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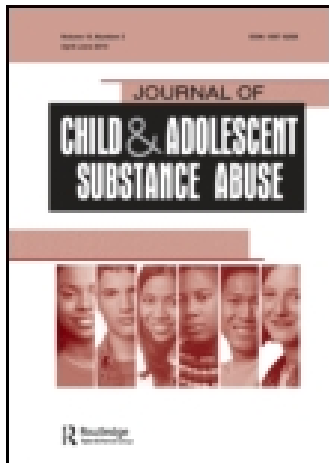
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Parental Influence on Inhalant Use

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The purpose of this article is to examine the dynamics of the relationship between parents and their adolescent children and their association with lifetime and past-month inhalant usage. The population studied was seventh- through ninth-grade students in rural Idaho (N = 570). The authors found a small, but consistent, significant inverse correlation between parental bonding and monitoring of behavior and inhalant usage. There was also a significant positive correlation between verbally aggressive behavior in the family and inhalant use. The data imply that family interaction may play a significant role in the use of inhalants and that the family can play a major role in prevention.

KEYWORDS *adolescent, inhalant use, parental bonding, parental monitoring, rural, verbal aggression*

INTRODUCTION

Inhalants are volatile substances that produce chemical vapors that can be deliberately inhaled to induce a psychoactive effect or a “high” (National Institute on Drug Abuse [NIDA], 2010). These substances are often found in such common household products as cooking spray, paint thinner, spot removers, and even whipped cream (Inhalant.org, 2012). This form of substance abuse is often under-recognized; yet such use is dangerous and can be fatal the first time it is experimented with (De Micheli & Formigoni, 2004; Pagare, Meena, Singh, & Sahu, 2004). Inhalant abuse crosses

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all demographic, ethnic, and socioeconomic boundaries, and causes significant morbidity and mortality in school-aged children (De Micheli & Formigoni, 2004; Pagare et al., 2004). Inhalant abuse is relatively common among younger age groups, and is considered to be poorly studied (Howard & Peron, 2009). In 2009, there were 552,027 adolescents ages 12–17 who reported to have used inhalants for the first time within the past 12 months. Similar inhalant use rates have been reported since 2002 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2011). Inhalant use is unique from other forms of dangerous drug use in that use starts earlier than other substances and usually the frequency of use peaks around eighth grade (Wu, Pilowsky, & Schlenger, 2004). Data from the National Survey on Drug Use and Health (SAMHSA, 2011) show that inhalant use is a “gateway drug” to later alcohol and other types of drug abuse, with 17.2% of adolescents who initiated illicit drug use in the past year reporting they used inhalants. This rate was stable from 2002 to 2007. Inhalant use rates actually decline as an individual ages, with 7.0% of eighth-graders using annually, 4.6% of tenth-graders, and 3.2% of twelfth-graders (Johnston, O’Malley, Bachman, & Schulenberg, 2011). In the 2011 Monitoring the Future report, more than 40% of eighth-graders did not consider the regular use of inhalants putting a person at risk of being harmed, with about two-thirds perceiving that trying inhalants once or twice was not risky (Johnston et al., 2011). These data suggest that early adolescents do not recognize the risks associated with inhalant use and therefore may be at significant risk for inhalant use.

Inhalants are the drug of choice for preteens more so than any other. The National Survey on Drug Use and Health (SAMHSA, 2012) reports that 12-year-olds had used inhalants (6.9%) more than marijuana, hallucinogens, and cocaine combined, and even more than cigarettes (5.2%), in their lifetime. The survey results showed that 1.1 million 12- to 17-year-olds used in the past month and 23 million have used in their lifetime. Another study found that 11% of 12- to 17-year-olds who had used in the past year met the criteria in the *DSM-IV* for inhalant abuse or dependence (Wu et al., 2004). Parents worry about baby-proofing their home when they have toddlers, but often have no idea there are dangers for their older children under the sinks and in their refrigerators.

