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SOCIAL PROCESSES

Alcohol Portrayals in Movies, Music Videos and Soap Operas and Alcohol Use of Young People: Current Status and Future Challenges

Renske Koordeman[1,*], Doeschka J. Anschutz[2] and Rutger C. M. E. Engels[1]

[1]Behavioural Science Institute, Radboud University Nijmegen, PO Box 9104, Nijmegen 6500HE, The Netherlands and [2]Centre for Research on Children, Adolescents and the Media, University of Amsterdam, Amsterdam, The Netherlands

*Corresponding author. Tel.: +31-24-361-1818; Fax: +31-24-361-2776; E-mail: r.koordeman@bsi.ru.nl

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Abstract — Aims: To provide an overview of studies of the effects of alcohol portrayals in movies, music videos and soap operas on alcohol consumption among young people. Moreover, we highlight important issues that need to be addressed in future research. **Methods:** This paper reviews the current literature on alcohol portrayals on-screen and the associated gaps and challenges in alcohol media research. **Results:** Thirteen longitudinal studies, 8 cross-sectional studies and 6 experimental studies examined the effects of alcohol portrayals on-screen on alcohol consumption among young people. They showed a relation between on-screen alcohol exposure and onset and progression of alcohol consumption. A distinction can be made between long-term effects and immediate effects on alcohol consumption. Only lately, more attention has been paid to processes underlying the effects of on-screen alcohol exposure. **Conclusion:** Replication of findings and development of new research designs is essential. On-screen alcohol exposure does not affect everyone. It is important to test individual differences in susceptibility to on-screen alcohol portrayals. Further, not all media alcohol portrayal might provoke similar effects. It is therefore essential to test the effect of different types of alcohol portrayals.

INTRODUCTION

Alcohol misuse among young people remains a major public health concern (Rehm *et al*., 2010; WHO, 2010) causing many social and (mental) health problems. In the last decade, more attention has been paid to the question whether alcohol portrayal in the media partially accounts for alcohol consumption of young people. Alcohol portrayals on-screen are quite common and widespread. Content analyses over the past years indicate a high prevalence of alcohol portrayal in movies (Everret *et al*., 1998; Roberts *et al*., 1999, 2004; Thompson and Yokota, 2001; Stern, 2005), soap operas (Furnham *et al*., 1997; Blair *et al*., 2005; Van den Bulck and Beulens, 2005; Van Hoof *et al*., 2009) and music videos (DuRant *et al*., 1997; Robinson *et al*., 1998). Dal Cin *et al*. (2008) showed that in a sample of 534 contemporary movies, 52% contained specific brands of alcohol. Roberts *et al*. (1999) showed that alcohol appeared in 93% of the top 200 rental films in 1996–1997 and that the majority (65%) of adult characters (mainly male) used alcohol, often depicted in a positive manner (43% of all characters). A recent content analysis of the drama series The OC indicated that more than half of all drinking acts involved female characters, and that in one-third of the drinking instances adolescent characters were involved (Van den Bulck *et al*., 2008).

The association between alcohol portrayals on-screen and youth alcohol use has been studied extensively. We aim to provide an overview of the existing literature on the effects of alcohol portrayal on-screen on alcohol consumption of young people. Moreover, we discuss remaining gaps and future challenges in this research area. We considered longitudinal, cross-sectional and experimental research that assessed the association between alcohol portrayals in movies, soaps or music videos and alcohol behaviour. Studies examining the association between alcohol advertising and alcohol consumption were not discussed since we assume that other underlying mechanisms play a role in the effects of on-screen advertising when compared with the effects of movie and TV alcohol portrayals. Reviews of alcohol advertising effects can be found elsewhere (Anderson *et al*., 2009; Smith and Foxcroft, 2009; Meier, 2011).

RESEARCH METHODS

Articles published from 1980 to May 2012 were identified through an electronic search of PubMed, MEDLINE, PsycINFO, Cochrane Library and Google scholar from 1980 to May 2012 to identify all longitudinal, cross-sectional and experimental studies assessing the association between alcohol portrayals in movies, soap operas and music videos and drinking behaviour of young people (10–29 years of age). We combined the following search terms. Alcohol consumption: (alcohol consumption(MeSH) OR alcohol*drink* OR alcoholic beverages(MeSH) OR alcohol*beverage* OR Beer(MeSH) OR Beer* OR Wine(MeSH) OR Wine* OR Liquor* OR Spirits OR Alcohol*) Media search: (Motion picture* OR Movie* OR Portrayals* OR Film* OR Display* OR Mass media(MeSH) OR Soap opera OR Music video OR Television(MeSH) OR Televis* OR TV) Youth search: (College OR Universit* OR High School* OR Child(MeSH) OR Child* OR Kids or Kid OR Young or Youth* OR Adolescent(MeSH) Adoles* OR Teen*). Reference sections of the identified articles and Web of Science citation lists were used to find additional relevant studies. (The limited number of published studies of this topic, and the complexity that a large part of the empirical evidence stems from one or two data sets from one research group do not allow a meta-analysis.)

The first author pre-screened titles and abstracts from studies identified in the electronic search, excluding those that did not focus on the effects of alcohol portrayals in the media on alcohol-related behaviour. Subsequently, two of the authors (first and last author) independently assessed relevant full-text articles for inclusion. Articles written in

languages other than English were excluded from the search. No methodological quality criteria were used in selecting the papers for inclusion. The search yielded 936 articles. We identified 36 potentially eligible studies after screening the title and abstract and screening reference sections of the identified articles and further reduced them to 27 when assessing the full-text papers. Table 1 provides an overview of the studies, describing keywords, study design, research methods, analysis and outcome of the studies.

OVERVIEW OF LITERATURE

Longitudinal studies

Thirteen longitudinal studies were identified that tested the association between alcohol portrayals in movies ($n = 10$) and music videos ($n = 3$) on the one hand, and alcohol consumption on the other. No longitudinal studies assessed the impact of soap operas on drinking. In the 10 movie studies, movie alcohol exposure was measured according to the so-called 'Beach' method (Sargent *et al*., 2008). With this method, on-screen alcohol use was timed in a large sample of popular contemporary movies, selected according to box office success. Exposure to these movies was estimated by asking respondents whether they had seen 50 movies, randomly selected from the larger sample of movies. This way, the total number of minutes of exposure to alcohol portrayals seen by each respondent could be calculated. We discuss the results on the basis of main effects, and mediating and moderating effects.

Main effects

As one of the first researchers examining the association between movie alcohol exposure and drinking, Sargent *et al*. (2006) found an association between exposure to movie alcohol portrayals and increased risk of initiation of alcohol use in a sample of 2406 adolescents aged 10–14 years, after controlling for potential confounders such as socio-demographics, personality characteristics of the adolescent (sensation seeking, rebelliousness and self-esteem), school performance, parenting style and smoking experimentation. In a similar vein, Hanewinkel and Sargent (2009) showed in a sample of 2708 German teenagers (10–16 years) by movie alcohol exposure and having a television in the bedroom were independent predictors of onset and problematic alcohol use. A recent study by Stoolmiller *et al*. (2012) assessed in the sample of Sargent *et al*. (2006) predictors of alcohol onset separately from transition to binge drinking. They found that movie alcohol exposure was associated with both drinking onset and binge drinking.

