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Longitudinal study of parental movie restriction on teen smoking and drinking in Germany

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Abstract

Aims—To determine if adolescents who report that their parents restrict viewing movies based on rating have a lower risk of trying smoking and drinking alcohol in the future.

Design—Prospective observational study. A cohort of 2110 German adolescents younger than 15 years who had never smoked or drunk alcohol at baseline were surveyed 12–13 months later to determine smoking and binge drinking initiation. Risk of substance use was assessed as a function of parental restriction on viewing FSK-16 movies (movies that only those aged 16 years and over would be allowed to see in theaters).

Findings—The percentage of students who tried smoking was 16.3%, 10.9% initiated binge drinking and 5.0% used both substances during the follow-up period. There was a significant effect of parental movie restriction on each substance use outcome measure after controlling for covariates. Compared with adolescents whose parents never allowed them to view FSK-16 movies, the adjusted relative risk [(RR) (95% confidence interval (CI))] for use of both substances were 1.64 (1.05–2.58) for adolescents allowed to view them once in a while, 2.30 (1.53–3.45) for sometimes and 2.92 (1.83–4.67) for all the time. FSK-16 restrictions were associated with lower viewership of all classes of movies, but especially FSK-16/18 movies; in addition, FSK-16 restrictions were associated with substantially lower exposure to movie depiction of tobacco and alcohol use, suggesting a mediational mechanism for the association.

Conclusions—Among young adolescents, parental restriction from viewing movies rated for older adolescents/adults decreases the risk of substance use in the future.

Keywords

Adolescence; drinking; mass media; movies; parenting; smoking

INTRODUCTION

Substance abuse remains a major threat to adolescent health in western cultures [1,2]. The onset of smoking and alcohol use, behaviors acquired in large part through observation and imitation [3], occurs typically during childhood or adolescence [4]. Children begin assimilating behavioral scripts for substance use prior to school entry [5], through imitation of role models, beginning with parents. Beyond direct observation of family and peers, various media play an

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important social-influence role in contemporary western cultures by depicting and helping to define modern societal norms [6]. Movies are a particularly salient type of media *vis-à-vis* substance use. Multiple studies have linked seeing smoking in movies with adolescent smoking [7-10]; additional studies have linked viewing drinking in movies with teen drinking [11,12].

These findings have prompted a search for factors that could reduce children's exposure to movie smoking and alcohol depictions or ameliorate its influence. However, few substance-use interventions directed towards youth focus upon limiting contact with media. To the extent that parents control media access, they could influence how much smoking and drinking children view. Movie ratings systems, present in most countries, are designed to limit access of children to unsuitable movie content. Although ratings vary from country to country, the systems generally rate on violence, profanity and sex, neglecting the consideration of exposure to alcohol and smoking. This is significant, given the links noted above, and due to content analyses showing that smoking and alcohol use are more prevalent in adult-rated movies, at least in the United States [13-15]. Ratings systems also differ across countries with respect to how the agency or organization promulgates the ratings and how they are enforced. For example, in the United States the ratings system is voluntary and implemented by the movie industry. This ratings system is 'designed to give parents information' about movies and restricts access at the theater, but only if the underage patron is not with a parent. Youth are allowed to enter any movie at the theater irrespective of age if their parent is present. In contrast, the ratings system in the United Kingdom is run by a government body, making age recommendations that are enforced at theaters regardless of parental preference. We are not aware of a ratings system that restricts media brought into the home, where children and adolescents may watch whatever their parents allow. Increasingly, through television and DVD, children and adolescents have access to many movies that would be otherwise restricted in theaters. Thus, parental rules about media use are an important adjunct to movie ratings systems in all countries.

Cross-sectional studies [16-19] indicate that young adolescents in the United States report a range of parental restrictions on 'R-rated' movies, which means that seeing these kinds of movies in a theater under the age of 17 requires an accompanying parent or adult guardian. Such restrictions are linked with less movie exposure, and those who report parental restrictions are less likely to smoke and drink. Longitudinal studies [20,21], also conducted in the United States, indicate that teens who report parental restriction on viewing R-rated movies are less likely to smoke in the future. These studies are consistent in showing a dose relationship between parental movie restriction and teen substance use, and in showing that the relation is independent of a number of other factors including general parenting style. Until the present, these studies have not been replicated in other countries. Studies of German youth suggest that teen exposure to movie depictions of smoking and alcohol use (from US films) may rival the exposure of US adolescents, and that this exposure is also associated with use of both substances [12,22,23]. Thus, it is possible that parental restriction from viewing movies rated for older adolescents and adults may prevent smoking and drinking in Germany. This study aimed to examine parental movie restriction in German adolescents and its association with the initiation of smoking and alcohol binge drinking using a prospective design; and to test, for the first time, the hypothesis that parental movie restriction could delay or prevent use of both substances.

