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# Relation Between Socioeconomic Status and Body Mass Index:
### Evidence of an Indirect Path via Television Use

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## Abstract

**Objective—**To test the hypothesis that media use mediates the relation between socioeconomic status (SES) and body mass index (BMI).

**Design—**Analysis of 2 large cross-sectional surveys, 1 from Germany and 1 from the United States.

**Setting—**Twenty-seven public schools in northern Germany; telephone interviews in the United States.

**Participants—**A total of 4810 German children and adolescents aged 10 to 17 years (mean age, 12.8 years); 4473 US children and adolescents aged 12 to 16 years (mean age, 14.0 years) recruited using random-digit-dial methods.

**Main Exposures—**Media exposure was assessed via survey questions about the presence of a television in the bedroom, television screen time, computer and video game screen time, and movie viewing. The SES was derived from type of school (German sample) or parental reports of their own education and family income (US sample).

**Main Outcome Measures—**The BMI was assessed by the use of self-reports in both samples, supplemented by parental reports (US sample) for height and weight.

**Results—**In both samples, SES was inversely associated with BMI, and media use was directly associated with BMI. The effect of SES on overweight was partially mediated by media exposure, which explained 35% of the SES-BMI association in the German sample and 16% in the US sample. In both groups, television in the bedroom and television screen time had statistically significant indirect paths, whereas video game use and movie viewing did not.

**Conclusions—**Students from low-SES backgrounds are at higher risk for overweight in part because of higher levels of television viewing. The change of media use habits could modify this health disparity.



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There is a clear need to better understand the mechanisms behind the development of obesity during childhood. Obesity is a serious public health concern because of numerous effects on physical (including cardiovascular, metabolic, and other chronic diseases) and psychosocial health.[1] Studies[2–6] in many countries have demonstrated increases in the prevalence of overweight in children and youth in recent years. One factor consistently associated with obesity in children and adults is socioeconomic status (SES). In developed countries, SES is inversely associated with obesity.[5,7–14] Another well-established risk factor for overweight in children and youth is media use,[15–22] which is thought to reduce energy expenditure through the displacement of physical activity and to increase food intake when children eat while watching television.[23,24] Television viewing may also prompt the eating of high-calorie snacks, convenience foods, fast foods, and sweets through the influence of food advertisements.[25]

There is also reason to believe that media use is higher in low-SES groups.[26–28] For example, in a study of North Carolina adolescents, Jackson et al[29] found much higher television and movie viewership in black vs white adolescents. These findings suggest that media exposure could be 1 mechanism underlying the well-documented SES–body mass index (BMI) (calculated as weight in kilograms divided by height in meters squared) relationship, especially in children. However, we could not find a study that explicitly models media use as a mediating factor; instead, it is usually considered as an independent risk factor for obesity. To treat media use in this way causes it to compete with SES as a predictor when it may instead be a pathway through which SES exerts influence on BMI.

In this study, we analyze data from 2 large child/adolescent samples, 1 from Germany and 1 from the United States, both of which included several indicators of media use, SES, and BMI. We decided to treat media use as 1 mechanism through which SES might affect BMI. Thus, the aim is to conduct a mediation analysis that models SES as an exogenous (external risk factor) variable and media use as an endogenous (part of a causal mechanism) variable. We also study 2 samples of children and adolescents to verify the findings.

# METHODS

## STUDY DESIGNS AND SAMPLES

**Germany—**Forty-two public schools from the state of Schleswig-Holstein were randomly selected and invited to take part in an investigation of media use and child/adolescent behavior; 27 schools (64%) agreed to participate. All the data were collected using paper questionnaires administered by trained research staff; students completed the questionnaires independently during 1 school period (approximately 45 minutes). Teachers were requested to stay seated at the front desk during data collection, and confidentiality was guaranteed at all stages of the study. The study was approved by the Ministry of Cultural Affairs of the State of Schleswig-Holstein.

All students (N=6607) in grades 6 to 8 were recruited for the study. Eight hundred thirty-six students (12.7%) were excluded because of missing parental consent forms, 145 (2.2%) were absent on the day of data collection, and 816 (12.4%) were excluded because of missing or inconsistent/implausible data (89% of them because of missing data in the BMI measure), which provided a final sample of 4810 children and adolescents.

