcement sensitivity and aggression, studies have focused either on the form of aggression or on the function of aggression (Bjork et al., 2010; Hubbard et al., 2002; Loukas et al., 2005; Marsee et al., 2008; Terranova et al., 2008). Forms of aggression can be divided into overt aggression, which refers to endangering others by verbal and physical means, and relational aggression which refers to endangering others through social relationships (Crick & Grotpeter, 1995). Although significant relations have been found between overt and relational aggression ($r = 0.5 - 0.7$, Card et al., 2008; Crick & Grotpeter, 1995), studies have determined their distinction via different associations with psychosocial problems of adjustment (Little et al., 2003). On the other hand, functional types of aggression are classified according to the motive of the perpetrator (Tuvblad et al., 2009). Accordingly, reactive aggression, which is described by the frustration-aggression hypothesis (Berkowitz, 1989), represents a hostile and defensive response to a perceived threat or provocation. On the other hand, proactive aggression requires neither threat nor provocation. It represents instrumental, offensive, goal-directed behaviour, as explained by the social learning theory (Bandura, 1971).

A multidimensional approach to the study of aggression starts from the combinations of forms and functions of aggression, namely, proactive overt aggression (POA), proactive relational aggression (PRA), reactive overt aggression (ROA) and reactive relational aggression (RRA). The association between reinforcement sensitivity and aggression according to the combination of forms and functions of aggression has not yet been examined. Moreover, gender differences in the association between reinforcement sensitivity and aggression according to the combinations of form and function were not examined. So, the goal of this research was to determine the associations between reinforcement sensitivity and aggression according to a multidimensional approach to the study of aggression and the role of gender in this relationship.

The relationship between reinforcement sensitivity and aggression according to its form and function

Studies show that overt and relational aggression as well as proactive and reactive aggression is associated with different personality dimensions (Batanova & Loukas, 2011; Dane & Marini, 2014; Hubbard et al., 2002; Loudin et al., 2003; Loukas et al., 2005; Marsee et al., 2008; Terranova et al., 2008). Accordingly, overt aggression is related to a low predisposition towards anxiety and fear (Dane & Marini, 2014; Terranova et al., 2008). Individuals who have a low predisposition towards anxiety and fear, have problems with internalising social norms which can lead to socially inappropriate behaviour such as aggression. Further, as a result of low

anxiety and fear, reward-driven behaviour becomes more salient (Scarpa et al., 2010). Overt aggression is associated with exaggerated limbic response to outcomes of reward-directed behaviour (Bjork et al., 2010; Hundt et al., 2008; Olson et al., 2013). On the other hand, relational aggression is related to a high predisposition towards anxiety and fear (Dane & Marini, 2014; Loudin et al., 2003; Loukas et al., 2005; Marsee et al., 2008; Terranova et al., 2008). Anxious individuals, due to the fear of punishment, choose a relational form of aggression which is more concealed and socially acceptable (Loukas et al., 2005; Terranova et al., 2008). Reactive aggression is related to dispositions toward anxiety, fear, and emotional dysregulation (Bobadilla et al., 2012; Marsee & Frick, 2007; Moran et al., 2014; Vitaro et al., 2002). In comparison, proactive aggression is related to low anxiety and fear (Bobadilla et al., 2012; Gao et al., 2015; Vitaro et al., 2002), and a disposition towards rewarding behaviour (Atkins et al., 2001; Barry et al., 2000; Frick & White, 2008). It can be concluded that overt aggression and proactive aggression are related to low punishment sensitivity and high reward sensitivity. On the other hand, relational aggression and reactive aggression are related to high punishment sensitivity. Thereafter, we can expect different associations between reinforcement sensitivity and aggression according to the combinations of form and function.