METHOD

Study sample

As has been reported previously, 42 randomly selected secondary schools from Schleswig-Holstein, Germany, were invited to participate in a school-based survey [12,22]. In 2005, a self-administered written survey was distributed to adolescents (aged 10–16 years) enrolled in

the 27 participating schools, and was repeated 12–13 months later. Trained research staff administered both confidential surveys during class time with parental written permission and student assent. The study was approved by the Ministry of Cultural Affairs of the Bundesland Schleswig-Holstein. Follow-up surveys were completed for 2315 of 2653 (87.3%) students younger than 15 years, who had never smoked or drunk alcohol without parental knowledge at baseline. After excluding 205 surveys (8.9%) for missing data on one or more variables in the analysis, the final sample consisted of 2110 adolescents.

Predictors of sample attrition were younger age, male gender, being higher on sensation seeking/rebelliousness, attending a lower socio-economic status (SES) school, having more friends who smoke, having parents who drink less frequently and less parental movie restriction. Attrition was not predicted by parenting style.

The German and US film ratings systems

In the United States, the movie ratings system is a voluntary system operated by the US Motion Picture Association of America (MPAA) and the National Association of Theater Owners (NATO). The ratings are intended to provide parents with advance information so they can decide for themselves which films are appropriate for viewing by their own children. In Germany, the ratings system is run by the Freiwillige Selbstkontrolle der Filmwirtschaft (Voluntary Self-Control of the Film Business: FSK), a Society of the German film industry. The FSK has established a ratings system comparable in many ways to the MPAA ratings system. Both systems are voluntary and run by their respective film industries; however, film producers in the United States may distribute unrated versions of a movie (e.g. on DVD), whereas a 2002 revision of the German Youth Protection Act requires that any media made available to the public carry an FSK certificate. To obtain FSK certification, each film is viewed by a rating board and classified into age categories based on the board's opinion; the board does not publish objective criteria for their decisions, but violence figures prominently in their decision making. The FSK film ratings include the following categories:

FSK-0: for all ages;

FSK-6: no one under 6 years admitted;

FSK-12: only those who are 12 years or older admitted, children between 6 and 11 years only when accompanied by parent or legal guardian;

FSK-16: only those who are 16 years or older admitted; and

FSK-18: only those who are 18 years and older admitted.

The FSK-16 rating was selected as the appropriate German query for parental movie restriction because the majority of the adolescents surveyed in this study were younger than age 16, and because it was the category most similar to the one used in assessing parental restriction in the US studies on this topic. In comparison, the current voluntary movie ratings system by the MPAA takes into account elements of theme, language, violence, nudity, sex and drug use when rating movies G, PG, PG-13 or R or NC-17 as follows:

G: general audiences, all ages admitted;

PG: parental guidance suggested, some material may be not suitable for children;

PG-13: parents strongly cautioned, some material may be inappropriate for children under 13 years;

R: restricted, under 17 years requires accompanying parent or adult guardian; and

NC-17: no one under 17 years admitted (rarely used in the United States).

Table 1 gives a comparison of the German and US ratings system by cross-tabulating FSK rating against MPAA rating for 398 movies used in the survey of the German adolescent sample (see description of the survey below). The table illustrates that the ratings were related; nevertheless, there was substantial disagreement. For example, some 26% of the FSK-12 movies were rated R in the United States, and 22% of the FSK-16 movies were rated either PG or PG-13 in the United States.

Risk factor assessment

Parental restriction of FSK-16 movies was determined at baseline by asking: ‘How often do your parents let you watch movies or videos that are rated for 16-year-olds?’. Answers included ‘never’, ‘once in a while’, ‘sometimes’ and ‘all the time’.

Potential confounders were also measured including: age; gender; school performance (‘How would you describe your grades last year?’: excellent, good, average, below average); and rebelliousness and sensation-seeking (12-item index, Cronbach’s alpha = 0.77). These two personality characteristics were combined into a single scale, with higher scores indicating greater propensity for rebelliousness and sensation seeking. Type of school was used as a proxy for SES. The school system in Schleswig-Holstein and other German Bundesländer selects students at a very early stage—after 4th grade—into several types of school. This selection process is driven largely by the SES of the parents [24]. A general measure of parenting style was also included (eight-item index, alpha = 0.64) [25] in order to control for the possibility that parents who were viewed generally as more responsive and demanding by their adolescents would also impose greater media restrictions and be more likely to address smoking and drinking. Higher scores on parenting style are indicative of higher levels of demandingness and responsiveness. Parent smoking, sibling smoking and friend smoking was assessed and categorized (yes/no). Peer alcohol use was measured with the item ‘How many of your friends drink alcohol’ (none, some, most, all) and parental alcohol use with the question ‘Which of the following statements best describes how often your parents drink alcohol?’ (never, once a year, once a month, once a week, every day). The measures have been described in detail elsewhere [12,22] [A copy of the measures can be obtained from the authors (mail: hanewinkel@ift-nord.de)].

