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Fight fire with rainbows: The effects of displayed violence, difficulty, and performance in digital games on affect, aggression, and physiological arousal

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ABSTRACT

There is a large amount of variables that need to be taken into account when studying the effects of violent content in digital games; one of those being difficulty. In the current study participants played a modified first-person shooter in one of four different conditions, with either high or low difficulty and high or low violent game content. We assessed number of kills and number of deaths as game performance. Neither the difficulty nor the displayed violence had an effect on psychophysiological arousal during play, post-game aggressive cognitions, nor aggressive behavior. Thus, this study corroborates previous research indicating that violence in games does not substantially influence human behavior or experience, and other game characteristics deserve more attention in game effects studies. In addition, findings showed that challenge manipulated by game difficulty is of main importance for post-game emotions: Number of deaths predicted positive affect, but only in the low difficulty condition while number of kills was a positive predictor for positive affect and a negative predictor for negative affect.

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Digital games account for a large part of today's media landscape (Quandt, Breuer, Festl, & Scharkow, 2013). It is thus not surprising that researchers have studied the influence of digital games on their players for about thirty years. Similar to research on other media, it has primarily focused on the negative impact of gaming and especially on the link between violent digital games and human aggression. The discussion on whether or not this link exists and how exactly playing violent games could lead to increased aggression continues, see for example the recent dispute between Elson and Ferguson (2014a, 2014b) and Bushman and Huesmann (2014), Krahé (2014), and Warburton (2014). Researchers have started considering distinctive differences of digital games compared to other media — for example the interactivity of the medium — as these are important factors when studying their effects. Previous research on the influence of digital games on aggression and physiological arousal indicates that a mono-causal

connection between violent contents and these outcomes might be too simplistic. There is evidence that the characteristics of the recipient of the game (Kneer, Glock, Beskes, & Bente, 2012a; Kneer, Munko, Glock, & Bente, 2012b), the playing context (Breuer, Scharkow, & Quandt, 2015; Velez, Mahood, Ewoldsen, & Moyer-Guse, 2013), and game-specific variables (Ivory & Kalyanaraman, 2007) have to be taken into account.

Regarding game characteristics, aside from violent content, which might have an influence on aggression, Adachi and Willoughby (2011a) name competitiveness, pace of action, and difficulty. While there have been studies on the interaction of the first two factors with violent content (Adachi & Willoughby, 2011a; Elson, Breuer, Van Looy, Kneer, & Quandt, 2015), it remains unclear is how the third variable — game *difficulty* — is influencing results on online- and post-game outcomes. Therefore, the current study explores the effects of difficulty and violence of a digital game on human aggression and psychophysiological arousal. To test this we modified the displayed violence and difficulty of a first-person shooter, measured aggressive behaviors, aggression-related associations, physiological arousal, and positive and negative affect, while also accounting for the individual in-game performance.

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1. Violent digital games and aggression

Different models and theories have been developed to predict the effects of violent content in games on physiological arousal and aggressive cognitions, emotions, and behaviors. The General Aggression Model (GAM; Anderson & Bushman, 2002) integrates several social-cognitive theories into one model and constitutes a social-cognitive approach to aggression. According to the GAM, aggressive behaviors are acquired through learning and reinforcement of knowledge-structures which influence the perception and interpretation of simple cues up to complex behavior-sequences. Over a period of time and repetitions these knowledge-structures can develop into scripts or become automated. According to the GAM, repeated exposure to violent media facilitates hostile perception of situational variables and behavior of others, and increases the accessibility of an aggressive repertoire. In the long term, the GAM predicts that this will result in fundamental changes and fostering an aggressive personality.

Other approaches, such as the Catalyst Model (Ferguson et al., 2008a), focus on biological determinants as well as the social context of family and peer groups in which aggression is fostered. Within such biopsychosocial models, aggression is largely caused by stable biological and genetic dispositions which can be influenced by environmental factors (e.g., violence in the family). The stronger the affinity for aggressive responses, the higher the likelihood a person behaves aggressively under taxing circumstances, which can be short-term (e.g., decision-making under pressure) or long-term (e.g., work or relationship related issues). Thus, biological and social variables can cause a proneness to behave aggressively, while environmental stressors motivate individuals to act upon it. Games and other violent media are considered an unimportant factor in the etiology of aggression, although they can become a stylistic catalyst, i.e. characteristics of violent behaviors might look similar to those displayed in media.

