

Oppositional Defiant Disorder dimensions and aggression: The moderating role of hostile bias and sex

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Abstract

Background: Hostile Attributional Bias (HAB) has been related to conduct problems. The common and unique associations between the different dimensions of Oppositional Defiant Disorder (ODD) symptoms, specific components of HAB, sex and types of aggression (overt and relational) in a community sample of 491 7-year-old children are investigated. **Method:** Teachers rated the children's ODD symptoms and aggression and the children self-reported about HAB. Multiple linear regressions showed that ODD dimensions were directly associated with both types of aggression. **Results:** Boys were more overtly aggressive and girls more relational. Emotional distress was directly associated with relational aggression. The relational component of HAB uniquely moderated the influence of the oppositional dimension on relational aggressive behaviour. **Conclusions:** The assessment of social cognition variables is necessary to approach specific interventions in the presence of ODD symptoms, as this may help to identify a subset of children prone to aggressive reactions.

Keywords: Hostile Bias, Oppositional Defiant Dimensions, overt aggression, relational aggression, social cognition.

Resumen

Dimensiones del Trastorno Negativista Desafiante y la agresión: el rol moderador del sesgo hostil y el sexo. Antecedentes: el sesgo hostil atribucional (SHA) se ha relacionado con los problemas de conducta. **Método:** este trabajo investiga asociaciones comunes y específicas entre las diferentes dimensiones del Trastorno Negativista Desafiante (TND), el sexo y diferentes tipos de agresividad (abierta y relacional) en una muestra comunitaria de 491 participantes de 7 años de edad. Los profesores informaron sobre los síntomas de TND y la agresividad de los participantes y estos autoinformaron sobre su SHA. Regresiones lineales múltiples mostraron que todas las dimensiones de TND estaban directamente asociadas con ambos tipos de agresividad. **Resultados:** los chicos mostraron más agresividad abierta y las chicas más agresividad relacional. El malestar emocional se asoció directamente con la agresividad relacional. El componente relacional del SHA moderó de manera específica la influencia de la dimensión oposicionista sobre la conducta de agresividad relacional. **Conclusiones:** la evaluación de variables de cognición social en presencia de síntomas de TND es necesaria, ya que podría ayudar a identificar un subgrupo de niños proclive a las reacciones agresivas y contribuir al diseño de intervenciones específicas.

Palabras clave: agresividad abierta, agresividad relacional, cognición social, sesgo hostil, dimensiones negativista desafiante.

Oppositional defiant children exhibit repeatedly negative, defiant, disobedient and hostile behaviour and so Oppositional Defiant Disorder (ODD) has been long considered a disruptive behavioural disorder. However, its high comorbidity with both internalizing and externalizing problems could be at least partially explained by the heterogeneity of ODD symptomatology, which encompasses not only behavioural components but also mood and emotional dysregulation (Evans, Pederson, Fite, Blossom, & Cooley, 2015). This evidence has led to considering ODD as a complex, multidimensional category and this is supported by

empirical work (Burke, Hipwell, & Loeber, 2010a; Ezpeleta, Granero, de la Osa, Penelo, & Domènech, 2012; Rowe, Costello, Angold, Copeland, & Maughan, 2010). The model suggested by Burke, Hipwell and Loeber (2010b) proposed three dimensions: 1) *oppositional behaviour (OP)*, which includes the symptoms loses their temper, defies and argues; 2) *negative affect (NA)*, which encompasses the symptoms touchy, angry and spiteful; and 3) *antagonistic behaviour (AB)*, which includes annoys others and blames. OP has been associated with disruptive disorders and aggressive Conduct Disorder (CD) symptoms, NA with anxiety and non-aggressive CD symptoms, and AB with disruptive disorders and, in boys, mood disorders (Burke & Loeber, 2010; Ezpeleta et al., 2012; Whelan, Stringaris, Maughan, & Barker, 2013).