**United States—**Using random-digit-dial methods, 6522 children and adolescents aged 10 to 14 years were recruited to participate in a cohort study on media use and child/adolescent behavior. The baseline sample was representative of the US population with respect to region of the country, ethnicity, and family income.[30] Parental reports and self-reports of height and weight were obtained beginning at wave 4, approximately 2 years after the baseline survey. Of the 4575 children and adolescents who participated in the wave 4 survey, 4473 had complete data for all variables in the mediation analysis. The US sample was ethnically mixed. Because of previous studies that showed no relation between family income and BMI in black adolescents,[31] we assessed the relation between SES and BMI by ethnicity. We found a weaker negative relationship in black children and adolescents, but the interaction term (black ethnicity × SES) on BMI did not reach statistical significance, so black children and adolescents were included in the mediation analysis.

## MEASURES

**Socioeconomic Status—**The German ethics board would not allow survey questions regarding parental SES, so school type was used. In Schleswig-Holstein and other German states, students are grouped at a very early stage (after grade 4) into several school types, via a selection process that begins at the age of 10 years and is determined by school achievement and the SES of the parents.[32,33] *Hauptschulen* (general schools) tend to recruit pupils from low-SES backgrounds, *Realschulen* (secondary schools) recruit students from middle-class families, G*esamtschulen* (comprehensive schools) serve students with a mix of SES backgrounds, and *Gymnasien* (college-preparatory schools) serve middle- and upper-class students. For example, the Programme for International Student Assessment revealed that 1 in 2 children from the highest socioeconomic group attends a *Gymnasium* and only 1 in 10 from this group attends a *Hauptschule*. In contrast, only 1 in 10 children from the lowest socioeconomic group goes to a *Gymnasium*.[34] Recruited schools in the German study did not differ in their composition from those that declined participation, which suggests that the school sample was not biased compared with other schools in the area. We assigned values from 0 (*Hauptschule*) to 3 (*Gymnasium*) as a proxy for the SES of each student.

For the US sample, we used parental reports of education and family income to construct an individual-level SES variable. Education was assessed via the question, "What is the highest grade or year of school that you completed?" Responses were coded to the following categories: less than high school, high school graduate, some post–high school education, associate's degree, bachelor's degree, and postbaccalaureate degree. Family income is a sensitive issue; it was approached with the following statement, "In studies like this, households are sometimes grouped according to income." Then, income was queried with the question, "Please tell me which group best describes the total income of all persons living in this household over the past year. Please include income from all sources, such as salaries, interest, retirement, or any other source for all household members." There was an additional query if needed: "Include income from all sources, such as earnings; social security and public assistance payments; dividends, interest, and rent; unemployment and worker's compensation; and government and private employee pensions." Answers included $10 000 or less, $10 001 to $20 000, $20 001 to $30 000, $30 001 to $50 000, $50 001 to $75 000, and more than $75 000. These 2 variables were combined into a standardized SES scale (Cronbach $\alpha$=.66) that was centered around 0 (mean [SD], 0.002 [0.89]).

**BMI Percentiles and Overweight Status—**The BMI was assessed in the German children and adolescents from self-reports of height and weight. For the US study, the BMI was an average generated from self-reports and parental reports of child/adolescent height and weight. Although regional studies[35] demonstrated that adolescents tend to underestimate the prevalence of overweight in adolescent populations, 1 large, nationally representative study[36] reported high correlations between measured BMI and self-reports in youth ($r$=0.94 for height and $r$=0.95 for weight). The correlation between parent- and child-reported BMI in the US sample was 0.83.

To account for the fact that BMI is systematically different for boys vs girls and for children vs adolescents, we assigned each student a BMI percentile based on national standards. For the German sample, we used percentile standards developed by the Arbeitsgemeinschaft Adipositas, a German medical consortium about obesity.[37] For the US sample, we used the 2000 Centers for Disease Control and Prevention BMI for age and sex growth chart data to determine BMI percentiles.[38,39] In the guidelines of the German Arbeitsgemeinschaft Adipositas, the 90th and 97th BMI percentiles are proposed as cutoff values for the definition of overweight and obesity, respectively; in the US system, it is the 85th and 95th percentiles, respectively. We used the US cutoff values in both samples for consistency. Students between the 85th and 95th percentiles where categorized as “at risk for overweight,” students above the 95th percentile as “overweight,” and all other students as “not overweight.”

