Examining a Social Reaction Model in the Prediction of Adolescent Alcohol Use

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Abstract

The Prototype Willingness Model (PWM; Gerrard et al., 2008) is a modified dual-processing model designed to improve the predictive value of existing health risk behavior by suggesting that there are two pathways to health risk behaviors: a reasoned path that is mediated by behavioral intention and a social reaction path that is mediated by behavioral willingness. Although there is evidence supporting the social reaction path to risk behavior among adolescents, most of this work has focused on specific components of the pathway such as prototypes or willingness rather than looking at the entire social reaction pathway as a whole. As such, the primary goal of the present study was to determine whether the social reaction pathway has acceptable fit for a sample of adolescents using a longitudinal design. Results from 835 adolescents support the social reaction pathway of the PWM model when applied to adolescent alcohol use. Specifically, prototypes, perceived vulnerability, and norms predicted willingness to drink, which in turn predicted drinking behavior (drinks per week and peak number of drinks) over a period of 12 months. As such, these findings suggest that the social reaction pathway of the PWM is applicable to adolescent drinkers, meaning that adolescent drinking behavior is based on a less planned and socially based decision process.

1. Introduction

Roughly 75% of the alcohol consumed in the US is in the form of heavy episodic drinking (binge drinking; NIAAA, 2007), which is typically defined as having at least four/five drinks

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Statement 2: Contributors
Example: Both Drs. Litt and Lewis were responsible for the conceptualization of the study. Dr. Lewis was in charge of doing primary statistical analysis with input with Dr. Litt. Dr. Litt wrote the first draft of the manuscript and Dr. Lewis assisted with subsequent drafts. All authors contributed to and have approved the final manuscript.

Statement 3: Conflict of Interest
All authors declare that they have no conflicts of interest.

on a single occasion during a specified time period for females/males, respectively. The proportion of current drinkers that engage in heavy episodic drinking is highest among 18- to 20-year-olds, with roughly 90% of all alcohol consumed in the form of heavy-episodic drinking (CDC, 2010). As a consequence of risky alcohol use, adolescents experience a range of negative outcomes such as poor class and/or work attendance, trouble with authorities, injuries, unprotected sex, and death (Hingson et al., 2009). As such, reducing the proportion of adolescents who engage in binge drinking of alcoholic beverages has been listed as a major objective of Healthy People 2020 (UDHSS, 2010). To effectively address alcohol prevention, it is important to consider the theoretical basis for decisions to use alcohol among adolescents.

1.1. Prototype Willingness Model

The Prototype Willingness Model (PWM; Gerrard et al., 2008) is a modified dual-processing model designed to improve the predictive value of existing health risk behavior theories by positing both a social and a more logical pathway to health risk behavior. This model combines elements of existing health behavior theories (e.g., Theory of Reasoned Action; Fishbein & Azjen, 1975), with a more social approach to decision making (Gibbons et al., 2003). The PWM is based on three primary assumptions. First, for adolescents, more so than adults, behaviors related to health risk are volitional, but not necessarily rational or intentional. This discrepancy between intentions and behavior is not due to a lack of awareness of their intentions, but instead is a reflection of the nature of risk behavior as being a reaction to risk-conducive and socially-based environments (Gibbons et al., 1998). Second, health risk behaviors, such as alcohol use, are social events for adolescents, as they rarely engage in such behaviors alone (Gibbons et al., 2003). Finally, because of their social nature, these risk behaviors have clear social images associated with them. When adolescents consider engaging in specific risk behaviors, these images have an impact (Gibbons et al, 1998). The model was designed to address the social nature of alcohol use and related risk behaviors in adolescents by acknowledging that risk behaviors are often reactions to risk-conducive environments one may encounter rather than planned behaviors (Gibbons et al., 2003). As a result, the PWM assumes that there are two pathways to health risk: a reasoned path that is mediated by behavioral intention and a social reaction path that is mediated by behavioral willingness. Within the PWM, the reasoned pathway is conceptualized as being analogous to the central or cognitive route that relies on more reasoned processing as seen in The Theory of Reasoned Action. The *social reaction pathway* relies on *willingness*, which varies as a function of perceived vulnerability, descriptive norms, and prototypes. Willingness is defined as an openness to engaging in a risk behavior under certain circumstances (Gibbons et al., 2003). Central to the social reaction pathway is the idea of prototypes, which are cognitive representations or social images of the type of person their age who engages in specific behaviors (e.g., typical drinker their age; Gerrard et al., 2006). Health risk behaviors, such as alcohol use, occur in social contexts (Gibbons et al., 1998; Nadler & Fisher, 1992). Therefore, adolescents are likely to find themselves in risk conducive situations where their perceptions of the type of person who drinks (prototypes) as well as peer behavior (descriptive norms) are salient. Given that adolescence is characterized as a period in which individuals are concerned about their personal image (Gerrard et al., 2002; Oyserman & Markus, 1990; Sussman et al., 2007), motivations to