ODD has been specifically associated with reactive aggression (Pederson & Fite, 2014), which refers to a defensive response guided by anger and frustration and occurring as a reaction to real or perceived provocation (Crick & Dodge, 1996). Misreading

social cues has likewise been related to developing and maintaining reactive aggressive conduct in children presenting disruptive behaviour, including those diagnosed with ODD (Donno, Parker, Gilmour, & Skuse, 2010; Mandy, Skuse, Steer, St Pourcain, & Oliver, 2013; Yoon, Hughes, Gaur, & Thompson, 1999). Correctly understanding other people's intentions enables children to predict what they feel or want and what they are about to do so that they can modify their own behaviour accordingly (Blakemore, 2010; Krieglmeyer, Wittstadt, & Strack, 2009). Children exhibiting reactive aggression tend to display hostile attribution biases (HAB) (Brugman et al., 2015; Crick & Dodge, 1996; Dodge, 2006).

HAB is a term used to describe people's tendency to attribute hostile intent to others (Nasby, Hayden, & DePaulo, 1980), which has been recognized as a contributor to peer-directed aggression. Theoretically, it has been suggested to be a bidimensional concept (Crick, 1995) comprising Instrumental Hostile Bias (IHB), which is related to situations involving overt physical dominance, territory issues or instrumental concerns, and Relational Hostile Bias (RHB), which involves interpersonal issues that occur when the relationship is used as the vehicle of harm and includes acts such as spreading rumours, excluding another from a group/activity or ignoring another. In contrast to overt aggression, that includes physical or verbal damage, relational aggression inflicts harm through damage to or control of relationships. Two recent meta-analyses (Card, Stucky, Sawalani, & Little, 2008; Casper & Card, 2017) indicate a substantial intercorrelation between both forms of aggression, but despite this fact, both studies also showed unique associations with maladjustment: Overt aggression is more strongly related to externalizing problems and relational aggression is more related to internalizing problems.

A large body of research supports the role of HAB in the development of aggressive behaviour (Castro, Veerman, Koops, Bosch, & Monshouer, 2002; Cillessen, Lansu, & Van Den Berg, 2014; Dodge & Crick, 1990; Dodge et al., 2015). Nevertheless, other studies (Choe, Lane, Grabell, & Olson, 2013; Mathieson et al., 2011) have failed to find such a direct relation and they highlight the need to include other critical variables such as gender differences in social cognition (Godleski, Ostrov, Houston, & Schlienz, 2010; Mathieson et al., 2011). Literature evidence males show higher rates in overt aggression and only trivial gender differences in relational aggression (Card et al., 2008; Casper & Card, 2017). Given the higher prevalence of overt aggression in males, many studies on HAB excluded girls (Leff, Lefler, Khera, Paskewich, & Jawad, 2012) and few studies differentiated by sex (Yoon et al., 1999).

ODD and HAB have been related in many ways. Dodge (2006) stated that ODD symptomatology could itself be seen as a manifestation of a hostile view of the world: a tendency to think the world is antagonistic, to overlook one's own responsibility and to be touchy. Components of HAB include a tendency to blame others for one's negative outcomes and not to blame oneself (Frick et al., 1992). Given the different characteristics of the symptoms of ODD dimensions, some of them more related to social relations such as annoying, blaming, being touchy, spiteful or angry (NA or AB dimensions) and others more overtly aggressive, such as losing one's temper, defying or arguing (OP dimension) (Keenan, Coyne & Lahey, 2008), we wanted to test the moderator role of subtypes of HAB (overt and relational) in the association between ODD dimensions and different types of aggression. To our knowledge, no previous studies have focused on these associations while also considering sex.

In addition, and given that distressful feelings may significantly influence children's interpretations of social situations in ways that contribute to aggressive response patterns (Crick & Dodge, 1994), the emotional distress component of HAB is also considered as a predictor of aggressiveness. IHB was expected to present specific associations for OP and RHB was expected to be more related to NA and AB, given the closer relation between the items of certain dimensions and the reactions elicited by the different types of situations presented (overt or relational). In all cases, we expected higher levels of HAB to interact with the ODD symptoms to enhance the relation between ODD and aggression. Given that previous meta-analysis (de Castro et al., 2002) concludes that the link between hostile attribution bias and aggressive behaviour is stronger in male-only samples than in mixed-gender samples, we expected stronger associations between hostile biases and aggression among boys than among girls.