Gender differences in reinforcement sensitivity and aggression according to its form and function

Gender differences in the associations between reinforcement sensitivity and aggression according to the combinations of form and function has not yet been examined. Research on gender differences in aggression according to the form shows that men score higher on overt aggression, while gender differences in relational aggression were not determined (Archer, 2004; Card et al., 2008; Lansford et al., 2012; Prinstein et al., 2001). Gender differences in aggression according to its function are not consistent. For example, some studies show no gender differences (Connor et al., 2003; Polman, de Castro et al., 2007) while others show that men score higher on proactive and reactive aggression (Little et al., 2003; Salmivalli & Nieminen, 2002). Furthermore, gender differences in aggression according to the combination of forms and functions have not been sufficiently examined. For example, it was determined that boys score higher on proactive overt and reactive overt aggression (Bailey & Ostrov, 2007; Marsee et al., 2011), girls score higher on reactive relational aggression (Marsee et al., 2011), or gender differences in functional types of relational aggression were not determined (Bailey & Ostrov, 2007). Besides, gender differences in reinforcement sensitivity are not consistent. Research shows either no gender differences (Slobodskaya & Kuznetsova, 2013; Vervoort et al., 2015) or suggests differences where women are more sensitive to punishment (Beaton et al., 2015; Cross, Copping, & Campbell, 2011; Robinson et al., 2010; Vervoort et al., 2010) while men are more sensitive to reward (Li et al., 2007).

Aims of the study and hypotheses

Until now, the relationship between aggression and sensitivity to reward and punishment has not been analysed in the context of the multidimensional approach to the study of aggression. So, the first goal of this research

was to determine the relationship between aggression types according to the combinations of form and function and reinforcement sensitivity. According to studies (e.g. Bobadilla et al., 2012; Dane & Marini, 2014; Scarpa et al., 2010) which relate forms and functions of aggression with dispositions towards anxiety and fear and towards rewarding behaviour, it has been hypothesised that sensitivity to punishment would have the strongest association with reactive relational aggression and the weakest association with proactive overt aggression. Moreover, sensitivity to reward would have the highest association with proactive overt aggression. Besides, the relationship between reinforcement sensitivity and aggression according to the combinations of forms and functions would be analysed separately for boys and girls. However, assumptions were not specified, while gender differences in this context were not examined. The second goal of the study was to analyse whether gender moderates the relationship between reinforcement sensitivity and aggression according to the combinations of forms and functions. While gender differences in reinforcement sensitivity and aggression according to the combinations of forms and functions are not consistent, no hypothesis has been determined about the role that gender plays in the relationship between reinforcement sensitivity and aggression according to the combinations of forms and functions. In this sense, the contribution of the study is based on ascertaining the relationship between reinforcement sensitivity and aggression among adolescents, and particularly in relation to gender.

Method

Participants and procedure

Participants were students of the third grade of secondary school in Zagreb, Croatia, aged 16 to 17 years old. In total, 656 individuals filled in a questionnaire, of whom 55.33 % were males and 44.66% females. Prior to the data collection, active participant assent and passive parental consent were obtained. The study was previously approved by the Ethics Committee of the Department of Psychology at the Faculty of Humanities and Social Sciences in Zagreb. The data were collected through a self-report questionnaire with guaranteed anonymity of the data. Participants were assessed in groups during their classes. Research was conducted in November and December in 2015.

Measures

Peer Conflict Scale (PCS; Marsee et al., 2011). The PCS is a self-report measure which consists of four subscales designed to differentiate between proactive overt aggression (e.g., "I threaten others to get what I want"), proactive relational aggression (e.g., "I gossip about others to become popular"), reactive overt aggression (e.g., "I have got into fights, even over small insults from others"), and reactive relational aggression (e.g., "If others make me mad, I tell their secrets"). Each subscale includes 10 items. Responses are scored on a Likert scale in the range of 0 (not at all true) to 3 (definitely true). The psychometric properties of the PCS have been analysed on a sample of adolescents in different types of settings (i.e., school-based, residential intervention, and detention settings). The four factors showed good internal consistency across

samples as well as construct validity in relation to external variables (Marsee et al., 2011). In this study, the internal consistency alpha coefficients of PCS aggression subtypes range from 0.75 to 0.8.

