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**Title:** Parenting mechanisms in links between parents' and adolescents' alcohol use behaviors

**Year:** 2008

**Version:** Accepted version (Final draft)

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**Please cite the original version:**

Latendresse, S.J., Rose, R.J., Viken, R.J., Pulkkinen, L., Kaprio, J., & Dick, D.M. (2008). Parenting mechanisms in links between parents' and adolescents' alcohol use behaviors. *Alcoholism-Clinical & Experimental Research*, 32(2), 322-330. <https://doi.org/10.1111/j.1530-0277.2007.00583.x>

Published in final edited form as:

*Alcohol Clin Exp Res.* 2008 February ; 32(2): 322–330.

## Parenting Mechanisms in Links between Parents' and Adolescents' Alcohol Use Behaviors

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### Abstract

**Background**—Adolescence has been identified as a critical period with regard to the initiation and early escalation of alcohol use. Moreover, research on familial risk and protective processes provides independent support for multiple domains of parental influence on adolescent drinking; including parents' own drinking behaviors, as well as the practices they employ to socialize their children. Despite this prevalence of findings, whether and how these distinct associations are related to one another is still not entirely clear.

**Methods**—The present study used data from 4731 adolescents and their parents to test the nature of associations between (a) parents' frequencies of alcohol use and intoxication, and lifetime alcohol-related problems, (b) adolescents' perceptions of the parenting that they receive, and (c) adolescents' prevalence of alcohol use and intoxication at ages 14 and 17½. As such, multiple mediation modeling was used to assess whether parental alcohol use behaviors influence adolescent alcohol use directly, or if they operate through indirect associations with various aspects of parenting that subsequently influence adolescent use.

**Results**—Examination of simple associations demonstrated that maternal and paternal alcohol use behaviors were positively linked with adolescent use behaviors at ages 14 and 17½. Likewise, several parenting behaviors were independently associated with both parental and adolescent drinking. Examined collectively, multivariate path analyses indicated that associations between parents' and adolescents' alcohol-related behaviors were mediated, in part, by adolescents' perceptions of the parenting that they received, especially at age 14. Furthermore, perceived parental monitoring and discipline had unique mediating capabilities, net the effects of all other parenting behaviors.

**Conclusions**—This study demonstrates that parenting is an important mediator of the association between parental and adolescent drinking practices. An important area for future research will be to study how adolescents can avoid alcohol-related problems despite being reared within a risk laden parenting environment and/or having parents who drink frequently.

## Keywords

Parenting; Mediation; Adolescence; Parental Alcohol Use; Adolescent Alcohol Use

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## INTRODUCTION

Throughout the human development literature, adolescence is identified as a critical period with regard to the initiation and early escalation of alcohol use behaviors. During the secondary school years, for example, the proportion of American adolescents who regularly drink alcohol roughly doubles (Blum et al., 2000, Johnston et al., 1998). The relevance of these findings is amplified by the fact that drinking among adolescents increases risk for a range of additional psychosocial and public health outcomes (Peterson et al., 1994). As such, researching the potential antecedents of adolescent alcohol use is of widespread importance.

As the earliest and most proximal source of influence on children's behavior, parents have been a chief focus of much of the research on adolescent drinking. In turn, research examining familial risk and protective factors implicate several domains of parental behavior in adolescents' alcohol use. For example, findings have consistently identified positive links between parents' drinking behaviors and the development of similar behaviors in their offspring (Kandel, 1980, Johnson and Johnson, 2001, Li et al., 2002, Su et al., 1997, Casswell et al., 2002, Lieb et al., 2002, Pedersen and Skrandal, 1998). Social learning theory (Bandura, 1977) has been offered as one explanation for these associations, in that individuals learn behavior through observing and interacting with those they are closest to. That is to say, children are most likely to observe parental alcohol use, and the effects thereof, in their very own homes. Beyond the modeling of behaviors (e.g., personal use or abstention), however, parents are also thought to assert influence through the conscious communication of general societal and individual expectations for their children's behavior.

Another association of potential importance is the intermediary influence that parental drinking has on the ability to adequately fulfill parental responsibilities; that is, parental substance use impairs the ability to parent responsibly (Barnes and Farrell, 1992, Chassin et al., 1993, Holden et al., 1988, Tarter et al., 1993, Hoffmann and Su, 1998). Parental problem drinking, for example, has been associated with inconsistent parenting, which may lead to tension in parent-adolescent relationships (Holmes and Robins, 1987, Windle, 1996) through contributions to poor parental monitoring (Dishion and Loeber, 1985), lower levels of warmth and nurturance (Brook et al., 1990), and harsh parental discipline (Windle, 1996).

In addition to parental functioning being influenced by parents' own drinking behaviors, a wealth of evidence suggests that parental socialization practices affect the alcohol use behaviors of their offspring. Among those behaviors previously examined, parental warmth (White et al., 2000, Hops et al., 1999, Nash et al., 2005), autonomy granting (Herman et al., 1997), monitoring (Ary et al., 1999), and engagement/involvement (Simons-Morton and Chen, 2005) have all been associated with decreased risk, while conflict has been linked to increases in adolescent use (Ary et al., 1999). Alternately, parental discipline is believed to have more equivocal influences on adolescent outcomes (Baumrind, 1996), though moderate levels are generally found to be associated with reduced risk for substance use (Fletcher and Jefferies, 1999). The weight of these findings is so great, in fact, that a growing number of prevention programs specifically target directed parenting practices as potential modifiers of adolescent substance use (Dishion et al., 2002, Kosterman et al., 2001, Lochman et al., 2007, Rohrbach et al., 1994).

