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Parental Perceptions of E-Cigarette and Vaping Usage Among Single-Sex, School-Going Adolescents in Toronto, Canada

James Crossland

This study explores parental perceptions of adolescent e-cigarette usage, specifically, examining adolescents who attend independent private schools in Toronto, Canada, in order to investigate if those of high socioeconomic status are more educated on the issue of increasing adolescent nicotine consumption. This study employs a quantitative, non-experimental research methodology through the use of surveys administered to parents who have a child at one of the two used independent private schools. This study finds that parents are largely unaware of the increasing e-cigarette usage within schools and more generally, across the globe. Additionally, it finds that parents are unaware of the health risks associated with e-cigarette usage. This study also finds a strong relationship between parental substance use and adolescents perceived risk of substance use. Mainly, it shows that if an adolescent has a parent who smokes or uses substances, that adolescent will have a positive view on substance use, resulting in a greater likelihood of usage in the future. These findings imply that governments and schools have not been effective in preventing this health epidemic and have not been educating parents and adolescents on the potential risks of e-cigarette usage and nicotine consumption.

Keywords: vaping, e-cigarette, adolescent substance use

Introduction

In recent years, the use of vaporizers (“vaping”) and e-cigarettes have become increasingly common among adolescents. This trend has received a large amount of interest from the media, academics, global health experts, and politicians. A study conducted by the Government of Canada published in 2018 found that 15% of Canadians aged 15 years and older reported trying or using an e-cigarette at least once, an increase from 13% in 2015 (Government of Canada, 2018). Vaping has become an increasingly important health issue, especially due to its addictive and toxic ingredients; a study conducted by Favrod-Coune and Broers (2010) found that nicotine use has been known to cause mental health and addiction problems later in life. This study only observes vaping e-liquid con-

taining nicotine as scientific evidence suggests there is a multitude of negative health effects related to nicotine use (Favrod-Coune & Broers, 2010).

The academic discussion around vaping is expanding. In particular, a large proportion of recently published studies observe prevalence rates in set regions or use a more media-forward approach, such as observing vaping advertising and representation in the media. For example, one study conducted by Chu et al. (2017) analyzed images and text posted by vaping companies on Twitter and Instagram specifically looking at product placement, follower activity, and participation with these advertisements.

Very few academic studies have been published regarding the question of parental perceptions and regulation of vaping within Canada, including what if any role parents play in vaping prevention. It is critical to examine all aspects and possible causes contribut-

ing to the increasing prevalence of vaping if government officials and global health experts are to reduce or prevent future consumption. It is important to examine parental perceptions of vaping, as parents have a significant influence on their children's development and regulatory skills (Kandel et al., 2015). The aim of this study is to examine parental perceptions of vaporizer use, and it aspires to provide a clearer glimpse into a possible cause of increasing consumption rates.

A majority of research exploring perceptions of e-cigarettes usage focuses on young adults and adolescents as their research subjects, exploring their perceptions of e-cigarettes. For this reason, this study will be basing its research methodology off studies in other fields that observe the parental perceptions of different activities that are similar to vaping, such as smoking conventional cigarettes or cannabis consumption. This study uses a quantitative non-experimental approach through surveys administered to parents who have a child attending a private independent institution, as surveys are an effective way to reach many parents to collect data efficiently. Additionally, other scholars in similar fields, such as those researching substance use, and parental perceptions in other areas, have used surveys, including that of Drouin et al. (2018), Popova & Ling (2013) and Brooks-Russell et al. (2018). With this data, this study hopes to provide a greater insight into parental perceptions of e-cigarette trends and how global health experts, policymakers and politicians can create strategies to address this growing public health issue.