Outcome assessment

Outcomes of analyses included onset of smoking, onset of binge drinking, and both outcomes. Initiation of smoking was determined at baseline and follow-up by asking: ‘How many cigarettes have you smoked in your life?’. Response options included ‘none’, ‘just a few puffs’, ‘1–19 cigarettes’, ‘20–100 cigarettes’ and ‘more than 100’ [26]. Only baseline never-smokers (those who answered ‘none’) were included in these analyses. A student who reported any smoking behavior at follow-up was classified as having tried smoking during the observation period. Initiation of binge drinking was assessed through the question: ‘Have you ever had five or more drinks of alcohol in a row, that is within a couple of hours?’ (yes, no). Questions about alcohol use were qualified with the statement: ‘By alcohol we mean beer, wine, alcopops, punch, and other alcohol beverages like vodka or rum’. Only students who reported never drinking alcohol at baseline were included in the analysis of binge drinking onset. Students who reported having tried smoking and having drunk five or more drinks of alcohol in a row were classified as use of both substances during the observation period. Only students who had tried neither substance at baseline were included in this third set of analyses.

Assessment of movie exposure

We used a population-based assessment of exposure to movies to examine exposure to FSK-0, FSK-6, FSK-12, FSK-16 and FSK-18 movies in the survey sample, as well as smoking and alcohol in these movies. To obtain a population-based estimate of exposure to popular movies,

a unique list of 50 movie titles was selected randomly for each adolescent from a sample of 398 popular contemporary movies released between 1994 and 2004 in German cinemas. These movies were box office hits in the United States and Germany as well. German box office success was determined by the German Federal Film Board (FFA), a German institution incorporated under public law, which has a website (<http://www.ffa.de/>) giving detailed information on the number of cinema visitors per movie per year. We selected the top 25 German box-office hits each year from 1994 to 2001 ($n = 172$ were internationally distributed movies) and the top 100 German box office hits from 2002 to 2004 ($n = 226$ were internationally distributed movies). This list of movies represents 80% of the German box office hits within this time-frame; the excluded movies were German or European in origin. Trained coders counted the number of occurrences of smoking in each movie using methods described previously [13].

Exposure to these movies was assessed by asking each student to indicate what films he or she had seen. Since each list was selected randomly, each contained an FSK mix that was comparable to the parent sample of movies. To examine the effect of FSK restriction on movie exposure, we report the relation between FSK restriction and the number of movies in each rating category the child reported seeing. We calculated exposure to movie smoking [22] and alcohol [12] as reported previously.

Statistical analysis

Using STATA version 9.2 (Stata Corp, College Station, TX, USA) for all analyses, the χ^2 -test was used to evaluate the association between FSK restriction and covariates, and FSK restriction and movie exposures. Univariate analysis of variance (ANOVA) and *t*-test were used to evaluate the association between FSK movie restriction and covariates. Trying smoking, binge drinking and use of both substances were examined as a function of parental restriction from viewing FSK-16 movies and other covariates, using generalized linear models [27] to determine adjusted relative risks (ARRs) and 95% confidence intervals (CIs) during the follow-up period for each of these substance use outcomes. A log link, rather than logistic regression, was used so that ARR could be estimated directly. As data were gathered at the school-level, STATA's 'cluster' command was used to generate clustered robust standard errors. Multivariate analyses were used to create fully adjusted models. Indexed variables (sensation seeking/rebelliousness and parenting style) were entered as continuous variables into multivariate models. The scale for parental movie restriction was reversed so that higher values indicate higher restriction. To examine which movie exposure factors were associated with FSK restrictions, we calculated exposure across each of the categories. Results were considered statistically significant if $P < 0.05$, using a two-sided test.

Finally, we tested for indirect (mediated) effects of parental movie restriction on substance use initiation by specifying a longitudinal path model with movie restriction at time 1 and covariates as exogenous variables, exposure to substance use in movies as the mediator, and substance use initiation at time 2 as the criterion. In this model, exposure to substance use in movies was the sum of the time 1 number of smoking occurrences divided into 11 quantiles and hours of alcohol exposure divided into 11 quantiles resulting in a composite score with the range 0–20. The criterion measure was a sum score of the two binary outcomes smoking and binge drinking initiation, with value 0 meaning no initiation, value 1 meaning initiation of one substance, value 2 meaning initiation of both substances. The analysis was performed in AMOS version 16.0 [28], path estimates were calculated by maximum likelihood estimation. Significance of indirect effects was tested with bootstrap approximations obtained by constructing two-sided bias-corrected 95% CIs [29-31].