Despite evidence linking both parental use and parenting to adolescent alcohol use, whether and how these associations function in relationship with one another is still not entirely clear. That is, while adolescents' alcohol use is consistently linked to the alcohol use of parents, some research suggests that these effects are secondary to the general parenting environment. Parental alcohol dependence has, for example, been shown to operate both directly on adolescent substance use, and indirectly, through parental monitoring and stress (Johnson and Pandina, 1991). Overall, however, there is very little within the literature explicitly addressing the mediating role of parenting in parent-adolescent alcohol use associations.

The objectives of the present study are to examine the links between parental and adolescent alcohol use behaviors, and to illuminate potentially important mechanisms underlying these associations. To date, individual studies exploring the antecedents and consequences of parenting, including those focused on adolescent substance use, have typically concentrated on effects related to a few targeted parenting practices, or to one or two behavioral dimensions representing a broad range of specific parenting behaviors (e.g., warmth and control). In complex systems of development, however, no influences act in isolation (Scott, 1990). Therefore, in the present study we will examine parenting as a dynamic system of influence by simultaneously considering the effects of multiple measures of parenting, and by examining unique contributions of different parenting dimensions. In doing so, we expect that the present analyses will replicate prior findings on the unique contributions of several individual parenting practices, while also providing important information about the global influence of parenting in relation to adolescent alcohol use behaviors. In addition to replicating findings on direct links, we expect the present study to clarify important, yet previously unidentified mechanisms in the intergenerational transmission of alcohol use.

## MATERIALS and METHODS

### Sample and Procedure

FinnTwin 12 (FT12) is a population-based, developmental twin study of health-related behaviors and correlated risk factors (Kaprio et al., 2002). It consists of five consecutive birth cohorts (1983–87) of twins identified through Finland's central population registry, assuring exhaustive and unbiased ascertainment. Self-report questionnaires were mailed to co-twins and their parents late in the autumn of the year in which their birth cohort reached age 11, with a minority returning the questionnaires very early in the year in which the cohorts turned 12. All twins were sent follow-up questionnaires at 14 and 17½ years of age; mean ages at response were 14.1 and 17.6, respectively. The initial response rates were high, with ~82% of eligible families participating, and retention of ~92% at each subsequent stage of assessment. The analyses presented here are based on data from the 4731 twins for which zygosity, sex, and all baseline parenting indices (i.e., potential mediators) were available.

With regard to parental alcohol use indices, both maternal and paternal self-reported drinking behaviors were available for approximately 87% of these families, while roughly 13% had data from only one parent (11.4% from mothers only, 1.2% from fathers only). Moreover, while the majority of these adolescents had biological parents residing in the same household (~78%), a small, but substantial proportion had parents living apart (~22%).

### Measures

*Parental alcohol use* was assessed via baseline measures of present drinking frequency, present intoxication frequency, and lifetime drinking problems, separately for mothers and fathers. Both indicators of current alcohol use were assessed on a 9-point scale, ranging from “never” to “daily”. Lifetime alcohol-related problems were assessed using a composite index consisting of the nine-item Malmö-modified Michigan Alcohol Screening Test (Mm-MAST; Seppä et

al., 1990; e.g., “have you ever daily drank a small amount of alcohol to relax yourself?”), with two additional items included as indicators of control over drinking (e.g., “have you ever felt it to be hard to stop drinking after one drink, once you have started drinking?”), in order to better approximate DSM criteria for alcohol abuse/dependence. Together, these items comprised a scale ranging from zero to eleven, as all items were coded dichotomously (no/yes). Alpha coefficients were .75 for mothers, and .82 for fathers. Consistent with previous analyses of parenting in the FT12 dataset (see Dick et al., 2007), for each of the parental drinking indices, the highest of the scores, for either available parent, was used in modeling.

Two dimensions of *adolescent alcohol use* (i.e., present drinking frequency and present intoxication frequency) were assessed via adolescent questionnaires at ages 14 and 17½. Age 14 items used a 4-point scale, ranging from “never” to “weekly”, while age 17½ items were measured with the same 9-point scale used in the parental questionnaires.