The term *inhalant* covers a wide range of volatile chemicals that are generally accessible from a store or home that can readily vaporize and be inhaled to give a quick, pleasurable high with minimal immediate negative symptoms (NIDA, 2010). Inhalants are usually common household products like nail polish or paint solvents, Freon from air conditioners, butane fumes, nitrous oxide, or the propellant fumes from some aerosol cans (Ridenour, Bray, & Cottler, 2007). Parents may be unaware of the dangers of household products and have no idea their children are participating in “huffing” or the action of breathing through the nose or mouth in a variety of ways such as sniffing or snorting fumes from a container, spraying aerosols directly into the nose or mouth, or placing an

inhalant-soaked rag in the mouth until permanent damage or death occurs (NIDA, 2010). Young people who use inhalants are often unaware of the serious health risks associated with huffing. Regular use can cause brain damage, organ failure, cardiac arrest, convulsions, deafness, impaired vision, impaired motor skills, loss of judgment, or death (Compton, Conway, Stinson, Colliver, & Grant, 2005; Dinwiddie, 1994; Evren, Barut, Saatcioglu, & Cakmak, 2006; Howard, Cottler, Compton, & Abdallahy, 2001; Wu & Howard, 2007). Physical consequences are not the only dangers; studies of inhalant users have shown high prevalence of depression, anxiety, and other mental health disorders (Compton et al., 2005; Dinwiddie, 1994; Evren et al., 2006; Howard et al., 2001; Wu & Howard, 2007).

Inhalant use may be initiated and show the highest use rates at younger ages than other drugs for several key reasons. First, children generally have limited traveling mobility, limited access to money, and therefore limited access to other drugs or alcohol. Second, inhalants are free and easily accessible in all households in the form of many household products. Third, parents are generally unaware of these dangers and take few precautions to either warn children of the dangers or monitor their access to harmful products. Fourth, inhalants can be and are used without one's peer group. In contrast, initiation and continued use of alcohol, marijuana, and other drugs often happens away from home in the presence of one's peer group (NIDA, 2010). As such, inhalant use may initiate and peak as alcohol and marijuana take over as primary drugs of use. Inhalants are considered a gateway drug to marijuana use for white females in sixth and seventh grade (Crankshaw, 2008).

Parents have a strong influence over their children's behavior. Preadolescents and early teenagers typically spend a lot of time at home under the supervision of their parents. As a result, parents are a major source of influence and socialization. Researchers have found that parents influence use of alcohol, illicit substances, and smoking (Bahr, Maughan, Marcos, & Li, 1998; Johnson, Hopkins, McBride, & Pepper, in press; McBride et al., 2005; Ramirez et al., 2004). The National Survey of American Attitudes on Substance Abuse reports that teens living in families who regularly eat suppers together have 40% less illicit drug use compared with families who do not eat an evening meal together (National Center on Addiction and Substance Abuse at Columbia University, 2006). SAMHSA (2011) reports that parents who monitor their children's behavior and help with their homework show a 50% lower rate of illicit drug use. Crano, Gilbert, Alvaro, and Siegel (2008) suggested that high-risk group drug prevention campaigns should emphasize parental monitoring because they found high-risk youths who were closely monitored by their parents or guardians were less rebellious.

Some research has found parents have an influence on inhalant use. Parental monitoring is considered a protective factor in inhalant use (Nonnemaker, Crankshaw, Shive, Hussin, & Farrelly, 2011). The quality of

the relationship between parents and children can also affect inhalant usage. Ramirez and colleagues (2004) found that parental monitoring and family cohesion were strongly associated with diminished inhalant and marijuana use. This finding was even stronger when there was also knowledge regarding the dangers of inhalant usage by adolescents.

While there is extensive literature on the relationship between parental bonding and substance use in general, there has been limited research on the influence of parents on inhalant use. Increasing the knowledge about the relationship between family dynamics and inhalant use would be helpful in targeting prevention and treatment strategies. This study examines how the relationship and interaction between parents and their children relate to youth inhalant use; specifically looking at how household rules, parental approval, parental monitoring, parental bonding, and verbally aggressive interactions correlate with inhalant usage.