**Media Use—**Studies[40] of media use and BMI have generally held that the media effect is a function of inactivity plus increased food intake by children during viewings of media content. Studies[41] confirm that children have increased food intake while watching television. Recent data in young adults question whether decreased physical activity plays a role in this association.[42] Regardless of the mechanism, we reasoned that media variables in this study should focus on time spent with media, and we selected the following for inclusion: (1) whether the child had a television in the bedroom, (2) a screen time measure for television watching, (3) a screen time measure for computer and video game use, and (4) the number of movies seen from a list of 50 (with the reasoning that those having seen a higher number of those 50 movies would have spent more time watching movies in general, and that most movies are watched at home on television or DVD). The presence or absence of television in the bedroom was assessed via the yes/no question, “Do you have a TV set in your room?” Average screen time for television and computer and video games was measured via the following questions: “On school days [on weekends], how many hours do you usually watch TV or DVDs?” and “On school days [on weekends], how many hours do you usually spend on your computer playing video games, sending e-mails, and surfing the Internet?” Response options were none, approximately half an hour, approximately an hour, approximately 2 hours, approximately 3 hours, approximately 4 hours, and more than 4 hours a day. The US study used similar questions and response categories but asked only about weekdays. In each study, the children and adolescents were asked whether they had seen each of 50 movies randomly selected from a large pool of popular contemporary movies.

## STATISTICAL ANALYSIS

Stata 10.0 (Stata Corp, College Station, Texas) was used for initial analyses. $\chi^2$ and *t* Tests were performed to check whether participants differed from those with missing data and obesity status with respect to demographics, media exposure, and BMI *z* scores. Zero-order associations between SES, media use, and overweight were assessed by the use of correlational matrices with 2-sided tests of significance. Indirect (mediated) effects analyses were performed using Mplus 5.1 (Muthén and Muthén, Los Angeles, California).[43] Path estimates were calculated by means of maximum likelihood estimation. Because the students in the German sample were nested within schools, we used a multilevel mediation approach for the German data, as described by MacKinnon,[44] in which maximum likelihood estimates have standard errors that are adjusted for the nonindependence of observations within clusters. The significance of indirect effects was tested by the use of the delta method (Sobel *z* test) in the German sample because Mplus does not yet have the capability to use the bootstrapping function in a multilevel analysis. In the US data, we tested the significance of the indirect effects by the use of bootstrap approximations (number of bootstrap draws: 2000) obtained by the construction of 2-sided, bias-corrected (bc) 95% confidence intervals

(CIs).[45] These resampling methods have the advantage that no assumptions about the shape of the sampling distribution of the statistic are necessary for the conducting of inferential tests.[46–48] Because there were significant differences in overweight for boys and girls, sex was included as an exogenous variable in both models.

# RESULTS

## MISSING VALUES ANALYSIS

Because there was a high percentage of missing values for height and weight in the German sample, we checked for systematic differences between reporters and nonreporters. There were differences in missing value frequencies depending on SES: students from *Hauptschule* (low SES) had more missing BMI values than students from other school types ($P$<.001). There were also more missing BMI data for girls (14.8%) than for boys (10.7%; $P$<.001). Student age was unrelated to missing status. The main cause of missing data in the US study was attrition from baseline, which reduced the sample by approximately 30%. Attrition was higher especially among black and Hispanic adolescents (approximately 50%), as has previously been described.[49]

## DESCRIPTION OF THE SAMPLE

**Germany—**The mean (SD) student age was 12.8 (1.2) years (range, 10–17 years) (98% of the sample was in the 11- to 15-year range), and the sample was equally distributed by sex. With regard to overweight status, 10.1% of the sample was classified as being at risk for overweight (85th–95th percentile) and 3.8% as overweight (>95th percentile); thus, this population of adolescents was leaner than their classmates in other areas. Being overweight was related to sex, with boys more often classified as being at risk for overweight and overweight (Table 1).

**United States—**The mean (SD) age at wave 4 was 14.0 (1.4) years (age range, 12–16 years), and the sample was equally distributed by sex. Black, Hispanic, and other nonwhite adolescents composed 8.2%, 13.7%, and 8.8% of the sample, respectively. Compared with the German sample, overweight was more common in the US adolescents: 10.8% were overweight and 15.9% were at risk for overweight. This compares with a nationwide prevalence of overweight for the US population from the National Health and Nutrition Examination Survey of 17.6% in 12- to 19-year-old children (2003–2006), so the sample was biased toward leaner children (or there were some who underreported their weight). Overweight status was only marginally related to age and sex but was more strongly related to SES and media use: the proportion of overweight was 17.9% vs 5.7% for the lowest vs the highest quartile of SES ($P$<.001). Overweight was also associated with having a television in the bedroom (12.8% with a television vs 7.5% without a television) and higher levels of television screen time (5.9% for those with no screen time vs 18.9% for those with >4 hours, $P$<.001). Overweight was not associated with video game time, and there was no association with higher levels of movie viewing (Table 2).

