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Peer Drinking and Alcohol Use. The Role of Risk Perception, Perceived Vulnerability, and Gender: A Moderated Moderation Analyses

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Abstract

Objective: to examine the moderating role of alcohol-related risk perception and perceived vulnerability to alcohol consequences in the relationship between descriptive drinking norms and personal alcohol use, and to determine if this moderation was, in turn, moderated by gender. **Methods:** 538 college students (78.0% women, mean age=21.2) from three Spanish universities completed a paper-and-pencil questionnaire. Simple moderation and moderated moderation analyses were conducted. **Results:** Risk perception and perceived vulnerability moderated the relationship between drinking norms and alcohol use. This relationship weakened as perceived vulnerability and risk

perception increased. High levels of risk perception and perceived vulnerability nullified the effect of perceived peer drinking on drinking quantity among both men and women, but higher values were necessary to nullify these effects among men.

Conclusions: Risk perception and perceived vulnerability appear to be useful in identifying specific subgroups more vulnerable to the effects of drinking norms and might be effective strategies for weakening its impact on alcohol use, with such strategies being more beneficial for women than men. These variables could thus be incorporated into norm-based interventions as they may improve their effectiveness. Our findings highlight the importance of designing gender-specific interventions to reduce the potential negative impact of alcohol consumption.

Keywords: alcohol use, descriptive drinking norms, risk perception, perceived vulnerability, college students.

Introduction

College years are considered a critical period in which an increase in alcohol use and alcohol-related negative consequences are evidenced (Cho et al., 2015; Derefinko et al., 2016). Previous research has documented that alcohol use, heavy episodic drinking, and alcohol-related negative consequences are more prevalent among college students than their non-college counterparts (Chen & Jacobson, 2013; Patrick & Terry-McElrath, 2017; Schulenberg et al., 2018).

Descriptive drinking norms (i.e., the perception of peer alcohol use, Borsari & Carey, 2003), have frequently been identified as strong and proximal predictors of alcohol use among college students (Borsari et al., 2007; Eisenberg et al., 2014; Merrill & Carey, 2016). Evidence has shown that college students tend to perceive that their

peers drink more frequently and in greater quantities than they actually do (Borsari & Carey, 2001, 2003; Borsari et al., 2007; Dumas et al., 2019; Rinker & Neighbors, 2014). As a consequence of this overestimation, personal alcohol use is seen as less risky or non-problematic (Borsari & Carey, 2001), which leads to heavier personal alcohol use. Thus, correcting misperceptions of peer drinking has been promoted as a way of successfully reducing alcohol drinking among college students (e.g., Collins et al., 2014; LaBrie et al., 2013; Neighbors et al., 2010). However, there are instances where norm interventions have shown no or little effect on drinking behaviors (Foxcroft et al., 2015). This emphasizes the need to investigate when, how and on whom descriptive drinking norms have the greatest impact (Reynolds, 2019), in order to improve the effectiveness of norms-based interventions. In this regard, the study of personal and social factors that moderate the relationship between descriptive norms and behavior seem to be a promising line of research (Chung, & Rimal, 2016).

Risk perception and perceived vulnerability have been proposed as key elements in decision-making processes (Williams & Noyes, 2007) and constitute one of the main axes of various theories that attempt to explain health-related behaviors, such as the Protection Motivation Theory (Rogers, 1975) and the Health Belief Model (Rosenstock et al., 1988). These theories posit that the perceived riskiness of various behaviors for oneself and for others is closely linked to the engagement in those behaviors (Conner & Norman, 2005). Indeed, perceptions of lower alcohol-related risks and lower vulnerability to alcohol-related negative consequences have been linked to heavier alcohol use among college students (Chen, 2017; Jurcik et al., 2013; Pilatti et al., 2017). Moreover, these perceptions seem to vary as a function of gender. Specifically, compared to men, women have shown greater alcohol related risk perception and

perceived vulnerability to alcohol-related consequences (Grevenstein et al., 2014; Maričić et al., 2013; Petronella Croisant et al., 2013; Wild & Cunningham, 2001).

Previous studies have shown that, among college students, the relationship between descriptive drinking norms and alcohol use is moderated by various socio-cognitive and psychological factors, including gender (Lewis & Neighbors, 2004), emotional intelligence (Cash Ghee & Johnson, 2008), social anxiety (Neighbors et al., 2007), group identification (Neighbors et al., 2010), social comparison (Litt et al., 2012), alcohol beliefs (Crawford & Novak, 2010) and drinking motives (Halim et al., 2012; Lee et al., 2007). While some of these factors appear to strengthen the norm/behavior relationship, others appear to attenuate it. For example, in a study with 1400 college students, Lee et al. (2007) examined the moderating role of social drinking motives in the relationship between perceived peer drinking and weekly drinking quantity. Their results showed that stronger social drinking motives strengthened the relationship between descriptive norms and number of drinks consumed per week. Cash, Ghee, and Johnson (2008) found that a higher emotional intelligence weakened the impact of descriptive drinking norms on drinking quantity.

