



A competitively designed version of the point subtraction aggression paradigm is related to proactive aggressive and psychopathic traits in males



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ARTICLE INFO

Keywords:

Proactive aggression
Reactive aggression
PSAP
Behavioral paradigm
Competition

ABSTRACT

The Point Subtraction Aggression Paradigm (PSAP) is a well-validated and frequently applied behavioral paradigm for provocation and quantification of reactive aggressive behavior in laboratory settings. Here, we design and test a newly developed PSAP version in its ability to quantify proactive aggressive behavior. A group of 119 male volunteers was allocated to the conventional PSAP and two other variants of the PSAP. The first PSAP adaptation intended to abet proactive aggression by monetary reward for aggressive actions. In the second variant, a highly competitive situation was created. In addition, two sets of aggression questionnaires, related to proactive and reactive aggressive and psychopathic traits, were used (Reactive-Proactive Aggression Questionnaire (RPQ), Psychopathic Personality Inventory-Revised (PPI-R)). Our results showed strong positive correlations among RPQ/PPI-R and aggressive behavior only for the new competitive version of the PSAP. In contrast, the scores of these scales showed weak and non-significant correlations with observed aggression in the two PSAP variants. The scores for reactive aggression were not significantly associated with any of the PSAP versions. These data indicate that aggression on the newly developed competitive PSAP design is mainly driven by proactive aggressive mechanisms.

1. Introduction

Aggressive behavior is a fundamental behavioral pattern that causes relevant suffering and financial burden (Waters et al., 2004). Besides several theories of aggression (e.g. the General Aggression Model (Anderson and Bushman, 2002)), authors describe two major categories of aggressive behavior, (i.e. *instrumental* vs. *hostile* (Anderson and Bushman, 2002), *instrumental* vs. *reactive* (Blair, 2001) or *proactive* vs. *reactive* aggression (Card and Little, 2006)), referring to similar underlying assumptions. Reactive aggression is considered to be an aggressive response to potentially threatening, insulting, or frustrating events (Berkowitz, 1993). The main intention of this behavior is to cause harm to the opponent without considering a specific benefit (Anderson and Bushman, 2002). In turn, proactive/instrumental aggression serves to achieve personal goals, and is less impulsive or emotional but rather calculated (Card and Little, 2006). In fact, factor analyses can statistically discriminate between proactive and reactive aggression (Poulin and Boivin, 2000; Stanford et al., 2003).

Valid assessments of aggressive behavior and corresponding thoughts and characteristics are challenging. Questionnaires can

reliably cover different shades of aggressive behavior but suffer from biased responses due to social desirability and limited introspection abilities. Behavioral paradigms provoke observable and quantifiable aggressive behavior but are restricted to certain situations used for provocation. Thus, construct validity appears to be better in such paradigms; however, external validity may be questionable.

One such well-studied paradigm is the Point Subtraction Aggression Paradigm (PSAP) (Cherek et al., 1990; for a review see Geniole et al., 2016). This task provokes aggressive behavior using a monetary reward task against a putative counterpart that habitually tries to steal money. Since the participant reacts to a provocation and is not monetarily rewarded for his aggressive actions (stolen money is not credited to his account), it is assumed that the PSAP focuses on reactive aggression (Geniole et al., 2011). Recently, investigators explored different modifications to the conventional PSAP. Effects of low vs. high provocations and monetary rewards for aggressive actions were tested (Carré et al., 2010). It appears that participants react less aggressively if they were not provoked, and their aggressive actions were not rewarded, than vice versa.

However, it is important to study reactive as well as proactive forms

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of aggression, as they both contribute to aggressive behavior in psychiatric disorders (Blair, 2004, 2010; Gardner et al., 2012; Banny et al., 2014; Lobbestael et al., 2015). Recently, Nouvion et al. (2007) applied a modified version of the PSAP, in which participants could steal money from the putative counterpart, which was credited to their own account. The authors hypothesized that a positive association exists between aggressive acts in this PSAP version and the individual's level of psychopathy. Although psychopathy is not entirely and unequivocally defined, it encompasses proactive aggressive traits (Vien and Beech, 2006). This hypothesis was confirmed by significantly higher scores on the Psychopathy Checklist-Revised (PCL-R) in the “proactive aggressive” group (Nouvion et al., 2007). However, this was observed in a complex between-group study design with pre-selection of subjects. Another approach to assess proactive aggression might be a change in the degree of competition in which the participant experiences himself. Previous reports argue for a high conceptual overlap between general (Geniole et al., 2016; Hillman, 2013), respectively proactive (Hoving et al., 1979) aggression and competition. Anderson and Morrow (1995) found that aggressive behavior during video games increased in a competitive relative to a non-competitive context, which was not linked to perceptions of hostility or mood changes and could therefore be regarded as a rational strategic decision. Another work revealed an association between competitive outcomes (winning or losing) and proactive and reactive aggressive behavior (Vongas, 2015). Hoving et al. (1979) constructed a competitive task scenario for measuring proactive aggression. Here they operationalized proactive aggression as a noxious, yet goal-oriented, action towards a contender (“The rate at which a child pressed a button which allegedly interfered with his opponent's progress on the task was the measure of instrumental aggression.”). For the conventional PSAP, aggression increased after competitive loss situation (Carré et al., 2009). Furthermore, the degree of aggressive behavior during PSAP influenced consecutive competitive behavior (Carré and McCormick, 2008; Carré et al., 2010). These findings support our notion that competitive circumstances might unleash proactive (instrumental) modes of aggressive behavior. Therefore, we developed a new competitive PSAP variant in the present study by instructing the participant that he would only receive his collected money when outperforming the putative counterpart (see Methods). In a competitive context reactive aggressive pathways of behavioral modulation are likely to be still present; however, there exists a relevant change in the impact of aggressive actions. Now, harming the counterpart is a powerful and comprehensible tool to win “the game” (and money consequently). Assumed that competitive circumstances would largely increase the frequency of aggression, this increase would be most likely associated with proactive aggression while serving a personal goal.