METHOD

Procedure

This study was presented at a regularly scheduled regional meeting of secondary school principals in rural Idaho. Of the 12 rural school districts contacted, 8 agreed to participate, providing a total sample of 10 schools from these districts. The rural Idaho area was chosen to study methamphetamine and inhalant use rates because of evidence in the literature that there were higher use rates of these substances in rural areas (Clayton, McBride, Weiss Roberts, & Hartsock, 2007).

Teachers at the schools were contacted through appropriate district administrative channels and were asked permission to administer the questionnaire during one of their class periods. Parents of the students were sent a letter requesting consent for their child to participate in the survey. The letter described the study and the types of questions on the survey. The letter clearly stated that their child did not have to participate, could opt out of the survey, and that the survey would be anonymous. Contact information for one of the study's authors was also provided. The letter had an attached form the parent or guardian could return to the school and the student was given an alternate activity to participate in if he or she declined to participate in the study. There were a total of six students who did not participate due to their parents' wishes. Over the course of one class period, a trained proctor administered the paper-and-pencil, closed-answer-format survey with 197 questions to the students. Only students who were ages 12–19 and in grades 7–9 were allowed to participate. Students were told not to provide any identifying information on the survey, and were ensured that participation was voluntary and their responses would remain confidential. The study was approved by the sponsoring university's Institutional Review Board (IRB).

The survey was administered by one of the study authors in all participating schools. The survey was given in a classroom, cafeteria, or gymnasium large enough to allow the students ample room for privacy. The students were read a script, approved by the sponsoring university's IRB, telling them the purpose of the study, that they did not have to participate, and that there would be no consequences if they chose not to participate in the study. In addition, the script stated their responses would be kept confidential and they were told how to mark their responses on the survey and how to avoid providing any identifying information. There were four students who did not participate. The students placed their completed surveys in a large manila envelope to ensure responses could not be traced to an individual. The surveys were then shipped to the sponsoring university for Scantron scoring.

Sample

In 2008, this study surveyed 570 students from grades 7–9 in elementary and high schools of rural Idaho. The sample has the following demographics: (1) age: 12–19, though most were ages 13–14 and in the seventh and eighth grades; (2) ethnicity: Caucasian 83.7%, Native American 7.7%, Latino 5.3%, African-American 3.5%, Asian 1.2%; and (3) gender: 52.5% male, 45.6% female.

Instrument

The Communities That Care Youth Survey (Hawkins, Catalano, & Arthur, 2002) was used. The survey instrument consists of 197 questions and measures 19 risk factors and 10 protective factors as well as current levels of substance abuse, violence, and delinquency. The survey is designed for students in grades 6 through 12. Its purpose is to help communities identify the risk and protective factors that pose the most significant challenges and opportunities in the community. The survey asks students questions about inhalant use within their lifetime and within the past 30 days. Inhalants are defined as sniffing glue, breathing the contents of an aerosol spray can, or inhaling other gases or sprays in order to get high. Students self-report inhalant use rates using a 7-point scale ranging from 0 times to 40 times. Parental relationships are measured by the respondents' feelings about the questions on a 4-point Likert-type scale ranging from No!, no, yes, to Yes!. The items looked at the respondent's engagement and commitment to the following variables: feeling close to parents, having set rules about substances, being involved in family decisions, feeling comfortable talking to parents about problems, parents giving encouragement and compliments. Other items examined verbal aggression in the family. These variables were (1) family argues a lot; (2) we have serious arguments; (3) we argue about the same things over and over; and (4) family members insult and yell at one another.

ANALYSIS

All statistical analyses were performed using the Statistical Package for Social Science (SPSS) Version 14.0. The primary analytical strategy used was the Pearson Correlation Coefficient to measure the strength and significance of the association between parent-child relationships and inhalant use. The alpha was set at a more stringent level to decrease the chance of making a Type 1 error. For example, the chance of these results occurring randomly is 1 in 100 when looked at the alpha level at 0.01.