drink will largely depend on perceptions of how drinking is socially evaluated (Gibbons & Gerrard, 1995). As such, it has been argued that the social reaction pathway is more applicable to adolescent populations, and as such is the focus of the current paper.

Evidence of this social reaction path to risk behavior has been demonstrated for a number of different behaviors, including alcohol use (Blanton et al., 1997; Gerrard, Gibbons, & Reis-Bergan et al., 2002; Litt & Stock, 2011; Pomery et al., 2009; Rivis, Sheeran, & Armitage, 2006). However, most of this work has focused on specific components such as prototypes (Spijkerman, Larsen, Gibbons, & Engels, 2010; Teunissen, Spijkerman, Prinstein et al., 2012) or willingness (Litt, Lewis, Patrick, Rodriguez, Neighbors, & Kaysen, 2014) and not the entire social reaction pathway. Research has yet to test the entire social reaction pathway in a sample of adolescents when applied to alcohol use. As such, the present study will focus on determining whether the social reaction pathway has acceptable fit for a sample of adolescents.

1.2 Current Study

It is hypothesized that in line with social reaction pathway of the Prototype Willingness Model, prototypes, perceived vulnerability, and descriptive norms, and willingness at 6 months will predict drinking behavior (drinks per week and peak number of drinks) at 12 months controlling for baseline drinking behavior and demographic variables.

2. Method

2.1 Participants

Approximately 2,936 high school seniors from 22 high schools in 17 cities across Washington State were invited to participate in the study. All study recruitment was conducted via study staff visits to the high schools. Participants were informed that the study was designed to look at how attitudes toward alcohol use, public policies about drinking, and culture affect alcohol use and other health behaviors. All students were also told that their results were confidential and could not be accessed by anyone at their school and that school administrators were told that only de-identified data would be provided to them and that no individually identifiable information would be contained in reports we generated at the school's request. All of the study procedures were approved by the university IRB, and that information was provided in both the participant and parent consent (for those under 18) forms.

Students had to meet the eligibility criteria of being 17 or 18 on the day of the researcher visit. Additionally, students who were 17 years old had to give assent and have parent consent in order to participate. Students who assented to participate but did not have parental consent were invited to participate once they turned 18. Of the 1735 students that had consent to participate and were invited to the baseline survey, 1095 participants (63%) completed the full baseline survey were thus included as participants in the longitudinal study. The average age at baseline was 17.58 (SD=.51) and 682 (57.7%) were female and 833 (72%) self-identified as Caucasian, 106 (9.2%) as multiracial, 68 (5.8%) as Asian/Asian American, 30 (2.6%) as African American, 19 (1.6%) as Native Hawaiian or Pacific

Islander, 15 (1.3%) as American Indian or Alaska Native, and 86 (7.4%) identified as "other." 176 (15.1%) identified as Hispanic/Latino(a). The present study used baseline 6, and 12-month timepoints. At the 6-month survey, 902 participants (retention rate: 82.4%) completed the assessment, and at 12 months, 835 completed the survey (retention rate: 76.2%).