## ZERO-ORDER RELATIONSHIPS

We found evidence for all assumed bivariate associations between the variables; that is, SES was consistently negatively correlated with BMI percentiles and the media measures, whereas all media measures were positively correlated with BMI percentiles (Table 3). The only exception was that computer use was not related to BMI or SES in US children and adolescents.

### DIRECT AND INDIRECT ASSOCIATIONS

Figure 1 shows the mediation model for German children and adolescents, with standardized estimates controlled for sex and school entered as a cluster variable. The direct association between SES and BMI percentile is shown by the arrow between these 2 variables. The indirect associations are drawn through each of the media variables. Because the association estimates are standardized, they are interpreted in terms of standard deviations. For example, the direct association of −0.10 means that each 1-SD decrease in SES is associated with a 0.1-SD increase in BMI. One can determine the size of each indirect association by multiplying the estimates of each indirect path: −0.031 for television screen time (95% CI, −0.044 to −0.017; $P < .001$), −0.015 for television in the bedroom (95% CI, −0.023 to −0.007; $P < .001$), −0.003 for computer use (95% CI, −0.009 to 0.002; $P = .26$), and −0.004 for number of movies seen (95% CI, −0.009 to 0.002; $P = .20$), indicating that only the television-related measures (television screen time and television in the bedroom) are important as mediating variables. The total indirect association is the sum of each indirect path (−0.052) and is significant (95% CI, −0.064 to −0.040; $P < .001$). The size of the total indirect path suggests that approximately 35% of the total association between SES and BMI was mediated through higher use of media.

The same path diagram is shown for US adolescents in Figure 2. The standardized estimates for the indirect associations are −0.016 for television screen time (bc 95% CI, −0.022 to −0.009; $P < .001$), −0.010 for television in the bedroom (bc 95% CI, −0.018 to −0.003; $P < .01$), 0.000 for computer use (bc 95% CI, −0.001 to 0.001; $P = .85$), and −0.002 for numbers of movies seen (bc 95% CI, −0.004 to 0.000; $P = .033$), which shows a similar pattern as in the German sample. The total indirect association between SES and BMI was smaller in the US sample (−0.028), although still significant (bc 95% CI, −0.037 to −0.018; $P < .001$), which indicates that in this case, approximately 16% of the total association between SES and BMI was mediated through higher media use.

### SENSITIVITY ANALYSIS

Because we used different BMI measures in the 2 study samples (student-only reports in the German sample and a composite score of parental and student reports in the US sample), we tested whether the results are affected by using parent- or adolescent-only BMI in the US analysis. This made no difference in the size or significance of the indirect paths. We also hypothesized that the associations would be strengthened by discarding the results from individuals for whom there was a large difference between parental reports and self-reports because doing so would select for more reliable BMI reports. When we discarded the results from 339 participants for whom BMI differed by more than 1 SD, the estimates for all the indirect paths became stronger, but the conclusions did not change. In addition, we ran separate models for males and females instead of using sex as a covariate. In the German sample, the indirect associations were the same for males and females. In the US sample, the indirect associations via the presence of a television in the bedroom and the number of movies seen were significant only for females. All the results of the additional analyses may be obtained by request.

## COMMENT

This study explored the hypothesis that higher media consumption among lower-SES children and adolescents partially accounts for the well-documented relationship between lower SES and higher BMI. In 2 developed countries with different cultural contexts and different rates of obesity, the mediation analyses revealed that the relationship between SES and BMI is partially mediated through higher media use. Television-viewing behaviors contributed most of the indirect association in both countries because movie viewing and video-game playing had a much weaker relationship with BMI. The results are consistent with the idea that children and adolescents with a low SES usually have a higher BMI in part because they tend to watch more television. To our knowledge, this is one of the first studies to try to untangle the complex interplay among SES, media use, and overweight. A similar approach by Lioret et al[28] suggested a mediation effect in a sample of French 3- to 6-year-olds but did not conduct a formal test of statistical significance. Longitudinal studies with better measures of SES and measured height and weight are necessary to determine whether the indirect pathway documented herein represents a causal mediational pathway.