RESULTS

Lifetime Inhalant Use

The lifetime prevalence of inhalant use in the total sample was 13.3% with a total of 74 lifetime users. Of the total sample, 6.5% (36 survey participants) had used on just 1 or 2 occasions, 1.8% (10) used on 3 to 5 occasions, 1.4% (8) had used on 6 to 9 occasions, 1.6% (9) had used on 10 to 19 occasions, .9% (5) had used on 20 to 29 occasions, and 1.1% (6) had used on 40 or more occasions (see Table 1).

Inhalant Usage Past Month

The percentage who used in the past 30 days in the total sample was 5.6% with a total of 31 regular users. Of the total sample, 2.9% (16) of survey participants had used on 1 or 2 occasions in the past 30 days, .5% (3) had used on 3 to 5 occasions, 1.3% (7) had used on 6 to 9 occasions, .4% (2) had used on 10 to 19 occasions, .4% (2) had used on 20 to 29 occasions, and .2% (1) had used on 40 or more occasions (see Table 1).

TABLE 1 Inhalant Usage

Inhalant Usage	Frequency	Percentage
<i>Lifetime Usage</i>		
0 occasions	483	86.7
1 or 2 occasions	36	6.5
3 to 9 occasions	18	3.2
10 to 40 occasions	20	3.8
Total	557	100.0
Total users	74	13.3
<i>Past-Month Usage</i>		
0 occasions	527	94.4
1 or 2 occasions	16	2.9
3 to 9 occasions	10	1.8
10 to 40 occasions	5	1.0
Total	558	100.0
Total users	31	5.6

The distribution of usage is similar to what was found in the Monitoring the Future Study of eighth-graders in 2008 (Johnston et al., 2011). That study found that eighth-graders had a lifetime prevalence of inhalant use of 15.7% and a past-month usage rate of 4.1%. This study found seventh- to ninth-graders had a lifetime prevalence of inhalant use of 13.3% and a past-month usage of 5.6%. Lifetime prevalence was 15% lower and past-month usage was 27% higher than the national average. Because our population included seventh-graders, the lower lifetime prevalence may reflect a younger age group that had not yet initiated use. The higher use rate in the past 30 days may reflect the rural population area. Rural areas often have a higher inhalant use rate. There were a large percentage of Caucasian participants, who are known to be more at risk for inhalant use (Perron & Howard, 2009). A combination of these two factors may explain why a higher percentage of the students were using in the previous month. The participants, then, at least have a close to typical rate of inhalant use.

The analysis presented in Tables 2, 3, and 4 suggests, overall, there is generally a consistent small, statistically significant correlation between inhalant usage and adolescent-parental relationships; though almost all of the variables showed a statistically stronger correlation with lifetime usage than past-month usage. Four main categories of correlations were examined: household rules and parental monitoring (Table 2), parental approval and bonding (Table 3), and verbally aggressive interactions (Table 4). Household rules (Table 2) had a fairly small, but statistically significant, inverse correlation for lifetime inhalant usage. This variable involves families determining household rules and making known to the children rules regarding substance use. Parental approval of the youth's accomplishments (Table 3) had a slightly stronger correlation, but only had a statistically significant inverse correlation with lifetime inhalant usage. Parental monitoring of the youth's activities (Table 2) had a stronger statistically significant correlation than parental approval. Parental monitoring variables show a statistically significant inverse correlation and all lifetime usage variables and 3 of the 6 past-30-day variables. The data imply that while clarity of parental rules is important knowing the rules are being monitored may ensure more compliance on the part of the child. Parental bonding (Table 3) had about the same strength in its statistically significant inverse relationships compared to parental monitoring. If there is an emotional bond between the parent(s) and child there is a relationship and a connection that may relate to an adolescent's increased willingness to comply with the parent's rules and they may care more about what their parent thinks. The verbal aggression (Table 4) variable has a much different relationship with inhalant use. This variable measures whether or not there is some level of verbal aggression in the household. Verbal aggression has a statistically significant positive correlation with inhalant use for lifetime and past-month usage. Verbally aggressive interactions within the family generally had the strongest correlations compared to the other relationships. In a verbally hostile environment it may be more difficult to develop and maintain family bonds.