In addition to alcohol use, several *parenting practices*, thought to be representative of the general parenting milieu, were assessed in the twins’ baseline questionnaires (i.e., at age 11–12). Each of these parenting measures was created by summing across a set of individual items. First, a measure of adolescents’ perceived home atmosphere yields a 4-item subscale of parental warmth (i.e., “warm, caring”, “creative, supportive”, “trusting, understanding”, and “open”), and a 3-item subscale of relational tension between adolescents and their parents (i.e., “unjust”, “argumentative”, and “indifferent”), with items rated on a 5-point scale, ranging from “does not hold true” to “holds completely true”. The resulting reliability coefficients were .79 and .68, for the parental warmth and relational tension scales, respectively. Three additional items, rated on a 5-point scale from “every day” to “never”, tapped into how often adolescents engaged in shared activities with their parents (i.e., “do favorite hobbies”, “take trips, travel, visit”, and “engage in recreation”; Narusk and Pulkkinen, 1994). This scale had an internal consistency of .61. Another four items ( $\alpha = .67$ ), rated on a 4-point scale from “not at all” to “very much”, were taken from a larger measure of parents’ child-rearing ideals and practices (i.e., “parents listen to my opinions”, “parents thank and encourage me”, “parents encourage me to be independent”, and “parents try to sort it out and discuss it if I’ve behaved badly”; Metsapelto and Pulkkinen, 2003) and used to assess the degree of autonomy granting in parent-adolescent relationships. An additional item taken from the same scale (“parents punish me if I do something I’m not supposed to”; Metsapelto and Pulkkinen, 2003) was combined with a single item from the home atmosphere scale (i.e., “strict”), resulting in a smaller, and therefore less reliable two-item scale of perceived parental discipline ( $\alpha = .52$ ). Finally, three items ( $\alpha = .73$ ), rated on a 4-point scale from “almost always” to “almost never”, were used to assess parental monitoring (i.e., “parents know my daily program”, “parents know my interests, activities, whereabouts”, and “parents know where I am and who I am with when not at home”; Chassin et al., 1993). Accordingly, the present study contains one of the most comprehensive assessments of parenting present in a large, population-based epidemiological sample.

### Multiple Mediation Model

A theoretically driven multiple mediation model (see Figure 1) was tested, using Mplus, Version 4.1 (Muthén and Muthén, 1998–2006), where path coefficients and standard errors (SE) were computed while accounting for non-independence of observations due to complex sampling (i.e., adolescents nested within twin pairs). More specifically, the present model assessed the effects of parental alcohol use behaviors on adolescent alcohol use behaviors, both directly and indirectly, through a representative range of parental socialization practices, in order to test the intermediary role of parenting in links between parents’ and adolescents’ drinking.

Whereas the most commonly applied method for assessing mediation – the causal steps approach (Baron and Kenny, 1986, Judd and Kenny, 1981) – requires the independent

establishment of significant bivariate associations between the mediator(s) and the independent (*a paths*) and dependent variables (*b paths*), as well as a significant reduction in the magnitude of the direct (i.e.,  $X \rightarrow Y$ , or the *c' path in the presence of mediator(s)*) effect, Mplus applies the *product of coefficients* strategy (MacKinnon et al., 2002, Preacher and Hayes, 2004) in the assessment of indirect effects. In the simple case, partial mediation by a single variable (i.e., a *partial indirect effect*) is evaluated in relation to the Z-distribution, with the ratio of the product of the *a* and *b* path coefficients over the normal-theory standard error for that product. When assessing the *total indirect effect* operating through multiple mediators, the sum of the products of coefficients taken over the square root of the asymptotic variance of the sum of those products provides a ratio to be evaluated in relation to the Z-distribution.

## RESULTS

### Descriptive Statistics

A three-way multivariate analysis of variance was conducted with all thirteen study variables to determine whether the effects of sex, zygosity, and family structure should be partialled out in subsequent analyses. Results demonstrated significant main effects for sex (Wilks'  $\Lambda = .96$ ,  $F_{13, 3314} = 11.48$ ,  $p < .001$ ), zygosity (Wilks'  $\Lambda = .99$ ,  $F_{13, 3314} = 2.09$ ,  $p = .012$ ), and family structure (Wilks'  $\Lambda = .96$ ,  $F_{13, 3314} = 10.54$ ,  $p < .001$ ), a significant overall two-way interaction effect between sex and family structure (Wilks'  $\Lambda = .99$ ,  $F_{13, 3314} = 2.24$ ,  $p = .006$ ), and a significant overall interaction between the three factors (Wilks'  $\Lambda = .99$ ,  $F_{13, 3314} = 1.95$ ,  $p = .021$ ). Thus, all three variables were included as covariates within the mediation models described in the following section. Means and standard deviations for all study variables are presented in Table 1, first for the overall sample, then by status on sex, zygosity, and family structure.

### Multiple Mediation Models

A set of twelve path models were run to test the intermediary role of parenting in associations between parents' drinking behaviors and those of their adolescents at ages fourteen and seventeen and a half, while controlling for the effects of zygosity, sex, family structure (i.e., whether biological parents lived together or apart), and prior alcohol use behavior (only for models predicting age 17½ behaviors). In each case, the theoretical model accounted for a significant amount of the variance in adolescents' alcohol use behaviors (i.e., between 5.2 and 6.9% of age 14 behaviors, and from 13.5 to 17.8% of age 17½ behaviors; see Table 2). Furthermore, parental drinking seemed to have greater explanatory power as adolescents aged, particularly in relation to the frequency of parental use, as indicated by increases in the magnitude of total effect size (i.e., the effects of parental alcohol use behaviors operating through direct and indirect paths) over time. For example, in the models examining the influence of parental use on adolescent alcohol use, the magnitude of the total effect increases from  $B = .038$  ( $Z = 6.18$ ) at age 14, to  $B = .222$  ( $Z = 11.60$ ) at age 17½ (see Table 2).