The causal pathways approach to the understanding of SES and obesity might be a powerful tool for health disparities research. To the extent that mediation analysis allows us to identify mechanisms that underlie health disparities (associations between SES or ethnicity and disease), it allows us to address the causal mechanism that underlies the disparity. Although we do not mean to suggest that media use entirely explains the SES-BMI relationship, we think that similar analyses of this and other outcomes could uncover additional mechanisms responsible for health disparities. For example, if one had data regarding food consumption behavior, one could model this as a mediator of the SES-BMI relationship to determine the extent to which different patterns of food consumption explain it. Thus, mediation analyses could represent an evidence-based approach to the targeting of interventions to address health disparities. In this way, the pursuit of knowledge about mediators has not only theoretical but also practical implications.

A strength of this study is that the findings were consistent across 2 independent samples of children and adolescents. Each sample was drawn from a developed country where there is an inverse relation between SES and BMI, with slightly different measures of SES, media use, and BMI. The fact that both studies implicate television viewing and the presence of a television in the bedroom over the other types of media exposures measured adds credibility to the finding because of its reproducibility.

There are several limitations to the present findings, however. First, height and weight were measured via self-report, which might have resulted in some underreporting bias,[35] as suggested by the lower prevalence of overweight in both samples compared with population statistics. Self-report bias seems to be more important in studies of adults because children and adolescents have been found to report height and weight with reasonable accuracy in a large US study[36] that included self-reports and measured heights and weights. A second limitation of the German study is the relatively high percentage of missing values for BMI in the sample. Students of low SES (a central variable in the present analysis) more often refused to or could not answer the height and weight questions; refusals could also have been higher among overweight individuals. These biases would make it more difficult to test the study hypothesis by limiting the analysis to adolescents with a lower BMI, unless the excluded individuals were not only more obese but also had less media use and were of higher SES, 3 possibilities we consider unlikely. Besides reporting bias, lower rates of overweight in the German sample may have been owing to the fact that the reference percentiles for the German population are from 1999, as opposed to the 1970s for the US population, and there has been a tendency toward more obesity with time in both countries. The US sample answers these concerns because of the much lower rate of nonresponse and by showing that the results hold regardless of whether one uses child/adolescent self-reports or parental reports of height and weight. Another problem with the German data is that SES measurement of each student was not allowed and the type of school was used as a proxy for this construct. The US sample answers that criticism by its confirmation of the finding by the use of individual-level measures of SES. Finally, because of higher attrition among minorities in the US sample, caution is warranted before the generalization of the results to these groups.

The cross-sectional nature of both data sets limits the ability to interpret the indirect pathways from both studies as causal. Although the causal pathway described herein is plausible, it might also be the case that the higher BMI of lower-SES children is the cause for their higher television use. The results need to be confirmed in a longitudinal analysis that predicts higher media use in the future based on SES and shows that this factor is related to increases in BMI with time.

This study raises other important questions. For example, the analysis tells us nothing about why media use is higher in children of lower SES. There are many possibilities. Less-literate families are probably more drawn to visual media sources that do not require reading. In addition, poor families are more often headed by a single parent. The television could be an essential tool that allows a single parent to complete household tasks that would be allocated between 2 parents in more traditional households. For these reasons, excessive media use in low-SES households could be less amenable to change than in higher-SES households.

In summary, we conducted an analysis that suggests that the relationship between SES and BMI is partially mediated through higher television exposure. If confirmed in longitudinal studies, this research could point to an intervention strategy to address this particular health disparity. We suggest that similar analyses could identify other mediating variables that are amenable to intervention.

