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How impulsivity and intelligence are related to different forms of aggression

Silvia Duran-Bonavila, Fabia Morales-Vives, Sandra Cosi, Andreu Vigil-Colet*

Universitat Rovira i Virgili, Research Center for Behavior Assessment, Spain

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ABSTRACT

Several studies have shown that the relationships between intelligence and self-reported aggression are low or non-existent. Most have focused on direct forms of aggression, which often have an impulsive component, unlike indirect aggression, which is usually delayed and allows more time to find alternative solutions to the problem. The present study analyses the relationships between different measures of intelligence and an overall estimate of "g" with direct and indirect forms of aggression and impulsivity in a sample of adolescents (N = 532). The results showed that impulsivity and intelligence showed a different pattern of relationships with different forms of aggression. While intelligence measures were more related to indirect aggression, particularly to the g factor estimate, impulsivity was more related to direct forms of aggression. Furthermore, the relationships observed between aggression and intelligence cannot be explained by impulsivity having the same effect on both kinds of measure and are independent of sex effects. Taking everything into account, intelligence should be regarded as a relevant predictor for the prevention of aggressive behaviour in adolescents, particularly indirect aggression.

1. Introduction

Intelligence is one of the most commonly studied predictors of delinquency. The inverse relationship between intelligence and delinquency has been widely documented with a variety of samples, tests, and methodological approaches (Ayduk, Rodriguez, Mischel, Shoda, & Wright, 2007; Beaver et al., 2013; Kennedy, Burnett, & Edmonds, 2011; Lynam, Moffitt, & Stouthamer-Loeber, 1993; White, Moffitt, & Silva, 1989). Intelligence, and especially verbal IQ, has also been related to violence and violent offenders (Ayduk et al., 2007; Kennedy et al., 2011; Walling, Meehan, Marshall, Holtzworth-Munroe, & Taft, 2012). Although violence may be understood as an extreme form of aggressive behaviour, these results suggest that intelligence is also related (albeit much less clearly).

One of the first studies to relate aggression and intelligence was carried out by Farrington (1989), who reported that low IQ at childhood had a slight relationship with aggression and violence in adolescence and adulthood. Nevertheless it should be pointed out that the measure of aggression used by Farrington (1989) was more a measure of difficulty with discipline than a measure of aggression. On the other hand, more recent studies have not found any relationship between intelligence and self-reported aggression (White, Jarrett, & Ollendick, 2013; Zajenkowski & Zajenkowska, 2015). Nevertheless, as Zajenkowski and Zajenkowska (2015) pointed out, the use of a homogenous university sample in some studies may involve a rank restriction which explains the lack of any relationship between intelligence and aggression measures.

It should be noted that the studies relating aggression measures and intelligence have mainly focused on measures of direct aggression (DA) and have not analysed the possible relationship between intelligence and indirect aggression (IA). Aggressive behaviour not only involves overt acts (physical or verbal) but also ways of harming others less directly. Indirect aggression refers to these other ways of harming which do not require the victim to be faced, and which use tools of social manipulation such as spreading rumours, gossiping, excluding them from the group, ignoring them, etc. (Salmivalli & Kaukiainen, 2004).

The study of IA is of considerable importance because direct forms of aggression are characteristic of early childhood but, as a result of the socialization process, decrease while indirect aggression increases during childhood, peaks during adolescence and becomes the most frequent form of aggression in adulthood (Björkqvist, 1994; Bjorkqvist, Lagerspetz, & Kaukiainen, 1992; Tremblay & Nagin, 2005).

Direct and indirect forms of aggression show a different pattern of relationships with many variables. In this regard, direct and indirect aggressions are differentially related to several aspects of maladjustment: DA is more related to delinquency and externalizing disorders, and IA is more related to internalizing disorders (Card, Stucky, Sawalani, & Little, 2008). The two forms of aggression also show different relationships with psychological maturity in adolescence, understood as the ability to take on obligations and make responsible decisions. IA shows a much greater relationship than DA (Morales-Vives, Camps, Lorenzo-Seva, & Vigil-Colet, 2014). On the other hand, the opposite pattern is found with anger, which is more related to DA than to IA (Warren, Richardson, & Mcquillin, 2011).