Method

Participants

The data corresponds to a longitudinal study of behavioural problems in preschoolers. The design included a two-phase sampling procedure, with an initial random sample of 2,283 children selected from the census of preschoolers in Barcelona in 2009. All the families of children in P3 in the participating schools were invited to participate. Families who agreed and met the screening criteria were contacted and were interviewed at the school annually. The proportion of participants in the first phase (screening phase) was 58.7% ($N = 1,341$ families) and no differences emerged for sex ($p = .95$) when comparing participants and refusals. However, the proportion of refusals was statistically higher for families in low socioeconomic (SES) groups ($p < .001$). The screening for including children in the second phase was carried out with the parental version of the Strengths and Difficulties Questionnaire (SDQ³⁻⁴; Goodman, 1997). A random sample including 30% of children with negative scores in the screening and all the children with a positive screening score were invited to continue with the longitudinal research (Ezpeleta, de la Osa & Domenech, 2014). The final second phase sample included 89.4% of the families asked to continue ($N = 622$ children) and no statistical differences were found when participants and refusals were compared by sex ($p = .82$) or type of school ($p = .85$).

The sample of the current study corresponds to the fifth follow-up (7-year-old children; $M = 7.7$, $SD = 0.35$, $N = 496$; 243 boys, 49.0%). As regard ethnicity, 91.7% of the children were Caucasian, 4.5% Hispanic-American, 1.0% Asian and the remaining 2.8% belonged to other ethnic groups. SES (Hollingshead, 1975) was as follows: 31.5% high, 63.9% middle, and 4.6% low. No statistical differences for sex ($p = .80$) or SES ($p = .17$) were found between the sample remaining in the study and the children who dropped out during follow-up. HAB was available for 491 children (50.7% girls). Children with an intellectual disability or pervasive developmental disorders were excluded.

Instruments

Hostile Attributional Bias (HAB) and Feelings of Distress (Crick & Dodge, 1996;) includes 10 written vignettes depicting common social conflict situations of ambiguous intent that occur with young

children: five for relationally provocative social situations (i.e., someone is not included in an activity, though it is unclear why) and five physically provocative social situations (i.e., someone is bumped from behind, though it is not clear why). Two questions per vignette ask the participant to indicate whether he/she thinks that the action depicted was hostile/intentional (rated with 1) or benign/unintentional (rated with 0). The children's two intentionality responses are then summed across the five relationally provocative or physically provocative vignettes: scores range from 0 to 10, with higher scores indicating higher levels of HAB. The children's level of distress is measured by their response to how upset and how angry (scored on a 1-3 Likert scale where 1 = *Not Upset at All* and 3 = *Very Upset*) they would be if the depicted situation happened to them. The children's feelings of distress are then summed across the relational or physical vignettes, ranging from 5 to 15. Previous study (de la Osa, Penelo, Navarro, Trepát, Domènech & Ezpeleta., 2017) confirmed the expected 2-factor structure (IHB and RHB). Complete strict measurement invariance and equivalence of factor variances was found across sex, whereas the factor covariance was lower for boys than for girls. Internal consistency was satisfactory ($\omega = .83$ for IHB and $\omega = .81$ for RHB).

The *Strengths and Difficulties Questionnaire* (SDQ⁴⁻¹⁶) (Goodman, 1997) was answered by teachers. The SDQ's conduct scale was used to measure ODD-symptoms (temper tantrums, disobedience, fights and spitefulness), plus five additional items that are required to complete the eight DSM-5 ODD symptomatology (annoys, blames, touchy, angry, argumentative) that are not included in the SDQ⁴⁻¹⁶. The sum of the symptoms, coded on a 3-point Likert-type scale (0: *not true*; 2: *certainly true*) was used to obtain the dimension scores. Internal consistency was as follows: NA (3 items): $\alpha = .73$ (mean inter-item correlation, $r = .50$); OP (3 items): $\alpha = .64$ ($r = .42$); and AB (2 items): $\alpha = .72$ ($r = .57$).