In the present investigation, we compared our newly developed PSAP variant (competitive PSAP: PSAP_COM) to the original PSAP-version (conventional PSAP: PSAP_CVN) and the Nouvion-version (proactive PSAP: PSAP_PRO), with respect to their ability to detect proactive aggressive behavior. For this first evaluation, only males were included due to strong gender-associated differences in aggressive behavior (e.g. Lagerspetz et al., 1988). Furthermore, inclusion of both sexes decreases the statistical power at any given sample size. Also, males were chosen because the social burden caused by aggressive behavior as mentioned above is mainly caused by men. Thus, male participants in three comparable groups underwent the three PSAP variants and were also characterized using two questionnaires related to proactive aggression to test which paradigm correlates best with these surveys [Reactive/Proactive Aggression Questionnaire (RPQ) (Raine et al., 2006) and Psychopathy Personality Inventory Revised (PPI-R) (Alpers and Eisenbarth, 2008)]. The PPI-R was chosen because psychopathy shows a strong link to proactive aggression (Cornell et al., 1996; Frick et al., 2003; Woodworth and Porter, 2002). However, the concept of psychopathy describes a personality dimension, whereas proactive aggression is mainly a behavioral construct which can be

driven by personality traits. In addition, a general personality assessment was administered with the Temperament and Character Inventory Revised (TCI-R), to detect potential confounding differences between the PSAP groups with respect to personality.

We hypothesized that the aggression scores from the two modified versions of proactive aggression paradigms might be associated with self-reported proactive aggression and PPI-R scores (Hypothesis 1 and 2), but not with reactive aggression (Hypotheses 3 and 4). For the conventional PSAP group, behavioral aggression might be associated with self-reported reactive (Hypothesis 5), but not proactive aggression and PPI-R scores (Hypothesis 6). We also hypothesized that aggressive behavioral scores on the two proactive aggressive modulated versions of the PSAP might be higher than those on the conventional PSAP (Hypothesis 7).

2. Methods

This study was approved by the Ethics Committee of the Medical Faculty of the RWTH Aachen University and performed in accordance with the Declaration of Helsinki (World Medical Association, 2013).

2.1. Participants

Participants were recruited via online advertisements. From a large sample of subjects who were interested to take part in the study, 121 males (age 18–35 years) with sufficient skills in German language were included. All participants provided their written informed consent. Subjects were randomly assigned to one of the three PSAP versions, and they provided their demographic information and answered personality questionnaires. One participant failed to fill in the RPQ version that captured present behavior (RPQ_present). Three participants failed to complete single RPQ-items, hence in one case the proactive and in two cases the reactive aggression scale could not be determined (= missing values on the respective scales). Furthermore, three participants did not complete the TCI-R and two the PPI-R questionnaire.

The datasets of two participants were excluded, because of computer malfunction during the paradigm (PSAP) and failed paradigm deception (he cast doubt on the existence of a real PSAP-counterpart) respectively. The mean age of the remaining participants ($N = 119$) was 24.9 years (SD: 3.2; range: 18–33). The average duration of school education was 12.7 years (SD: 0.8; range: 9–13). Most of the participants were students ($n = 101$).

2.2. Personality questionnaires

2.2.1. Reactive – proactive aggression questionnaire

(RPQ; (Raine et al., 2006))

The RPQ is a short, reliable, and valid self-report questionnaire developed for a juvenile population (Raine et al., 2006). Twelve of 23 items on the questionnaire refer to proactive aggression; the remaining 11 items depict reactive aggressive behavior. The RPQ is, to our knowledge and judgment, the most valid and reliable questionnaire for measuring proactive and reactive aggression. However, one drawback is that the questionnaire was developed for a juvenile population, whereas we examined an adult population in this study. Therefore, participants were first instructed to complete the questionnaire reflecting their behavior as adolescents aged 12–16 years (RPQ_past_pro and RPQ_past_re), since many of the RPQ items might seem inapplicable to an adult population. Additionally, an adjusted version (for use in adults) of the RPQ was used, for which participants were instructed to think of their general present behavior (RPQ_present_pro and RPQ_present_re).

2.2.2. Psychopathic personality inventory revised

(PPI-R; (Lilienfeld and Widows, 2005; Alpers and Eisenbarth, 2008))

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