Sensitivity to Punishment and Sensitivity to Reward Questionnaire for Children (SPSRQ-C, Luman et al., 2012). SPSRQ-C is a parent report questionnaire measuring sensitivity to reward and punishment in children. The sensitivity to reward scale, which consists of 18 items, includes three subscales: impulsivity, reward responsiveness, and drive. The sensitivity to punishment scale, which consists of 15 items, includes the BIS and FFFS scale. Responses are scored on a Likert scale in the range of 1 (strongly disagree) to 5 (strongly agree). Good internal consistency as well as external validity of the SPSRQ-C were determined (see Luman et al., 2012). Since no questionnaire to measure reinforcement sensitivity in adolescents exists, and keeping within existing studies on reinforcement sensitivity, the SPSRQ-C was modified into a self-report SPSRQ-C. The psychometric properties of the SPSRQ-C were analysed on a sample of children aged 6 to 13, but owing to face validity, the content of items stayed the same, and the items were rephrased into a self-report. For example, the sensitivity to reward item was: "I engage in risky behaviour to obtain a reward", and the sensitivity to punishment item was: "I often refrain from doing something I like in order not to be rejected or disapproved by others". The questionnaire was first piloted with students of the third grade of one secondary school in Zagreb (N = 81). Due to negative correlations with other items, three items were deleted, namely item 2 (FFFS), 26 (impulsivity) and 33 (BIS) which improved the reliability of the scales. Cronbach alpha for all subscales ranged from 0.70 to 0.75. Consequently, the questionnaire used in this study consisted of 30 items. To analyse the discriminant validity of the constructs, exploratory factor analysis (EFA) was conducted on the existing 30 items. Nevertheless, the sensitivity to reward factor (which consisted of impulsivity, reward responsiveness and drive items) and the sensitivity to punishment factor (which consisted of BIS and FFFS items) were efficiently differentiated. The internal consistency alpha coefficients in the main study were 0.836 and 0.835 for the sensitivity to reward scale and the sensitivity to punishment scale, respectively.

Statistical Analysis

The data were analysed using IBM SPSS Statistics. Correlational analysis was conducted to determine the relationship between aggression types according to the combinations of form and function and reinforcement sensitivity; T-tests were employed to determine gender differences in aggression subtypes according to the combination of form and function as well as in sensitivity to reward and punishment. Moderation analysis was used to determine whether gender moderates the relationship between aggression subtypes and sensitivity to reward and sensitivity to punishment.

Results

Descriptive statistics

The descriptive statistics of the PCS for boys and girls are presented in Table I, together with the Cronbach alpha coefficients for the whole sample. Gender differences were analysed via t-test. The results show that boys scored higher on the POA and ROA while girls scored higher on the RRA.

Table I. Descriptive Statistics for Peer Conflict Scale Aggression Subtypes in Boys and Girls, and Internal Consistency Values for Overall Sample

	Boys		Girls		<i>t</i>	<i>d</i>	α
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
POA	0.35	0.42	0.20	0.24	5.55**	.43	.77
PRA	0.34	0.37	0.32	0.33	.51	.05	.75
ROA	0.87	0.58	0.76	0.48	2.23*	.21	.80
RRA	0.42	0.39	0.54	0.37	-4.75**	-.31	.75

Note: POA = proactive overt aggression, PRA = proactive relational aggression, ROA = reactive overt aggression, RRA = reactive relational aggression. *d* = Cohen's *d* index. α = Cronbach's α . **p* < .05; ***p* < .01.

Descriptive statistics for the SPSRQ-C for boys and girls are presented in Table II, together with the Cronbach alpha coefficients for the whole sample. Gender differences were analysed via t-test. The results show that boys scored higher on sensitivity to reward while girls scored higher on sensitivity to punishment.

Table II. Descriptive Statistics for Sensitivity to Reward Scale and Sensitivity to Punishment Scale from SPSRQ-C in Boys and Girls and Internal Consistency Values for Overall Sample

	Boys		Girls		<i>t</i>	<i>d</i>	α
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Sensitivity to reward	2.95	0.70	2.72	0.65	4.00**	.33	.83
Sensitivity to punishment	2.64	0.74	2.77	0.72	-2.30*	-.17	.83

Note: *d* = Cohen's *d* index. α = Cronbach's α . **p* < .05; ***p* < .01.