The *Children's Aggression Scale* (CAS; Halperin & McKay, 2008) assesses aggressive behaviour with 22 items on a 5-point Likert-type scale (0: *never*; 4: *many days*). It is structured in seven primary factors: verbal aggression, aggression against objects and animals, use of weapons, provoked physical aggression, initiated physical aggression, aggression toward peers and aggression toward adults. It was answered by teachers. For this study, the verbal aggression, provoked physical aggression and initiated

physical aggression raw scale scores were added to obtain an overt aggression total score. Internal consistency in the present sample was satisfactory ($\alpha = .85$; 14 items).

The *Relational Aggression measure* was created for the study. It contains 13 items on a 5-point Likert-type scale (0: *never*; 4: *many days*) for aggressive behaviour in relationships with others (crying to get sympathy, being malicious, criticizing others behind their backs, being manipulative, being hurtful, ganging up with other children to isolate a child, etc.). Teachers answered the questionnaire. Internal consistency in the present sample was satisfactory ($\alpha = .93$).

The *Child Behavior Checklist* (CBCL/6-18; Achenbach & Rescorla, 2001) was used to measure behavioural and emotional problems at age 7. It includes a set of 120 items with 3 response options (0: not true; 2: very true). Higher scores indicate more problems. Direct scores for anxious-depressed original syndrome scales were used as control variable ($\alpha = .70$ in the present sample).

Procedure

The project was approved by the ethics review committee of the authors' institution. Families gave written consent. Interviewers were trained and were blind to the screening group. After the interview, teachers filled in the questionnaires. Children performed the HAB task in a separate room with a different researcher, blind to the parent's interview and questionnaire results. Given the high comorbidity between ODD and anxiety problems (Granic, 2014), we considered that the level of anxious symptomatology should be controlled for.

Data analysis

The statistical analyses were carried out with SPSS24. Given that in the second phase of the project the sampling for participants' selection was conditioned by the presence/absence of behaviour problems, analyses were conducted with weighted procedures.

Two multiple linear regressions were used to explore the effect of hostile bias and emotional distress (instrumental or relational), sex and ODD dimensions on aggression measures, adjusted by the

Table 1
Associations between HAB scores, sex and ODD dimensions, and aggression raw measures

Criterion	Predictors	B	CI 95% B	β	p	Ra ²
Overt aggression	Sex: males	32.88	13.46	.11	.001	.53
	Instrumental hostile bias	-2.57	-6.56	-.05	.205	
	Instrumental emotional distress	2.85	-1.98	.04	.247	
	ODD-Negative affect	20.03	10.54	.18	< .001	
	ODD-Oppositional behavior	49.96	38.71	.40	< .001	
	ODD-Antagonistic behavior	37.49	22.81	.23	< .001	
Relational aggression *	Sex: males	-1.02	-1.80; -0.24	-.08	.011	.61
	Relational hostile bias	-0.14	-0.34; 0.07	-.06	.185	
	Relational emotional distress	0.25	0.04; 0.47	.10	.022	
	ODD-Negative affect	1.51	1.13; 1.90	.31	< .001	
	ODD-Oppositional behavior	1.29	0.68; 1.90	.25	< .001	
	ODD-Antagonistic behavior	1.59	1.00; 2.17	.24	< .001	
	Relational hostile bias × ODD Oppositional behavior	0.17	0.05; 0.28	.15	.005	

Ra² means adjusted R-square;
* Model adjusted by CBCL Anxious/Depressed scores

CBCL/6-18 Anxious/Depressed scores where necessary. For the model regarding overt aggression, the CAS aggression score was used as criterion and predictors considered were IHB, instrumental emotional distress, NA, OP and AB, and sex; regarding moderation, the initial model included five interaction terms, which were between IHB and each of the remaining predictors. For the model regarding relational aggression measure as criterion, predictors considered were RHB, relational emotional distress, NA, OP and AB, and sex, and the five interaction terms were between RHB and each of the other predictors. Interaction terms were evaluated based on the chunk test for the whole set and complemented by a step-wise backward procedure term by term (Kleinbaum & Klein, 2012; Kleinbaum, Kupper, Nizam, Muller & Rosenberg, 2014). Non-significant interaction ($p > .05$) terms were removed from the final model and main effects were then estimated; for significant interactions ($p < .05$), moderation was estimated at minimum (0), median (4) and maximum (10) levels of HAB. We analyzed and discarded the possible overlapping between predictors, outcomes and moderating variables.

