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Honors Thesis

The Transgenerational Effect of Substance Abuse

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Abstract

Using a survey conducted among college students at Andrews University, this study focused on substance use and sexual behaviors of students and the presence of familial substance use problems. Analysis indicated a significant association between substance use problems of fathers and their children's substance use. There was a stronger statistical association between father's substance use problems and male children's alcohol use. In addition there was a significant relationship between grandparents substance use and youth sexual behavior for both genders. There is a need for further analysis of the study.

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The Transgenerational Effect of Substance Abuse

This study will examine the relationship between the use of a substance- such as alcohol, marijuana, cocaine- by family members and the increased risk of substance use and sexual behaviors by children. Substance abuse has become a serious health concern in America. The National Institute of Alcohol Abuse and Alcoholism (NIAAA) (2014) reports that 1,825 students between the ages of 18 and 24 died from unintended alcohol related injuries, 97,000 have been victims of alcohol related sexual assault and 690,000 have been assaulted by someone who has been drinking. The Center for Disease Control (CDC) (2012) reported that prescription drug overdose has become a U.S. epidemic. Since 2003, there have been more deaths related to the use of opioids more than cocaine and heroin combined. In 2007, there was one death attributed to unintentional overdose every 19 minutes. Not only are these substances affecting the persons using them, but they are affecting the tax payers whose money helps pay for programs. Drug addiction alone costs our country over \$600 billion each year as relating to crime, health care, and lost work productivity (Rehm et al., 2009; NDIC 2010). Studies have shown that the use of substances by parents not only affect the child's health, but can also increase his or her risk of substance use. I would like to see if this transmission of risk behavior is visible from one generation to the next. Being able to discover what factors influence the spread of this destructive behavior can guide prevention specialist in developing intervention and cure programs.

Literature Review

Parental use of substances, such as alcohol, marijuana, and tobacco, negatively affects the health of the child (Vassoler et al., 2014; Vermeulen-Smit, 2014). In additional to having subpar

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health, children whose parents used substances such as alcohol and morphine showed an increase risk of substance use in life (Vassoler et al., 2014). There are multiple avenues by which researchers believe behaviors are transmitted. The possible transfer of behaviors can be divided into environmental and biological factors- nurture vs nature. While the exact mechanism for the transfer of behaviors is not fully understood, that does not discredit the correlations and possible causation relationships present within families. One environmental theory that can explain the transfer of behaviors through families is the family systems theory.

This theory implies that a person cannot be understood separate from his or her family, since they play such an important role in their life development. The children are a part of a family system, which consists of interrelated members. Although every individual of a family may not be the same, the family is one unit that has overall themes and ideologies reflected as a whole, the composition law. The themes and ideologies of a family are usually not explicitly stated or written down, but the understood acceptable behavior develops over time through constant interaction. Thus, being interdependent on family it is reasonable to suspect that children's behaviors are shaped by family members.

More specifically, the multigenerational transition process theory, a subset of the family process theory, explains that behaviors are transmitted from parents to child via conscious teaching or unconscious learning caused by perception of parent's moods, attitude or behavior. As children develop, at least one of them typically develops behaviors similar to that of the parents and at least one usually develops behaviors highly differentiated from the behavior of the parents. Despite the differences in the children's personality, most often the most severe

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problems and most highly adaptive behaviors are found from generation to generation (Lehmann et al., 2008).

There is evidence of multigenerational transmission from grandparent to grandchild. Fox et al. (2009) discovered affirmation for the grandmother hypothesis, which states that women who have experienced menopause and can no longer reproduce, live decades after their gametes in order to contribute to the survivorship of their grandchildren. The key in this correlation was that the survivorship was dependent on the X-chromosome relation between grandmother and child. The genetic mechanism as to how this correlation is so strong in data- collected from five countries over different time spans- has yet to be discovered. The data sample populations did not include America; which is the main concern of my study. Perhaps the results would have differed in this type of society. However, this lack of information does not discredit the evidence of grandparents having an effect on their grandchildren's fitness- fitness being the ability to survive and produce offspring and successfully find a mate. This can be the result of highly adaptive behaviors explained in the MTP theory. If a grandparent can add to the fitness of her grandchild, it could be possible for the grandparent to take away from the fitness of the grandchild. I believe substance abuse can potentially be an example of these problems. There are some behaviors and physiological changes that can also be transmitted from parental generation up to the third generation by interactions of genetics and the environment (Crews et al., 2012; Jablonka et al., 2009).