In addition to the total effects described above, direct effects between parents' and adolescents' alcohol use behaviors (i.e., parent-adolescent alcohol use associations, net the effects of the parenting mediators) were consistently positive. As with total effects, direct effects were stronger in relation to adolescents' self-reported drinking behaviors at age 17½. For example, controlling for all other influences, a comparison of the direct effects (i.e., *c' paths*) of the parental alcohol use on adolescents' frequencies of alcohol use at ages 14 and 17½ yielded test-statistics differing by nearly six standard deviations ( $B_{\text{direct}, 14} = .034$ ,  $Z = 5.52$ ;  $B_{\text{direct}, 17\frac{1}{2}} = .246$ ,  $Z = 12.06$ ; see Table 2), though both were significant. Moreover, several distinct aspects of parenting were associated with parental (i.e., *a paths*) and adolescent (i.e., *b paths*) alcohol use behavior (see Table 3). With respect to parental drinking behaviors, frequencies of parental alcohol use and intoxication were negatively associated with



adolescents' perceptions of shared activities and monitoring, and positively associated with perceived relational tension and discipline. With the exception of links to shared activities, all associations also held true in relation to parents' lifetime drinking problems. In contrast, parental warmth and autonomy granting showed little evidence of being directly affected by any parental drinking behaviors. Regarding associations between individual parenting practices and adolescent alcohol use behaviors (i.e., *b* paths), links were somewhat less stable across time. For example, parental monitoring was associated with less frequent intoxication among adolescents, both at ages 14 and 17½, but with less frequent use only at age 14. Parental discipline, on the other hand, was positively linked with adolescent drinking behaviors, but only at age 17½.

In terms of each model's total indirect effect (formula 3), multivariate path analyses indicate that associations between parents' and adolescents' alcohol-related behaviors were mediated by adolescents' collective perceptions of the parenting that they received, though not in full, as all direct links remained significant in the presence of the mediating variables (i.e., coefficients for all *c'* paths continued to reach statistical significance, despite the presence of significant total indirect effects; see Table 3). Furthermore, the magnitude of the mediated effects (i.e., the proportion of the total effect operating indirectly through the parenting variables) between all parental and adolescent alcohol use behaviors decreased with the age of the adolescents (see Table 2). Using the association between parental intoxication and frequency of alcohol use among adolescents as an example, the total effect increases from age 14 to age 17½ ( $B_{\text{total}, 14} = .041, Z = 5.09$ ;  $B_{\text{total}, 17\frac{1}{2}} = .166, Z = 7.69$ ), while the indirect effect decreases ( $B_{\text{indirect}, 14} = .008, Z = 4.94$ ;  $B_{\text{indirect}, 17\frac{1}{2}} = .005, Z = 1.84$ ), resulting in a proportional decrease in mediation: ( $B_{\text{indirect}, 14}/B_{\text{total}, 14} = .195$ ;  $B_{\text{indirect}, 17\frac{1}{2}}/B_{\text{total}, 17\frac{1}{2}} = .03$ ).

Finally, while parental alcohol use was shown to have some influence on adolescent drinking through the six dimensions of parenting, collectively, two specific parenting characteristics were identified as having unique mediating ability with respect to these associations (see Table 4). That is to say, conditioned on the inclusion of the other five parenting characteristics in the model, perceived parental monitoring and discipline each significantly mediated the parent-adolescent alcohol use associations examined in the present study. More specifically, monitoring was a "partial" mediator of all parent-adolescent alcohol use associations at age 14, and associations between parental drinking indices and adolescent intoxication at age 17½. Similarly, adolescents' perceptions of discipline served a partial mediating role for associations between parental alcohol related behaviors and adolescents' age 17½ alcohol use behaviors.

## DISCUSSION

In the present study, we conducted analyses on several parenting mechanisms potentially underlying the associations between parents' and adolescents' alcohol use behaviors within an epidemiological sample of more than 4700 Finnish adolescents and their parents. Consistent with prior findings (Kandel, 1980, Johnson and Johnson, 2001, Li et al., 2002, Su et al., 1997, Casswell et al., 2002, Lieb et al., 2002, Pedersen and Skrondal, 1998), parents' self-reported drinking behaviors were important predictors of subsequent frequencies of alcohol use and intoxication among their children at age 14, and even more so at age 17½. While earlier studies have identified similar influences operating through individual parenting practices, so far such mediation has only been found in relation to more extreme levels of parental alcohol (e.g., paternal alcohol dependence; Johnson and Pandina, 1991) and drug use disorders (King and Chassin, 2004). Of course, it is possible that null findings (i.e., the dismissal of parenting as a mediator in the transmission of alcohol-related behaviors) in earlier studies may have resulted from the use of the *causal steps approach* proposed by Kenny and colleagues (Baron and Kenny, 1986, Judd and Kenny, 1981), as this method sometimes lacks the power to detect indirect effects (MacKinnon et al., 2002). Thus, unique to the present study is consistent

evidence that parental socialization plays an important, indirect role in the parent to child transmission of normative alcohol-related behaviors, both in terms of the general parenting environment, and in relation to some specific parenting practices.

