

## Abstract

**OBJECTIVES:** Testing the *Deletion Hypothesis*. According to this hypothesis, the consumption of excessive media violence could lead to poorer memory consolidation or a deletion of short-term memory contents and therefore impair school achievement. **DESIGN:** Experimental study, between-subject-design. **PARTICIPANTS:** 360 adolescents (180 male; 180 female) aged 18 to 25. Gaming habits, level of education and sex were used as stratification criteria. **MAIN EXPOSURES:** Filmlets (violent vs. non-violent), video games (violent vs. non-violent) and non-media leisure activity. **MAIN OUTCOME MEASURES:** Visual and verbal memory performance and performance on a concentrativeness task. **RESULTS:** Experimental- and control group did not differ significantly in most of the memory test outcome measures. There was a significant effect of treatment on concentrativeness for subjects with a higher self-reported entertainment level: Highest performance showed participants in the non-media control group, lowest task performance was observed in the violent video games condition. **CONCLUSIONS:** Although our findings could not support the main predictions of the *Deletion Hypothesis* regarding the detrimental effect of media violence on *memory consolidation*, our results rather suggest an impairing effect of media violence on *information processing*.

## Introduction

Different survey studies have shown a significant relationship between violent video game use and reduced school performance (e.g. Gentile et al., 2004; Möhle et al., 2006; Roberts et al., 2005). Unfortunately, these studies can only illustrate a correlational relationship of two phenomena and cannot explain a potential underlying causal relationship. Among other influencing factors, memory performance and concentrativeness are of vital importance for school achievement. In this context the *Deletion Hypothesis* claims that the consumption of excessive media violence could lead to poorer memory consolidation or deletion of short-term memory contents.

Recent studies could show effects of impaired memory consolidation for ads presented in violent movie contexts in contrast to ads presented in non-violent movie contexts (Bushman et al., 2002). In terms of concentrativeness studies report an improved attention task performance for subjects who played video games. However, those studies focused on performance in visuospatial reaction time tasks; the results therefore reflect psychomotor skills which indeed could be improved by most video games given their similar focus on quick visuospatial processing ('point and shoot'). Still ambiguous, however, is the impact of video games on more cognitive aspects of concentrativeness, such as enduring attention to a complex task, e. g. mental arithmetic.

Our experiment was designed to test whether the consumption of media violence results in lower performances in a memory task as well as in a cognitive concentration task.

## Method

360 young participants aged 18 to 25 (180 male; 180 female) were recruited in the city of Hanover, Germany. The subjects participated voluntarily and received an allowance. Different gaming habits (non-, casual, and intensive) and two levels of education (high vs. low) were used as stratification criteria (see Table 1 for details). Participants with 'improper' behavior during the two test days (e.g. simulating in learning test, alcohol intoxication or low degree of fitness) were excluded from calculations.

Participants performed a visual and verbal memory task (VVM: Visueller und Verbaler Merkfähigkeitstest) and a concentrativeness test (KLT-R: Konzentrations-Leistungstest) before and after the treatment. Treatment consisted of three leisure periods, in which one of five treatments took place (3 x 20 min.): Non-violent G-rated filmlets, Violent X-rated filmlets (ages 16+ or 18+), Non-violent G-rated video games, Violent X-rated video games (ages 16+ or 18+), Non-media leisure activities (tabletop soccer, darts, ping-pong). In all of the groups three different filmlets, games or non-media activities were presented. The participants rated all leisure periods regarding entertainment, violence and other related constructs.

To assess possible effects of the treatment on long-term memory the participants performed the second VVM-measurement exactly 24 hours later. Subsequently all participants completed a comprehensive questionnaire, in which they were asked about their usual leisure time activities, media usage, socialization, socio-demographic and educational background as well as traumata (Total time of day one: 180 min, total time of day two: 90 min).