It should be taken into account that direct forms of aggression, and especially reactive aggression, often have an impulsive compo-

* Corresponding author at: Universitat Rovira i Virgili, Departament de Psicologia, Crtra. Valls s/n, 43007 Tarragona, Spain.
Email address: andreu.vigil@urv.cat (A. Vigil-Colet)

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nent. Furthermore, DA usually occurs immediately after the situation that triggers it, while IA is usually delayed because it does not occur in front of the victim and requires a higher degree of planning, often involving a third person or group. These differences may mean that direct aggression is more related to processes that are subject to less cognitive control because they are mainly driven by impulsivity and anger, while the delay between the triggering act and the aggressive response that characterizes IA may give some individuals the chance to search for solutions to the problem other than retaliation. This last hypothesis may explain why psychological maturity is more related to IA than to DA while anger shows the reverse pattern. Furthermore, one consequence of this possible effect is that intelligence may show a different pattern of relationships with DA and IA, in the sense that, as previous research has shown, the relationships between intelligence and DA are low or non-existent but, in the case of IA, individuals with higher cognitive abilities may find solutions other than aggressive retaliation.

One issue that we had to take into account in this study is the possible effect of impulsivity on the relationships between aggression and intelligence, which are controversial. Several authors have reported that they are related, although the correlation coefficients reported are usually small (Lynam et al., 1993; Russo, De Pascalis, Varriale, & Barratt, 2008; Schweizer, 2002), while others have failed to find any relationship (Ashton, Lee, Vernon, & Jang, 2000; Austin et al., 2002; de Wit, Flory, Acheson, McCloskey, & Manuck, 2007; Vigil-Colet & Morales-Vives, 2005). Nevertheless, taking into account the close relationship between impulsivity and aggression, we discarded the possibility that impulsivity underlies the relationship between aggression and intelligence so it cannot possibly explain any relationships found.

Bearing in mind all the above, the main objective of this paper was to analyse the relationships between intelligence and different forms of aggression, under the hypothesis that intelligence is more related to IA than to DA. On the other hand, if DA is more related to acting on the "spur or the moment" than IA, then DA should be more related to impulsivity than IA. This second hypothesis reflects the work of several authors who have shown that impulsive aggression is quite frequent and involves unplanned aggressive acts which are spontaneous in nature, have a large emotional component and process information inefficiently, and which make people rely upon their default cognitive-processing patterns (Barratt, Stanford, Dowdy, Liebman, & Kent, 1999; Fite, Goodnight, Bates, Dodge, & Pettit, 2008; Houston & Stanford, 2001).

To test these hypotheses we administered various measures of intelligence and impulsivity to a sample of adolescents, a population that usually shows high levels of aggression. The different measures of intelligence allowed us to compute an estimate of the score of each individual on the "g" factor. This is relevant because as Zajenkowski and Zajenkowska (2015) pointed out, one limitation of the few studies that have related aggression and intelligence is that they use a single measure of intelligence which cannot identify g. The use of different measures allowed us to compute g scores for each individual by means of a factor analysis of different intelligence scales as Jensen and Weng (1994) suggested and to analyse whether, as in the case of delinquency, aggressive behaviour is also related to deficits in verbal abilities. Furthermore, instead of using a sample of university students, which may be homogenous in intelligence and aggression, we used a more heterogeneous sample.

Our last objective was to test whether sex has effects on the relationships between intelligence and aggression. As several metanalyses have shown (for example, Archer, 2004), sex differences in aggressive behaviour are well established for PA and less clear for IA, so it is possible that any relationship between intelligence and aggression may be sex dependent only in some kinds of aggression.

2. Method

2.1. Participants

The sample consisted of a total of 532 volunteer students (252 men and 280 women) from 8 different public high schools from the Tarragona province, with ages ranging from 11 to 18 years old (M = 14.75 SD = 2.1). A total of 80.4% of the participants were native Spaniards and 19.6% were immigrants. Both parents were unemployed in 4.7% of cases and employed in 70% of cases.