With regard to developmental differences in the mechanisms influencing adolescents' drinking behaviors, findings from this study imply that the mediating role of parenting decreases between early and later adolescence, despite the increasing influence that parents' alcohol related behaviors have on their adolescents' drinking behaviors. In keeping with the general literature on development, adolescents appear to become increasingly socialized by their peers, often at the expense of parents' efforts. Moreover, these results are congruent with the literature on twin studies, wherein common environmental influences, measured latently via biometrical models, have been shown to decrease across adolescence, at the same time that genetic effects show dramatic increases (e.g., Rose et al., 2001). Importantly, however, the present findings allow us to clarify the diminishing effects of specific socialization experiences measured directly, rather than extrapolating on a general level about the "shared" effects of home/parenting environments. Taken together, this evidence suggests that it may be particularly important to initiate parenting-based prevention and intervention programming, at least among those parents who drink, before their offspring reach adolescence.

In relation to specific dimensions of parenting, monitoring appears to successfully discourage adolescent alcohol use and intoxication, which matches the extant literature on other risky adolescent behaviors. Moreover, there was some evidence suggesting that perceived parental monitoring functions somewhat differentially in relation to age. That is, monitoring partially mediated the associations between parental drinking behaviors and adolescents' frequencies of use and intoxication at age 14, but only those links between parental drinking behaviors and adolescents' frequencies of intoxication at age 17½. In contrast, perceived parental discipline became a significant mediator of parents' influence over their adolescents' drinking behaviors, but only in later adolescence. Thus, in addition to providing evidence of the general importance of parenting in relation to adolescents' drinking behaviors, the present study offers two specific areas to target: monitoring and discipline, which both serve particularly important functions in the transmission of risk for alcohol use and/or intoxication among adolescents.

When considering the practical implications of these findings, it is important to acknowledge some potential limitations in the measurement and design of this study. For example, a common issue related to the measurement of parental monitoring is a general failure to identify how parents gain awareness of their children's whereabouts and activities (Stattin and Kerr, 2000). So, while we suggest that parents' should be encouraged to keep tabs on their adolescents' whereabouts, activities, and peer networks, especially early in their development, this study does not clarify the best strategy by which to do so. While much recent evidence asserts that adolescent self-disclosure is the primary mechanism by which parents gain insight into their children's daily lives (Kerr and Stattin, 2000; Soenens et al., 2006; Stattin and Kerr, 2000), other work has suggested that such "passive" methods of knowledge gathering may only be advantageous in the absence of more "active" efforts, such as direct participation in activities with children and directly questioning children and informed others (Waizenhofer et al., 2004). However, most of this work has been cross-sectional and conducted with older adolescents (e.g., at age 14 or greater; Kerr and Stattin, 2000; Soenens et al., 2006; Stattin and Kerr, 2000) and/or across wide age ranges (e.g., from 15–21, Soenens et al., 2006; and from 10–17, Waizenhofer et al., 2004), making identification of a developmentally appropriate prevention strategy difficult. Thus, an approach that encompasses the promotion of self-disclosure (e.g., via the maintenance of trust and parental responsiveness; Kerr et al., 1999; Soenens et al., 2006) and direct parental involvement will likely serve to reduce adolescent drinking across the widest developmental range. Likewise, while a lack of parentally imposed structure and discipline has been shown to increase vulnerability to substance use among youth



(Cohen and Rice, 1997), there does appear to be risk at the upper limits as well. For example, our findings suggest that parents should be advised not to assert undue punishment or excessive strictness, as this may increase the frequency of adolescents' alcohol use behaviors, particularly later on, when it is more critical for youth to establish their independence.

Within these analyses, as is often the case within a multiple regression framework, the effect that any one parenting practice had on adolescents' alcohol use behaviors was likely attenuated to the extent that it was correlated with the other measures of parenting. Thus, despite our findings on the unique roles of parental monitoring and parental discipline, these data do not negate the potential importance of the other parenting mechanisms that were examined. In fact, a large body of research on parenting styles has demonstrated that, regardless of the magnitude of their main effects, interactions between individual dimensions of parenting can result in significant contextual associations, whereby the influence of one factor depends upon another (Baumrind, 1971; Maccoby and Martin, 1983). In the same way, those parenting dimensions not identified as unique mediators of parent-adolescent alcohol use associations in the present study may still have important intermediary functions that are conditioned on appropriate parental controls (i.e., high monitoring and moderate levels of discipline). Future studies could explicitly test this hypothesis using moderated mediation models (Bauer et al., 2006; Edwards and Lambert, 2007; Muller et al., 2005). At present, however, an overall focus on positive parenting practices would seem to be the most prudent socialization strategy for addressing the transmission of alcohol use behaviors between parents and their adolescents.

Another potential limitation of this design relates to our sole reliance on adolescents' perceptions of the parenting that they received. Throughout the literature on parental socialization, no single informant is universally acknowledged to be the optimal source of reported parenting. Importantly, however, much work has demonstrated low correlations between parents' and adolescents' reports of parenting. In findings from our own group on the FT12 sample, for example, adolescents' reports of parenting were more strongly associated with their frequencies of use and intoxication (at both 14 and 17½ years of age) than were parents' self-reported behaviors, and parents' reports had very little predictive utility once adolescents' perceptions were taken into account (S. Latendresse et al., unpublished observations).