TABLE 2 Household Rules and Monitoring and Inhalant Use in Lifetime and Past 30 Days

Household Rules and Monitoring	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high in your lifetime ?	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high during the past 30 days ?
Rules are clear in the family.	-.098*	.003
There are clear rules about alcohol and drug use.	-.111*	-.073
Parents know where child is and whom child is with.	-.150**	-.078
Parents will catch child using beer or wine or hard liquor without permission.	-.172**	-.105*
Parents will catch child using a handgun without permission.	-.162**	-.081
Parents will catch child if he or she skipped school.	-.236**	-.112**
Parents ask if homework is done.	-.171**	-.075
Parents know if child did not come home on time.	-.141**	-.111*

* $p = 0.05$. ** $p = 0.01$.

TABLE 3 Parental Approval and Bonding and Inhalant Use in Lifetime and Past 30 Days

Parental Approval and Bonding	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high in your lifetime ?	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high during the past 30 days ?
Parents notice when child is doing a good job and let him or her know about it.	-.141**	-.061
Parents tell child how proud they are of something he or she has done.	-.135**	-.054
Feels very close to mother.	-.183**	-.112**
Shares thoughts and feelings with mother.	-.134**	-.100*
Enjoys spending time with mother.	-.141**	-.074
Feels very close to father.	-.125**	-.134**
Shares thoughts and feelings with father.	-.088*	-.101*
Enjoys spending time with father.	-.137**	-.131**
Child is involved in most decision making affecting him or her.	-.169**	-.130**
Could ask mom or dad for help with a personal problem.	-.200**	-.132**
Has lots of chances to do fun things with parents.	-.159**	-.107*

* $p = 0.05$. ** $p = 0.01$.

TABLE 4 Verbally Aggressive Interactions and Inhalant Use in Lifetime and Past 30 Days

Verbally Aggressive Interactions	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high in your lifetime ?	Sniffed glue, breathed the contents of an aerosol spray can, or inhaled other gases or sprays in order to get high during the past 30 days ?
Family insults one another.	.226**	.217**
Family has the same arguments repeatedly.	.126**	.124**
People in the family have serious arguments.	.174**	.105*

* $p = 0.05$. ** $p = 0.01$.

DISCUSSION

It is important to note that this study supports the premise that parents may have an influence on youths' inhalant usage, either positive or negative. Almost all positive parental involvement questions had small, though significant, inverse correlations to inhalant use. These results are similar to findings by Ramirez and colleagues (2004) in that parental monitoring and family cohesion were associated with diminished inhalant and marijuana usage. Verbally aggressive interaction between family members also showed a small but significant relationship to increased rates of inhalant use, both lifetime and in the past 30 days. Bahr, Maughan, Marcos, and Li (1998) found similar results in a study focusing on family aggression and adolescent drug use. Smith, Ireland, and Thornberry (2005) and Daudin and colleagues (2010) found that in families where there was maltreatment, including neglect or emotional abuse, adolescents were more likely to use drugs. Thus, inhalant use shows similar patterns with other drugs in their relationship with parental dynamics. What is unique about inhalant use is that the behaviors are typically conducted in the home when children are younger and under closer parental supervision. Alcohol, marijuana, and other drugs are generally initiated and used away from home at an older age and with one's peer group. As such, the findings in this study expand the scope of parental influence to even earlier ages when the child is more likely to be under primary parental supervision and influence. Parental monitoring, positive family communication, parental bonding, and approval all show a significant inverse relationship to inhalant use. The strongest correlations were found in the following relationships: (1) if a child skipped school, he or she knew they would be caught by their parents (lifetime, $-.23$; past month, $-.11$); (2) if the child felt he or she could ask his or her mom or dad for help (lifetime, $-.20$; past month, $-.13$); and (3) people in the family yelling or insulting one another (lifetime, $.23$; past month, $.22$).