Three longitudinal studies assessed the main effects of music video exposure on adolescent alcohol consumption. Robinson *et al*. (1998) found among 1533 adolescents [mean age 14.6 (SD 0.5) years] that increased television and music video viewing was risk factor for the onset of alcohol use but not for the maintenance of drinking. Wingood *et al*. (2003) indicated in a sample of 522 African American females (14–18 years) that high exposure to rap music videos was associated with alcohol consumption 12 months later. Alcohol use at baseline was not measured, so no conclusions regarding directions of associations can be drawn. Van den Bulck and Beulens (2005) showed in a sample of 1648 adolescents (13 and 16 years of age) that overall TV viewing per day and music television viewing predicted the amount of alcoholic beverages adolescents consumed while going out 1 year later. These studies have linked the overall effect of TV viewing and music videos to alcohol consumption, but did not specifically assess the amount of alcohol displayed in the video clips in relation to alcohol use.

Mediators

Several studies used the sample described in Sargent *et al*. (2006) to test social and cognitive processes underlying the relation between movie alcohol portrayals and alcohol use. Dal Cin *et al*. (2009) showed that alcohol prototypes, expectancies and friends' use, were mediators of the relation between movie alcohol exposure and willingness to drink and alcohol use. Higher levels of alcohol exposure predicted more favourable prototypes of drinkers, more favourable expectancies about alcohol and increases in friends' alcohol use, and these variables were associated with willingness to drink and subsequent increases in alcohol use over time. In line with this, Wills *et al*. (2009) found that movie alcohol exposure was related to an increase in friends' alcohol use, which was related to an increase in adolescents' subsequent alcohol use. Movie alcohol exposure also directly predicted an increase in alcohol consumption over time. Gibbons *et al*. (2010) reported that alcohol prototypes, willingness to drink and friends' alcohol use positively mediated the relation between drinking in movies and alcohol consumption 8 and 16 months later. In addition, they found stronger associations for White adolescents than for Black adolescents.

Hanewinkel *et al*. (2008) investigated the role of parenting in the effects of movie alcohol exposure. They showed in a cohort of 2110 German teenagers (10–16 years) that parental restrictions on viewing movies rated for older ages lowers the risk of problematic alcohol use. Furthermore, parental movie restrictions were associated with lower movie alcohol exposure, indicating a mediational pathway between parental restrictions and alcohol use. In a US sample of 2406 10–14-year-old adolescents, Tanski *et al*. (2010) confirmed the findings of Hanewinkel *et al*. (2008) by showing a plausible causal pathway, from parental movie restrictions to lower movie alcohol exposure, to lower risks of alcohol onset. They showed that the media parenting effect operated independently from other parenting measures.

Moderators

Stoolmiller *et al*. (2010) showed in a sample of 6255 adolescents (ages 10–14) that sensation seeking moderated the relation between R-rated movie exposure and initiation of alcohol use. Exposure was associated with greater increases in initiation of alcohol use among low-sensation seekers than among high-sensation seekers. A study by Wills *et al*. (2010) in the same sample revealed that the association between movie alcohol exposure and adolescent alcohol use was moderated by self-control. The effect of movie alcohol exposure on alcohol use was lower among persons higher on self-control than among those lower on self-control.

To summarize, on-screen alcohol portrayals affect the onset and progression of alcohol use in adolescents. Prototypes, alcohol expectancies, friends' alcohol use,

Table 1. Summary of included studies

Study	Key words	*n*	Age (range or average)	Country	Design	Research method	Analysis	Outcome
Longitudinal designs								
Dal Cin *et al.* (2009)	Movies, alcohol use, expectancies, prototypes, friends' alcohol use, willingness to drink	4574	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Multi-level logistic regression. Adjusted for multiple covariates	Alcohol prototypes ($\beta = 0.01$, $P < 0.05$), expectancies ($\beta = 0.01$, $P < 0.05$) and friends' use ($\beta = 0.01$, $P < 0.05$) were mediators of the relation between movie alcohol exposure and willingness to drink and alcohol use
Gibbons *et al.* (2010)	Movies, alcohol use, willingness to drink, racial differences, prototypes, peers	6522	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Multi-group SEM with FIML estimation. Adjusted for multiple covariates	Alcohol prototypes and willingness to drink ($z = 2.70$, $P < 0.01$), and friend's alcohol use ($z = 3.40$, $P < 0.001$), positively mediated the relation between drinking in movies and alcohol consumption 8 and 16 months later in White adolescents. In black adolescents no associations were found
Hanewinkel and Sargent (2009)	Movies, alcohol initiation, binge drinking, parental knowledge	2708	10–16	Germany	Random selection of 42 schools of which 27 participated. Two waves with 12–13-month interval	Self-reported questionnaire	Generalized linear models using a log link. Adjusted for covariates	Movie alcohol exposure and having a TV in the bedroom were independent predictors of drinking without parental knowledge (RR ranging from 1.42 to 2.00 comparing quartiles 2 and 4, respectively, with quartile 1) and binge drinking (RR ranging from 1.44 to 2.23)
Hanewinkel *et al.* (2008)	Movies, drinking onset, parental movie restriction	2110	10–16	Germany	Random selection of 42 schools of which 27 participated. Two waves with 12–13-month interval	Self-reported questionnaire	Generalized linear models using log link. Multivariate analysis	Adolescents reporting least restrictions for viewing movies rated for older ages have a higher relative risk of future binge drinking [RR = 2.53 (95% CI = 1.55–4.12)] than those once in a while allowed [RR = 1.64 (1.03–2.63)] or those sometimes allowed [RR = 2.06 (1.31–3.25)]
Robinson *et al.* (1998)	Music videos, television, video games, alcohol use	1533	14.6	USA	Prospective cohort study Two waves with 18-month interval	Self-reported questionnaire	Logistic regression analysis separately for baseline lifetime non-drinkers and drinkers. Adjusted for covariates	Increased television and [OR = 1.09 (95% CI = 1.01–1.18)] music video viewing [OR = 1.31 (1.17–1.47)] were risk factors for the onset of alcohol use but not for the maintenance of drinking