1.1. Empirical evidence for violent game effects

Research concerning negative effects of digital games is still contested. For psychophysiological arousal (heart rate, HR; skin conductance level, SCL; and blood pressure) as an online-measurement during game play, the findings are ambivalent. Some studies found that violent games increase psychophysiological responses (Barlett, Harris, & Bruey, 2008), while other studies could not reveal these effects (Anderson & Carnagey, 2009). Research on the activation of aggression-related cognitions after playing violent games shows the same inconclusive pattern. Some studies found violent games lead to a higher accessibility of aggressive thoughts (Anderson & Dill, 2000), while others found that aggressive thoughts are suppressed by experienced players (Glock & Kneer, 2009). Besides these controversial results on psychophysiological arousal and aggressive cognitions, the measurement of aggressive behaviors is still discussed among scholars regarding the operationalization, standardization, and validity of measures used in laboratory studies (Elson, Mohseni, Breuer, Scharkow, & Quandt, 2014c; Ferguson & Savage, 2012; Tedeschi & Quigley, 1996). It might be due to these methodological shortcomings that, not surprisingly, results concerning aggressive post-game behaviors are ambivalent as well. Some scholars report findings of increases in aggressive behaviors after playing violent games (Anderson et al., 2004), while others find mixed evidence (Anderson & Dill, 2000), or no link at all (Adachi & Willoughby, 2011a). For narrative review of the empirical literature on these and other variables, see Elson and Ferguson (2014b). The latest meta-analysis on the topic has been conducted by Greitemeyer and

Mügge (2014; substantial corrigendum by Greitemeyer and Mügge, 2015).

One main criticism of many studies investigating the effect of violent content on aggressive behavior and physiological arousal is the lack of stimulus control. Usually, participants are assigned to play one of two different games, a violent or a nonviolent one. However, violent content is usually not the *only* dimension on which the games used in these studies differ (Adachi & Willoughby, 2011b). These other dimensions might pose confounds that must be controlled so they do not interfere with any effect that should be explained exclusively by the manipulation. For a study to qualify as an experiment, however, all conditions must be held constant except for one factor which is the independent variable. Without sufficient stimulus control, manipulating game contents as independent variables by using completely different games could violate fundamental assumptions of experiments as a scientific method (Elson & Quandt, 2014d). Järvelä, Ekman, Kivikangas, and Ravaja (2014) also stress the benefits of manipulating the variables in one game instead of using a different game for each condition, which can be done, for instance, through in-game settings or game modifications ("modding").

1.2. Digital games and aggression: the role of difficulty

Despite its obvious importance for the experience of games (Van den Hoogen, Poels, IJsselsteijn, & de Kort, 2012) and for potential positive and negative outcomes of playing (Adachi & Willoughby, 2011a), game difficulty as a source of aggression has so far only been investigated systematically by very few studies (Przybylski, Deci, Rigby, & Ryan, 2014). Challenge, determined by game difficulty and player skill, is one major requirement for game enjoyment (Kneer & Glock, 2013; Kneer, Rieger, Ivory, & Ferguson, 2014; Kneer & Rieger, 2015). A game too easy (e.g., for an experienced player) could result in boredom, while a game too demanding (particularly for beginners) could lead to frustration. According to Van den Hoogen et al. (2012), the optimal experience of games (resulting in a higher enjoyment) exists in the perfect balance between challenge and defeat (see also the literature on the concept of flow in games, e.g. Cowley, Charles, Black, & Hickey, 2008).

In addition, considering the classic frustration-aggression hypothesis (Berkowitz, 1989; Dollard, Miller, Doob, Mowrer, & Sears, 1939), frustration could be an important confound in the research on game violence and aggression. Game difficulty and the resulting in-game performance could influence frustration and, thus, affect game experience and post-game behaviors (Breuer et al., 2015). Despite its relevance for explaining aggressive behaviors in particular, frustration has not seen a lot of attention in digital games research. Some studies identified self-reports of frustration as important control variables (Anderson et al., 2004; Valadez & Ferguson, 2012; Velez et al., 2013) without specifically testing frustration-related hypotheses. Ivory and Kalyanaraman (2007) conclude that "research that intentionally manipulates frustration as an independent variable might prove insightful" (p. 551) when trying to understand media effects as more than just issues of content. The frustration-aggression hypothesis is mentioned explicitly as a potential explanation for the effects of (violent) digital games by several authors (Eastin & Griffiths, 2006; Williams & Clippinger, 2002). So far, only two studies tested this hypothesis for digital games: Schmierbach (2010) found no mediating effect of frustration on aggressive cognitions after violent game exposure, while Breuer et al. (2015) found that frustration mediated the effect of outcome (losing) in a non-violent game on aggressive behavior. This is further corroborated by the study of Shafer (2012), who found that undesired outcomes in competitive situation can facilitate hostility. Finally, Przybylski et al. (2014) conducted a series of