SEDENTARY VIDEO GAMING AND BODY MASS
A META-ANALYSIS

Caroline Marker
University of Würzburg; University of Koblenz-Landau

Timo Gnambs
University of Linz & Leibniz Institute for Educational Trajectories

Markus Appel
University of Würzburg
BACKGROUND

- General screen time and body mass (e.g., Buchanan et al., 2016)
  - Higher screen time was associated with higher body mass
  - Screen time mostly consisted of watching television

- Possible Mechanisms
  - Less physical activity (e.g., Robinson et al., 2017)
  - Higher caloric food intake (e.g., Ford, Ward, & White, 2012)
  - More advertisement for unhealthy foods (e.g., Binder, Naderer, & Matthes, 2019)
  - Sleep deprivation (e.g., Fatima, Doi, & Mamun, 2015; Hale & Guan, 2015)
Video Gaming: Evidence is heterogeneous
- Positive relationship (e.g., Martinovic et al., 2015)
- No relationship (e.g., Scharrer & Zeller, 2014)

Differences between general screen time and video gaming
- Less advertisement for unhealthy foods (Leibowitz, Rosch, Ramirez, Brill, & Ohlhausen, 2012)
- Higher energy expenditure (e.g., Penko & Barkley, 2010)
- Snacking in front of the screen is less likely (e.g., Tomlin et al., 2014)
METHOD

- Literature search
  - Databases: PsychINFO, MEDLINE, Google Scholar
  - References of relevant articles
  - Grey literature through Proquest Dissertation Abstracts and Google Scholar

- Selection criteria
  - Measure of video gaming (e.g. frequency, duration, etc.)
  - Measure of body mass (e.g. BMI, body fat percentage, etc.)
  - Correlational data or comparable information about the results
  - Exclusion of other screen media (e.g. active video gaming, general computer use)
METHOD

Identification

Records identified through database searching (PsychINFO, MEDLINE) \( (k = 710) \)
Records identified through references of relevant articles \( (k = 27) \)
Additional records identified through other sources \( (k = 11) \)
Additional records identified through Google (Scholar) \( (k = 5) \)

Screening

Records screened \( (k = 753) \)

Eligibility

Full-text articles assessed for eligibility \( (k = 160) \)

Included

Articles included in quantitative synthesis (meta-analysis) \( (k = 20) \)

Notes.

\( ^a \) no results on relevant associations, missing information or associations controlled for third variables.
\( ^b \) only indicators for screen time, computer use, or video gaming mixed with other media uses (e.g., internet use).
\( ^c \) focus on active video games, eating behavior, weight loss intervention, health communication.
\( ^d \) theoretical papers and reviews
METHOD

Coding process and meta-analytic procedure

- Video gaming and body mass
  - Effect sizes (zero-order correlation, crude odds ratios)
  - Sample size
- Variables for later moderator analysis
  - Publication year
  - Age group (children, adolescents, adults/undergraduates)
  - Gender ratio in the sample
  - Sample-wise estimate for gender differences in body mass
  - Type of body mass measure (self-reported vs. objective; continuous vs. dichotomous)
  - Study quality index
METHOD

Coding process and meta-analytic procedure

- Video gaming and physical activity
  - Effect sizes (zero-order correlation, crude odds ratios)
  - Sample size

- Physical activity and body mass
  - Effect sizes (zero-order correlation, crude odds ratios)
  - Sample size
RESULTS

Descriptives

- 20 Publications with 24 independent samples (total $N = 38,097$) and 32 effect sizes
- 51.69% females
- Mean age 15.27 ($SD = 11.35$)
- Sample: $k = 10$ children, $k = 5$ adolescents, $k = 5$ adults (mostly undergraduates)
RESULTS

Video Gaming and Body Mass

- $r = .07$, 95% CI [.03; .15], $p = .006$
  - Power = .56 for small effect ($r = .10$)
  - Power = .75 for moderate effect ($r = .20$)

Heterogeneity

- $Q(31) = 593.03$, $p < .001$
- $t^2.3 = 84.16$, $t^2.2 = 10.97$
- $\sigma^2.3 = .014$; $\sigma^2.2 = .002$
MODERATOR

Age

- Children
  \( r = .09, 95\% \text{ CI} [-.07, .25] \)

- Adolescents
  \( r = .01, 95\% \text{ CI} [-.21, .23] \)

- Adults
  \( r = .22, 95\% \text{ CI} [.04, .40] \)
Test for funnel plot asymmetry: $B = -0.58$, $SE = 1.43$, $t(30) = -0.41$, $p = .686$

- One outlier, but no substantial changes in the results

*Figure S1*. Funnel plot of the meta-analysis between video gaming and body mass.
MEDIATOR

Time Displacement?

- Video Gaming and Body Mass ($k = 20; N = 38,097$): 
  $r = .07$, 95% CI $[.03; .15]$, $p = .006$

- Video Gaming and Physical Activity ($k = 4; N = 3,864$): 
  $r = -.08$, 95% CI $[-.17; .01]$, $p = .074$

- Body Mass and Physical Activity: ($k = 11; N = 20,582$) 
  $r = -.08$, 95% CI $[-.14; -.01]$, $p = .029$
Meta-analytic structural equation model (MASEM). Standardized regression parameters are presented. *$p < .05$
CONCLUSION

Results of the meta-analysis show that

• For adults, higher video gaming is associated with body mass

• Children and adolescents‘ body mass is unrelated to their time spent with video games

• First evidence suggests a mediating role of physical activity