2.2 Measures

2.2.1. Drinking—The Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) is a 4 item measure used to assess typical weekly drinking habits at baseline, 6, and 12-months. The DDQ has been used in previous studies of college student drinking demonstrating good convergent validity and high test–re-test reliability (Marlatt et al., 1998). The weekly item read, "Consider a typical week during the last three months. How much alcohol, on average (measured in number of drinks), do you drink each day of a typical week?'" Typical weekly drinking was the sum of the standard number of drinks (i.e. 12 oz. beer, 10 oz. wine cooler, 4 oz. wine, 1 oz. 100 proof [1 ¼ oz. 80 proof] liquor) for each day of the week. For peak drinking, participants were asked to "Think of the occasion you drank the most this past month. How much did you drink" and respond on a scale from 0–25.

2.2.2. Prototypes—Prototypes were assessed at the 6 month timepoint by asking "Please think about the typical male (female) your age who drinks alcohol. How much do you think the following words describe your image of that person?" Following the stem were 3 different adjectives (smart, popular, attractive; Gerrard et al., 2002; Litt & Stock, 2011), each rated on a scale from (0) *not at all* to (6) *extremely* (α = .89).

2.2.3. Perceived descriptive norms—The Drinking Norms Rating Form, (DNRF; Baer, Stacy, & Larimer, 1991) was used to assess perceived peer group drinking at the 6 month timepoint. The current study only used the first question, 'Consider a typical week during the last three months. How much alcohol, on average (measured in number of drinks), does a typical male/female (gender in question was based on same-sex of respondent) student drink on each day of a typical week?' Total weekly drinks were summed for the final score.

2.2.4. Willingness—Behavioral willingness was assessed using a measure that has been used in several other studies (Gerrard et al., 2006; Gibbons et al., 1998). In this measure, participants are presented with a hypothetical scenario involving alcohol use and then asked to indicate how willing they would be to engage in a series of behaviors. The willingness measure, assessed at the 6 month timepoint, began with a description of a hypothetical scenario: "Suppose you were with a group of friends at one of their houses. Your friend's parents are gone for the night, and your friend has gotten a hold of some alcohol. If your friend offered you alcoholic beverages, how willing would you be to do each of the following?" Two items assessing willingness to drink followed—"stay and have 1 or two drinks," "stay and continue to drink (more than 2 drinks)". Both items were rated on a scale ranging from 1 = *not at all willing* to 7 = *very willing*. The two items were averaged (α = .93).

2.2.5. Perceived Vulnerability—At the 6 month timepoint, participants were asked to rate how much they think people risk harming themselves if they have one or two drinks nearly every day and responded on a scale from 1= *no risk*, 2 = *slight risk*, 3 = *moderate risk*, 4 = *great risk*.

2.2.6. Covariates—Participants reported their age, gender, race, ethnicity, and type of school (public vs. private) at baseline.

2.3. Analysis Plan

Statistical analyses focused on evaluating mediation using SPSS 22 and the PROCESS macro (Hayes, 2013). Mediation was assessed by evaluating indirect effects between all three independent variables (descriptive norms, prototypes, and perceived vulnerability) and drinking outcomes through willingness to drink. Standard errors were bootstrapped (10,000 samples), which provides a more accurate evaluation of mediation tests and is less restricted by distributional assumptions in comparison to traditional regression approaches. All analyses controlled for age, gender, race, ethnicity, school type (public vs. private), and drinking at baseline. For each mediation model, kappa-squared (κ^2), or the ratio of the indirect effect relative to its maximum possible value in the data was calculated as a measure of overall effect size (Preacher & Kelley, 2011).

3. Results

3.1. Descriptives and Correlations

As seen in Table 1, participants, on average, reported consuming 2.32 drinks per week and 2.18 drinks on a peak occasion at baseline. One year later, they reported consuming 4.45 drinks per week and 3.54 per peak occasion. In general, all major study variables were correlated with each other in a manner consistent with the PWM.