Sargent *et al.* (2006)	Movies, drinking onset, self-esteem, maternal support, rebelliousness	2406 never drinkers, selected from baseline sample (n = 4655)	10–14	USA	Longitudinal survey with two waves with 18–26-month interval	Self-reported questionnaire with telephone interview follow-up	Multi-level logistic regression. Adjusted for covariates	Movie alcohol exposure was associated with onset of drinking [OR = 1.15 (95% CI = 1.06–1.25)]. The association was stronger among adolescents in lower exposure categories
Stoolmiller *et al.* (2010)	Movies, drinking onset, sensation seeking, R-rated movies	6522	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Four-wave dual-process linear growth model and discrete time hazard regression	Sensation seeking moderated the relation between R-rated movie exposure and initiation of alcohol use. Exposure was associated with greater increases in initiation of alcohol use among low sensation seekers than among high sensation seekers (log odds hazard = –0.75, $P < 0.05$)
Stoolmiller *et al.* (2012)	Movies, family predictors, predictors of drinking onset and binge drinking	6522	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Discrete time hazard survival models	High movie alcohol exposure was associated with both drinking onset [OR = 2.13 (95% CI = 1.76–2.57)] and binge drinking [OR = 1.63 (1.20–2.21)]
Tanski *et al.* (2010)	Movies, parental R-rated movie restriction, drinking onset	2406	10–14	USA	Longitudinal survey with two waves with 13–26-month interval	Self-reported questionnaire	Multivariate logistic analysis and structural equation modelling analysis	Adolescents reporting least restrictions for R movies have higher odds of future drinking [OR = 3.5 (95% CI = 2.0–6.0)] than those once in a while allowed [OR = 3.0 (1.7–5.1)] or those sometimes allowed [OR = 3.3 (1.9–5.6)]
Van den Bulck and Beulens (2005)	Effect of exposure to music video and TV on alcohol use while going out	1648	13 and 16	Belgium	Randomized longitudinal survey with two waves with 12-month interval	Self-reported questionnaire	Multiple regression analyses. Adjusted for covariates	Overall TV viewing per day and music television viewing predicted the amount of alcoholic beverages adolescents consumed while going out 1 year later (respectively β = 0.073, $P = 0.004$ and $\beta = 0.068$, $P = 0.001$)
Wills *et al.* (2009)	Movies, progression alcohol use, alcohol problems, self-control, rebelliousness	A total of 961 ever drinkers selected from baseline (n = 6522) at time three	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Structural equation modelling analysis. Adjusted for covariates	Movie alcohol exposure at time 1 directly predicted an increase in peer alcohol use ($\beta = 0.11$; $P <$ 0.05) and adolescent use (β = 0.10; $P < 0.05$) at time 2. Via friends' alcohol use at time 2 movie exposure at time 1 had indirect effects to alcohol use at times 3 ($\beta = 0.09$, $P < 0.05$) and 4 ($\beta = 0.13$, $P < 0.05$). Further, via adolescents' alcohol use at time 2 movie exposure at time 1 predicted alcohol use (β = 0.29, $P < 0.05$) and alcohol problems 3 ($\beta = 0.11$, $P < 0.05$) at time and 4

Continued

Table 1. *Continued*

Study	Key words	*n*	Age (range or average)	Country	Design	Research method	Analysis	Outcome
Wills *et al.* (2010)	Movies, self-control, alcohol expectancies, peers	6522	10–14	USA	Random digit-dial-telephone survey. Four waves with 8-month intervals	Telephone interview	Multiple regression analysis and multiple-group analysis. Adjusted for covariates	The association between movie alcohol exposure and adolescent alcohol use was moderated by self-control ($t = -8.42$, $P < 0.0001$). The effect of movie alcohol exposure on alcohol use was lower among persons being higher on self-control than among those lower on self-control
Wingood *et al.* (2003)	Rap music video, alcohol use, parental monitoring	522	14–18	USA	Survey with two waves with 12-month interval. (No baseline measurement of alcohol use)	Self-reported questionnaire	Logistic regression analysis	High exposure to rap music videos was associated with alcohol use 12 months later [OR = 1.60 (95% CI = 1.1–2.3)]
Cross-sectional designs								
Dalton *et al.* (2002)	Movies, parental restrictions, smoking and alcohol use	4544	10–14	USA	Randomized survey	Self-reported questionnaire	Overdispersed log-linear quasi-likelihood models. Adjusted for covariates	Children who were completely restricted from viewing R-rated movies were less likely to use alcohol compared with children who had no restrictions [RR = 0.30 (95% CI = 0.21–0.42)]
Dalton *et al.* (2006)	Movies, parental rules, risk smoking and drinking, prototype	2606	9–12	USA	Randomized survey	Self-reported questionnaire and telephone interview	Generalized linear model using log link. Adjusted for covariates	Parental rules and monitoring of children's movie viewing were associated with a lower risk of adolescent drinking [RR = 0.59 (95% CI = 0.48–0.72)]
Hanewinkel *et al.* (2007)	Movies, alcohol use, parental knowledge, binge drinking	5581	12.8	Germany	Random selection of 42 schools of which 27 participated	Self-reported questionnaire	Multivariate logistic regression analysis. Adjusted for covariates	Exposure to alcohol use in US movies was associated with alcohol use without parental knowledge OR = 1.47 (95% CI = 1.19–1.82), OR = 2.12 (1.75–2.57) and OR = 2.95 (2.35–3.70) for quartiles 2, 3 and 4), and binge drinking OR = 1.42 (0.93–2.28), OR = 1.84 (1.27–2.67) and OR = 2.59 (1.70–3.95) for quartiles 2, 3 and 4)
Hanewinkel *et al.* (2012)	Movie exposure, binge drinking Europe, cross cultural	16,551	13.4 (10–19)	Germany, Poland, Italy, Iceland, The Netherlands, Scotland	Survey at 114 schools	Self-reported questionnaire	Multi-level mixed-effects linear regression analysis with random intercepts for country, school, and class	Association between movie alcohol exposure and binge drinking of adolescents in five of six European countries ($\beta = 0.12$, $P < 0.001$)
Hunt *et al.* (2011)	Movies, alcohol and drug use, heavy drinking, binge drinking	1002	19.0	UK	Cross-sectional data of wave four of a randomized longitudinal cohort study	Computer-aided personal interviews	Multivariate logistic regression analysis. Adjusted for covariates	Association between exposure to alcohol portrayals in movies and both binge OR = 1.59 (95% CI = 1.10–2.30) comparing highest with lowest quartile of movie alcohol exposure) and heavy drinking [OR = 1.56 (1.10–2.30)]

Primack *et al.* (2009)	Movies, music videos, marijuana, alcohol	1211	15.9	USA	Survey study	Self-reported questionnaire	Bivariate and multivariate logistic regression analysis. Adjusted for covariates	Higher movie exposure was associated with ever using alcohol [OR = 1.65 (95% CI = 1.13–2.42)]. The association was stronger for those who were younger than 17 [OR = 3.2 (1.8–5.6)] than those who were older than 17
Thomsen and Rekve (2006)	Television, alcohol intentions, alcohol expectancies, friends' alcohol use	392	13.2	Norway	Survey study	Self-reported questionnaire	Structural equation model analysis	For adolescents having no friends who drink, US-produced programmes viewing predicted both normative beliefs (β = 0.14, $P < 0.05$) and drinking intentions ($\beta = 0.31$, $P < 0.01$), whereas no associations were found for adolescents reported having friends who drink
Tucker *et al.* (1985)	TV watching, alcohol use socio-economic status, parental income	394	15.7	USA	Survey study	Self-reported questionnaire	Analysis of variance for unbalanced data with *a priori* comparison. Adjusted for covariates	Heavy TV viewers reported more monthly alcohol use than did light viewers ($F = 5.2$, $P = 0.12$)
Experimental designs								
Bahk (2001)	Movies, positive and negative alcohol portrayal, role attractiveness	158	19.8	USA	Between-participant design with two conditions. Random assignment	Self-reported questionnaire	Independent samples *t*-tests. *Post hoc* path analysis	Role attractiveness of the drinking character increased favourableness in alcohol attitudes ($r = 0.24$, $P < 0.05$) but only in the movie that portrayed alcohol positively. In the negative condition the greater the level of perceived realism the less favourable attitudes towards alcohol (r = 0.22, $P < 0.05$)
Engels *et al.* (2009)	Movies, advertisements, alcohol consumption, naturalistic setting	80	18–29	The Netherlands	Between-participant design with four conditions. Random assignment. Compared different movies	Observations and self-reported questionnaire	Analysis of variance and multi-level analyses	Participants drank more alcohol when exposed to a movie with many alcohol portrayals compared with a movie with less alcohol portrayals (F = 4.44, $P < 0.05$)
Koordeman *et al.* (2011a)	Movies, alcohol, sex differences, identification, naturalistic setting	244	18–29	The Netherlands	Two by two between-participant design. Random assignment. Compared same movie	Observations and self-reported questionnaire	Multivariate regression analysis	Assignment to movie alcohol increased alcohol use during the movie for men ($\beta = -0.65$, $P < 0.05$) but not for women. Identification and weekly alcohol use did not moderate this relation