The relationship between reinforcement sensitivity and aggression according to the combination of form and function

Correlations between reinforcement sensitivity and aggression subtypes on the overall sample and separately on a sample of boys and girls respectively, are presented in Table III. The results show that reward sensitivity has the strongest correlation with proactive overt aggression, while punishment sensitivity has the strongest correlation with reactive relational aggression and the weakest correlation with proactive overt aggression both in the overall sample and on the sample of boys and girls. Furthermore, punishment sensitivity positively

correlates with proactive relational and reactive relational aggression in boys, while in girls it correlates positively just with reactive relational aggression. Thus, sensitivity to punishment in both genders correlates with reactive relational aggression. In order to determine whether there is a significant difference between the two correlation coefficients, i.e. whether there is a gender difference in the relationship between sensitivity to punishment and reactive relational aggression, the transformation procedure of Fisher's correlation coefficients into corresponding z values was employed. Accordingly, a significant gender difference (Fisher's $z = 2.19$, $p < 0.05$) was found in the relationship between punishment sensitivity and reactive relational aggression which was stronger in boys than in girls.

Table III. Correlations Between Explored Variables for Overall Sample and for Boys and Girls

	SR	SP	SR		SP	
	Overall Sample	Overall Sample	Boys	Girls	Boys	Girls
POA	.48**	.01	.46**	.47**	.05	-.01
PRA	.43**	.14**	.41**	.46**	.18**	.09
ROA	.45**	.04	.44**	.44**	.06	.03
RRA	.36**	.24**	.39**	.43**	.30**	.13*

Note: SR = Sensitivity to Reward, SP = Sensitivity to Punishment. POA = proactive overt aggression, PRA = proactive relational aggression, ROA = reactive overt aggression, RRA = reactive relational aggression. * $p < .05$; ** $p < .01$.

Gender as a moderator in the relationship between reinforcement sensitivity and aggression according to the combination of form and function

In order to determine whether there are any gender differences in the relationship between reinforcement sensitivity and aggression subtypes, eight hierarchical regression analyses were conducted. In four analyses, sensitivity to reward and gender were entered in the first step, while interaction, i.e. product of reward sensitivity and gender, was entered in the second step. In every analysis, the criterion variable was one of the aggression subtypes - POA, PRA, ROA or RRA. Accordingly, in the subsequent four analyses, punishment sensitivity and gender were entered in the first step while interaction, i.e. the product of gender and punishment sensitivity, was entered in the second step. In every analysis, the criterion variable was one of the aggression subtypes - POA, PRA, ROA or RRA.

In the case where POA was the criterion variable, interaction between reward sensitivity and gender resulted in a border significant change in R^2 ($\Delta R^2 = 0.004$; $\Delta F_{(3/652)} = 73.949$, $\beta = -0.067$; $p = 0.050$) which suggests gender differences in the relationship between reward sensitivity and POA. The interaction between reward sensitivity and gender is presented in Figure 1 where it can be seen that boys with high sensitivity to reward manifest the highest level of POA. The regression model was significant ($R^2 = 0.249$; $F_{(2/653)} = 108.521$,

$p < 0.01$). Significant predictors were sensitivity to reward ($\beta = 0.457$; $p < 0.01$) and gender ($\beta = -0.136$; $p < 0.01$).

