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Intelligence and aggression: The role of cognitive control and test related stress ☆

Marcin Zajenkowski [a,*], Anna Zajenkowska [b]

[a] Faculty of Psychology, University of Warsaw, Poland
[b] Institute of Applied Psychology, Academy of Special Education, Poland

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ABSTRACT

In three studies we explored the relationship between cognitive ability and various aspects of aggression. In the first investigation, we found that intelligence was not associated with external aggression (physical or verbal), although it tended to correlate negatively with internal processes related with aggressive behavior (anger and hostility). The results of study 2 indicated that higher anger was associated with poorer cognitive control. However, this relationship was attenuated when cognitive ability was added to the model. In the last study we sought psychological states that might accompany individuals with high level of anger and hostility while they are completing an intelligence test. It revealed that the state of worry mediates the relationship between trait anger and hostility and the cognitive ability score. High trait anger and hostility individuals exhibit higher level of negative thoughts about performance and focus on personal concerns while solving a demanding cognitive test.

1. Introduction

Many researchers emphasize the adaptive nature of intelligence (Gottfredson, 1997). One of the facts that favor this view is the observed reduced antisocial behavior at high level of general cognitive ability (Lynam, Moffitt, & Stouthamer-Lauber, 1993). It has also been found that cognitive ability is negatively related to aggression, which, per traditional definition, includes antisocial aspects, i.e., the intention to harm another living being (Berkowitz, 1993). The meta-analytic research by Ackerman and Heggestad (1997) reported a negative association between general intelligence and general aggression as a personality trait (effect size = −.19), and the same direction of relationship between trait anger and cognitive ability was found by Austin et al. (2002). Despite these findings, still little is known about the nature of the intelligence-aggression association.

Much research has explored the relationship between cognitive control and the self-regulation of aggressive behavior. A number of studies have reported that poorer control is associated with direct aggression and that prefrontal cortex might be a common substrate of both (cf. Campbell, 2006). Interesting findings concern also the recruitment of cognitive control resources within hostile situations of individuals with low trait anger (Wilkowski & Robinson, 2010). Furthermore, it has been shown that cognitive control is one of the most important functions determining individual differences in intelligence (Kane, Conway, Hambrick, & Engle, 2007). Thus, cognitive control seems to be a natural factor explaining the inverse intelligence-aggression relation. Indeed, few studies considered intelligence, control and aggression together. For instance, it was found that the Conditional Association Task (CAT; assesses the ability to learn a series of conditional associations between unrelated stimuli; see Petrides, 1985) produced an anomalous pattern in which unstable-aggressive boys performed more poorly than both stable aggressive and non-aggressive boys (see Seguin, 2009). These latter two groups did not differ when intelligence was controlled. Ogilvie, Stewart, Chan, and Shum (2011) in a meta-analytic study found that antisocial and highly aggressive groups had significantly poorer executive functions and cognitive ability than control groups. The authors indicated that larger intelligence group differences in part accounted for larger effect sizes in executive functions.

Researchers investigated mainly the contribution of cognitive functions into aggressive responses. However, one may wonder whether the tendency toward aggressive feelings and thoughts might influence the process of solving a demanding intellectual test. This possibility was previously examined with respect to neuroticism (Eysenck, 1994). It is possible that poorer scores on intellectual tasks exhibited by high trait anger and hostility subjects

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* Corresponding author.
E-mail address: zajenkowski@psych.uw.edu.pl (M. Zajenkowski).

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might be partially explained by increased negative affect and stress states during task performance, since the latter often accompanies aggressive response (Berkowitz, 1993).

The aim of the present studies was deeper understanding of the association between cognitive abilities and aggression-related phenomena. In the first study we explored the link between cognitive ability and aggression. Prior work focused mainly on aggressive behavior and its consequences (e.g. Lynam et al., 1993), often neglecting internal aspects of aggression. However, recent data suggest that cognitive regulation might be also important for hostile thoughts and feelings (Wilkowski & Robinson, 2010). Therefore, we decided to include both external and internal aspects of aggression. Further, we tested the role that other variables may play in the relationship between intelligence and aggression. In study 2 we considered cognitive control, because of its significance for both intelligence and aggressive responses. In the last study, we sought psychological states that might accompany individuals with high levels of anger and hostility while they were solving a demanding cognitive task. We referred to the concept of task related stress states, because it distinguishes between cognitive and emotional experiences related to performance (Matthews et al., 2002).