The claims made by these readings might seem like a stretch of theory, yet there has been significant data showing parental substance use behaviors leading to increased risk of substance abuse in the children (Vassoler et al., 2014; Vermeulen-Smit et al., 2012). A study conducted by

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Adkinson et al. (2013) gives evidence of the multigenerational transmission theory process for substance use between parent and child. Adkinson et al. found that sons of alcoholics were at higher risk of having poor self-regulatory control. This would be an example of a most severe problem passed through generations that could lead to substance abuse. A biological study on lab mice, noticed that males exposed to a fungicide, a harmful substance to the body, altered the physiology and behavior in the three subsequent generations (Crews et al., 2012). If there is data suggesting that parents can make the children more susceptible, how far back in the germline does this transmission go?

Research has shown that adverse childhood experiences (ACE) are strongly related to personal alcohol abuse later in life. ACE describes traumatic experiences in a child's life that occurs before the age of 18. Examples of traumatic experiences would be witnessing domestic violence, growing up with substance abuse, mental illness or parental discord. This chronic exposure to stressful events can disturb the neurodevelopment. This hinders the child's ability to properly cope with these traumatic experiences with negative or disruptive emotions, eventually leading to the child adopting coping mechanisms such as substance abuse (SAMHSA, 2015). Dube et al., (2001), noticed that children who had parents with an alcohol abuse problem were more likely to experience ACE. Children who report having parents who had a substance abuse problems have been reported to have experienced adverse events and are more likely to have an alcohol abuse problem (Brown University Digest, 2002). Children with ACE who drink do not attribute their drinking to social reasons as given by the average college age students. Children with ACE expressed that they typically feel alone and viewed alcohol as a means to face their challenges or as a means to cope with the stress of their family (Rothman et al., 2010).

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The biological explanation as to how a grandchild is affected by parents and grandparent is best explained by epigenetics inheritance. Jablonka & Raz (2009) define epigenetics as a study of the mechanisms responsible for development plasticity and robustness that are transmitted to subsequent generations without variations in the DNA sequence. Research has found examples of altered DNA expression, due to father's alcohol use, passed through the male germline to the subsequent generation (Govorko et al., 2012). In fact, much of the research with biological explanations for the change in epigenetics related to a substance abuse is related to the male germline. During sperm formation, it was discovered that only about 4% of DNA stored in the sperm retains its original orientation around histones while the rest of the DNA is unraveled from the and subject to an alternate expression in the sperm that is different from the parent . Having such a small amount of DNA maintain its original expression, highly limits the epigenetic contributions of the sperm (Hammoud et al. 2009). This means that the sections of DNA scientists are focusing on to understand the connection of the male germline has been significantly decreased and perhaps they are even closer to understanding the biological implications as to how certain traits are passed through generations, especially alcoholism passed through the fathers.

While the exact mechanism for the relationship between family members such as grandparent and grandchild may not be fully understood or explained, this study is still relevant because it seeks to discover whether or not this relationship exists within our Andrews population. The method I chose to conduct this study is to use data from a survey gaining historical information on the person's current substance abuse and their family's substance abuse and look for correlations between the grandparents and child's substance use.

Methods

Participants

The survey participants consisted of 750 college students attending Andrews University (435 women, 301 men, 14 unreported, $M_{age} = 22$) who were in classes believed to have been a good example of the socio-demographics of the student population. Participants were not compensated for their participation in this survey. Yet completion of this survey did not interfere with the students' free time.

Materials & Procedure

This study used data that were previously collected in a survey. The surveys were distributed in a blank envelope and returned to the administrator in the same fashion to ensure anonymity and confidentiality. The sampling method used was a purposive sampling method to get a good representation of the student body. Participants were discouraged from playing and identifying numbers or names on the survey. All students present were given surveys and those who chose not to participate were instructed to also hand in the survey in the sealed envelope at the end of the time period. They were encouraged to read other materials in the meantime. All surveys were collected at the same time. Not all of the questions in the survey were used to conduct this research. To identify the students who use alcohol, marijuana or tobacco from those who do not, I used questions 6 and 7 of section II of the survey. To identify students who partake in oral sex, I used question 2 and 3 of section IV. Lastly, to identify whether or not the parents and grandparents substance use plays a role, I used question 11 of section II. This survey is very similar to the Youth Risk behavior surveillance system established by the CDC with

modifications to focus on a college student population at a Christian university (Brener et al., 2013).