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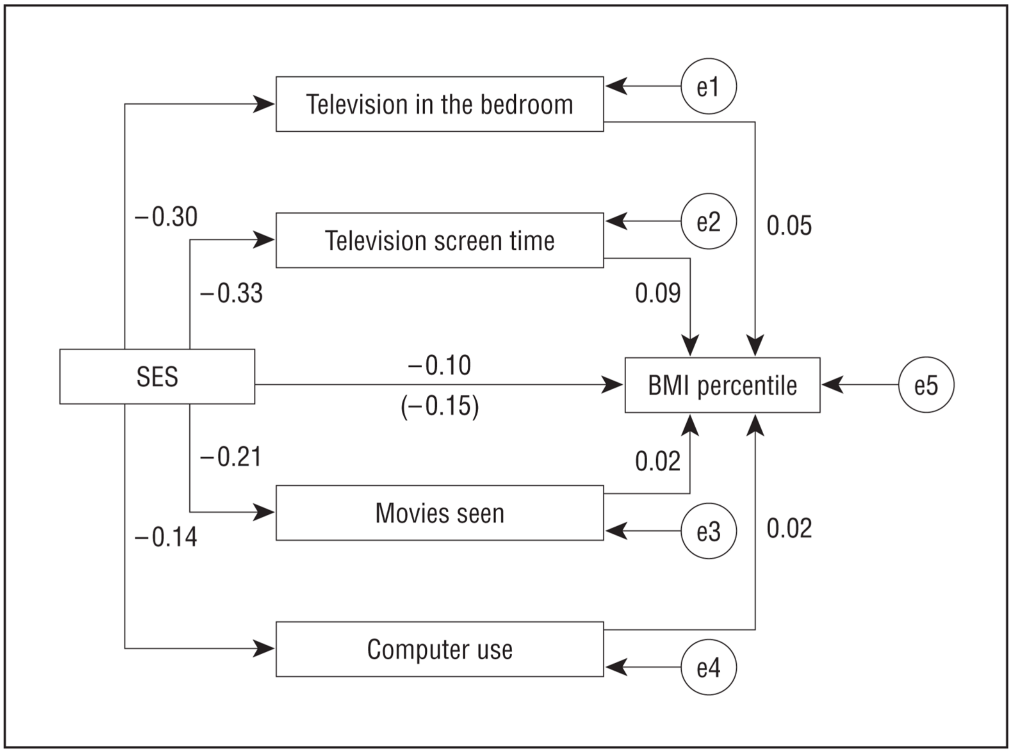


**Figure 1.**
Mediation model for the German sample (N = 4810). All values are standardized estimates. Sex was included as an exogenous variable in the model but was excluded from the figure for graphical simplicity. Standardized direct and indirect effects of socioeconomic status (SES) on body mass index (BMI) are −0.097 and −0.052, respectively ($P < .001$ for both). e1 to e5 indicate error terms for the stated endogenous variables. The value in parentheses is the standardized total (direct + indirect) effect of SES on BMI.

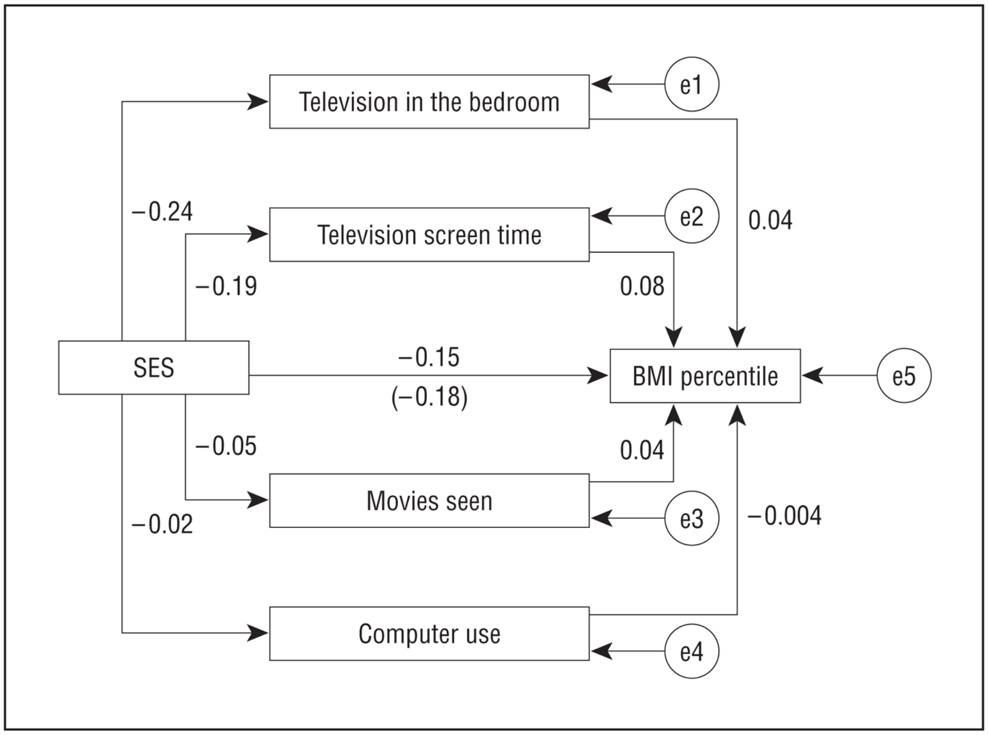


**Figure 2.**

Mediation model for the US sample (N = 4473). All values are standardized estimates. Sex was included as an exogenous variable in the model but was excluded from the figure for graphical simplicity. Standardized direct and indirect effects of socioeconomic status (SES) on body mass index (BMI) are −0.147 and −0.028, respectively ($P$ <.001 for both). e1 to e5 indicate error terms for the stated endogenous variables. The value in parentheses is the standardized total (direct + indirect) effect of SES on BMI.