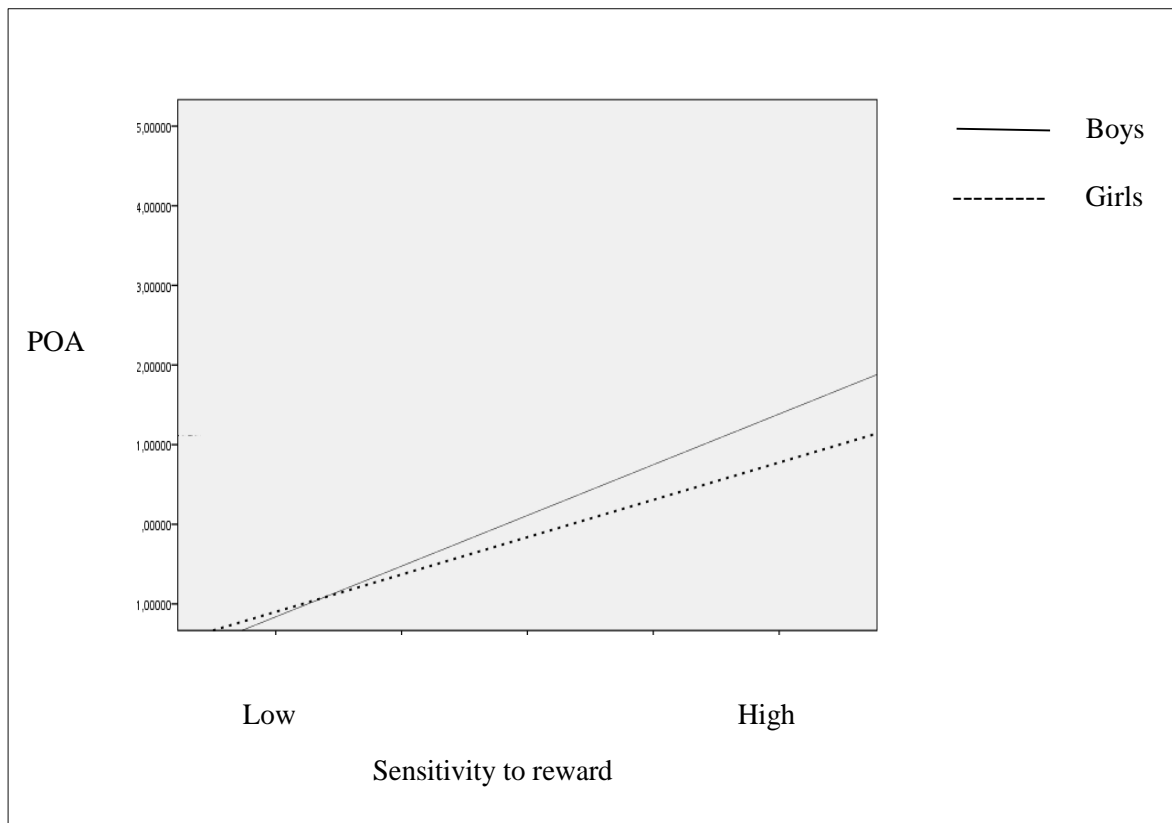


Figure 1. Moderation effect of gender in the relationship between proactive overt aggression (POA) and sensitivity to reward

Furthermore, in the case where the criterion variable was RRA, interaction between gender and punishment sensitivity resulted in a significant change in R^2 ($\Delta R^2 = 0.004$; $\Delta F_{(3/652)} = 22.317$, $\beta = -0.087$; $p < 0.05$) which suggests gender differences in the relationship between punishment sensitivity and RRA. Interaction between punishment sensitivity and gender is presented in Figure 2 where it can be seen that boys with high punishment sensitivity manifest the highest level of RRA. The regression model was significant ($R^2 = 0.086$; $F_{(2/653)} = 30.557$, $p < 0.01$). Significant predictors were sensitivity to punishment ($\beta = 0.227$; $p < 0.01$) and gender ($\beta = 0.164$; $p < 0.01$).