Despite the longitudinal nature of these data, the design of this study is not sufficient to draw conclusions about these associations in terms of cause and effect. For example, though the theoretical model assumes that parental alcohol use precedes parenting, parents' self-reported drinking behaviors and adolescents' reports of parenting were both assessed at baseline. Thus, it is impossible within the present design to establish temporal precedence. Although a clear limitation, concern over this issue is lessened by the fact that parents' reports of lifetime alcohol-related problems (i.e., MAST scores) followed the same pattern as indices of present use and intoxication. In relation, it is also possible that prior childhood behaviors and/or temperament contributed to parents' frequencies of use and intoxication. A more comprehensive longitudinal design would be required to determine whether parents' drinking practices might lead to compromised parenting practices, even after controlling for children's earlier behaviors. Likewise, while parenting is implicated as playing a critical role in the influence that parental alcohol use has on adolescents' use, the extent to which these pathways can be accounted for by genetic versus environmental factors remains unclear. Parents provide both genetic predispositions and a rearing environment for their children, making it difficult to disentangle these processes. Furthermore, to the extent that the environments within which offspring are socialized reflect characteristics of the parents, parental socialization may be genetically influenced (for reviews see Maccoby, 2000, McGuire, 2003). Nonetheless, these results indicate that parenting behavior, whether genetically and/or environmentally influenced, is an important mediator of the association between parental and adolescent

drinking practices. An important area for future research will be to study how adolescents can avoid alcohol-related problems despite being reared within a risk-enhancing parenting environment and/or having parents who drink frequently. Thus, attempting to identify potential modifiers may help to further illuminate mechanisms through which parents influence their adolescents drinking behaviors.

In conclusion, this examination of the intergenerational transmission of alcohol use and intoxication within a nationally representative sample of Finnish adolescents provided evidence that parents' alcohol use behaviors promote similar behaviors in their adolescents, both directly and through their compromising effects on parenting. Though many factors may influence these links, two specific aspects of parental socialization, monitoring and discipline, were identified as potential targets for modification.

### Acknowledgements

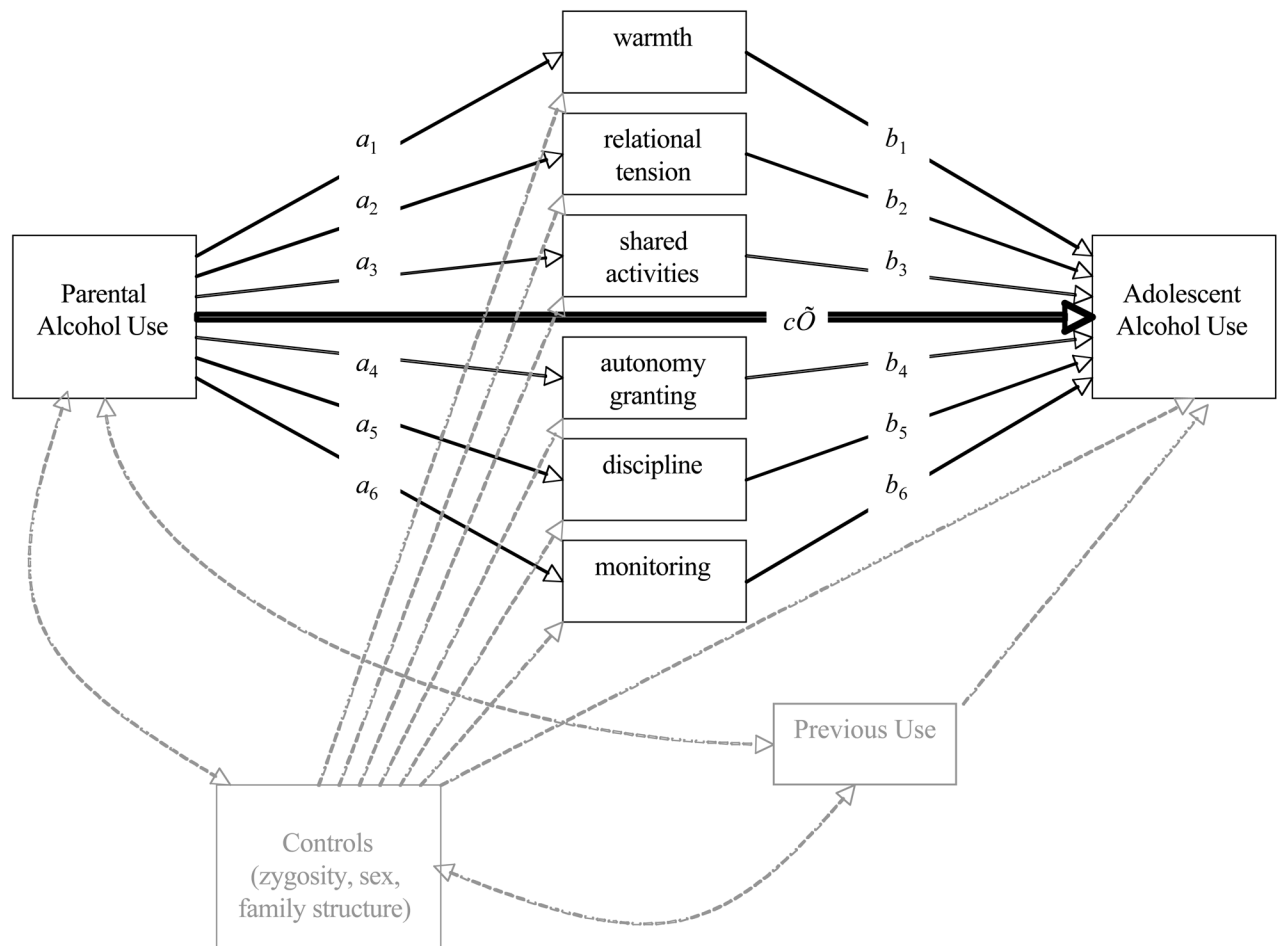
The Finnish Twin studies have been supported by the National Institute of Alcohol Abuse and Alcoholism (grants AA-12502, AA-00145, and AA-09203 to RJR), the Academy of Finland (grants 100499, 205585, and 118555 to JK), and the Finnish Centre of Excellence Programme (to LP & JK). The present study has been supported by a grant from the National Institute of Alcohol Abuse and Alcoholism (AA-15416 to DMD).