Researchers and clinicians have often focused on the differential impact of a child's bonding with mother or father. It is interesting to note that the questions about relationship with the father maintained about the same or increased correlational value for past-month use compared to lifetime use whereas other relationships tended to have lower correlations in the past-month use versus lifetime use. This may suggest the importance of fathers in preventing regular inhalant use. Paternal acceptance has been found to be inversely related to more health-risk behaviors than maternal acceptance alone (Schwartz et al., 2009). A sense of emotional abandonment by the father, typically through divorce, can sometimes lead to emotional problems followed by self-medicating through regular drug use. The data may suggest the importance of the bonding between fathers and their early adolescent children.

It is important to note that the strongest correlation found in examining inhalant use in the past 30 days was between family members insulting one another and inhalant use in the past month (.22). This was stronger than any of the family bonding variables. These data remind us of the importance of being aware of family interactions that are destructive to a child's sense of worth and well-being.

Parents generally view their homes as a safe place where their children are protected from substance abuse. Educators and health officials need to educate parents on the existence of volatile chemicals that are routinely available in the home, the warning signs and use patterns associated with inhalant use, and ways parents can educate their children on the dangers of inhalant use (Inhalant.org, 2012). Because inhalants are easily available, easy to hide, and often inhaled in the home at a young age, the data suggest that strengthening family bonding and monitoring may be the best way to prevent and decrease inhalant use. In addition, it is crucial to educate parents about the risks to which they subject their children with verbally aggressive family interactions. A recent study by Johnson and colleagues (in press) found that verbally aggressive family interactions, which are essentially verbal abuse, negatively affect the parent-child bond. This study shows that in working with families it is important to eliminate verbal abuse in the home, promote parental monitoring of school attendance, develop good parental monitoring of adolescent activities, and encourage parental involvement and good relationships between parents and children. These are positive family behaviors that cluster together to help protect against inhalant drug use and all other forms of illicit drug use as found by other researchers.

LIMITATIONS

There are limitations to this study. The most obvious is that the data used were cross-sectional so causal relationships between variables could not be established. However, these data are consistent with previous research. There

was little racial/ethnic variance in this study. Caucasian students comprised 83.7% of those surveyed in this study. Ethnicity and race could affect how children bond with their parents. There is not enough of a sample of the various ethnic groups to make any comparisons between ethnic or racial groups. Parents are not the only influence over whether or not a child uses inhalants. Other well-documented protective and risk factors, such as religiosity, poverty, peer group behavior, and other adult mentoring, were not considered. However, parents were focused on in this study because they are a major source of influence and socialization for children in the age group studied.

RECOMMENDATIONS

Inhalant use is a gateway in that it occurs prior to other substance use, and so it may be crucial to focus on prevention of inhalant use. School and community programs need to focus more on parental involvement, parental monitoring, family bonding, and preventing and decreasing verbal aggression in the home. This can happen with parenting classes and marriage enrichment seminars offered in the community and churches. Schools may need to educate parents regarding the benefits and location of these resources. School-based drug prevention programs should include developing household rules, education on the benefits of parents giving approval to their children, parental monitoring, and children spending enjoyable time with their parents as a way to prevent inhalant use. School counselors and teachers will need to watch for verbally aggressive interactions between children and their parents or between the parents and refer them to community resources for marriage and family therapy. Since more and more children are being homeschooled (1.5 million in the United States in 2007, up from 1.1 million in 2003), schools cannot be the only resource to address these problems (U.S. Department of Education, 2008). Homeschool families are often involved in homeschool associations and churches so those can be a source of resource education. Inhalant education Web sites should also include the benefits of positive parental relationships and monitoring of children as a way to decrease the chance of inhalant use.

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