RESULTS

Sample description and relation between parental FSK-16 restriction and covariates

The final sample of 2110 students had a mean age of 12.3 years at baseline [standard deviation (SD) = 0.98] and contained 45% boys. Forty-five per cent had at least one parent member who smoked and 35% had parents who drank alcohol at least on a weekly basis. Forty-one per cent of students reported that their parents never allowed them to view FSK-16 movies, 28% were allowed once in a while, 22% were allowed sometimes and 9% all the time.

Weaker FSK-16 restrictions were associated significantly with older age; male gender; attending schools representing lower SES; poorer school performance; having friends/siblings/parents who smoke, friends who drink, or parents with lower responsiveness/demandingness; and having higher sensation seeking and rebelliousness scores.

Predictors of substance use

Overall, by the 12–13-month follow-up, some 16.3% of the youth had started smoking, 10.9% had initiated binge drinking and 5.0% had engaged in both behaviors. Multivariate analysis was used to control for the effects of multiple covariates, and Table 2 gives crude and adjusted RRs for all three substance use outcomes as a function of parental FSK-16 restrictions and covariates. With covariate controls, parental FSK-16 movie restriction retained a strong and statistically significant effect on each substance use outcome. In all cases, the dose–response relationship was retained in the multivariate analysis, with those adolescents in less restrictive FSK-16 categories (more often allowed to view) having a statistically significant higher risk of substance use (with the exception of the ‘once in a while’ category in the tried smoking analysis). The associations with teen smoking and binge drinking were independent of general parenting style; in fact, parenting style retained no independent association with any substance use outcome in the multivariate models. In addition, parent smoking was not associated independently with smoking or use of both substances. Higher levels of parent drinking were associated with adolescent alcohol use but not with use of both substances.

Movie exposure and FSK-16 restriction

Table 3 shows the relationship between parental FSK-16 restriction and various aspects of movie exposure. Adolescents who reported FSK-16 restriction had lower exposure to movies of all rating categories. However, the differences in mean are smaller and there is less of a clear response across categories for FSK-0 and FSK-6 movies compared with FSK-12 and FSK-16/18 movies. Additionally, there was a dose–response for exposure to movie smoking and alcohol use. From the sample of 398 movies, adolescents who were never allowed to watch FSK-16 movies had seen about one-third as much movie smoking and movie alcohol use compared with adolescents who were allowed to watch all the time.

Test for indirect effects

To investigate further the assumed relationships of FSK-16 movie restriction, exposure to substance use in movies and substance use initiation, we performed a mediation analysis with amount of exposure to substance use in movies as the mediating variable. All covariates were included as exogenous variables in the model, presented in Fig. 1. Measures of fit indicated a satisfactory fit of the model to the data, e.g. $\chi^2(6; n = 2110) = 133.15$; comparative fit index (CFI) = 0.96; root mean square error of approximation (RMSEA) = 0.10. Several of the exogenous variables, including parental movie restriction, had significant direct effects on amount of exposure to substance use in movies and/or substance use initiation.

Regarding the primary hypothesis, the analysis revealed that parts of the effect of parental restrictions on substance use initiation were indeed mediated by movie exposure, as there was

a significant difference between the total and the direct effect of movie restrictions on substance use initiation (-0.037 , bootstrap standard error = 0.007 ; $P < 0.001$).

DISCUSSION

Young German adolescents who report that their parents restrict them from watching movies rated for older adolescents or adults have a substantially lower risk of trying smoking, binge drinking and engaging in use of both substances in the future. This is the first study to examine parental restriction on movie viewing outside the United States, and offers a strong replication of the US findings. Interestingly, the association between movie restriction and decreased substance use seems to apply across these two countries despite substantial disagreement on what constitutes 'adult' material as reflected by different ratings for the same films. Both rating systems neglect the consideration of exposure to alcohol and smoking. The US rating system focuses to a great extent upon profanity and sex, while the German rating system focuses primarily upon violence. Nevertheless, content analyses indicate that more mature-rated movies depict more smoking and alcohol scenes [11,13]. The association between movie restriction and decreased substance use is independent of a number of known risk factors for the initiation of smoking and alcohol. These findings support strongly the development of interventions across these countries to motivate and assist parents in monitoring and limiting access to adult movies.

We were careful to examine the possibility of a mediating influence through general parenting practice or parent substance use, but found that parental restrictions affected substance use independently of these factors. Instead, movie restriction appears to have a much stronger specific effect on substance use [18,21]. We suggest that movie restriction is a unique aspect of parenting, one that may relate to how parents influence the media environment within the household. The fact that restricted adolescents have about one-third the exposure to movie smoking and alcohol use compared with unrestricted adolescents suggests that lower exposure to these socializing influences may mediate the effect partially, as suggested by the mediational model. The mediational model suggests that there may be other important pathways. One possibility is that seeing adult-rated movies impacts growth in sensation seeking. Thus, by exerting control on media access, parents may influence the type and amount of a particular social influence, e.g. media smoking and drinking depictions or media violence, and thereby influence risk for these behaviors. As such, parental FSK-16 movie restriction could also be a marker for restriction of other unmeasured exposures that depict smoking and drinking, such as television dramas. Given the complexity and variety of broadcast and cable/satellite television content and advertising, it is difficult to gain even an approximation of alcohol or tobacco content exposure from television, which is one limitation of this study.