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Table 1. *Continued*

Study	Key words	*n*	Age (range or average)	Country	Design	Research method	Analysis	Outcome
Koordeman *et al.* (2011a)	Movies, imitation of alcohol consuming characters	79	18–29	The Netherlands	Observational design	Observations and self-reported questionnaire	Multi-level logistic regression and survival analysis	Participants were more likely to sip in accordance with the actors' sipping than without such a cue [OR = 1.50 (95% CI = 1.28–1.75)]. Men were more likely to imitate actors' sipping than women [HR = 1.97 (1.36–3.09)] and participants tended to respond to actors' sipping at the beginning rather than towards the end [HR = 1.17 (0.358–1.43)]
Kulick and Rosenberg (2001)	Movies, positive and negative alcohol portrayal, alcohol expectancies, intentions to drink	108	18–19	USA	Between-participant design with three conditions	Self-reported questionnaire	Analysis of variance	Participants in the positive alcohol portrayals movie condition had more positive alcohol expectancies than participants in the control condition ($F = 3.28$; $P < 0.05$), and participants in the positive and negative film conditions had more negative expectancies than did participants in the control condition ($F = 3.23$; $P < 0.04$). Intentions to drink did not differ between conditions
Van Hoof *et al.* (2009)	Soap opera, alcohol attitudes, drinking intentions, sex differences	248	12–18	The Netherlands	Two by two between-participant design	Self-reported questionnaire	Analysis of variance	Adolescents who were exposed to alcohol portrayal in soap series had a less positive attitude towards alcohol ($F = 4.81$, $P < 0.05$) and lower drinking intentions ($F = 17.25$, $P < 0.001$). The effects were stronger for men ($F = 10.11$, $P < 0.005$)

willingness to drink, sensation seeking, self-control and parenting can be identified as mediating and moderating factors in the relation between movie alcohol exposure and the onset and progression of alcohol consumption.

Cross-sectional studies

Eight cross-sectional studies have examined the effects of movie alcohol portrayals and alcohol consumption of adolescents. We will discuss the main effects of these studies since no mediating or moderating effects have been studied.

In a German sample of 5581 adolescents [mean age 12.8 (SD = 1.2)], Hanewinkel *et al*. (2007) demonstrated an association between exposure to alcohol use in US movies and alcohol use without parental knowledge and binge drinking. In a similar vein, Hunt *et al*. (2011) showed an association between exposure to alcohol in films and both binge and heavy drinking in a cohort of 1002 Scottish young adults [mean age 19.0 (SD = 7.3)]. A recent study by Hanewinkel *et al*. (2012) in six European countries found an association between movie alcohol exposure and binge drinking of adolescents [mean age 13.4 (SD = 1.18)] in five of six European countries after controlling for important covariates. Primack *et al*. (2009) studied which media exposures were associated with alcohol use among 1211 adolescents (mean age 15.9 years). They indicated that movie exposure was associated with alcohol use. The association was stronger for adolescents younger than 17 compared with adolescents older than 17. Thomsen and Rekve (2006) showed in a sample of 392 non-drinking Norwegian adolescents (mean age 13.2 years) that for adolescents having no friends who drink, TV exposure predicted both normative beliefs and drinking intentions, whereas for adolescents having friends who drink, viewing US-produced programmes had no effect on normative beliefs or intentions to drink. Further, a study by Tucker (1985) showed in a sample of 394 adolescents (mean age 15.7) that heavy TV viewers consumed alcohol more often than did light and moderate viewers. A limitation of the latter studies is that they did not assess actual exposure to alcohol cues on TV, but just measured the overall viewing time.

Dalton *et al*. (2002) conducted a study of parental restrictions on movies and alcohol use among 4544 10–14 year US adolescents. They showed that parental movie restrictions were associated with lower risk of drinking. In another study of 2606 child–parent dyads (children 9–12 years of age), Dalton *et al*. (2006) found that parental rules and monitoring of children's movie viewing were associated with a lower risk of adolescent drinking, over and above monitoring of non-media-related behaviours.

In sum, these cross-sectional studies showed an association between movie alcohol portrayals and drinking without parental knowledge and binge drinking. Parental movie restrictions were associated with lower risk of drinking.

Experimental studies

Six experimental studies tested the relation between movie alcohol portrayals and alcohol cognitions and alcohol consumption. We will distinguish between studies establishing main effects and moderating effects.

Main effects

Engels *et al*. (2009) tested in a controlled bar-lab setting among 80 male college students (ages 18–29 years) the immediate effects of movie alcohol portrayals on alcohol consumption while watching. They found that participants drank more alcohol when exposed to a movie with many alcohol portrayals compared with a movie with fewer alcohol portrayals. Kulick and Rosenberg (2001) exposed 108 college students (18–19 years) to movie clips with positive alcohol portrayals, negative alcohol portrayals or no alcohol portrayals. Participants in the positive alcohol portrayals movie condition had more positive alcohol expectancies than participants in the control condition, and participants in the positive and negative film conditions had more negative expectancies than did participants in the control condition. Intentions to drink did not differ between conditions. In a study by Bahk (2001), 158 college students (mean age 19.8 years) watched one of two movie versions that portrayed alcohol use either in a positive or in negative way. Role attractiveness of the drinking character increased favourableness in alcohol attitudes but only in the movie that portrayed alcohol positively. In the negative condition, high perceived realism decreased favourable attitudes towards alcohol. In a class-room setting, Van Hoof *et al*. (2009) showed in a sample of 248 adolescents (12–18 years) that participants who were exposed to alcohol portrayals in a soap opera had less positive attitudes towards alcohol and lower drinking attitudes and intentions to drink than participants who were not exposed the soap opera without alcohol portrayals. The effects were stronger for male participants.