Literature Review

Parental Perceptions & Substance Use

It is only in recent years that scholars have begun to observe and analyze parental perceptions of adolescent substance use. Looking at the role of parents in adolescent substance use makes sense, as parents have a considerable influence on their children's actions and development. For example, a study conducted by Pardini et al. (2008) that researched bidirectional parenting found that child behavioural problems have a large negative impact on parents' psychological well-being and parenting efforts, and if parents are in a worse mental state, they may be less persistent and

motivated in enforcing rules. Thus, behavioural issues in children necessitate a vicious cycle whereby they influence parenting negatively which can, in turn, lead to adolescent substance abuse. Another study conducted by Kiff et al. (2011) that examined the role of parents in the context of both child temperament and psychological development, found that children with high levels of frustration, low levels of self-regulation and high levels of impulsiveness were more affected by negative parenting, or less attentive parenting, which in turn, increased these characteristics. Furthermore, a study conducted by Piotrowski et al. (2013) concluded that if children inhibit self-regulatory deficits in their youth, they will be at a greater risk of these deficits worsening while transitioning into adolescent and adult years. Regarding substance abuse, a study conducted by Kiff et al. (2011) suggests that children with lower self-regulation levels have a higher chance of exploiting and trying substances. The existing literature regarding the relationship between parents and children's perceptions of smoking is best summarized within a study conducted by Kandel et al. (2015). The study concluded that there is a greater likelihood that children will have positive perceptions of smoking, including that it is unharmed, if their parents smoke tobacco in their presence. This, in turn, increases the likelihood that such children will smoke in the future. Conversely, the findings of this study suggest that if parents enforce negative beliefs on smoking, children will have negative perceptions of substance use, resulting in a lower likelihood of usage. Although not much research has been conducted on parental perceptions of vaping, one study conducted by Satghare et al. (2018) observed both parental and child perceptions of vaping and found that both groups had little knowledge on the topic and that parents believe vaping is a healthier option than conventional cigarettes. The remaining gap within this field of study lies within parental perceptions of vaping within Canada, specifically, those of a high socioeconomic class (SEC), as previous research on this topic conducted within Canada used subjects attending public schools who are generally of a lower SEC. It is important to continue to research on vaping trends and their possible causes, as many health experts believe vaping has become a health epidemic in the last decade. Observing parents, specifically those of a higher socioeconomic class, could shed further light on why there has been

an increase in vaping usage among adolescents in general—assuming the parents may be part of the cause—and would allow for policymakers and politicians to continue to combat this issue.

Youth & Vaping

The existing literature reveals that vaporizer and e-cigarette use among adolescents is increasing and smoking of conventional cigarettes is decreasing (Naskar & Jakati, 2017; Hyman & Brown, 2017). A study conducted by Hyman and Brown (2017) concluded that between 2013-2014, vaping incidence rates among middle school and high school students have tripled, increasing from 4.5% to 13.4%. Another study conducted by Owusu et al. (2017) that observed prevalence rates of vaping among school-going adolescents in Central Appalachia reported that, out of the 894 participants, 11% of subjects were current e-cigarette users, 36% had tried an e-cigarette once and 22% reported using both e-cigarettes and tobacco products. With the emergence of the internet and e-commerce, businesses have been able to communicate and sell products more efficiently to a larger audience (Hyman & Brown, 2017). Not only is it easier to purchase vapes, but it is also a more cost-effective option than smoking. The flavouring and design of vapes and e-cigarettes has made the products more appealing and attractive to adolescents (Measham et al., 2016). Vaping has also had a significant presence and impact on social media platforms. A study conducted by Emery et al. (2014) suggests that 86% of adults are aware of vaporizers and that 47% of those adults were informed through media outlets, specifically social media databases. As social media is constantly growing and becoming more integrated within people's daily lives, specifically millennials, adolescents will be more susceptible to developing substance patterns. The increasing usage of e-cigarettes may act as a gateway to other highly-concentrated nicotine substances, such as smoking conventional cigarettes. As Measham et al. (2016) suggest, the introduction of vaping containing nicotine at a young age will make young users develop a dependence that may result in the usage of other nicotine products such as conventional cigarettes.

Furthermore, a study conducted by Sijia Ying et al. (2018) suggests that e-cigarette advertisements within the media have an enormous impact on ado-

lescents who are already regular nicotine users. The study concluded that many vaping portrayals and representations within the media makes current adolescent smokers less likely to switch to a less harmful substance such as e-cigarettes as the media alters their perceptions of both smoking harm perceptions and smokers' vaping harm perceptions. These findings show how media alters perceptions of vaping and how adolescents who already use nicotine products, mainly conventional cigarettes, will be less likely to transition to a less harmful product such as e-cigarettes mainly due to the way in which vaping companies market their products. Although the existing literature regarding vaping is not vast, it is expanding, and as vaping becomes more prevalent with adolescents and youth, we are likely to see a growing global health issue within the coming years.