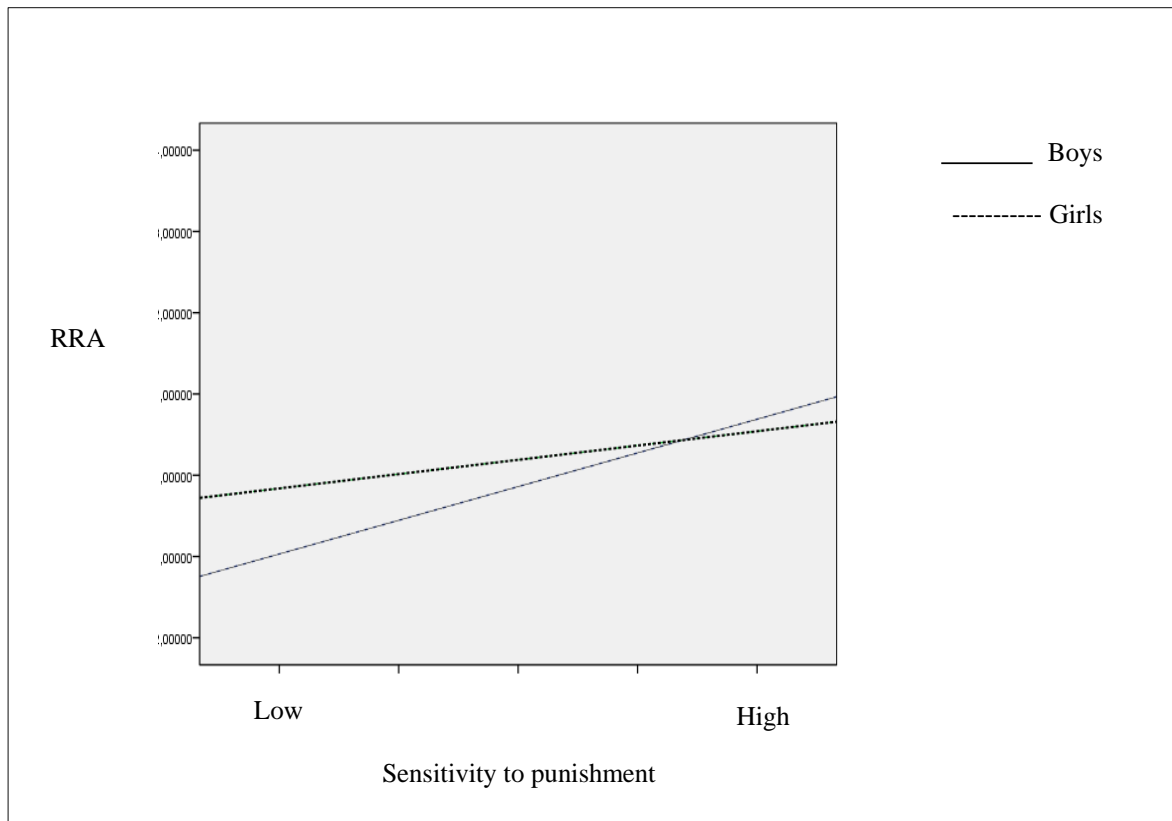


Figure 2. Moderation effect of gender in the relationship between reactive relational aggression (RRA) and sensitivity to punishment

Discussion

The results on the overall sample and on a sample of boys and girls show that sensitivity to reward has the highest association with POA, while sensitivity to punishment has the highest association with RRA and the lowest with POA, thus confirming the first hypothesis. The results also show that boys manifest a higher level of POA and ROA than girls. This result is in accordance with studies whose focus was either forms of aggression or a combination of forms and functions, which indicate a higher level of overt aggression in males (Archer, 2004; Bailey & Ostrov, 2007; Marsee et al., 2011.). Past studies show no gender differences in relational aggression. However, boys and girls may differ in how this use of aggression affects their peer relationships. For example, initial relational aggression predicted increased perceived popularity over time for girls, while it did not lead to increased perceived popularity for boys (Rose et al., 2004). If relational aggression is considered atypical for boys, then this type of aggression would less likely lead to increased perceived popularity for them (Rose et al., 2004). Moreover, studies which have shown no gender differences in relational aggression, focused particularly on forms of aggression (Card et al., 2008; Lansford et al., 2012.; Prinstein et al., 2001). In the present study, girls show a higher level of RRA which is in accordance with Marsee et al. (2011). Gender differences in reinforcement sensitivity show a higher sensitivity to reward in boys while girls show a higher sensitivity to punishment which is in accordance with the meta-analysis of Cross et al. (2011). The observed gender differences in aggression can be explained through the relation between reinforcement

sensitivity and aggression. Girls show higher sensitivity to punishment and thereby reactive aggression would manifest itself more in a hidden way, i.e. relationally and they would also manifest a lower level of overt aggression than boys. A lower manifestation of overt aggression among girls can also be explained by different gender roles. Gender roles are based on the different expectations that individuals, groups, and societies have of individuals based on their sex and also on each society's values and beliefs about gender. Gender roles give individuals cues about what sort of behavior is believed to be appropriate for what sex (Blackstone, 2003). Namely, feminine role is defined as one avoiding conflicts and by suppressed anger (Powell, 2009; Strough et al., 2007).