3.2. Drinks Per Week

In the first PROCESS model, willingness (at 6 month follow-up) was examined as a mediator between descriptive norms, prototypes, and perceived vulnerability (at 6 months) (entered simultaneously) and drinks per week (at 12 month follow-up) (see Figure 1). All of the direct effects of the predictors on drinks per week were significant (all $p's > .05$). Results also indicated that all three predictors were uniquely associated with willingness, and in turn willingness was significantly associated with subsequent drinking (drinks per week) when controlling for descriptive norms, prototypes, and perceived vulnerability. Examination of willingness as a mediator of the association between descriptive norms and drinks per week revealed a significant indirect effect ($ab = .030$; $SE = .015$; 95% bootstrap CI: .006 – .062), as anticipated. Additionally, the indirect effects of prototypes ($ab = .540$; $SE = .091$; 95% bootstrap CI: .395 –.782) and perceived vulnerability ($ab = −.424$; $SE = .104$; 95% bootstrap CI: − .688– .253), on drinks per week were significant. Results for the overall model ($\kappa^2 = .143$, $SE = .019$, *95% bootstrap CI:* .108 – .183) indicated a medium effect size such that the indirect effect of norms, prototypes, and perceived vulnerability on drinks per week through willingness to drink accounted for roughly 14% of the maximum possible effect.

3.3. Peak Occasion

In our second model, willingness (6 month follow-up) was examined as a mediator between descriptive norms, prototypes, perceived vulnerability (at 6 months) (entered simultaneously) and peak drinking at 12 month follow-up (see Figure 2). As seen with drinks per week, all of the direct effects of the predictors on drinks per week were significant (all $p's > .05$). Results further indicated that all three predictors were uniquely associated with willingness, and in turn willingness was significantly associated with subsequent drinking (drinks per week) when controlling for descriptive norms, prototypes, and perceived vulnerability. Examination of willingness as a mediator of the association between descriptive norms and peak drinks per occasion revealed a significant indirect effect ($ab = .146$; $SE = .035$; 95% bootstrap CI: .087 – .224). Similar to the findings in the previous model, there were significant indirect effects of prototypes ($ab = .358$; $SE = .058$; 95% bootstrap CI: .252 –.483) and perceived vulnerability ($ab = −.328$; $SE = .080$; 95% bootstrap CI: − .483– −.187), on peak drinking. Results for the overall model ($\kappa^2 = .152$, $SE = .020$, *95% bootstrap CI*: .113 – .190) indicated a medium effect size such that the indirect effect of norms, prototypes, and perceived vulnerability on peak drinks through willingness to drink accounted for roughly 15% of the maximum possible effect.

4. Discussion

The primary aim of the present study was to examine the utility of the social reaction pathway of the PWM (Gerrard et al., 2008; Gibbons et al., 1998) in predicting alcohol use among adolescents. Overall, results provide support for the social reaction pathway of the PWM model when applied to adolescent alcohol use. Specifically, prototypes, perceived vulnerability, and norms predicted willingness to drink, which in predicted drinking behavior (drinks per week and peak number of drinks) over a period of 12 months.

The majority of health behavior interventions have focused on reasoned elements of decision making about health behavior, and have been designed to promote deliberative processing, e.g., strengthen intentions to avoid risk and increase consideration of potential negative consequences. Although some work indicates that alcohol interventions based on the social reaction pathway model are efficacious among early adolescents (Brody et al., 2004; Gerrard et al., 2006), far less is known about the applicability of the social reaction pathway to interventions among later adolescents. The present study provides evidence that interventions that focus on the social reaction cognitions (willingness, prototypes, descriptive norms, perceived vulnerability) may be efficacious among adolescents as they complete high school. A large body of literature has documented that personalized feedback interventions are often mediated by reductions in descriptive normative perceptions (Reid & Carey, 2015). Future research should consider examining changes in other social reaction pathway constructs (perceived vulnerability, prototype favorability, and willingness) as mediators of intervention efficacy.

Despite the important findings, the present study is not without limitations. First, several constructs (perceived vulnerability and descriptive norms) only used single item, thus findings should be replicated with more extensive measures. Moreover, the measure of perceived vulnerability assessed a perceived level of risk at drinking levels that were higher