Health Effects

Vaping and e-cigarette usage involves the burning of a liquid, also referred to as "e-liquid" or "e-juice," which usually contains propylene glycol, vegetable glycerin, artificial flavouring and nicotine (Goniewicz et al., 2013; Pisinger & Dossing, 2014). A review of toxicology and chemical presence within these liquids reports that although no carcinogens are present, other chemical compounds such as nitrosamines and diethylene have been found within certain e-liquids and these have been proven to lead to many other health issues (Cheng, 2014). Furthermore, a study conducted by Rouabhia et al. (2014) found that exposure to second-hand e-cigarette vapors increased apoptotic cell numbers, or the amount of "dead cells," a phenomenon which has also been shown to be caused by exposure to tobacco smoke. So, even parents just using vaporizers around their child not only increases the chances of their child developing substance use patterns, but it also has direct negative health effects. Additionally, a study conducted by Hughes & Hendrickson (2018) found that even olfaction of e-liquid refill bottles or e-liquid fluids resulted in higher toxicity levels within both youth and adult cells. Just as the true negative health effects of smoking tobacco were only discovered decades after their introduction, the long-term health effects of vaping are not yet fully known, and this is a serious concern to parents and public health experts alike. However, the existing liter-

ature does suggest that nicotine use and the ingestion of nitrosamines and diethylene do have both negative mental and physiological effects. So, in summary, the existing academic conversation thus far suggests that from a current tobacco user perspective vaping and e-cigarette usage may be a less harmful option than tobacco ingestion (Rahman et al., 2016). From the perspective of non-tobacco users, vaping may cause subjects to develop a nicotine dependence, which in turn may result in them using other nicotine products such as cigarettes (Measham et al., 2016). As the existing literature suggests, vaping contains chemicals that have negative health effects, but the long-term health effects are not yet fully known.

Methodology

This study used a quantitative, non-experimental approach with distribution of surveys to parents across the Greater Toronto Area (GTA), as no known studies have been conducted regarding parental perceptions of vaping in Toronto, Canada. The survey was administered through the use of emails collected online from parents who had one or more children attending selected schools in the GTA, as this is an effective way to reach all subjects efficiently. The data was collected from parents of both male and female independent private school in order to determine whether there is a correlation between parents of a higher socioeconomic status (SES) and e-cigarette incidence rates. Parents willing and able to pay large sums of money for an independent school education are generally themselves well educated, as a study conducted by Jez (2017) shows a strong correlation between parents' education and income levels. If parents care greatly for their children's education, presumably they will be more aware and cautious towards their children's decisions and beliefs on issues such as substance use (Cui et al., 2002). Parents of students attending two different high schools across the GTA were surveyed as this allowed for a large enough sample size to fit the time restrictions. The schools were chosen so that they would not be too close in proximity in order to fully represent the whole GTA population of high SES. The survey was created using Google Forms and responses were coded using a similar structure to that of Kaufman et al. (2004), which analyzed usage pat-

terns among regular heroin sniffers. The participants within the survey were kept anonymous, so no data could be traced back to subjects. This study used surveys because other academics in this field used the same method. For example, a study conducted by Drouin et al. (2018) that observed parental perceptions of children's risk of tobacco administered surveys to 648 parents used this methodology. Another study conducted by Popova & Ling (2013) observed perceptions of the relative risk of tobacco and cigarettes among smokers in the United States administered surveys. The survey was administered to parents from one male independent high school and one female independent high school to ensure gender is equal relative to sample size. Sample sizes were chosen in order to take into account differences in school population, the one boy's school required that 20 parents be surveyed and the one girl's school required that 33 parents be surveyed. The survey was comprised of 14 questions as Poornima et al. (2016), which observed parental perceptions of passive smoking used a survey with fourteen questions. The survey's questions were mainly targeted to determine whether parents know what an e-cigarette is, if they believe e-cigarettes are harmful, and whether they approve of their children using e-cigarettes. These questions are similar to those used by other scholars who researched parental perceptions. It is important to acknowledge some limitations within the study to establish internal and external validity. As this study used distributed surveys to parents and parents were not forced to respond, the responses were voluntary, which may represent biases as those who responded may have a vested interest on the topic. Parents having strong previous knowledge of e-cigarettes and vaping may skew the results and, in turn, may cause the study to be unreplicable. Furthermore, some students may be on a scholarship. This would result in the loss of the socioeconomic factors, as the parents of the student on scholarship may be of a lower SES and may be less educated on the health effects of nicotine and e-cigarettes and, thus, less attentive to enforcing rules. Finally, not all parents that can afford independent school tuition are themselves well-educated, which may result in less persistent enforcement of rules and less parental monitoring (Leung et al., 1998).