Results

As regard overt aggression, the chunk test showed that the whole set of interaction terms were non-significant ($p = .331$) and the step-wise backward procedure also showed that all interaction terms were not statistically significant ($p \geq .102$); therefore, all were removed in the final model. Furthermore, it was not necessary to adjust by the CBCL/6-18 Anxious/Depressed scores (Table 1, top). Positive associations, independent of the level of IHB, were found between ODD dimensions and CAS overt aggression (overt) (NA: $\beta = .18$; OP: $\beta = .40$; AB: $\beta = .23$; all p -values $< .001$) and sex ($\beta = .11$, $p = .001$), boys scoring higher than girls, whereas no statistically significant effect was found for IHB and emotional distress.

For relational aggression, the chunk test showed that the whole set of interaction terms was non-statistically significant ($p = .136$). However, based on a step-wise backward procedure, the interaction between RHB and OP attained statistical significance; moreover, it was considered necessary to adjust by the CBCL/6-18 Anxious/Depressed scores (Table 1, bottom). RHB scores moderated the relation between OP dimension and relational aggression ($p = .005$) and there were also positive associations for relational emotional distress ($\beta = .10$, $p = .022$), NA ($\beta = .31$, $p < .001$), AB ($\beta = .24$, $p < .001$) and a negative association for sex ($\beta = -.08$, $p = .011$). Regarding the OP \times RHB interaction, the OP dimension was positively and increasingly related to relational aggression for null ($\beta = .25$, $p < .001$), median ($\beta = .37$, $p < .001$) and maximum ($\beta = .56$, $p < .001$) levels of RHB (Figure 1).

Discussion

The study aimed to provide data on common and unique associations between ODD dimensions and different types of aggression, examining the moderating effects of HAB subtypes and sex. Findings are consistent with both the idea of distinctions among ODD symptom dimensions (Burke et al., 2010b) and the existence of a common pattern of aggressive problems linked to ODD (Aizpitarte, Atherton & Robins, 2017; Evans et al., 2015; Keenan, Coyne & Lahey, 2008). According to the relational vulnerability and dispositional models (Dodge et al., 2015; Tuckett,

Kushner, Herzhoff, Smack & Reardon, 2014), the findings suggest that different dimensions of ODD symptoms and aggression are differentially influenced by individual characteristics: in this case, the level and subtype of HAB and sex.

Results showed common direct and positive relations between all ODD dimensions and both overt and relational types of aggression, as previously stated by the literature (Burke et al., 2010b; Ezpeleta et al., 2012), even after controlling for the presence of anxious symptomatology. Also according to the literature and hypothesis, sex has a direct effect, with boys scoring higher in overt aggression. However, when we examined unique effects, IHB did not interact with the relation between any ODD dimension and overt aggression, contrary to what was expected. This may be due to the fact that overt aggression is strongly related to externalizing problems (Card et al., 2008) and in the presence of ODD symptomatology the role of HAB is less relevant. In these cases, reactive overt aggression could be more related to impulsivity than to social information processes (Pederson & Fite, 2014).