In the present study, we referred to Buss and Perry (1992) who distinguished physical and verbal aggression (i.e., tendency to use physical means or words to harm another person) as well as two components of aggression: anger and hostility. Anger represents individual differences in the frequency of experiencing and the reactivity toward angry feelings, while hostility reflects mainly the cognitive aspect (i.e., a tendency to negatively evaluate other people) often accompanied by a desire to harm particular others. Additionally, we examined other variables important for the relationship between cognitive ability and aggression: cognitive control and stress states. Since cognitive ability and control are very broad constructs, we decided to focus on their more narrow components. Specifically, we considered inhibition (an ability to suppress prepotent and inappropriate responses; Miyake & et al., 2000), because it has been already shown that this aspect of cognitive control is relevant for stopping the effects of activated angry feelings and hostile thoughts (e.g. Tang & Schmeichel, 2014; Wilkowski & Robinson, 2008). Furthermore, we included fluid aspect of intelligence, because it represents maliny the information-processing ability and is highly correlated with cognitive control (including inhibition; Kane et al., 2007).

2. Study 1

In the first study we examined the associations between fluid intelligence and four aspects of aggression distinguished by Buss and Perry (1992): physical and verbal aggression, anger, and hostility.

2.1. Method

2.1.1. Participants

The study involved 314 students (168 male, 146 female) from various universities in Warsaw. The proportion of men and women differed from the student population, which in Poland is 45% men, and 55% women. The mean age of the sample was 22.90 years (SD = 2.61). Participants were recruited through local website announcements and advertisements at the universities. There were no missing data.

2.1.2. Materials

The Aggression Questionnaire (AQ; Buss & Perry, 1992) is comprised of 29 items divided to four subscales; two of them relate to overt expressions of aggression: physical aggression and verbal aggression, whereas the other two relate to aggressive emotions: anger and cognitions: hostility. The AQ uses a 5-item Likert-type scale to score the items. The instrument has high internal consistency (αs = .85, .72, .83 and .77, for physical aggression, verbal aggression, anger and hostility dimensions, respectively; Buss & Perry, 1992).

Raven's Advanced Progressive Matrices Test (APM; Raven, Court, & Raven, 1983) was used as a measure of fluid intelligence. APM is a paper-and-pencil test and consists of 36 items that include a three-by-three matrix of figural patterns which is missing the bottom-left pattern, and eight response options which potentially match a missing one. The score was the total number of correct responses. APM is a non-verbal test and captures the spatial aspect of fluid ability. Because of its high reliability and good psychometric properties this measure has been widely used as a marker of general fluid ability, however some researchers point out that such interpretations should be made with caution (Ackerman, Beier, & Boyle, 2005).

2.1.3. Statistical analyses

First, we correlated the variables used in the study. As men and women might differ in terms of aggressive responses (Campbell, 2006), we conducted a series of regression analyses where, each time, the AQ scale was dependent variable while sex (entered in step 1) and APM score (step 2) were predictors (Table 2). Bonferroni correction was used for alpha inflation.

2.2. Results

The APM was negatively associated only with two scales from AQ: anger and hostility (Table 1). Moreover, all AQ dimensions were positively correlated with one another, which is consistent with previous research (Buss & Perry, 1992).

The regression models were significant in case of physical aggression ($F(2, 311) = 22.53$; $p < 0.001$; $R^2 = .12$), anger ($F(2, 311) = 5.77$; $p < 0.001$; $R^2 = .03$), and hostility ($F(2, 311) = 7.95$; $p < 0.001$; $R^2 = .05$). In particular, men had higher tendency toward physical aggression (beta = .36; $t = 6.70$; $p < 0.01$). This result is consistent with previous findings (Campbell, 2006). Intelligence remained a significant and negative predictor of anger (beta = −.18; $t = -3.30$; $p < 0.01$) and hostility (beta = −.22; $t = -3.97$; $p < 0.01$), after controlling for sex.

2.3. Discussion

The results revealed that cognitive ability was negatively associated only with two aggression-related dimensions: anger and hostility. No correlation between fluid intelligence and external aggression (physical or verbal) might be due to homogeneous sample used in the study. It is possible that, in the group of university students, the individual differences in expressed aggressive behavior were too small to reveal any systematic relationship with intelligence. The inverse association between cognitive ability and anger and hostility is consistent with previous findings (Austin et al., 2002) and may suggest that high level of intelligence helps to efficiently reduce the experience of aggressive feelings and hostile thoughts.

3. Study 2

As fluid intelligence is a broad construct, it would be interesting to identify specific processes of cognitive ability responsible for the reduction of anger and hostility. Many studies examining the cognitive underpinnings of anger showed that cognitive control, and