Adolescent Volatile Substance Misuse: Atypical Agents, Perceived Intoxication, and Patterns of Use

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Abstract

Context: Volatile Substance Misuse (VSM) is a particularly toxic form of adolescent drug use, but specific inhalants of misuse are not well characterized.

Objective: This study examined the prevalence, abuse liability, and modalities and frequency of use of 27 comparatively uncommon, but clinically important, inhalants misused by adolescents. The reported findings extend those of a prior study that examined more prevalently used inhalants in the same adolescent sample.

Methods: 723 youth in residential care for delinquent behavior completed a comprehensive structured and open-ended assessment of VSM.

Results: Considered collectively, results of the current and prior investigation of this sample indicate that the 267 (36.9%) inhalant users used a total of more than 65 specific agents; 47.9% of users reported misuse of at least 4 inhalants. Most of the low prevalence inhalants examined in this report were perceived as intoxicating by 50% to 100% of users. Qualitative findings suggested that use of low prevalence inhalants occurred primarily among youth with histories of polyinhalant and polysubstance misuse.

Discussion and conclusion: Poison control specialists and emergency department physicians confront a daunting diversity of inhalants misused by adolescents as intoxicants. Greater knowledge of the types of inhalants used by adolescents and the patterns and consequences of their use is needed along with enhanced efforts to identify youth at risk for inhalant-related toxicities.

Keywords: Volatile substance misuse; Volatile solvent misuse; Inhala nt abuse; Adolescents

Volatile Substance Misuse (VSM) is among the most prevalent and a pernicious form of psychoactive drug use globally, but remains little studied [1]. General population estimates indicate that 9.1% of the US population ages 12 and older (22.5 million persons) have engaged in VSM, with rates of use significantly higher among adolescents [2,3] associated with subjective effects [4] and adverse consequences [5] that place youth at significantly elevated risk for inhalant-related toxicities and other adverse outcomes.

VSM is endemic, if not epidemic, among high-risk youth. Howard and Jenson [6] found that 34.3% of 475 juvenile probationers in Utah had a history of VSM; similarly, Howard et al. [7] reported that nearly 37.0% of 723 Missouri youth in residential care for delinquent conduct had engaged in VSM, many of them hundreds of times and with seriously deleterious consequences.

Scant data are available characterizing the range of products/chemicals inhaled by youth as intoxicants and there is no widely accepted taxonomic classification of inhalants [3]. Howard et al. [7] were the first to assess VSM across a range of specific inhalants, evaluating use of 55 volatile solvents and 10 other inhalants including nitrates, nitrous oxide, and several gases and commercial products with putatively no psychoactive effects that nevertheless might have abuse potential or possible toxicity if misused (e.g., helium, bleach). However, they limited their analyses to the 31 most prevalently used of the volatile solvents with known psychoactive effects.

This investigation extends these earlier findings by examining the lifetime prevalence, abuse liability, predominant modality of use, and lifetime frequency of use of the 27 less prevalently used inhalants assessed by Howard et al. [7]. Studies of this sample specific to nitrite and nitrous oxide use have been published elsewhere; thus, these agents are not included in this report [3]. In addition to these new interview-based quantitative data, qualitative findings were examined to identify misused inhalants that were not captured by the structured inhalant assessment administered by Howard et al. [7].

Poison control specialists, emergency department physicians, and inhalant use researchers would benefit from greater awareness of the many volatile agents adolescents inhale in their efforts to achieve intoxication. Although many of these inhalants are widely available, inexpensive, and potently psychoactive with seriously deleterious effects, health professionals are often unaware of their use as intoxicants.

Methods

Detailed information regarding the parent study sampling protocol, sample characteristics, and data collection and analytic methods is available elsewhere [7]. All youth in residential care for delinquent conduct in Missouri’s Division of Youth Services (DYS) were recruited for participation. A total of 723 youth agreed to be interviewed, representing 97.7% of the pertinent state population. Youth averaged 15.5 (SD=1.2) years of age and 87.0% were boys.

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Received March 12, 2012; Published November 21, 2012

Citation: Howard MO, Garland EL (2012) Adolescent Volatile Substance Misuse: Atypical Agents, Perceived Intoxication, and Patterns of Use. 1:492. doi:10.4172/scientificreports.492

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Participating youth provided written informed assent and the Missouri DYS granted permission for youth to participate. The project was certified by the Office of Human Research Protections and granted a Certificate of Confidentiality by the National Institute on Drug Abuse. Study protocols were approved by the Missouri DYS IRB and Washington University Human Studies Committee IRB.

Each adolescent completed a 30-90 minute interview conducted by trained graduate psychology students.

Measures

Participants completed the Volatile Solvent Screening Inventory (VSSI), a structured interview assessing lifetime use of 65 inhalants. For each inhalant, youth were asked: “Have you ever inhaled/huffed (INHALANT) through your nose or mouth in an effort to get high?” If they responded “yes,” to this item, they were asked “Did you actually get high when you used this inhalant?” “How many days have you used this inhalant in your lifetime?” and “How did you most often use it?” Response options for these questions are presented in footnotes to Table 1. The VSSI also included an open-ended item screening for inhalant use not otherwise assessed.