Moderating effects

Koordeman *et al*. (2010) found in a sample of 244 college students (ages 18–29 years) that alcohol consumption was higher in the alcohol movie condition compared with the non-alcohol movie condition for men, but not for women. Identification and weekly alcohol consumption did not moderate the relation between movie condition and alcohol consumption. In another study Koordeman *et al*. (2011a) tested whether imitation of characters drinking alcohol on screen explained alcohol consumption. They showed that college students ($n = 79$) were more likely to sip in accordance with actors' sipping than without such a cue. Men were more likely to imitate actors' sipping than women and participants tended to imitate more at the beginning of the movie than at the end.

Current status

The longitudinal, cross-sectional and experimental studies in this relatively young field of research provide new and important insights into the link between on-screen alcohol portrayals and alcohol consumption. They show a relation between on-screen alcohol exposure and the onset and progression of alcohol consumption. A distinction can be made between the immediate effects of alcohol portrayals (studied via experimental studies) and long-term effects (studied via longitudinal studies). Only lately, more attention has been paid to processes underlying the effects of on-screen alcohol portrayals. Personality traits such as rebelliousness, sensation seeking and self-control, and factors such as drinker

prototypes, alcohol expectancies, willingness to drink, parenting style, parental drinking and friends' alcohol use seem to mediate the long-term relation between movie alcohol portrayals and drinking levels. Further, being male, having friends' who consume alcohol and low self-control seem to moderate the relation between movie alcohol portrayals and drinking. Concerning the immediate effects of movie alcohol portrayals, experimental studies showed that imitation processes probably explain the association between portrayals and consumption and that this seems to be stronger for men. In addition, positive alcohol portrayals lead to more positive expectancies and alcohol-related attitudes, and both positive and negative alcohol portrayals lead to more negative alcohol expectancies. However, alcohol portrayals in soap operas lead to less positive alcohol attitudes and intentions to drink.

Despite efforts to unravel mechanisms explaining the effects of on-screen alcohol portrayals on alcohol consumption, little is known about how susceptibility to media effects develops or how movie alcohol portrayals affect levels of drinking. Replication of these findings and development of new research designs is therefore essential. Furthermore, there is a possibility that publication bias may have affected our identified studies. It is possible that there are studies with negative findings or null findings that have not been published or that have been published but with no references we could retrieve with our search strategy. It is important that studies with negative or null findings should be published, to aid theory testing and balance the field of research.

Future directions and challenges

On the basis of previous literature, we propose several new endeavours that need to be studied (see a conceptual scheme in Fig. 1). We are aware of the fact that we cannot be complete in our suggestions, but will try to provide a basis for new directions for future research.

First, alcohol exposure is often measured as any instance where alcohol is portrayed, so no distinction is made between different contexts in which alcohol cues appear. Perhaps, not all movie alcohol portrayals provoke the same effect on alcohol consumption since there is some evidence that positive (e.g. party, dinner) and negative (e.g. drunkenness, drinking to suppress emotions) movie alcohol portrayals lead to different alcohol expectations and attitudes towards alcohol (Bahk, 2001; Kulick and Rosenberg, 2001). Mason *et al*. (2008) showed that positive and not negative affective stimuli were associated with increased craving. Movies mostly portray alcohol in a positive way (Everret *et al*., 1998; Stern, 2005) and subsequently this might induce higher levels of craving. Furthermore, specific features of movie characters consuming alcohol might provoke different responses and effects on alcohol use. Adolescents identify more with media characters when they evaluate them positively, when they perceive similarities between themselves and the character and when they wish to be like the media character (Spijkerman *et al*., 2012). Designs taking into account the specific social-emotional context of alcohol use (e.g. negative vs. positive portrayal; male vs. female drinking characters; different brand and types of alcoholic drinks) could lead to greater understanding of the processes by which alcohol portrayal leads to increased alcohol consumption in young viewers.

Second, there should be more emphasis on frequency of exposure as a factor promoting alcohol use among viewers. We do not know how much exposure is necessary to provoke an effect on drinking (onset). How many movies should an adolescent watch to be more vulnerable to start drinking or to increase drinking or to change from normative to abnormal drinking patterns? Designs testing the dose–response relation are warranted to explain why adolescents at some point start drinking.

Third, dual-process models (cf. Strack and Deutsch, 2004; Wiers *et al*., 2007; Stacy and Wiers, 2010) can provide more insight into the mechanisms affecting movie alcohol portrayals and should steer developments in this field. These models presume alcohol use and misuse to develop because of an imbalance between a fast automatic appetitive system and a slower controlled regulatory system. Research showed that repeated alcohol use produces a dopaminergic response and that this way the automatic system becomes sensitized every time it is exposed to alcohol cues (Robinson and Berridge, 2001, 2004). This automatic process causes alcohol to be perceived as necessary and allows it to acquire strong motivational properties. Automatic processing of alcohol cues is thought to interact with a slower reflective system that consists of controlled processes related to the ability to inhibit drinking and the motivation to really do so. In early stages of alcohol use controlled processing is probably more important for the initiation of alcohol use than automatic processing, whereas in more experienced drinkers the automatic processes become more salient and deliberate control decreases (Hemel-Ruiter *et al*., 2011). Future studies could further specify and test this type of models both for the onset of drinking and for the progression of drinking to explain individual differences in susceptibility to alcohol portrayals.

Relatedly, studies should test in which circumstances people are more susceptible to movies alcohol portrayals. Self-regulation failure is an important factor in this context. Research by Baumeister *et al*. (1998, 2003) suggested that self-regulation is an exhaustible resource that can be used up. Situational factors such as being tired or stressed, being in a specific social context (e.g. bar) or specific personality characteristics might lead to a decrease in deliberate control and increased susceptibility to alcohol cues. Recent cognitive neuroscience research indicates that good self-regulation depends on a balance between subcorticol regions involving reward and emotions and prefrontal regions involving self-control (Heatherton and Wagner, 2011). When the balance is more in favour of subcortical regions, the self-regulatory resource is weakened. This can happen when people see alcohol cues, or when prefrontal functioning is impaired, for example because of alcohol or depletion of self-regulatory resources (Wagner and Heatherton, 2010). Designs manipulating self-regulation prior to watching alcohol portrayals might be useful in understanding the circumstances under which effects of on-screen alcohol portrayals occur.