Analysis

To analyze the data and determine whether or not there is a relation between a student's substance use and their familial substance issue, the Chi-square test for independence was used. The effect size of the chi-square value was determined by Cramer's V. Further analysis was conducted to determine whether or not the significance between a student's substance use and their familial substance problems differed based on the gender. The chi-square test for independence was used and the effect size was determined by Cramer's V. To gain further understanding as to the predictive ability of the familial substance abuse problem on the student's odds of using alcohol, a logistical regression was conducted. All of these calculations were done in SPSS 21 analyzing system, to ensure accuracy.

Results

Analyses focus on participants who reported having ever used alcohol or marijuana and having engaged in sex within the past year or ever had oral sex. Of the students who reported having used either substance, Table 1 indicates what percentage had parents or a grandparent with reported substance abuse problems. For alcohol use, the significant correlations were found amongst fathers and their children who have used alcohol along with grandparents and male students who have indulged in alcohol. A chi square test for independence (with Yates Continuity Correlation) indicated significant association between students who have used alcohol and father's substance abuse problems, $\chi^2(1, n=287) = 15.380, p=.000$, Cramer's $V = .149$. In terms of gender the data shows for females, $\chi^2(1, n=413) = 5.859, p=.015$, Cramer's $V = .119$;

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for males $\chi^2 (1, n=274) = 10.917, p=.001$, Cramer's $V = .200$. A chi square test for independence (with Yates Continuity Correlation) indicated significant association between male students who have used alcohol and grandparents substance abuse problems, $\chi^2 (1, n=274) = 5.678, p=.017$, Cramer's $V = .144$.

For marijuana use, the significant correlations were found between mother and son, father and daughter and grandparent with grandson. A chi square test for independence (with Yates Continuity Correlation) indicated significant association between male students who have used marijuana and their mothers with substance abuse problem, $\chi^2 (1, n=273) = 5.184, p=.023$, Cramer's $V = .138$. A chi square test for independence (with Yates Continuity Correlation) indicated significant association between female students who have used marijuana and their fathers with substance abuse problem, $\chi^2 (1, n=412) = 3.975, p=.046$, Cramer's $V = .098$. A chi square test for independence (with Yates Continuity Correlation) indicated significant association between male students who have used marijuana and their grandparents with substance abuse problem, $\chi^2 (1, n=273) = 5.733, p=.017$, Cramer's $V = .145$.

Of the students who reported having had sex within the year or who engaged in oral sex, Table 2 indicates what percentage had grandparents with reported substance abuse problems. A chi square test for independence (with Yates Continuity Correlation) indicated a significant association between students who had sex within the year and grandparents with substance abuse problems, $\chi^2 (1, n=52) = 76.082, p=.014$, Cramer's $V = .103$. A chi square test of independence indicated an association between students whoever engaged in oral sex and grandparents substance abuse problems, $\chi^2 (1, n=63) = 6.141, p=.013$, Cramer's $V = .110$. There were also a higher percentage of students who used these substances with grandparents who had substance

abuse problems. Thus these results provide some evidence that a grandparent's substance abuse past is related to a student's substance use and sexual activity. Yet a logistic regression of the student's sexual activity and grandparent's substance abuse problem did not prove to yield any significant relations or odd predictions.

Logistic regression was performed to assess the impact of familial substance abuse problem on the likelihood of students to use alcohol. The model contained three independent variables (presence of substance abuse problems in father, mother or grandparent). The full model containing all predictors was statistically significant, $\chi^2(3, N=274) = 14.168, p=.003$, indicating that the model was able to distinguish between respondents who reported and did not report using alcohol. The model as a whole explained between 50.0% (Cox and Snell r square) and 68.0% (Nagelkerke R squared) of the variance in alcohol usage, and correctly classified 63.9% of cases. The table of the Logistic regression is represented in table 3.