2.2. Measures

*2.2.1. The indirect-direct aggression questionnaire – IDAQ (*Ruiz-Pamies, Lorenzo-Seva, Morales-Vives, Cosi, & Vigil-Colet, 2014*)*

The test comprises 27 items and participants rate each item using a five-point Likert-type scale. The tests gave scores on a T-scale (M = 50 SD = 10) where higher scores meant higher aggression levels. This test gives scores for the factors physical aggression (PA; 6 items), verbal aggression (VA; 7 items) and indirect aggression (IA; 10 items) and an overall aggression score. Four items were used as markers of social desirability because the test was developed using a method that controls social desirability and acquiescence, because they have a considerable effect on the scores and factor structure of aggressive behaviour self-reports (Navarro-Gonzalez, Lorenzo-Seva, & Vigil-Colet, 2016; Vigil-Colet, Ruiz-Pamies, Anguiano-Carrasco, & Lorenzo-Seva, 2012). The factors measured by I-DAQ have appropriate factorial reliabilities: $r_{\theta\theta}$ = 0.83, $r_{\theta\theta}$ = 0.77 and $r_{\theta\theta}$ = 0.78 for PA, VA and IA respectively.

*2.2.2. Barratt Impulsiveness Scale-11 for children (*Chahin, Cosi, Lorenzo-Seva, & Vigil-Colet, 2010; Cosi, Vigil-Colet, Canals, & Lorenzo-Seva, 2008*)*

This is a self-report questionnaire for assessing impulsivity that is specifically designed for children and adolescents. The test gives scores for Motor Impulsivity (MI), Non-Planning Impulsivity (N-PI) and Cognitive Impulsivity (CI). MI is related to lack of inhibition and delay, and N-PI is related to planning abilities while CI is related to the tendency to make quick cognitive decisions.

*2.2.3. Thurstone's primary mental abilities (*Cordero, Seisdedos, González, & de la Cruz, 1989*)*

The subscales of Thurstone's test were: Verbal, Spatial, Numerical, Reasoning, and Word Fluency. This test comprises scales of fluid and crystallised intelligence.

*2.2.4. Raven progressive matrices test (*Raven, 1996*)*

This test can be regarded as a measure of fluid intelligence free of cultural bias.

*2.2.5. Information scale of the WAIS intelligence test for adults (*Cordero et al., 1989*)*

This scale is an indicator of crystallised intelligence.

2.3. Procedure

School approval and parental written informed consent were obtained before participation in the study. Participation was voluntary and no incentives were given. About 96% of the participants who

were invited to participate in the study eventually did so. The ethics committee of the Faculty of Education and Psychology approved the research project, which is made up of several different studies. A professional psychologist administered the tests collectively in their classrooms Only when more than one class was tested at the same time was a second psychologist involved in the testing process. The participants were asked to volunteer to answer the inventories in their classroom. The questionnaires were anonymous, and respondents had to provide only their gender and age.

2.4. Data analysis

General intelligence was estimated by computing each individual's factorial score on the first factor extracted by maximum likelihood using all the intelligence measures. Sex differences were analysed using the "t" test using an $\alpha = 0.01$ to avoid an excessive experimentalwise error rate. The relationships between intelligence and personality measures were analysed using product moment correlations, while differences in the magnitude of correlations were analysed using Fisher's "z" test.

3. Results

We performed an exploratory factor analysis on the intelligence measures in order to compute each individual's factorial score on "g". The Kaiser-Meyer-Olkin was *KMO* = 0.832, which indicates that the correlation matrix was suitable for factor analysis. Only the first factor had an eigenvalue > 1, which accounted for 42.2% of the variance. Table 1 shows the loadings of the intelligence scales on this factor.

Table 2 shows descriptive statistics for intelligence, impulsivity and aggression measures for both sexes. Taking into account the high number of comparisons involved, we adopted a $\alpha = 0.01$ in order to prevent the experimentalwise error rate from being excessive. As can be seen, girls showed higher scores on the PMA subscales reasoning and word fluency while boys showed significantly higher scores on physical aggression. Nevertheless, the effect sizes were small, the biggest effect being for physical aggression ($d = 0.39$), which shows that boys have higher scores than girls.