There are other limitations to this study which must be acknowledged. In addition to the possible imprecision of the media parenting measure, there could be other aspects of parenting not captured in the survey, such as teaching media literacy [32-34]. In addition, the outcome measures of trying smoking and drinking are highly prevalent among German adolescents, yet not every adolescent who tries these substances becomes an adult smoker or drinker. However, the evidence indicates that trying smoking and drinking at an early age places adolescents at substantially higher risk for drug use in the future [35,36]. This is also true of binge drinking [37]. Further, binge drinking during adolescence is a highly risky behavior, with increased risk of alcohol poisoning, date rape, drunk driving and accidents [38-40].

In conclusion, adolescents whose parents restrict their exposure to FSK-16 movies are at lower risk than those adolescents whose parents do allow FSK-16 movies for initiating smoking, drinking without parental knowledge and binge drinking within the next year. These findings imply that parental interventions may protect youth from the adverse effects of observing actors

smoking and drinking in movies. The associations identified here and in the United States regarding movie restrictions and tobacco and alcohol use strengthen the case for developing and testing an intervention to motivate and assist parents in enforcing adult-rated movie restrictions for underage youth. Ultimately, the best test of efficacy for preventing substance use would be a randomized trial, and we believe that such trials should now be conducted in order to test the hypotheses that specific parental media education training could have an effect on adolescent risk behavior uptake.

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References

1. Eaton DK, Kann L, Kinchen S, Ross J, Hawkins J, Harris WA, et al. Youth risk behavior surveillance —United States, 2005. *MMWR Surveill Summ* 2006;55:1–108. [PubMed: 16760893]
2. Warren CW, Jones NR, Eriksen MP, Asma S. Patterns of global tobacco use in young people and implications for future chronic disease burden in adults. *Lancet* 2006;367:749–53. [PubMed: 16517275]
3. Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall; 1986.
4. Patton GC, McMorris BJ, Toumbourou JW, Hemphill SA, Donath S, Catalano RF. Puberty and the onset of substance use and abuse. *Pediatrics* 2004;114:e300–6. [PubMed: 15342890]
5. Dalton MA, Bernhardt AM, Gibson JJ, Sargent JD, Beach ML, Adachi-Mejia AM, et al. Use of cigarettes and alcohol by preschoolers while role-playing as adults: 'honey, have some smokes'. *Arch Pediatr Adolesc Med* 2005;159:854–9. [PubMed: 16143745]
6. Strasburger VC, Donnerstein E. Children, adolescents, and the media: issues and solutions. *Pediatrics* 1999;103:129–39. [PubMed: 9917450]
7. Charlesworth A, Glantz SA. Smoking in the movies increases adolescent smoking: a review. *Pediatrics* 2005;116:1516–28. [PubMed: 16322180]
8. Distefan JM, Pierce JP, Gilpin EA. Do favorite movie stars influence adolescent smoking initiation? *Am J Public Health* 2004;94:1239–44. [PubMed: 15226149]
9. Sargent JD. Smoking in movies: impact on adolescent smoking. *Adolesc Med Clin* 2005;16:345–70. [PubMed: 16111622]
10. Song AV, Ling PM, Neilands TB, Glantz SA. Smoking in movies and increased smoking among young adults. *Am J Prev Med* 2007;33:396–403. [PubMed: 17950405]
11. Sargent JD, Wills TA, Stoolmiller M, Gibson J, Gibbons FX. Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol* 2006;67:54–65. [PubMed: 16536129]
12. Hanewinkel R, Tanski SE, Sargent JD. Exposure to alcohol use in motion pictures and teen drinking in Germany. *Int J Epidemiol* 2007;36:1068–77. [PubMed: 17586537]
13. Dalton MA, Tickle JJ, Sargent JD, Beach ML, Ahrens MB, Heatherton TF. The incidence and context of tobacco use in popular movies from 1988 to 1997. *Prev Med* 2002;34:516–23. [PubMed: 11969352]
14. Roberts, DF.; Henriksen, L.; Christenson, PG. *Substance Use in Popular Movies and Music*. Rockville, MD: Office of National Drug Control Policy and Department of Health and Human Services Substance Abuse and Mental Health Services Administration; 1999.
15. Worth KA, Dal CS, Sargent JD. Prevalence of smoking among major movie characters: 1996–2004. *Tob Control* 2006;15:442–6. [PubMed: 17130372]
16. Dalton MA, Ahrens MB, Sargent JD, Mott LA, Beach ML, Tickle JJ, et al. Relation between parental restrictions on movies and adolescent use of tobacco and alcohol. *Eff Clin Pract* 2002;5:1–10. [PubMed: 11874190]