As regards NA and AB symptoms, they are also associated with relational aggression and sex also has a direct effect, with girls obtaining higher scores. This result as regards girls is not completely aligned with recent research, which states that relational aggression in not significantly different between girls and boys (Casper & Card, 2017). Distress caused by relational situations perceived as nasty or intentional directly increased the level of relational aggression (Crick et al., 2002; Mathieson et al., 2011). In this case, emotional distress seems to affect the level of aggression similarly for both boys and girls, whereas Crick et al. (2002) found distress to be higher for girls. Results also show that children with a hostile view of social relations may answer in an inappropriate way, which in turn predicts subsequent hostility and aggression towards others (Burt, Mikolajewski, & Larson, 2009). Furthermore, levels of RHB only moderated the relation between OP dimension and relational aggression, but they did not for NA and AB, and this moderation was sex-independent. Our results highlight the idea that relational

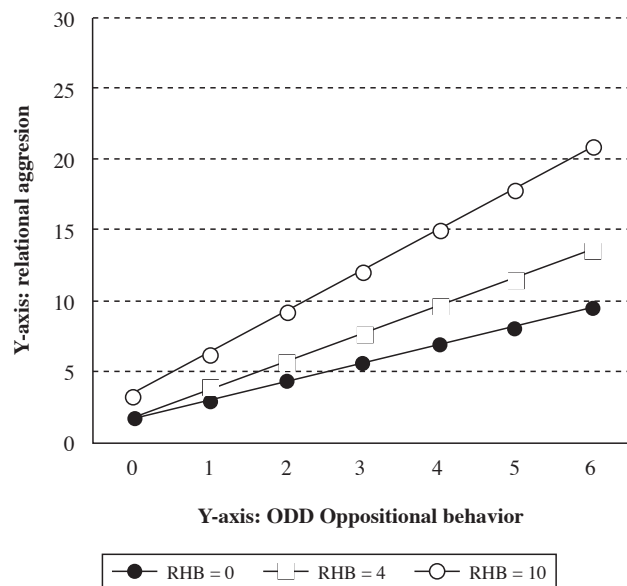


Figure 1. Simple slope analysis of the interaction effect between ODD Oppositional behavior dimension and Relational Hostile Bias (RHB) on relational aggression scores

events are uniquely associated with relational aggression (Crick et al., 2002). In the presence of ODD-OP symptoms (particularly overt), children react to what they consider relational aggression in a relational aggressive way. This is true also for boys, although this may be counterintuitive at first glance because the literature reports that boys are more overtly aggressive than girls (Casper & Card, 2017). The results are extremely interesting, as they indicate that even in the presence of ODD-OP symptomology children are also sensitive to the perception of social rejection and to the stress that it occasions, even in the absence of anxiety symptoms, and this is contrary to the image of physically and verbally aggressive children as insensitive, cold or disinterested in social relations.

The strengths of this study include a large sample and the consideration of multiple informants. Teachers provide a unique perspective on functioning about peer and social relations and therefore social difficulties. On the other hand, our data are cross-sectional and more longitudinal analyses are needed to prove the relation between ODD-HAB and aggression. Also, few lower SES families participated in the study and this could have led to bias.

Our results indicate that RHB may be considered a risk factor for developing relational aggression in the presence of OP dimension symptoms. Based on these results, we can state that hostile perceptions of others' social actions may be a trigger for relational aggressive behaviour in the presence of OP symptoms and this knowledge should be taken into consideration for its clinical implications. Clinical benefit might be gained from also focusing on attribution tendencies (Schultz et al., 2010). Identifying patterns

of social cognition that differentiate groups and contribute to the association between ODD dimensions and types of aggression would add value to efforts to match optimal interventions with important child characteristics. The absence of the cognitive social perspective in most treatments for disruptive problems could be at the root of their partial inefficacy (Granic, 2014; Voulgaridou & Kokkinos, 2015; Yoon et al., 1999). These results encourage the idea (Dodge et al., 2015) of the benefits of including changes in the way children, and especially boys, are socialized in the processing of social cues to prevent chronic and more severe aggressive behaviour. They also provide further support for a multidimensional conceptualization of ODD symptoms when reported by teachers and highlight the importance of not only a dimensional assessment approach to antisocial and conduct problems (Hughes & Ensor, 2007), but also of including the assessment of social cognition in the field of ODD management. Considering ODD as simply a problem of disruptive behaviour is a limitation that could lead to ignoring the need for education in social and cognitive areas.

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