than most participants in this sample drank. Therefore, it is unclear whether perceived risk of lower levels of drinking would still map on to PWM social reaction pathway. Second, while the longitudinal nature of our study is a contribution to the literature, our retention rate after one year was around 76%, so future studies are needed to replicate and extend findings from this study. In addition, while the present study did not assess temperament or personality traits, there is some research that indicates that individual differences in factors such as self-control and negative emotionality are related to this more socially-based decision making among early adolescents (Gerrard et al., 2008). Therefore, future research should determine the role that these traits, and others including openness, conscientiousness, and others, play in the social reaction pathway supported in the present manuscript. Further, it is unclear whether participants felt overt social pressure to drink in social situations, so future studies should also assess this in relation to situational risk. An additional limitation is that all drinking measures were self-report. However, research suggests that in comparison to other methods of assessing alcohol use, self-report is preferable (Laforge, Borsari, & Baer, 2005). In the current study, we assured all students of the confidentiality of their responses, obtained a Federal Certificate of Confidentiality to further protect our participants' privacy, utilized standardized measures of alcohol use that have demonstrated good reliability and validity in past research with student populations, and provided information about standard drink content to help anchor responses. These steps have been found to increase reliability and validity of self-report in a variety of populations (Babor, Stephens, & Marlatt, 1987; Marlatt et al., 1998) and thus any potential bias is minimized. Finally, future work should also examine the full PWM, including both the social reaction pathway and the reasoned pathway.

In summary, the current results supported the theoretical contentions of the social reaction pathway of the PWM, providing further evidence that the PWM is applicable to adolescent alcohol use over time. Our results also have clinical implications for prevention and intervention programs aimed at reducing alcohol use, and conceivably substance use more broadly, among adolescents. Combined with previous experimental research showing that willingness to drink is malleable (Blanton, Stuart, & VandenEijnden, 2001; Litt & Stock, 2011), our results suggest that attempts to modify adolescents' beliefs regarding the prevalence and characteristics of individuals who engage in drinking and other substance use behaviors may enhance existing programs, such as personalized feedback interventions.

Acknowledgments

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Highlights

- Results from 835 adolescents support the social reaction pathway of the PWM model when applied to adolescent alcohol use.

- Specifically, prototypes, perceived vulnerability, and norms predicted willingness to drink, which in turn predicted drinking behavior (drinks per week and peak number of drinks) over a period of 12 months.