17. Dalton MA, Adachi-Mejia AM, Longacre MR, Titus-Ernstoff LT, Gibson JJ, Martin SK, et al. Parental rules and monitoring of children's movie viewing associated with children's risk for smoking and drinking. *Pediatrics* 2006;118:1932–42. [PubMed: 17079564]
18. Sargent JD, Dalton MA, Heatherton T, Beach M. Modifying exposure to smoking depicted in movies: a novel approach to preventing adolescent smoking. *Arch Pediatr Adolesc Med* 2003;157:643–8. [PubMed: 12860784]
19. Thompson EM, Gunther AC. Cigarettes and cinema: does parental restriction of R-rated movie viewing reduce adolescent smoking susceptibility? *J Adolesc Health* 2007;40:e181–6.
20. Jackson C, Brown JD, L'Engle KL. R-rated movies, bedroom televisions, and initiation of smoking by white and black adolescents. *Arch Pediatr Adolesc Med* 2007;161:260–8. [PubMed: 17339507]
21. Sargent JD, Beach ML, Dalton MA, Ernstoff LT, Gibson JJ, Tickle JJ, et al. Effect of parental R-rated movie restriction on adolescent smoking initiation: a prospective study. *Pediatrics* 2004;114:149–56. [PubMed: 15231921]
22. Hanewinkel R, Sargent JD. Exposure to smoking in popular contemporary movies and youth smoking in Germany. *Am J Prev Med* 2007;32:466–73. [PubMed: 17533061]
23. Hanewinkel R, Sargent JD. Exposure to smoking in internationally distributed American movies and youth smoking in Germany: a cross-cultural cohort study. *Pediatrics* 2008;121:e108–17. [PubMed: 18166530]
24. Richter M, Leppin A. Trends in socio-economic differences in tobacco smoking among German schoolchildren, 1994–2002. *Eur J Public Health* 2007;17:565–71. [PubMed: 17353201]
25. Jackson C, Henriksen L, Foshee VA. The Authoritative Parenting Index: predicting health risk behaviors among children and adolescents. *Health Educ Behav* 1998;25:319–37. [PubMed: 9615242]
26. World Health Organization. *Guidelines for Controlling and Monitoring the Tobacco Epidemic*. Geneva: World Health Organization; 1998.
27. Liang KY, Zegler SL. Longitudinal data analysis using generalized linear models. *Biometrika* 1986;73:13–22.
28. SPSS, Inc. *AMOS [computer program]*, version 16.0. Chicago: SPSS, Inc.; 2007.
29. MacKinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. *Annu Rev Psychol* 2007;58:593–614. [PubMed: 16968208]
30. MacKinnon DP, Lockwood CM. Advances in statistical methods for substance abuse prevention research. *Prev Sci* 2003;4:155–71. [PubMed: 12940467]
31. Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav Res Methods Instrum Comput* 2004;36:717–31. [PubMed: 15641418]
32. Brown JD. Media literacy has potential to improve adolescents' health. *J Adolesc Health* 2006;39:459–60. [PubMed: 16982377]
33. Primack BA, Gold MA, Land SR, Fine MJ. Association of cigarette smoking and media literacy about smoking among adolescents. *J Adolesc Health* 2006;39:465–72. [PubMed: 16982379]
34. Primack BA, Gold MA, Switzer GE, Hobbs R, Land SR, Fine MJ. Development and validation of a smoking media literacy scale for adolescents. *Arch Pediatr Adolesc Med* 2006;160:369–74. [PubMed: 16585481]
35. Mathers M, Toumbourou JW, Catalano RF, Williams J, Patton GC. Consequences of youth tobacco use: a review of prospective behavioural studies. *Addiction* 2006;101:948–58. [PubMed: 16771887]
36. Dawson DA, Grant BF, Li TK. Impact of age at first drink on stress-reactive drinking. *Alcohol Clin Exp Res* 2007;31:69–77. [PubMed: 17207104]
37. McCarty CA, Ebel BE, Garrison MM, DiGiuseppe DL, Christakis DA, Rivara FP. Continuity of binge and harmful drinking from late adolescence to early adulthood. *Pediatrics* 2004;114:714–19. [PubMed: 15342844]
38. Hingson RW, Heeren T, Jamanka A, Howland J. Age of drinking onset and unintentional injury involvement after drinking. *JAMA* 2000;284:1527–33. [PubMed: 11000646]
39. Hingson RW, Heeren T, Zakocs R. Age of drinking onset and involvement in physical fights after drinking. *Pediatrics* 2001;108:872–7. [PubMed: 11581438]