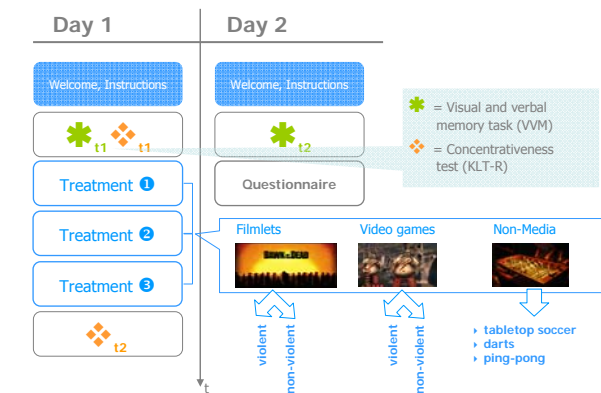


Figure 1. Experimental Design

Table 1. Stratification of Sample

Gaming Habits	Level of Education	
	High	Low
None	♀30 / ♂30	♀30 / ♂30
Casual	♀30 / ♂30	♀30 / ♂30
Intensive	♀30 / ♂30	♀30 / ♂30

n = 360

# Impact of Violent Video Games on Memory Consolidation and Concentrativeness

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## Results

No differences in visual or verbal memory performance could be observed between the different leisure activities (see Table 2).

Regarding concentrativeness, a significant effect of treatment ( $F = 2.44, p = .047; \epsilon = .19$ ) on outcome performance was found when controlling for self-reported entertainment: Participants in the control group performed best, followed by participants in the two groups watching filmlets. Participants playing violent video games showed the lowest performance (see figure 2). Post-Hoc-Tests (Bonferroni) revealed that only the violent video game group and the control group differed significantly ( $p = .043$ ).

In our experiment, a high level of entertainment increased the impairing effect of violent media exposure, especially for violent video games. When controlling for level of education there were no differences in self-reported entertainment. In addition, the reported results cannot be attributed to different levels of achievement motivation because treatment groups did not differ in this respect.

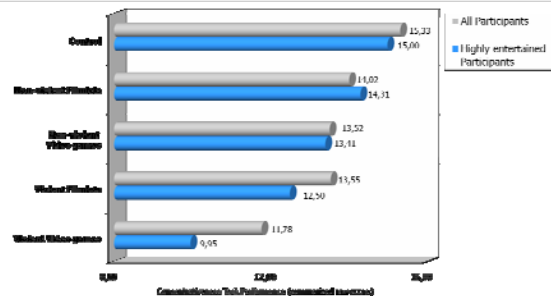


Figure 2. Concentrativeness Task Performance t<sub>2</sub>

Table 2. Results

Outcome measures	Treatment Group				
	Control	Non-violent Filmlets	Non-violent Video games	Violent Filmlets	Violent Video games
<b>KLT-R</b>					
M	15.33	14.02	13.52	13.55	11.78
SD	6.831	6.698	6.348	6.693	5.755
<b>VVM</b>					
Verbal Memory					
M	14.70	13.11	13.97	13.42	13.15
SD	5.016	4.842	4.834	4.681	4.823
Visual Memory					
M	22.43	21.20	22.82	21.42	22.16
SD	6.142	6.743	5.124	5.732	6.691

Note. M = mean, SD = standard deviation. For the KLT-R,  $r_s$  were 53, 51, 58, 54, and 52 for the "Violent Filmlets", "Non-violent Filmlets", "Violent Games", "Non-violent Games", and control group, respectively. For the VVM,  $r_s$  were 60, 56, 61, 58, and 54 for the "Violent Filmlets", "Non-violent Filmlets", "Violent Games", "Non-violent Games", and control group, respectively. Scores on the KLT-R could reach from 0 to 40. Scores on the VVM Verbal Memory scale could reach from 0 to 24. Scores on the VVM Visual Memory scale could reach from 0 to 31.

## Conclusions

Expected impairments of violent media exposure, particularly violent video games, on concentrativeness at t<sub>2</sub> could be observed especially at a high level of entertainment (which in turn indicates that the assigned leisure time activity was an adequate one for the participants). It should be noted however that a high level of entertainment in a laboratory context does not exactly match a high level of entertainment in real life. It is likely that our results therefore underestimate the real effect of media violence on concentrativeness.

Upcoming studies should examine for how long the shown treatment effects persist and whether the shown results can be validated with other measures of concentrativeness. Compared to other studies reporting a stimulation of visual attention performance by video games, our results indicate the opposite effect for concentrativeness. Future experiments should focus on a clear distinction of the different constructs.

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