Fourth, genetic factors may provide support to theoretical models explaining individual differences in susceptibility to on-screen alcohol portrayals. Conflicting results in gene-environment interaction studies and the chance of false positives in small samples call for a careful selection of candidate genes (Flint and Munafo, 2008; Van der Zwaluw and Engels, 2010). Two widely studied candidate genes in relation to alcohol could be proposed that might moderate the

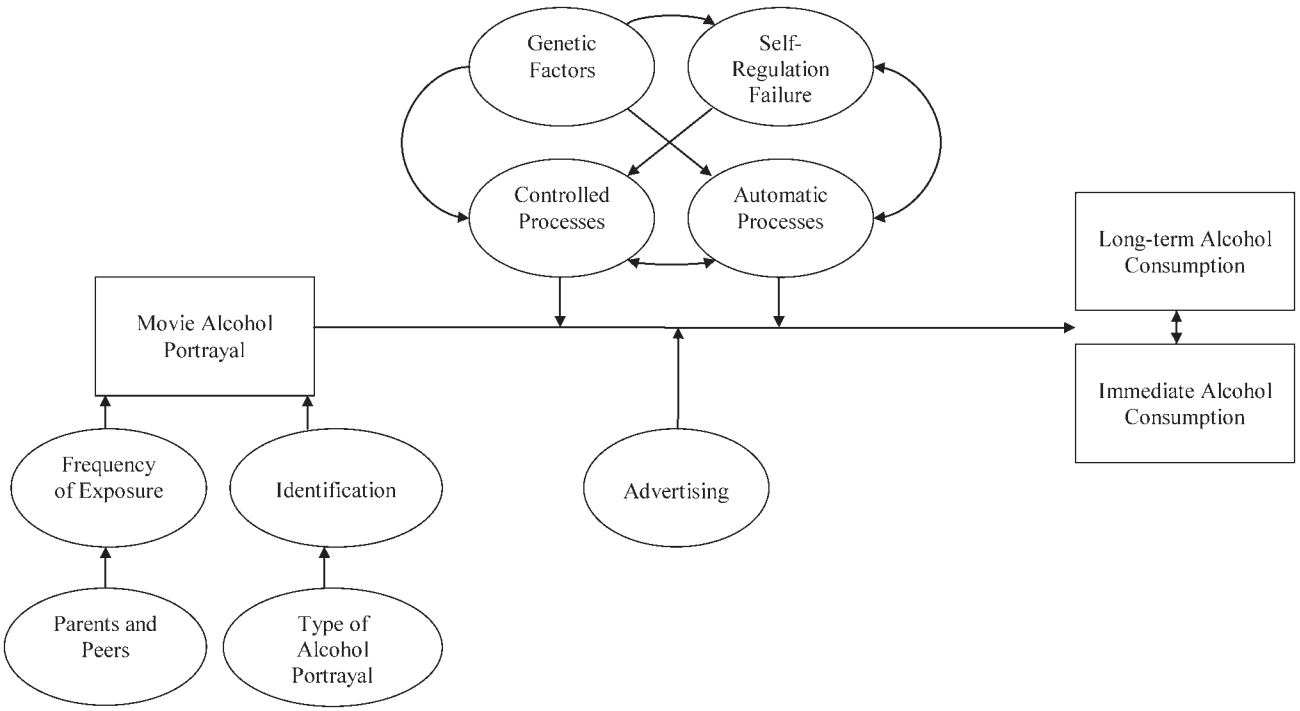

Fig. 1. Scheme on movie alcohol portrayal effects on alcohol consumption in young people.

relation between on-screen alcohol portrayals and alcohol consumption. Both the dopamine D4 receptor gene (DRD4) as the single nucleotide polymorphisms of the μ-opiod receptor gene (OPRM1) are associated with craving for alcohol (Berridge and Robinson, 1998; Hutchison *et al*., 2002; Filbey *et al*., 2008; Van den Wildenberg *et al*., 2007; Ray *et al*., 2010) and externalizing behaviour such as impulsivity (Bakermans-Kranenburg and Van Ijzendoorn, 2006; Laucht *et al*., 2007; Propper *et al*., 2007; Ray *et al*., 2009), although some studies failed to replicate the effects of the DRD4 receptor gene (Kluger *et al*., 2002; Van den Wildenberg *et al*., 2007). The role of genetic factors in the aetiology of alcohol abuse may vary at different stages of alcohol use (Laucht *et al*., 2007). There is preliminary evidence that OPRM1 is more involved in the onset of drinking and that DRD4 is more prominent in experienced drinkers since rewarding properties of alcohol are more important in this drinking phase (Pieters *et al*., 2012). Testing of specific genes to assess individual differences in the effects of on-screen alcohol portrayals could be incorporated in longitudinal and experimental paradigms.

Fifth, the interplay between alcohol advertising (both product placement and explicit advertising) and movie alcohol portrayals is an essential challenge to test. Product placement occurs when a company pays movie makers to portray their brand in a movie (Dal Cin *et al*., 2008). It might be that strategies to embed advertisements in a movie context with appealing actors (and without conscious processing of the intentions of the message) are even more powerful than general advertising strategies and general movie alcohol portrayals since the message is not perceived as advertising (Petty and Cacioppo, 1986; Dal Cin *et al*., 2009). Future studies could subcategorize movie alcohol exposure to assess the single effect of alcohol product placement on consumption compared with general alcohol portrayal in movies. Besides product placement traditional forms of TV advertising might interfere with and increase the effect of movie alcohol portrayals. Green and Brock (2002) revealed that when people feel transported into a narrative (being psychologically engaged by it), they are likely to agree with the message of that narrative. When people are highly transported into the storyline of a movie, this might lead to increased processing of the persuasive messages of alcohol advertisements. Especially when a movie and an ad share similar themes, that is, when they are thematically congruent, this might positively affect processing of advertisements (Wang and Calder, 2009). Engels *et al*. (2009) indeed showed that movie alcohol portrayals in combination with alcohol ads lead to increased alcohol consumption, whereas Koordeman *et al*. (2012) found that alcohol ads in combination with a movie in which no thematic compatible alcohol cues were included did not increase alcohol consumption. The question is however, how movie content affects an ad, and *vice versa* how alcohol ads affect movie alcohol portrayals (Wang and Calder, 2009). Future studies should test whether distinctive combinations of movies and advertisements have differential effects on alcohol consumption.

Sixth, a distinction can be made between the immediate effects of alcohol portrayal while watching TV and the more long-term effects of alcohol portrayal on drinking behaviour. An important question is how these two interact. Is someone who is more susceptible to imitating while watching a movie also more likely to drink more in the long term? Thus far, no study has tested this. One way to test this could be to integrate repeated observations of immediate effects of alcohol portrayals over time into a longitudinal design using the 'Beach' method.

Finally, the role of the social environment (parents and peers) should be taken into account while assessing the

relation between alcohol exposure and alcohol use. Adequate communication between parents and adolescents might stimulate adolescents to think more critically of the media and to have a more active role in understanding the media. A systematic theory- and research-based programme guiding parents on how to facilitate appropriate media use of their children is currently lacking. Further, peers are important in affecting substance use in adolescence (Henry *et al*., 2005; Hoffman *et al*., 2006) and seem to have a mediating role in movie effects on alcohol use (Dal Cin *et al*., 2009; Wills *et al*., 2009). However, little is known about how peers influence one another with respect to media choice and substance use. More in-depth research designs testing the influence of the social environment on the amount of media exposure of adolescents are an important step to accomplish.

CONCLUSION

In this review, we provided an overview of studies of alcohol portrayals on-screen and alcohol consumption of youth and highlighted important issues that need to be addressed in future research. This field of research is relatively young. Recently, studies have shed light the mechanisms underlying the effects of media alcohol portrayals. Essential is the development of new designs in which proposed theories (e.g. dual-process models, self-regulatory failure) can be tested. On the one hand alcohol portrayals in the media do not affect everyone and not all media alcohol portrayals might provoke similar effects. Therefore, it is important to test individual differences in susceptibility to on-screen alcohol portrayals and the effect of different alcohol portrayals should be studied.