**Table 1**

Relation Between Predictor Variables and Overweight Status: German Sample

| | Students, No. (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variables** | **Total** | **Not Overweight (<85th Percentile)** | **At Risk for Overweight (85th-95th Percentile)** | **Overweight (>95th Percentile)** | $\chi^2$ | ***df*** | ***P* Value** |
| Overall | **4810** (100) | **4144** (86.2) | **484** (10.1) | **182** (3.8) | | | |
| Age, y | | | | | | | |
| ≤12 | **1994** (41.5) | 1737 (87.1) | 179 (9.0) | 78 (3.9) | 4.50 | 2 | .11 |
| >12 | **2816** (58.5) | 2407 (85.5) | 305 (10.8) | 103 (3.7) | | | |
| Sex [a] | | | | | | | |
| Female | **2294** (47.7) | 2035 (88.7) | 183 (8.0) | 76 (3.3) | 24.84 | 2 | <.001 |
| Male | **2516** (52.3) | 2109 (83.8) | 301 (12.0) | 106 (4.2) | | | |
| SES [a] | | | | | | | |
| 0 *Hauptschule* | **1357** (28.2) | 1083 (79.8) | 193 (14.2) | 81 (6.0) | 109.57 | 6 | <.001 |
| 1 *Realschule* | **999** (20.8) | 835 (83.6) | 119 (11.9) | 45 (4.5) | | | |
| 2 *Gesamtschule* | **358** (7.4) | 303 (84.6) | 38 (10.6) | 17 (4.8) | | | |
| 3 *Gymnasium* | **2096** (43.6) | 1923 (91.7) | 134 (6.4) | 39 (1.9) | | | |
| Television in the bedroom | | | | | | | |
| No | **2047** (42.6) | 1829 (89.4) | 164 (8.0) | 54 (2.6) | 31.5 | 2 | <.001 |
| Yes | **2763** (57.4) | 2315 (83.8) | 320 (11.6) | 128 (4.6) | | | |
| Television screen time, h | | | | | | | |
| <1 | **669** (13.9) | 619 (92.5) | 33 (4.9) | 17 (2.5) | 93.3 | 6 | <.001 |
| 1–2 | **2713** (56.4) | 2389 (88.1) | 235 (8.7) | 89 (3.3) | | | |
| 3–4 | **1083** (22.5) | 878 (81.1) | 150 (13.9) | 55 (5.1) | | | |
| >4 | **345** (7.2) | 258 (74.8) | 66 (19.1) | 21 (6.1) | | | |
| Video game time, h | | | | | | | |
| <1 | **2080** (43.2) | 1836 (88.3) | 171 (8.2) | 73 (3.5) | 31.3 | 6 | <.001 |
| 1–2 | **1979** (41.1) | 1700 (85.9) | 209 (10.6) | 70 (3.5) | | | |
| 3–4 | **494** (10.3) | 414 (83.8) | 55 (11.1) | 25 (5.1) | | | |
| >4 | **257** (5.3) | 194 (75.5) | 49 (19.0) | 14 (5.5) | | | |
| Movies seen | | | | | | | |

| Variables | Students, No. (%) | | | | $\chi^2$ | *df* | *P* Value |
|---|---|---|---|---|---|---|---|
| | Total | Not Overweight (<85th Percentile) | At Risk for Overweight (85th-95th Percentile) | Overweight (>95th Percentile) | | | |
| Quartile 1 | **1300** (27.0) | 1148 (88.3) | 110 (8.5) | 42 (3.2) | | | |
| Quartile 2 | **1281** (26.6) | 1125 (87.8) | 111 (8.7) | 45 (3.5) | 19.8 | 6 | .003 |
| Quartile 3 | **1128** (23.5) | 947 (84.0) | 127 (11.3) | 54 (4.8) | | | |
| Quartile 4 | **1101** (22.9) | 924 (83.9) | 136 (12.4) | 41 (3.7) | | | |

Abbreviation: SES, socioeconomic status.

[a]For an explanation of *Hauptschule*, *Realschule*, *Gesamtschule*, and *Gymnasium*, see the "Socioeconomic Status" subsection of the "Methods" section.