Results

Overall, more than 65 volatile substances were inhaled as potential intoxicants by youth in this sample, including the 27 specifically examined in this study. Twenty (74.1%) of these inhalants were perceived as intoxicating by 50% to 100% of adolescents using them and most were sniffed directly from a container or “huffed” using a cloth soaked with the substance and placed over their nose and mouth. Seventeen youth used 8 of these 27 inhalants on more than 100 days and 33 youth used 12 inhalants on 11 to 99 days. Nearly one-half (47.9%) of the 267 inhalant users reported use of 4 or more inhalants.

Fourteen youth reported other inhalant use on the open-ended item. These youth included:

a) A 14-year-old biracial boy who inhaled WD-40 (a lubricant containing aliphatic hydrocarbons) <5 times, reporting that he did not get high when he used the product and typically sprayed it directly into his nose or mouth. This youth had used 6 other inhalants.

b) A 16-year-old boy who inhaled “Nitro,” an organic solvent containing nitromethane used to fill remotely controlled cars. The youth got high after using Nitro and snuffed it from its container. He had used “Nitro” <5 times, but had used 10 other inhalants.

c) A 16-year-old Caucasian boy who inhaled embalming fluid (i.e., formaldehyde, methanol, ethanol, and other solvents) <5 times in his life by sniffing it from a cloth saturated with the substance. The youth got high when he inhaled the fluid and had used 8 other inhalants.

d) A 16-year-old Caucasian boy who inhaled sparkler/firework fumes from PVC pipe <5 times, but who did not get high when doing so. This youth had no other inhalant use.

e) A 16-year-old Caucasian boy who inhaled wood cleaner <5 times from a cloth saturated with the fluid and who got high while doing so. He reported use of 12 other inhalants.

f) An 18-year-old Latino boy who inhaled a leather stain remover product <5 times directly from the container and who got high when doing so. This youth had used 5 other inhalants.

g) A 16-year-old Caucasian boy who inhaled fumes from burning plastic/glue <5 times and who got high while doing so. This youth had used 17 other inhalants.

h) A 16-year-old Caucasian boy who inhaled the “red part” of matches
after they had combusted <5 times and who got high while doing so. This youth reported use of 13 other inhalants.

i) A 15-year-old Caucasian boy who inhaled ammonia on 10 to 19 days directly from a container and who got high while doing so. This youth had inhaled 10 other inhalants.

j) A 15-year-old Caucasian boy who inhaled “Windex” window cleaner on 10 to 19 days from cloth saturated with the substance but who did not find the experience intoxicating. This youth had used 11 other inhalants.

k) A 15-year-old Caucasian boy who inhaled fumes from a “Drano” canister <5 times and who did not find the experience intoxicating. This youth had used 5 other inhalants.

l) A 16-year-old Caucasian girl who inhaled perfume <5 times from a plastic bag into which the substance had been sprayed and who got high while doing so. She reported use of 8 other inhalants.

m) A 16-year-old biracial boy who inhaled “Vick’s Vapor Rub” while wearing a painter’s mask to intensify the effects. He got high while doing so and reported lifetime use of 3 other inhalants.

n) A 15-year-old Caucasian male who inhaled motor oil <5 times directly from the container and who did not get high while doing so. The youth had used 8 other inhalants.

Discussion

Inhalant use was prevalent and varied in this sample, with more than 65 specific agents inhaled by adolescents as potential intoxicants. Many of the 267 (36.9%) youth reporting inhalant use in this sample had extensive histories of polyinhalant and other drug use and nearly half had used 4 or more inhalants. Given the recognized neurological and organ toxicity of many of these agents [3,4], and their widespread use among US and UK youth generally, the present findings are worrisome. It is critical that poison control specialists, medical and social service practitioners who work with adolescents, and researchers in this area be aware of the many inhalants that are misused often with disastrous consequences [8-10].

Most inhalants were included in the VSSI assessment because they had been described as inhalants of abuse in published clinical and research reports. Helium and bottled oxygen were included as control substances to ensure that inhalation of these substances were not confused with VSM. Interestingly, these substances which had been presumed to have no psychoactive effects were in actuality considered intoxicating by substantial percentages of youth who had inhaled them. Youth queried informally about their bottled oxygen use were emphatic that inhalation of this agent was intoxicating. Likewise, one-third of helium users found the experience to be intoxicating, perhaps due to the hypoxia produced by inhaling the gas (see www.youtube.com and search “helium gas” and “passing out” for a number of disturbing videos of helium inhalation leading to sudden unconsciousness in adolescents).

Clearly, the self-report and retrospective nature of these findings and the small number of youth reporting use of select inhalants render them inconclusive. More research is needed examining the onset, nature, course, and consequences of adolescent VSM. Screening for inhalant use in clinical, correctional, and other high-risk service populations should be dramatically enhanced to prevent adverse inhalant-related outcomes in youth.

Acknowledgements

This work was supported by National Institute on Drug Abuse grants DA021405 (Natural History, Comorbid Mental Disorders, and Consequences of Adolescent Inhalant Use, M.O. Howard, Principal Investigator) and DA15556 (Neuropsychiatric Impairments of Adolescent Inhaling Users, M.O. Howard, Principal Investigator). Grateful acknowledgements to Kirk Foster, Michael Dayton, and Jon Zelner for their assistance with data collection, data entry, and project management and to Mark Steward, Director, Gail D. Mumford, Deputy Director, and Alicia Jenkins, Dual Jurisdiction/Case Management Coordinator of the Missouri Division of Youth Services.

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