- Considering socially based variables in the prediction of adolescent drinking is important for alcohol intervention and preventions.
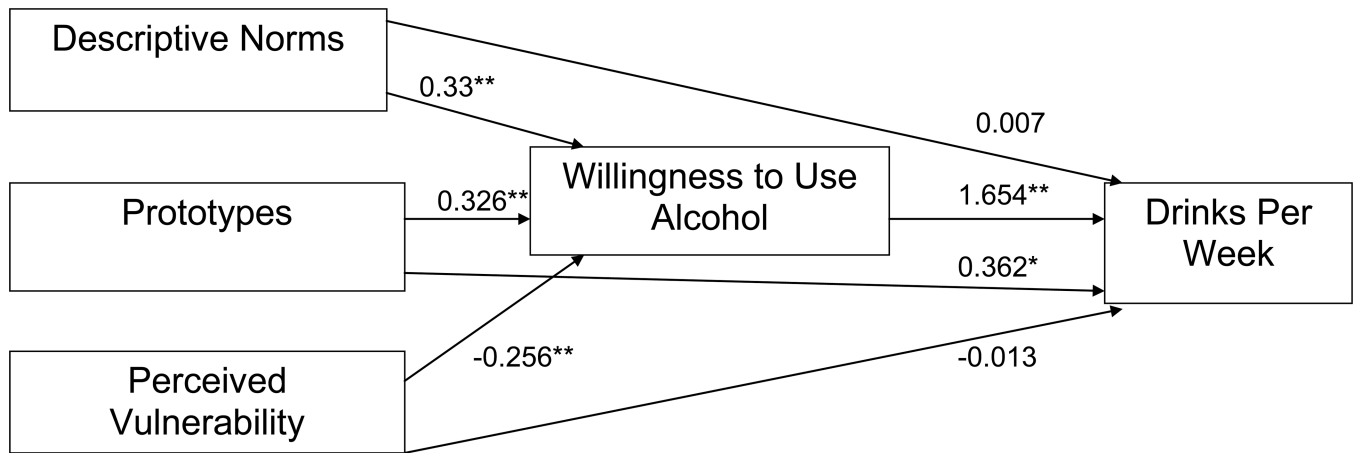
Figure 1.
Multiple Mediation Figure predicting T3 drinks per week controlling for age, gender, drinks per week, school type
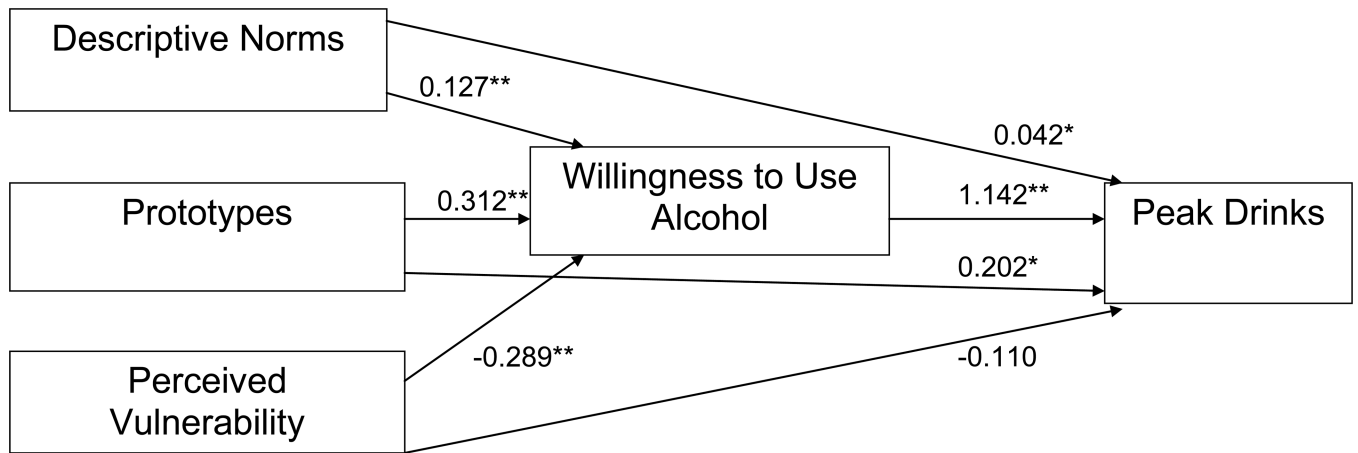
Note: $p < .01$**

Figure 2.
Multiple Mediation Figure predicting T3 peak drinks controlling for age, gender, peak drinks, School type

Note: $p < .01^{**}$.

Table 1

Study Means, Standard Deviations, and Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Age (T1)	-										
2. Gender (T1)	-.16**	-									
3. Drinks Per Week (T1)	-.05**	-.09**	-								
4. Peak Drinks (T1)	-.01**	-.07**	-.70**	-							
5. School Type (T1)	-.02**	-.05**	-.06**	-.07**	-						
6. Descriptive Norms (T2)	-.04**	-.06**	-.07**	-.12**	-.02**	-					
7. Prototype Favorability (T2)	-.01**	-.02**	-.06**	-.18**	-.12**	-.07**	-				
8. Perceived Vulnerability (T2)	-.10**	-.11**	-.06**	-.11**	-.05**	-.05**	-.01**	-			
9. Willingness to Drink (T2)	-.07**	-.13**	-.30**	-.44**	-.10**	-.11**	-.33**	-.18**	-		
10. Drinks Per Week (T3)	-.05**	-.17**	-.32**	-.43**	-.12**	-.10**	-.22**	-.09**	-.46**	-	
11. Peak Drinks (T3)	-.04**	-.16**	-.31**	-.47**	-.13**	-.06**	-.21**	-.06**	-.48**	-.78**	
Mean	17.58	0.58	2.32	2.18	0.17	8.67	2.68	3.29	2.04	4.45	3.54
Standard Deviation	0.51	0.49	6.31	4.08	0.37	9.82	1.49	0.92	1.62	7.56	4.59
Range	0–1	0–1	0–66	0–25	0–1	0–25	0–6	1–4	1–7	0–87	0–25

Note:

*
$p < .05.$

**
$p < .01,$

Gender: male = 0, female = 1; School type: public = 1, private = 0, T1= baseline, T2= 6 month, T3= 12 month