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**Figure 1**  
 . Theoretical model with multiple dimensions of parenting simultaneously mediating the association between parental and adolescent alcohol use behaviors, in the presence of covariates.

**Table 1**  
Means and standard deviations for the overall sample, and by sex, zygosity, and family structure

	Overall mean (sd)	Female mean (sd)	Male mean (sd)	MZ twins mean (sd)	DZ twins mean (sd)	Parents living together mean (sd)	Parents living apart mean (sd)
Warmth	17.55 (2.24)	17.68 (2.25)	17.43 (2.22)	17.69 (2.20)	17.49 (2.25)	17.63 (2.15)	17.48 (2.35)
Relational tension	5.08 (2.04)	4.94 (1.95)	5.23 (2.11)	4.99 (2.01)	5.13 (2.05)	5.03 (2.00)	5.19 (2.10)
Shared activities	12.76 (3.30)	12.44 (3.16)	13.06 (3.39)	12.85 (3.28)	12.71 (3.30)	12.89 (3.21)	12.46 (3.47)
Autonomy granting	13.46 (2.08)	13.59 (2.06)	13.33 (2.09)	13.59 (2.05)	13.40 (2.09)	13.50 (2.04)	13.40 (2.20)
Discipline	5.54 (2.01)	5.35 (1.99)	5.72 (2.02)	5.47 (2.00)	5.57 (2.01)	5.46 (1.99)	5.71 (2.06)
Monitoring	10.77 (1.42)	10.97 (1.30)	10.57 (1.51)	10.84 (1.40)	10.73 (1.43)	10.88 (1.31)	10.48 (1.63)
Parental use	5.92 (2.22)	5.90 (2.22)	5.93 (2.21)	5.95 (2.18)	5.90 (2.23)	5.89 (2.25)	6.01 (2.08)
Parental intoxication	3.51 (1.95)	3.49 (1.95)	3.53 (1.96)	3.64 (1.97)	3.45 (1.94)	3.38 (1.89)	3.84 (2.08)
Parental MAST <sup>a</sup>	3.79 (2.94)	3.73 (2.91)	3.85 (2.96)	3.99 (2.98)	3.69 (2.91)	3.66 (2.85)	4.15 (3.15)
Age 14 use	1.52 (.81)	1.56 (.83)	1.49 (.78)	1.48 (.79)	1.54 (.81)	1.47 (.77)	1.72 (.90)
Age 14 intoxication	1.31 (.61)	1.36 (.67)	1.25 (.54)	1.27 (.59)	1.32 (.62)	1.26 (.57)	1.47 (.73)
Age 17½ use	4.97 (2.06)	4.87 (2.05)	5.08 (2.14)	4.80 (2.16)	5.05 (2.06)	4.84 (2.14)	5.42 (1.87)
Age 17½ intoxication	3.67 (1.97)	3.54 (1.92)	3.80 (2.02)	3.52 (2.00)	3.74 (1.95)	3.52 (1.96)	4.17 (1.93)

<sup>a</sup>Malmö-modified Michigan Alcohol Screening Test



**Table 2**  
Effect coefficients and test-statistics for multiple mediation models

Parental Drinking	Adolescent Drinking	Model $R^2$	Total Direct Effect			Total Indirect Effect (Mediation)			Total Effect (Indirect + Direct)			Mediated Proportion of Total Effect
			B	SE	ratio	B	SE	ratio	B	SE	ratio	
<i>Parental Use</i>	Age 14 Use	.057	.034	.006	5.52	.004	.001	3.35	.038	.006	6.18	.105
	Age 14 Intoxication	.063	.023	.005	4.92	.003	.001	2.81	.026	.005	5.48	.115
	Age 17½ Use	.178	.219	.019	11.39	.003	.002	1.32	.222	.019	11.60	.014
<i>Parental Intoxication</i>	Age 17½ Intoxication	.151	.143	.017	8.28	.005	.002	2.23	.148	.017	8.62	.034
	Age 14 Use	.056	.033	.008	4.14	.008	.002	4.94	.041	.008	5.09	.195
	Age 14 Intoxication	.069	.034	.006	5.49	.005	.001	4.33	.039	.006	6.30	.128
<i>Parental MAST<sup>a</sup></i>	Age 17½ Use	.149	.161	.022	7.43	.005	.003	1.84	.166	.022	7.69	.030
	Age 17½ Intoxication	.153	.162	.020	8.12	.008	.003	2.75	.170	.020	8.49	.047
	Age 14 Use	.052	.014	.005	2.65	.005	.001	4.87	.019	.005	3.59	.263
	Age 14 Intoxication	.062	.014	.004	3.36	.003	.001	4.00	.017	.004	4.11	.176
	Age 17½ Use	.135	.064	.014	4.45	.006	.002	2.75	.070	.014	4.86	.086
	Age 17½ Intoxication	.135	.062	.013	4.60	.007	.002	3.74	.069	.013	5.16	.101

Critical ratios (i.e., *Z-scores*) of 1.96, 2.58, and 3.29 correspond to *p*-values of .05, .01, and .001, respectively.