Discussion

The most notable findings of this study are that the father's substance abuse problems have a significant impact on the possibility of the student's use of alcohol. Female students are almost 2 times more likely to use alcohol if their father had a substance abuse problem, than those whose fathers did not. For male students the odds are higher. Male students are almost 3 times more likely to use alcohol if their father had a substance abuse problem. This is consistent with research that indicates a father's substance use increases a child's risk of using substances in their future (Finn & Justus, 1997; Adkinson et al., 2013; Crews et al., 2012). What is interesting is that the mother's substance abuse problems did not have any significant effect on the students; yet the grandparent's substance abuse had a significant correlation. The results of

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this experiment indicated that the substance abuse problems of a father or grandparent could give an indication of students who are at higher risk of using marijuana or alcohol. Another notable finding was the correlation between the sexual behaviors of the male students and the substance abuse past of their grandparent. However, the effect size of the data for the relationship between grandparents and students were very small, which seems to indicate there are other factors playing a role in the student's substance use and the logistic regression also did not give any significant findings.

In terms of the student's marijuana usage, the findings were not unanimously under one family member such as with alcohol neither has previous research shown any indication that a parent substance abuse increase child's use of marijuana. The significant correlations noted in the student's marijuana use can be a result of the environmental factors influencing the student's behaviors.

While this study went well, there are some aspects that can be fixed in replication a study or simply noted. This survey is self-reported information, which means that some students may not feel comfortable with reporting their data, or some students may not know whether or not their parents or grandparent had a substance abuse problem. While this study looked at the likelihood of students indulging in substances such as alcohol, it did not differentiate between the students who indulge once in a while from those who frequently use harmful substances. This means that our data can only indicate to us the students who are at risk of trying these substances in their lifetime rather than those who may have a substance abuse problem. Further study should be conducted to determine where students are engaging in these activities to control for their environment. For instance, the role the family plays on the decisions of an upper classman

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might be different than the lower classes because the upper classmen have been away from their family environment for a longer time period.

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Table 1 Student's use of substances in relation to family members

Table I	Gender	Mother w/ problem	Father w/problem	Grandparent w/problem
% of Students that ever used alcohol [Effect size]	MALE	64.3 [.114]	65.7*** [.200]	54.9* [.054]
	FEMALE	44.4 [.008]	55.9* [.119]	47.4 [.144]
% of Students that ever used marijuana [Effect size]	MALE	42.9* [.138]	31.4 [.116]	31.4* [.143]
	FEMALE	22.2 [0.48]	22.1* [0.98]	18.6 [.067]

This table is a representation of students who reported ever using substances and the percentage of them that had family members with substance abuse problems & having family members with substance abuse problems * $p < .05$ ** $p < .01$ *** $p < .001$ Using Chi Square Analysis. Effect size determined by Cramer's V.

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Table 2 Students sexual activity in relation to grandparents

Table II	Gender	Grandparent w/problem
% of Students who had sex within the last year (unmarried) [Effect size]	MALE	57.5* [.138]
	FEMALE	50.6 [.097]
% of Students who have ever engaged in oral sex [Effect size]	MALE	50.0* [.161]
	FEMALE	35% [.048]

This table is a representation of students who reported ever engaging in these various sexual activities and the percentage of them that had family members with substance abuse problems & having family members with substance abuse problems *p<.05 **p<.01 ***p<.001 Using Chi Square Analysis. Effect size determined by Cramer's V.

Table 3 Students usage of alcohol relation to family- logistic regression

Table III	Female				Male			
	B	S.E.	O.R.	C.I.	B	S.E.	O.R.	C.I.
Predictor of alcohol use								
Mother	-.192	.507	.825	.305-2.231	.393	.621	1.482	.438- 5.008
Father	.631 *	.273	1.879	1.101-3.209	1.020 *	.401	2.773	1.263-6.090
Grandparents	.207	.240	1.230	.768-1.970	.532	.331	1.703	.891-3.257

This table is a representation of the impact of familial substance abuse problems on students alcohol use.

* p<.05. using Logistic regression. S.E. standard error O.R.- odds ratio. C.I.- Confidence interval