Findings

Table 1 describes the school split between responses, including overall grade response percentages relative to the total sample population. The majority of parent respondents have children attending Female School 1 (62.3%) at 33 responses, with the remaining 20 responses or 37.7% having children attending Male School 1. The grade split follows between the overall sample responses with parents of grade 12 students at 19 responses or 35.8% of the overall sample population, parents of grade 11 students at 18 responses or 34% of the overall sample population, parents of grade 10 students at 8 responses or 15.3% of the overall sample population and parents of grade 9 students with 7 responses which amounts to 13.2% of the overall sample population.

Table 1

Sample Demographics (n=53) (# & %)

Grade	Male	Female	Total Response
9	2 (3.77%)	6 (11.3%)	8 (15%)
10	2 (3.77%)	6 (11.3%)	8 (15%)
11	7 (13.2%)	11 (20.7%)	18 (33.9%)
12	9 (16.9%)	10 (18.8%)	19 (35.8%)
Total:	20 (37.7%)	33 (63.3%)	53 (100%)

Table 2 illustrates parental perceptions of e-cigarettes and vaporizers in relation to any perceived health effects that such products pose. In terms of basic knowledge on e-cigarettes and vaporizers, a significant majority of 52 respondents, or 98.1% of the total sample population, have heard of an e-cigarette/vaporizer, with 1 parent or 1.9% of the sample population not having heard of an e-cigarette/vaporizer. Following knowledge on e-cigarettes and vaporizers, 48 respondents or 90.6% of the sample population answered that they would not assent or permit their child to use a vaporizer. Although an overwhelming majority expressed dismay towards the use of such products, a surprising 5 respondents, or 9.4%, approved of child substance use. Furthermore, 38 of

respondents (77.4%) answered “yes” to recognizing the negative health effects associated with nicotine consumption, 7 subjects (13.2%) answered that they were uncertain of the short-term health effects of nicotine and 8 subjects (15.1%) expressed they were unsure of the long-term physiological, psychological and mental-health related effects. Similarly, question four explores the health effects of nicotine but deviates from question three as it examines long-term perceptions, with 37 subjects (69.8%) answering that they understand the health effects associated with nicotine consumption with the remaining 16 subjects (30.2%) stating that they do not understand the long-term impacts of nicotine use.

Table 2

Parental Perceptions of E-Cigarettes, Vape Products & Health Effects

Have you heard of an E-Cigarette or Vape?

Yes – 52 (98.1%)

No – 1 (1.9%)

Would you be okay with your child using an E-Cigarette?

Yes – 5 (9.4%)

No – 48 (90.6%)

Do you know the health effects of nicotine?

Yes – 38 (71.7%)

Not Sure – 7 (13.2%)

No – 8 (15.1%)

Did you know nicotine use has been known to cause a number of both physiological and psychological/mental health-related issues later in life?

Yes – 37 (69.8%)

No – 16 (30.2%)

Table 3 examines parents’ preferred substance for their child’s use, comparing conventional tobacco cigarettes on the one hand and e-cigarettes and vaporizers on the other. The table also examines whether the parents themselves use either vaporizers or e-cigarettes. A total of 48 subjects (90.6%) responded that they would rather their child use an e-cigarette or vaporizer while the remaining 5 subjects (9.4%), interestingly, would rather their child use conventional tobacco cigarettes. Additionally, regarding parents’

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substance behavior, 5 subjects (9.4%) reported that they use an e-cigarette/vaporizer themselves, with the remaining 48 subjects (90.6%) answering that they do not use an e-cigarette/vaporizer.