Table 3 shows the product-moment correlation coefficients between aggression measures, intelligence and impulsivity. As can be seen, aggression measures showed a pattern of low or moderate negative relationships with intelligence measures but these relationships depend on the kind of aggression measured. In this regard, while indirect aggression showed a significant negative relationship with all intelligence measures, physical and verbal aggression showed these relationships only with some intelligence measures, and the magnitude of correlation coefficients was smaller. Fisher's "z" test of correlation differences showed that the differences in magnitude between the correlations of physical and indirect aggression with intelligence measures were not significant, but indirect aggression was more related to intelligence than verbal aggression for the WISC information scale ($z = 2.1$ $p < 0.05$), the PMA total score ($z = 2.12$ $p < 0.05$) and the "g" score ($z = 2.28$ $p < 0.05$). Furthermore, the highest relationship between overall aggression and indirect aggression with intelligence was found for the "g" factor estimate.

The same table shows that two of the impulsivity measures – motor impulsivity and non-planning impulsivity – showed the opposite pattern: that is, the greatest relationships between impulsivity and aggression measures were found for physical aggression while the low-

Table 1
Loadings of intelligence measures on the first factor extracted.

Scale	Loading
WISC information	0.611
PMA verbal	0.593
PMA spatial	0.526
PMA reasoning	0.647
PMA numerical	0.520
PMA word fluency	0.595
Raven	0.591

Table 2
Descriptive statistics for men and women and effect sizes for significant differences.

Test	Scale	Men		Women		p	d
		Mean	S.D.	Mean	S.D.		
WAIS	Information	11.9	4.3	11.1	3.9	n.s.	
PMA	Verbal	16.8	7	17.1	6.3	n.s.	
	Spatial	20.1	12.4	17.5	11.1	n.s.	
	Reasoning	12.9	5.8	14.6	5.5	< 0.01	0.30
	Numerical	8.8	6.5	9.8	5.8	n.s.	
	Word fluency	34.5	10.7	37.2	10.3	< 0.01	0.25
	Total score	114.3	36.7	119.4	31.6	n.s.	
Raven	General	45.9	8.5	46	7.2	n.s.	
	G estimate (T scores)	49.5	10.7	50.5	9.2	n.s.	
IDAQ	Physical aggression	58.22	12.9	53.23	12.6	< 0.01	0.39
	Verbal aggression	51.6	9.6	53.6	10.6	n.s.	
	Indirect aggression	55.1	9.62	53.6	9.8	n.s.	
	Overall aggression	57.1	10.6	54.5	11.1	n.s.	
BIS 11 c	Cognitive impulsivity	12.9	2.6	12.16	2.5	n.s.	
	Non Planning impulsivity	9	3.8	8.5	4.2	n.s.	
	Motor impulsivity	25.4	6.1	25.6	6.6	n.s.	

Table 3
Correlations of aggression measures with intelligence and impulsivity. In brackets, correlations between aggression and intelligence measures controlling for impulsivity measures.

	Aggression measures				Impulsivity measures		
	Physical	Verbal	Indirect	Overall	Motor	Non planning	Cognitive
WISC information	**− 0.173** (**− 0.155**)	− 0.075 (− 0.044)	**− 0.258** (**− 0.244**)	**− 0.237** (**− 0.221**)	*− 0.106*	− 0.012	**0.151**
PMA verbal	*− 0.091* (*− 0.108*)	− 0.080 (− 0.087)	**− 0.228** (**− 0.231**)	**− 0.174** (**− 0.198**)	0.001	0.037	*0.092*
PMA spatial	− 0.059 (− 0.015)	− 0.053 (− 0.025)	**− 0.145** (**− 0.127**)	*− 0.111* (− 0.073)	*− 0.096*	− 0.066	0.071
PMA reasoning	**− 0.231** (**− 0.198**)	− 0.065 (− 0.026)	**− 0.213** (**− 0.193**)	**− 0.247** (**− 0.215**)	**− 0.123**	*− 0.090*	*0.110*
PMA numeric	− 0.081 (*− 0.078*)	− 0.055 (− 0.042)	**− 0.148** (**− 0.140**)	**− 0.129** (**− 0.127**)	− 0.052	0.048	*0.102*
PMA word fluency	− 0.025 (− 0.061)	0.025 (0.002)	**− 0.129** (**− 0.147**)	− 0.063 (*− 0.106*)	0.078	− 0.032	**0.118**
PMA Total	*− 0.146* (**− 0.135**)	− 0.066 (− 0.051)	**− 0.253** (**− 0.246**)	**− 0.213** (**− 0.210**)	− 0.059	− 0.043	**0.142**
Raven	*− 0.109* (− 0.051)	**− 0.157** (**− 0.117**)	**− 0.204** (**− 0.181**)	**− 0.199** (**− 0.152**)	**− 0.140**	*− 0.102*	0.006
G_stimate	*− 0.*180 (**− 0.159**)	*− 0.096* (− 0.070)	**− 0.294** (**− 0.282**)	**− 0.261** (**− 0.248**)	*− 0.096*	− 0.049	**0.149**
Motor impulsivity	**0.416**	**0.335**	**0.204**	**0.432**			
Non planning impulsivity	**0.241**	**0.140**	0.081	**0.219**			
Cognitive impulsivity	**− 0.009**	**− 0.019**	− 0.023	**− 0.021**			