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REFERENCES

Anderson P, de Bruijn A, Angus K *et al*. (2009) Impact of alcohol advertising and media exposure on adolescent alcohol use: a systematic review of longitudinal studies. *Alcohol Alcohol* **44**:1–5.

Baumeister RF, Bratslavsky E, Muraven M *et al*. (1998) Ego depletion: is the active self a limited resource? *J Pers Soc Psychol* **74**:1252–65.

Bahk CM. (2001) Perceived realism and role attractiveness in movie portrayals of alcohol drinking. *Am J Health Behav* **25**:433–46.

Bakermans-Kranenburg MJ, Van Ijzendoorn MH. (2006) Gene-environment interaction of the dopamine D4 receptor (DRD4) and observed maternal insensitivity predicting externalizing behavior in preschoolers. *Dev Psychobiol* **48**:406–9.

Baumeister RF. (2003) Ego depletion and self-regulation failure: a resource model of self-control. *Alcohol Clin Exp Res* **27**:281–4.

Berridge KC, Robinson TE. (1998) What is the role of dopamine in reward: hedonic impact, reward learning, or incentive salience? *Brain Res Brain Res Rev* **28**:309–69.

Blair NA, Yue SK, Singh R *et al*. (2005) Depictions of substance use in reality television: a content analysis of The Osbournes. *BMJ Open* **331**:517–9.

Dal Cin S, Worth KA, Dalton MA *et al*. (2008) Exposure to alcohol use and brand appearances in popular contemporary movies. *Addiction* **103**:1925–32.

Dal Cin S, Worth KA, Gerrard M *et al*. (2009) Watching and drinking: expectancies, prototypes, and peer affiliations mediate the effect of exposure to alcohol use in movies on adolescent drinking. *Health Psychol* **28**:473–83.

Dalton MA, Ahrens MB, Sargent JD *et al*. (2002) Relation between parental restrictions on movies and adolescent use of tobacco and alcohol. *Eff Clin Pract* **5**:1–10.

Dalton MA, Adachi-Mejia AM, Lonacre MR *et al*. (2006) Parental rules and monitoring of children's movie viewing associated with children's risk for smoking and drinking. *Pediatrics* **118**: 1932–42.

DuRant RH, Rome ES, Rich M *et al*. (1997) Tobacco and alcohol use behaviors portrayed in music videos: a content analysis. *Am J Public Health* **87**:1514.

Engels RCME, Hermans R, Van Baaren RB *et al*. (2009) Alcohol portrayal on television affects actual drinking behaviour. *Alcohol Alcohol* **44**:244–9.

Everret SA, Schnuth RL, Tribble JL. (1998) Tobacco and alcohol use in top-grossing American films. *J Community Health* **23**:317–24.

Filbey FM, Ray L, Smolen A *et al*. (2008) Alcohol. *Clin Exp Res* **32**:1113–23.

Flint J, Munafo MR. (2008) Forum: interactions between gene and environment. *Curr Opin Psychiatry* **21**:315–7.

Furnham A, Ingle H, Gunter B *et al*. (1997) A content analysis of alcohol portrayal and drinking in British television soap operas. *Health Educ Res* **12**:519–29.

Gibbons FX, Pomery EA, Gerrard M *et al*. (2010) Media as social influence: racial differences in the effects of peers and media on adolescent alcohol cognitions and consumption. *Psychol Addict Behav* **24**:649–59.

Green MC, Brock TC. (2002) The role of transportation in the pervasiveness of public narratives. *J Pers Soc Psychol* **79**:701–21.

Hanewinkel R, Sargent JD. (2009) Longitudinal study of exposure to entertainment media and alcohol use among German adolescents. *Pediatrics* **123**:989–95.

Hanewinkel R, Tanski SE, Sargent JD. (2007) Exposure to alcohol use in motion pictures and teen drinking in Germany. *Int J Epidemiol* **36**:1068–77.

Hanewinkel R, Morgenstern M, Tanski SE *et al*. (2008) Longitudinal study of parental movie restriction on teen smoking and drinking in Germany. *Addiction* **103**:1722–30.

Hanewinkel R, Sargent JD, Poelen EA *et al*. (2012) Alcohol consumption in movies and adolescent binge drinking in 6 European countries. *Pediatrics* **129**:709–20.

Heatherton TF, Wagner DD. (2011) Cognitive neuroscience of self-regulation failure. *Trends Cogn Sci* **15**:132–9.

Hemel-Ruiter ME, de Jong PJ, Wiers RW. (2011) Appetitive and regulatory processes in young adolescent drinkers. *Addict Behav* **36**:18–26.

Henry KL, Slater MD, Oeting ER. (2005) Alcohol use in early adolescence: the effect of changes in risk taking. Perceived harm and friends' alcohol use. *J Stud Alcohol* **66**:275–83.

Hoffman BR, Sussman S, Unger JB *et al*. (2006) Peer influence on adolescent cigarette smoking: a theoretical review of the literature. *Subst Use Misuse* **41**:103–55.

Hunt K, Sweeting H, Sargent J *et al*. (2011) Is there an association between seeing incidents of alcohol or drug use in films and young Scottish adults' own alcohol or drug use? A cross sectional study. *BMC Public Health* **23**:259.

Hutchison KE, McGeary J, Smolen A *et al*. (2002) The DRD4 VNTR polymorphism moderates craving after alcohol consumption. *Health Psychol* **21**:139–46.

Koordeman R, Anschutz DJ, Van Baaren RB *et al*. (2010) Effects of alcohol portrayals in movies on actual alcohol consumption: an observational experimental study. *Addiction* **106**:547–54.

Koordeman R, Kuntsche E, Anschutz DJ *et al*. (2011a) Do we act upon what we see? Direct effects of alcohol cues in movies on young adults' drinking. *Alcohol Alcohol* **46**:393–8.

Koordeman R, Anschutz DJ, Engels RCME. (2012) The effect of alcohol advertising on immediate alcohol consumption in college students: an experimental study. *Alcohol Clin Exp Res* **36**:874–80.