Does gender moderate the relationship between reinforcement sensitivity and aggression according to the combination of forms and functions?

The moderator analysis shows that boys with high sensitivity to reward manifest the highest level of POA. Although border significance was obtained, the result can be explained by gender roles where overt instrumentalization of aggression is in accordance with the masculine role (Gini & Pozzoli, 2006; Weisbuch et al., 1999). Namely, masculine traits are defined as agentic and instrumental (Bartley et al., 2005). The finding is consistent with the research of Knyazev and colleagues (2004) who determined that high sensitivity to reward in boys predicts higher inclusion in risky behaviour than high sensitivity to reward in girls. Furthermore, it was determined that boys who are highly sensitive to punishment manifest the highest level of RRA. A similar result was also obtained by Marsee et al. (2008) who show that highly anxious men manifest a higher level of RRA than highly anxious women. Knyazev et al. (2004) show that girls with high punishment sensitivity were less engaged in risky situations unlike girls with low punishment sensitivity. For boys, there was no difference between those with high and low punishment sensitivity in engagement in risky situations. The results show a stronger relationship between punishment sensitivity and RRA in boys than in girls. Likewise, punishment sensitivity is associated with PRA in boys but not in girls. A possible reason for given gender differences could be attributed to boys' fear of manifesting behaviours which are not congruent with their masculine role. Individuals who manifest a gender non-normative form of behaviour have more socioemotional problems (Carver et al., 2003; Egan & Perry, 2001; Younger et al., 2004). Given that there is more socially acceptable anxious behaviour in girls than in boys, boys may feel greater social pressure toward conforming to a gender normative role (Younger et al., 2004). Social anxiety is related to a lower identification with the masculine role. Hence, identification with the masculine role reduces the risk of social anxiety (Moscovitch et al., 2005). Researchers have determined masculine gender role stress (MGRS), defined as the experience of distress in situations which an individual appraises as a threat to his masculine identity. Many men who are strongly dedicated to the traditional male role experience masculine gender role stress. Men who experience high level of MGRS report higher levels of aggression than men who experience low level of MGRS (Copenhaver et al., 2000). Aggressive behaviour may represent a coping strategy for negative affective experiences that result from internal conflicts with the masculine ideal (Moore & Stuart, 2004).

The extent to which a man internalizes cultural values of the male ideal and evaluates a given situation as threatening to his male identity may increase the likelihood that he will react aggressively. Men who do not over-identify with the masculine role may not be overly preoccupied with adhering to gender role norms and may be less likely to use aggression (Cohn & Zeichner, 2006). People differ in the extent to which they adopt socially shared expectations about gender and therefore differ in the extent to which they incorporate cultural gender into their identities (Wood & Eagly, 2009). Hence, gender socialization is better to observe as an ambivalent process where men and women have active role in development of his or her identity regarding cultural context and structures where they live such as family, school, and friends (Oosten & Vlugt, 2004).

Conclusion

There are some limitations in this research that need to be addressed. The study was correlational which prevents a causal link being made. Furthermore, because of the specific developmental processes that take place in adolescence, the results cannot be generalized to other developmental periods. Generally, the results suggest that boys with high reward sensitivity show the highest level of POA. However, it should be considered that border significant moderation was obtained, and thus the present research needs to be repeated. In addition, the results suggest that boys with high punishment sensitivity manifest the highest level of RRA.

The contribution of this research lies in ascertaining the relationship between reinforcement sensitivity and aggression among adolescents, which can help in intervention programmes. Aggressive adolescents could benefit from the treatment of co-occurring low or high punishment sensitivity and reward sensitivity which are important factors in the manifestation of aggression (Marsee et al., 2008). Another contribution lies in ascertaining the role that gender plays in the relationship between reinforcement sensitivity and aggression. Individuals who show gender non-normative forms of behaviour manifest more socioemotional problems (Carver et al., 2003; Egan & Perry, 2001; Yungler et al., 2004).

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