p < 0.05 **p < 0.01**

est relationships were found for indirect aggression. Motor impulsivity showed a significantly greater relationship with physical aggression than with indirect aggression ($z = 2.6$ $p < 0.01$) while all other correlation coefficients did not differ significantly.

Finally, impulsivity and intelligence measures were quite unrelated. MI shows a small negative relationship with measures of fluid intelligence (PMA reasoning, Raven), while CI, which reflects the capacity to take quick and appropriate decisions, showed small positive correlations with most of the intelligence measures. The same table shows that when the effects of impulsivity measures were partialled out, the relationships between intelligence and aggression measures were almost unaffected.

Finally, Table 4 shows the correlations between intelligence and personality measures for men and women. None of the correlation coefficients for men and women differed significantly.

4. Discussion

The results reported above are along the same lines as those reported in other studies which have shown that intelligence has little or no relationship with direct aggression measures (White et al., 2013; Zajenkowski & Zajenkowska, 2015). Furthermore, this weak relationship between intelligence and direct aggression measures has been found in a sample without rank restrictions in intelligence and using a wide range of intelligence measures and an estimate of the "g" factor.

Nevertheless, this seems not to be the case when intelligence is related to indirect aggression measures. As we have shown, measures of crystallised and fluid intelligence had a low to moderate significant inverse relationship with indirect aggression, the highest relationship being with an estimate of the "g" factor. Although those relationships were only significantly greater than verbal aggression, eight of the nine correlations between indirect aggression and intelligence measures were greater than the correlations between intelligence and physical aggression.

On the other hand, impulsivity measures showed a reverse pattern of relationships with aggression. MI and N-PI showed a greater relationship with direct forms of aggression than with indirect forms. Several studies have shown that MI and N-PI impulsivity but not CI are related to the impulsivity scales that are more associated to inhibition deficits, such as the narrow impulsivity scale of Eysenck's I7 impulsivity questionnaire (Eysenck, Pearson, Easting, & Allsopp, 1985) or Dickman's (1990) dysfunctional impulsivity scale (Stanford et al., 2009; Whiteside & Lynam, 2001). Bearing this in mind, it seems that more impulsive individuals are unable to inhibit the emotional reactions that trigger direct forms of aggression such as verbal and, particularly, physical aggression using perhaps a more automatic default cognitive-processing pattern. The results reported above also show that these relationships are not influenced by sex.

It is worth mentioning that the highest relationship of indirect aggression and overall aggression are with the "g" estimate and with the reasoning scale of the PMA while specific abilities showed lower relationships with aggression. It should be pointed out that, although authors such as Ayduk et al. (2007) and Kennedy et al. (2011) have shown that delinquency and the degree of violence of offenders is more related to verbal IQ than to performance IQ it seems that this is not the case for aggressive behaviour because the PMA word fluency and verbal scales showed a null relationship with direct aggression and low relationships with indirect aggression.

On the other hand, the WISC information scale showed relationships closer to the ones observed for the "g" factor. This scale is highly sensitive to acculturation and schooling and may reflect the importance of education in the prevention of aggressive behaviours.