Kluger AN, Siegfried Z, Ebstein RPA. (2002) meta-analysis of the association between DRD4 polymorphism and novelty seeking. *Mol Psychiatry* **7**:712–7.
Kulick AD, Rosenberg H. (2001) Influence of positive and negative film portrayals on drinking on older adolescents' alcohol outcome expectancies. *J Appl Soc Psychol* **31**:1492–99.
Laucht M, Becker K, Blomeyer D *et al*. (2007) Novelty seeking involved in mediating the association of between the dopamine D4 receptor gene exon III polymorphism and heavy drinking in male adolescents: results from a high-risk community sample. *Biol Psychiatry* **61**:477–84.
Mason BJ, Light JM, Escher T *et al*. (2008) Effect of positive and negative affective stimuli and beverage cues on measures of craving in non treatment-seeking alcoholics. *Psychopharmacology* **200**:141–50.
Meier PS. (2011) Alcohol marketing research: the need for a new agenda. *Addiction* **106**:466–71.
Petty RE, Cacioppo JT. (1986) *Communication and Persuasion: Central and Peripheral Routes to Attitude Changes*. New York: Springer.
Pieters S, Van der Vorst H, Burk WJ *et al*. (2011) The effect of the OPRM1 and DRD4 polymorphisms on the relation between attentional bias and alcohol use. *Dev Cogn Neurosci* **4**:591–9.
Primack BA, Kramer KL, Fine MJ *et al*. (2009) Media exposure and marijuana and alcohol use among adolescents. *Subst Use Misuse* **44**:722–39.
Propper C, Willoughby M, Halpern CT *et al*. (2007) Parenting quality, DRD4, and the prediction of externalizing and internalizing behaviors in early childhood. *Dev Psychobiol* **49**:619–32.
Ray LA, Hutchison KEA. (2004) Polymorphism of the mu-opioid receptor gene (OPRM1) and sensitivity to the effects of alcohol in humans. *Alcohol Clin Exp Res* **28**:1789–95.
Ray LA, Bryan A, Mackillop J *et al*. (2009) The dopamine D receptor (DRD4) gene exon III polymorphism, problematic alcohol use and novelty seeking: direct and mediated genetic effects. *Addict Biol* **14**:238–44.
Ray LA, Miranda R, jr, Tidey JW *et al*. (2010) Polymorphisms of the mu-opioid receptor and dopamine D4 receptor genes and subjective responses to alcohol in the natural environment. *J Abnorm Psychol* **119**:115–25.
Rehm J, Ballunas D, Borges GLG *et al*. (2010) The relation between different dimensions of alcohol consumption and burden of disease: an overview. *Addiction* **105**:817–43.
Roberts DF, Henriksen L, Christenson PG (1999) *Substance Use in Popular Videos and Music*. Washington, DC: Office of National Drug Control Policy.
Roberts DF, Henriksen L, Foerh UG (2004) Adolescent and media. In Richard M, Steinberg L (eds). *Handbook of Adolescent Psychology*, 2nd edn. Hoboken, NJ, USA: John Wiley & Sons Inclerner, 487–21.
Robinson TE, Berridge KC. (2001) Incentive sensitization and addiction. *Addiction* **96**:103–14.
Robinson TE, Berridge KC. (2004) Incentive-sensitization and drug 'wanting'. *Psychopharmacology* **71**:352–53.
Robinson TN, Chen HL, Killen JD. (1998) Television and music video exposure and risk of adolescent alcohol use. *Pediatrics* **102**:E54.
Sargent JD, Wills TA, Stoolmiller M *et al*. (2006) Alcohol use in motion pictures and its relation with early-onset teen drinking. *J Stud Alcohol* **67**:54–65.
Sargent JD, Worth KA, Beach M *et al*. (2008) Population-based assessment of exposure to risk behaviors in motion pictures. *Commun Methods Meas* **2**:1–18.
Smith LA, Foxcroft DR. (2009) The effect of alcohol advertising, marketing and portrayal in drinking behaviour in young people: systematic review of prospective cohort studies. *BMC Public Health* **9**:51.
Spijkerman R, Lochbuehler K, Engels RCME. (2012) Identification with favorite characters in soap operas: do viewers experience higher levels of identification when they perceive characters as positive, similar or desirable? *J Broadcast Electron Media* (Submitted).
Stacy AW, Wiers RW. (2010) Implicit cognition and addiction: a tool for explaining paradoxical behavior. *Annu Rev Clin Psychol* **6**:551–75.
Stern SR. (2005) Messages from teens on the big screen: smoking, drinking, and drug use in teen-centered films. *J Health Commun* **10**:331–46.
Stoolmiller M, Gerrard M, Sargent JD *et al*. (2010) R-rated movie viewing, growth in sensation seeking and alcohol initiation: reciprocal and moderation effects. *Prev Sci* **11**:1–13.
Stoolmiller M, Wills TA, Mcclure AC *et al*. (2012) Media and family predictors of drinking onset and binge drinking among U.S adolescents. *BMJ Open* **20**:e000543.
Strack F, Deutsch R. (2004) Reflective and impulsive determinants of social behavior. *Pers Soc Psychol Rev* **3**:220–47.
Tanski SE, Dal Cin S, Stoolmiller M *et al*. (2010) Parental R-rated movie restriction and early-onset alcohol use. *Alcohol Drug* **71**:452–59.
Thompson KM, Yokota F. (2001) Depiction of alcohol, tobacco, and other substances in G-rated animated feature films. *Pediatrics* **107**:1369–74.
Thomsen SR, Rekve D. (2006) The relationship between viewing US-produced television programs and intentions to drink alcohol among a group of Norwegian adolescents. *Scand J Psychol* **47**:33–41.
Tucker LA. (1985) Television's role regarding alcohol use among teenagers. *Adolescence* **20**:593–98.
Van den Bulck J, Beulens K. (2005) Television and music video exposure and adolescent alcohol use while going out. *Alcohol Alcohol* **40**:249–53.
Van den Bulck H, Simons N, Van Gorp B. (2008) Let's drink and be merry: the framing of alcohol in the prime-time American youth series the OC. *J Stud Alcohol Drugs* **69**:933–40.
Van Hoof JJ, De Jong MDT, Fennis BM *et al*. (2009) There's alcohol in my soap: portrayal and effects of alcohol use in a popular television series. *Health Educ Res* **24**:421–29.
Van der Zwaluw CS, Engels RCME. (2010) Gene-environment interactions and alcohol use and dependence: current status and future challenges. *Addiction* **104**:907–14.
Van den Wildenberg E, Wiers RW, Dessers J *et al*. (2007) Functional polymorphism of the μ-opioid receptor gene (OPRM1) influences cue-induced craving for alcohol in male heavy drinkers. *Alcohol Clin Exp Res* **31**:1–10.
Wagner DD, Heatherton TF. (2010) Giving in to temptation: the emerging cognitive neuroscience of self-regulatory failure. In Vohs KD, Baumeister RF (eds). *Handbook of Self-Regulation: Research, Theory, and Applications*, 2nd edn. New York: Guilford Press, 41–63.
Wang J, Calder BJ. (2009) Media engagement and advertising: transportation, matching, transference and intrusion. *J Cons Psychol* **19**:546–55.
WHO (2010). *Best Practice in Estimating the Costs of Alcohol—Recommendations for Future Studies*. Geneva: WHO. http://www.euro.who.int/data/assets/pdf_file/0009/112896/E93197.pdf (2 December 2010, date last accessed).
Wiers RW, Bartholow BD, van den Wildenberg E *et al*. (2007) Automatic and controlled processes and the development of addictive behaviors in adolescents: a review and a model. *Pharmacol Biochem Behav* **86**:263–83.
Wills TA, Sargent JD, Gibbons FX *et al*. (2009) Movie exposure to alcohol cues and adolescent alcohol problems: a longitudinal analysis in a national sample. *Psychol Addict Behav* **23**:23–35.
Wills TA, Sargent JD, Gerrard M *et al*. (2010) Good self-control moderates the effect of mass media on adolescent tobacco use and alcohol use: test with studies of children and adolescents. *Health Psychol* **29**:539–49.
Wingood GM, DiClemente RJ, Bernardt JM *et al*. (2003) A prospective study of exposure to rap music video and African American female adolescents' health. *Am J Public Health* **93**:437–39.