40. Hingson RW, Heeren T, Levenson S, Jamanka A, Voas R. Age of drinking onset, driving after drinking, and involvement in alcohol related motor-vehicle crashes. *Accid Anal Prev* 2002;34:85–92. [PubMed: 11789578]

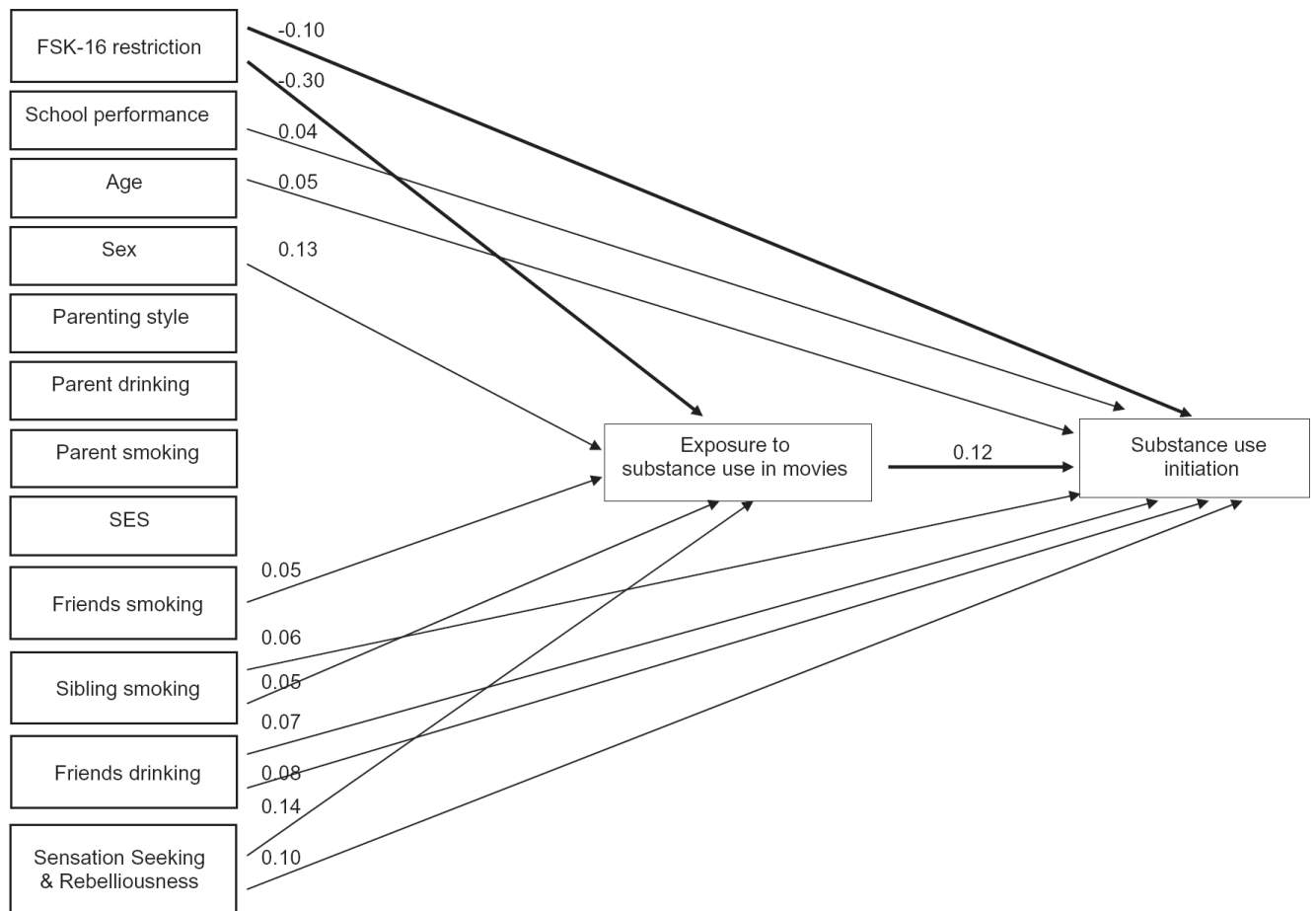


Figure 1. Path model of the relation between FSK-16 restriction and covariates on substance use initiation. All values are standardized estimates. Only significant ($P < 0.05$) paths are drawn. Correlations between exogenous variables were included in the model but excluded from the figure for graphical simplicity. Standardized indirect effect of FSK-16 restriction on initiation = $-0.301 \times 0.122 = -0.037$ ($P < 0.001$). FSK: Freiwillige Selbstkontrolle der Filmwirtschaft (Voluntary Self-Control of the Film Business); SES: socio-economic status

Table 1
Cross-tabulation of the movies according to the German and the US movie rating system.