**Table 2**

Relation Between Predictor Variables and Overweight Status, US Sample

| Variables | Adolescents, No. (%) | | | | $\chi^2$ | *df* | *P* Value |
|---|---|---|---|---|---|---|---|
| | Total | Not Overweight (<85th Percentile) | At Risk for Overweight (85th-95th Percentile) | Overweight (<95th Percentile) | | | |
| Overall | **4473** | **3282** (73.4) | **709** (15.9) | **482** (10.8) | | | |
| Age, y | | | | | | | |
| ≤14 | **2680** | 1927 (71.9) | 447 (16.7) | 306 (11.4) | 7.4 | 2 | .02 |
| >14 | **1793** | 1355 (75.6) | 262 (14.6) | 176 (9.8) | | | |
| Sex | | | | | | | |
| Female | **2239** | 1629 (72.8) | 381 (17.0) | 229 (10.2) | 5.3 | 2 | .07 |
| Male | **2234** | 1653 (74.0) | 328 (14.7) | 253 (11.3) | | | |
| SES | | | | | | | |
| Quartile 1 | **1141** | 701 (61.4) | 236 (20.7) | 204 (17.9) | 154 | 6 | <.001 |
| Quartile 2 | **1184** | 876 (74.0) | 175 (14.8) | 133 (11.2) | | | |
| Quartile 3 | **1045** | 794 (76.0) | 169 (16.2) | 82 (7.9) | | | |
| Quartile 4 | **1103** | 911 (82.6) | 129 (11.7) | 63 (5.7) | | | |
| Television in the bedroom | | | | | | | |
| No | **1687** | 1292 (76.6) | 269 (16.0) | 126 (7.5) | 31.3 | 2 | <.001 |
| Yes | **2786** | 1990 (71.4) | 440 (15.8) | 356 (12.8) | | | |
| Television screen time, h | | | | | | | |
| 0 | **221** | 181 (81.9) | 27 (12.2) | 13 (5.9) | 78.0 | 8 | <.001 |
| <1 | **935** | 744 (79.6) | 119 (12.7) | 72 (7.7) | | | |
| 1–2 | **2157** | 1584 (73.4) | 367 (17.0) | 206 (9.6) | | | |
| 3–4 | **863** | 583 (67.6) | 145 (16.8) | 135 (15.6) | | | |
| >4 | **297** | 190 (64.0) | 51 (17.2) | 56 (18.9) | | | |
| Video game time, h | | | | | | | |
| 0 | **1272** | 946 (74.3) | 187 (14.7) | 139 (10.9) | 7.1 | 6 | <.31 |
| <1 | **1758** | 1290 (73.4) | 292 (16.6) | 176 (10.0) | | | |
| 1–2 | **1119** | 820 (73.3) | 168 (15.0) | 131 (11.7) | | | |
| 3–4 | **324** | 226 (69.8) | 62 (19.1) | 36 (11.1) | | | |
| Movies seen | | | | | | | |

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| Variables | Total | Adolescents, No. (%) | | | $\chi^2$ | *df* | *P* Value |
|---|---|---|---|---|---|---|---|
| | | Not Overweight (<85th Percentile) | At Risk for Overweight (85th-95th Percentile) | Overweight (<95th Percentile) | | | |
| Quartile 1 | **1237** | 916 (74.0) | 183 (14.8) | 138 (11.2) | | | |
| Quartile 2 | **1075** | 805 (74.9) | 160 (14.9) | 110 (10.2) | 6.2 | 6 | .40 |
| Quartile 3 | **1086** | 793 (73.0) | 185 (17.0) | 108 (9.9) | | | |
| Quartile 4 | **1075** | 767 (71.4) | 181 (16.8) | 126 (11.8) | | | |

Abbreviation: SES, socioeconomic status.

**Table 3**

Zero-Order Correlations

| | German Sample | | US Sample | |
|---|---|---|---|---|
| | **SES** | **BMI** | **SES** | **BMI** |
| SES | | | | |
| BMI | −0.15[a] | | −0.18[a] | |
| Television screen time | −0.34[a] | 0.16[a] | −0.19[a] | 0.12[a] |
| Television in the bedroom | −0.30[a] | 0.12[a] | −0.24[a] | 0.10[a] |
| Computer use | −0.15[a] | 0.10[a] | −0.02 | 0.01 |
| Movies seen | −0.22[a] | 0.10[a] | −0.05[a] | 0.06[a] |

Abbreviations: BMI, body mass index; SES, socioeconomic status.

[a] $P < .001$.