*Note:* All standardized effect coefficients and associated standard errors are rounded to the nearest thousandth. Models of adolescent alcohol use behaviors at age 17½ control for the same alcohol use behavior at age 14.

<sup>a</sup> Malmö-modified Michigan Alcohol Screening Test

Table 3

Path coefficients for multiple mediation models

	Paths from Parental Use to Parenting Indices						Paths from Parenting Indices to Adolescent Use						Path from Parental Use to Adolescent Use c'	
	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	a <sub>4</sub>	a <sub>5</sub>	a <sub>6</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	b <sub>4</sub>	b <sub>5</sub>	b <sub>6</sub>		
Parental Drinking	Adolescent Drinking													
Parental Use	Age 14 Use	.00	.03*	-.09***	.03	.05***	-.04***	-.02*	.01	-.01	.01	.01	-.08***	.03***
	Age 14 Intoxication	.00	.03*	-.09***	.03	.05***	-.04***	-.02*	.00	-.01	.01	.00	-.06***	.02***
	Age 17½ Use	.00	.03*	-.09***	.03	.05***	-.04***	.00	.02	.02	.01	.05**	-.04	.22***
	Age 17½ Intoxication	.00	.03*	-.09***	.03	.05***	-.04***	.00	.03	.02	.02	.05**	-.08**	.14***
Parental Intoxication	Age 14 Use	-.03	.05**	-.09**	-.02	.05**	-.08***	-.02*	.01	-.01	.01	.01	-.08***	.03***
	Age 14 Intoxication	-.03	.05**	-.09**	-.02	.05**	-.08***	-.02*	.00	-.01	.01	.00	-.06***	.03***
	Age 17½ Use	-.03	.05**	-.09**	-.02	.05**	-.08***	.00	.03	.02	.03	.06**	-.04	.16***
	Age 17½ Intoxication	-.03	.05**	-.09**	-.02	.05**	-.08***	.00	.04	.02	.03	.05**	-.07**	.16***
Parental MAST <sup>a</sup>	Age 14 Use	-.01	.06***	-.03	-.01	.04***	-.05***	-.02*	.01	-.01	.01	.01	-.08***	.01**
	Age 14 Intoxication	-.01	.06***	-.03	-.01	.04***	-.05***	-.02*	.00	-.01	.01	.00	-.06***	.01***
	Age 17½ Use	-.01	.06***	-.03	-.01	.04***	-.05***	.00	.02	.01	.03	.06**	-.05	.06***
	Age 17½ Intoxication	-.01	.06***	-.03	-.01	.04***	-.05***	.00	.03	.01	.03	.05**	-.08**	.06***

\*  $p \leq .05$  (z-score  $\geq 1.96$ ),\*\*  $p \leq .01$  (z-score  $\geq 2.58$ ),\*\*\*  $p \leq .001$  (z-score  $\geq 3.29$ )

Note: Numerals in subscript correspond to the following parenting indices: (1) warmth, (2) relational tension, (3) shared activities, (4) autonomy granting, (5) discipline, (6) monitoring. All standardized path coefficients are rounded to the nearest hundredth.

<sup>a</sup> Malm6-modified Michigan Alcohol Screening Test

Table 4  
Effect coefficients and test-statistics for parenting variables demonstrating unique partial mediation

Parental Drinking	Adolescent Drinking	B (a*b)	Monitoring SE	ratio	B (a*b)	Discipline SE	ratio
<i>Parental Use</i>	Age 14 Use	.003	.001	3.10			
	Age 14 Intoxication	.002	.001	3.03			
<i>Parental Intoxication</i>	Age 17½ Use				.003	.001	2.17
	Age 17½ Intoxication	.003	.001	2.15	.003	.001	2.10
	Age 14 Use	.006	.001	4.47			
	Age 14 Intoxication	.004	.001	4.22			
<i>Parental MAST<sup>a</sup></i>	Age 17½ Use				.003	.001	2.08
	Age 17½ Intoxication	.005	.002	2.30	.003	.001	1.97
	Age 14 Use	.004	.001	4.61			
	Age 14 Intoxication	.003	.001	4.37			
	Age 17½ Use				.003	.001	2.39
	Age 17½ Intoxication	.004	.002	2.50	.002	.001	2.29

Critical ratios (i.e., *Z-scores*) of 1.96, 2.58, and 3.29 correspond to *p*-values of .05, .01, and .001, respectively. *Note:* Standardized effect coefficients and associated standard errors are rounded to the nearest thousandth.

<sup>a</sup>Malmö-modified Michigan Alcohol Screening Test