| MPAA rating | FSK rating | | | | | | Total |
|-------------|------------|-----------|------------|-----------|-----------|-----------|------------|
| | FSK-0 | FSK-6 | FSK-12 | FSK-16 | FSK-18 | FSK-18 | |
| G | 19 (31%) | 7 (9%) | 1 (1%) | 0 (0%) | 0 (0%) | 0 (0%) | 27 (7%) |
| PG | 23 (37%) | 29 (38%) | 10 (6%) | 1 (1%) | 0 (0%) | 0 (0%) | 63 (16%) |
| PG-13 | 20 (32%) | 33 (43%) | 109 (67%) | 17 (21%) | 0 (0%) | 0 (0%) | 179 (45%) |
| R | 0 (0%) | 8 (10%) | 42 (26%) | 62 (78%) | 17 (100%) | 17 (100%) | 129 (32%) |
| Total | 62 (100%) | 77 (100%) | 162 (100%) | 80 (100%) | 17 (100%) | 17 (100%) | 398 (100%) |

FSK: Freiwillige Selbstkontrolle der Filmwirtschaft (Voluntary Self-Control of the Film Business); MPAA: Motion Picture Association of America.

Table 2
Risk of smoking and alcohol drinking initiation by covariate ($n = 2110$).

| Risk factor | n | Smoking initiation (16.3%) | | | Initiation of binge drinking (10.9%) | | | Use of both substances (5.0%) | | |
|---|-----|----------------------------|-------------------|-----------------------------------|--------------------------------------|-------------------|-----------------------------------|-------------------------------|--------------------|-----------------------------------|
| | | % | RR (95% CI) | Adjusted RR (95% CI) ^a | % | RR (95% CI) | Adjusted RR (95% CI) ^b | % | RR (95% CI) | Adjusted RR (95% CI) ^c |
| How often do your parents allow you to view FSK-16 movies? (FSK-16 movie restriction) | | | | | | | | | | |
| Never | 861 | 9.9 | Reference | | 4.7 | Reference | | 1.9 | Reference | |
| Once in a while | 592 | 14.5 | 1.47 (1.07, 2.03) | 1.19 (0.85, 1.67) | 11.7 | 2.51 (1.67, 3.78) | 1.64 (1.03, 2.63) | 4.7 | 2.55 (1.62, 4.00) | 1.64 (1.05, 2.58) |
| Sometimes | 466 | 23.6 | 2.39 (1.81, 3.16) | 1.71 (1.33, 2.20) | 15.2 | 3.28 (2.19, 4.91) | 2.06 (1.31, 3.25) | 7.3 | 3.93 (2.57, 6.00) | 2.30 (1.53, 3.45) |
| All the time | 191 | 32.5 | 3.29 (2.33, 4.64) | 1.85 (1.27, 2.69) | 25.7 | 5.52 (3.91, 7.81) | 2.53 (1.55, 4.12) | 14.1 | 7.71 (4.76, 12.15) | 2.92 (1.83, 4.67) |

^a Adjusted for: age, sex, socio-economic status (SES), school performance, sensation seeking and rebelliousness, friend/sibling/parent smoking, parenting style.

^b Adjusted for: age, sex, SES, school performance, sensation seeking and rebelliousness, friend/parent drinking, parenting style.

^c Adjusted for: age, sex, SES, school performance, sensation seeking and rebelliousness, friend/sibling/parent smoking, friend/parent drinking, parenting style.

CI: confidence interval; RR: relative risk.

Table 3
 Various aspects of movie exposure as a function of FSK-16 restriction.

| Variable | How often do your parents allow you to view FSK-16 movies? (FSK-16 movie restriction) | | | | P |
|-----------------------------|---|---------------------------|---------------------|------------------------|--------|
| | Never Mean (SD) | Once in a while Mean (SD) | Sometimes Mean (SD) | All the time Mean (SD) | |
| Total number of movies seen | 53 (39) | 86 (51) | 103 (61) | 126 (70) | <0.001 |
| FSK-0 movies seen | 18 (12) | 22 (14) | 22 (13) | 21 (15) | <0.001 |
| FSK-6 movies seen | 15 (13) | 20 (14) | 21 (16) | 22 (16) | <0.001 |
| FSK-12 movies seen | 16 (19) | 34 (27) | 43 (29) | 56 (33) | <0.001 |
| FSK-16/18 movies seen | 4 (8) | 10 (14) | 17 (19) | 27 (22) | <0.001 |
| Smoking occurrences | 196 (234) | 374 (333) | 491 (418) | 655 (479) | <0.001 |
| Alcohol use in hours | 1.8 (2.0) | 3.2 (2.6) | 3.8 (2.9) | 4.7 (3.4) | <0.001 |

FSK: Freiwillige Selbstkontrolle der Filmwirtschaft (Voluntary Self-Control of the Film Business); SD: standard deviation.