Another important issue is that the relationship between aggression and intelligence cannot be explained by the relationships they have with impulsivity. In this regard our data shows that when impulsivity was partialled out, the relationships between intelligence and aggression were almost unaffected. This result is not surprising if it is borne in mind that we have found no relevant relationships between impulsivity measures and intelligence measures, the highest relationships being found around $r = 0.15$. Our results seem to show that, as in the case of the intelligence-delinquency relationship reported by Lynam et al. (1993), impulsivity cannot account for the aggression-intelligence relationship. It is worth mentioning that although authors such as Meldrum, Petkovsek, Boutwell, and Young (2016) have shown that there is a relationship between self-control, understood as the ability to self-regulate impulsive desires, and intelligence, this relationship cannot underlie the relationships reported above. Furthermore, if impulsivity had any effect on the intelligence aggression relationship we should expect direct aggression, which is the kind of aggression that is most related to impulsivity, to show the highest relationships with intelligence measures. However, our results showed that the pattern of relationships is the opposite: that is, the highest relationships of intelligence measures were found with indirect aggression, which was the aggression measure that was least affected by impulsivity.

The present study has certain limitations that must be taken into account in future research. First, the sample consisted of adolescents, who usually show higher levels of aggression and impulsivity than adults, so new research with older samples will have to test if the results reported above can be generalised to this kind of population. Secondly, the present research has not measured the emotional (anger) or cognitive (hostility) components of aggressive behaviour that are related to intelligence (Zajenkowski & Zajenkowska, 2015), physical and verbal aggression (Harris, 1997; Morren & Meesters,

Table 4
Correlations of aggression measures with intelligence for men and women.

	Men				Women			
	Physical	Verbal	Indirect	Total	Physical	Verbal	Indirect	Total
WISC information	− *0.***176**	− 0.088	− **0.241**	− **0.238**	− *0.142*	− 0.002	− **0.244**	− **0.188**
PMA verbal	− 0.062	− 0.064	− **0.252**	− **0.164**	− 0.083	− 0.061	− **0.202**	− *0.158*
PMA_spatial	− 0.077	− 0.077	− *0.133*	− *0.124*	− 0.071	− 0.009	− **0.199**	− *0.131*
PMA_reasoning	− *0.155*	− *0.147*	− **0.197**	− **0.224**	− *0.159*	0.042	− **0.202**	− *0.164*
PMA_numeric	0.035	− 0.030	− *0.130*	− 0.088	− *0.137*	− 0.102	− **0.182**	− **0.195**
PMA_word fluency	0.014	0.064	− 0.100	− 0.015	− 0.092	− 0.094	− *0.141*	− *0.148*
PMA_total	− 0.094	− 0.077	− **0.231**	− *0.151*	− 0.160	− 0.056	− **0.270**	− **0.229**
Raven	− 0.063	− **0.185**	− 0.**180**	− **0.173**	− 0.084	− 0.090	− **0.205**	− *0.166*
G_estimate	− *0.127*	− *0.113*	− **0.267**	− **0.227**	− **0.190**	− 0.082	− **0.307**	− **0.269**

p < 0.05 **p < 0.01**

2002) and impulsivity (Vigil-Colet & Codorniu-Raga, 2004). In consequence, we cannot eliminate the possibility that anger or hostility effects may be underlying the relationships reported. Lastly, we have used only self-reported measures of aggression, so it would be interesting to know if the relationships reported above are also found using other assessment methods, such as peer-reported aggression, teacher/parent-reported aggression and objective measures of aggression.

Despite these limitations, the results reported above have important implications for the prediction of aggressive behaviour, particularly in the case of IA. Indirect aggression is the most usual form of aggression in adolescence and adulthood, and has an important role in phenomena such as bullying, workplace violence, mobbing, etc. (Björkqvist, Österman, & Hjelt-Bäck, 1994; Garandeau & Cillessen, 2006). Nevertheless, as Vaillancourt (2005) pointed out, in comparison with DA much less is known about its predictors. Our results seem to show that low intelligence is a risk factor that needs to be taken into account in the prediction of IA and the prevention of the processes mentioned above.

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