Table 3
Parents' Perceptions Of Health Effects Related To Substance Use & Parental Behavior

Would you rather your child smoke conventional tobacco cigarettes or use an E-Cigarette/Vape?

E-Cigarette/Vape – 48 (90.6%)
Conventional Tobacco Cigarettes – 5 (9.4%)

Do you use a Vape or E-Cigarette yourself?

Yes – 5 (9.4%)
No – 48 (90.6%)

Table 4 illustrates parental perceptions of prevalence and consumption rates of e-cigarettes and vaporizers among adolescents. Regarding consumption rates among adolescents worldwide, 45 subjects (84.9%) believe that rates are increasing, while 8 subjects (15.1%) believe they are not. Subjects presented an almost equal split in perceptions of use of e-cigarettes and vaporizers within schools their children attend. A total of 19 subjects (35.8%) answered that the use of e-cigarettes or vaporizers within the school their child attends is an issue, 23 subjects (43.4%) expressed uncertainty, and 11 subjects (20.7%) said that it is not an issue. Furthermore, parental perceptions of the Canadian Government's restrictions and prevention of underage vaping showed that a majority of 34 subjects (64.2%) are not informed of their actions, while the remaining 19 subjects (35.8%) expressed their familiarity with restrictions implemented to combat recent consumption increases among adolescents.

Table 4
Parents' Perceptions Of Prevalence & Consumption Rates Among Adolescents

Do you believe the rates of e-cigarette and vaporizer usage are increasing among adolescents in Canada, the U.S., the U.K. and worldwide?

Yes – 45 (84.9%)
No – 8 (15.1%)

Is using e-cigarettes or a vape in school an issue at the school your child attends?

Yes – 19 (35.8%)
Not Sure – 23 (43.4%)
No – 11 (20.7%)

Are you aware of any laws the Canadian Government has been trying to enforce to restrict e-cigarette and vaporizer usage in Canada?

Yes – 19 (35.8%)
No – 34 (64.2%)

Discussion

Parents Substance Usage Patterns & Restriction of Adolescent Substance Usage

The findings suggest a strong, direct correlation between parents substance usage patterns and restriction of adolescent substance use. Through a tracing of subject responses, it is possible to determine that all five subjects who used e-cigarettes themselves answered that they would be okay if their child were to use one (see Table 5). Therefore, parents who use vaporizers or e-cigarettes themselves are less likely to enforce rules upon their children, either because they perceive it as not harmful or because they perceive it as a better option versus conventional cigarettes. Additionally, 15 respondents (28.3%) were either not sure or were unaware of the health effects of nicotine, a remarkably high percentage given the significant amount of publicly available research on—and media coverage of—this topic.

Parents Lack of Awareness on Vaping Epidemic

A total of 16 respondents (30.2%) were unaware of the long-term effects of nicotine use, also a relatively high percentage. These results illustrate a worrisome lack of awareness of the health effects of vaporizer and e-cigarette products, and nicotine generally. It could be that parents' relative lack of awareness on the issue of substance use is mainly caused by the lack of teach-

ing by both schools and a lack of public education by governments, which may ultimately lead to less parental enforcement and, in turn, increasing usage rates of e-cigarettes and vaporizers among adolescents. More research clearly needs to be done in this area.

*Table 5
Tracing of Parents' Substance Use Rates & Perceptions of Health Effects*

Do you use a Vape or E-Cigarette Yourself?

Grade & Response #	Male	Female	Total
9	-	-	-
10	-	-	-
11	-	3	3
12	1	1	2

Would you be okay with your child using an E-Cigarette?

Grade & Response #	Male	Female	Total
9	-	-	-
10	-	-	-
11	-	3	3
12	1	1	2

Parental Substance Usage Patterns & Adolescent Perceived Risk of Substances

It can be inferred from the findings that there is a strong relationship between substance use and perceptions of health effects. Children with parents who use e-cigarettes will be at greater risk of developing patterns of substance use while transitioning into later adolescent years and early adulthood. This relation-

ship can be seen within a multitude of other studies such as that of Vuolo and Staff (2013). Specifically, among males, less parental regulation due to skewed perceptions of the health effects associated with nicotine consumption can also cause male adolescents to be more susceptible to other substances, while with females, parental regulation had a much less significant influence (Borawski et al., 2003; Gilman et al., 2009). Additionally, as discussed by Benzinovic & Malatestinic (2009), the level of exposure to substances, such as conventional cigarettes, alcohol and marijuana, had a much greater influence on females' perceptions of substances in comparison to males.

Parental E-Cigarette Usage as an Alternative to Smoking Tobacco & Potential Risks

Although e-cigarettes and vaporizers may pose fewer health risks and may be an effective way to creating a path to smoking cessation, which has been proven effective in-depth by Malas et al. (2016), parents who use e-cigarettes and vaporizers in order to quit smoking conventional cigarettes, may actually cause their children to be at a greater risk of using substances. Second-hand smoke alone within households has been proven to increase a child's chances of e-cigarette usage (Song et al., 2009).

Although parents transitioning to less harmful substances such as vaporizers and e-cigarettes is beneficial not only for them but for governments and healthcare systems, it may lead to increased usage and consumption rates among adolescents. Given the lack of research on the long-term health effects of e-cigarette usage, this is a serious concern that requires further study.

Parental Perceptions of Global Incidence of E-Cigarette Usage

Regarding perceptions of usage rates worldwide, as well as within the schools the subjects' children attend, there seems to be a salient unawareness of the issue of vaping. Many parents answered that their child does not use a vape, and that rates are increasing worldwide, but they are either unaware if, or do not believe that vaping is an issue at schools, when it clearly is. This trend shows that within this population parents believe that this issue does not exist within their com-

munity, and because of this they may feel as if they do not have to enforce rules as they hold the “my child would never do that” mentality. An acknowledgment of their child using an e-cigarette or vape would be an attack on their parenting skills and capabilities. This effect has existed within parent-child relations with substance abuse since conventional cigarettes were determined to be harmful.

Limitations

Fifty-three subjects were surveyed from two single-sex independent schools. More female school parents were included, which may pose a gender-based effect on overall responses and relationships. As discussed by Moon and Hoffman (2008), parenting differs depending on the gender of the child. Additionally, previously married or single parents with children who went through a divorce might also have an impact on the psychological development of that child (Sun & Li, 2002). Both parents and children who experience an event like a divorce are at a greater chance of developing substance abuse habits, although many other factors come into play in such situations (Needle & Doherty, 1990). Additionally, the small sample size of fifty-three subjects may have restricted a true illustration of social trends and parents perceptions of e-cigarettes. Another restriction to this study lies within the methodology chosen. A multitude of biases arise when using a survey as the basis of a study. Although they can be effective in fully representing subjects’ true intentions, many biases still remain. This survey was ultimately a voluntary response survey, meaning that those who have a vested interest in this topic would be more likely to respond. This may have an effect on the results, whether it be beneficial or harmful.

Future Research

These findings point to the need to further examine parental perceptions of adolescent e-cigarette usage. An examination of parents with children who attend public schools and who are of lower SES would provide a better understanding of differences of both parents use and perceptions of adolescent e-cigarette use. This research, if it presents similar trends, could

strengthen and validate the trends illustrated within this study. Overall, if the trends are uniform across both studies, it could lead to the conclusion that there is no causal relationship between SES and e-cigarette usage rates, showing that parents may actually be a cause of the increased consumption rates. Such a finding might also help inform the development of public policies to combat increased usage of vaping and e-cigarettes among adolescents.

These findings also suggest the need for further research into e-cigarettes and vaporizers and specifically, observing parental perceptions. The findings also suggest the need for more educational programs for parents and children to teach them about substance use. It highlights the need for independent schools to interact more with parents and maybe hold events or talks to discuss the issue of vaping within schools.

Finally, there is little research on the long-term health effects of e-cigarette usage; this should be a priority area for future research given the growing prevalence of vaping among adolescents.

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Appendix A

Google Forms survey distributed to parents with children at independent schools in the GTA.

https://docs.google.com/forms/d/e/1FAIpQLSdxN8UmKa-ATRrIv5Kf-6fR4lLJCqUW7X8LijuOyprC2twWdmA/viewform?usp=sf_link