It could be expected that students with low-risk perception and low-perceived vulnerability are more vulnerable to the perceptions of their peers drinking behavior. However, to our knowledge, no studies have tested the moderating role of risk perception and perceived vulnerability in the relationship between descriptive drinking norms and drinking behavior. This information could be useful for identifying specific risk groups with similar characteristics and for increasing the effectiveness of interventions aimed at reducing the overestimation of peer drinking as a means of reducing excessive alcohol use. Thus, the present study sought to (i) examine the moderating role of alcohol-related risk perception and perceived vulnerability to alcohol

consequences in the relationship between descriptive drinking norms and personal alcohol use, and (ii) analyze whether this moderation effect differs according to gender.

Methods

Participants and procedure

A total of 603 undergraduate students were recruited from three Spanish universities in the South of Spain (universities of Almeria, Huelva, and Seville) through a convenience sampling procedure. To participate, students had to report at least one episode of alcohol use during the previous three months. The responses of 65 participants were discarded for reporting no alcohol use (49 never consumed alcohol and 14 had not drunk during the previous three months) or failing to report alcohol use frequency ($n=2$). Thus, the final study sample consisted of 538 college students (78.0% women, mean age = 21.21 ± 3.62) that were studying at the University of Huelva (59.3%); Almería (24.5%); or Seville (16.2%). The majority (66.9%) were studying for the degree in Psychology, 20.1% the degree in Social Education and 13.0% the degree in Education.

Once the study protocol was approved by the ethics committee of the University of Almería (Spain), students were invited to participate and those who agreed were asked to provide written informed consent and complete a self-administered questionnaire. Questionnaires were completed in groups of 20-50 students, in their classrooms, and in the presence of an interviewer. Researchers emphasized the confidentiality and anonymity of the data and that participation was voluntary.

Measures

Alcohol use

To measure the amount of alcohol consumed in a typical week during the last month, a modified version of the Daily Drinking Questionnaire (DDQ-Collins et al., 1985) was employed. The DDQ asks about the number of drinks consumed on each day of a typical week. This information was requested for six types of alcoholic beverages. To facilitate the task, each question was accompanied by images of the beverages, as established by the Spanish Observatory of Drugs and Addictions (Observatorio Español de las Drogas y las Adicciones, 2019). Based on the known alcoholic contents in each alcoholic beverage, the number of drinks consumed during a typical week was then converted into Standard Drink Units (SDUs), defining each SDU as equivalent to 10 grams of pure alcohol (Rodríguez-Martos et al., 1999).

Descriptive drinking norms

A modified version of the DDQ (Collins et al., 1985) was employed to assess perceived quantity of alcohol use for a same-sex typical college student. As with personal alcohol use, participants had to indicate the number of drinks they thought a same-sex typical college student of their university drank in a typical week during the previous month. Participants had to respond to this question for six types of alcoholic beverages. The number of drinks they perceived a typical student drank was then converted into perceived number of SDUs consumed in a typical week.

Perceived vulnerability to alcohol-related consequences

Based on previous studies (De los Reyes et al., 2010; Garcia et al., 2018; Wild et al., 2001) we included two questions to assess perceived vulnerability to alcohol-related consequences. Participants were asked to indicate how likely they believed they would suffer negative consequences when consuming alcohol, and when getting drunk. Responses ranged from: 1 - “very unlikely” to 5 - “very likely”. The scores of both

responses were summed to obtain a single score for perceived vulnerability to alcohol consequences. The correlation between these two items was $r_s = .71, p < .001$.

Risk perception of alcohol use

Similar to perceived vulnerability and based on previous studies (De los Reyes et al., 2010; Garcia et al., 2018; Wild et al., 2001), two questions were used to ask about the perceived risk of alcohol use and intoxication. Specifically, participants were asked to indicate how likely they believe that others would suffer negative consequences when consuming alcohol and when getting drunk (answers ranged from 1 - “very unlikely” to 5 - “very likely”). A single score for risk perception was obtained by summing the scores of both responses. The correlation between these two items was $r_s = .49, p < .001$.

Data analysis

To determine whether risk perception and perceived vulnerability moderated the relationship between descriptive drinking norms and drinking quantity, two independent moderation analyses were conducted using the PROCESS macro for SPSS (Hayes, 2017). Age and gender were included as covariates in these models. Then, to examine if these moderations differed according to gender, two moderated moderation models, also known as three-way interaction models, were computed using the PROCESS macro for SPSS (Hayes, 2017). The first model included perceived vulnerability as the primary moderator and gender as the secondary moderators, and the second model included risk perception (primary moderator) and gender (secondary moderator). Age was included as a covariate in both models. A depiction of the conceptual models tested can be observed in Figure 1. Bootstrap resampling (5,000 samples) was used to estimate 95% confidence intervals. Data analysis was conducted in SPSS 23.0 and the Alpha value was set at 0.05. The moderation effects of risk perception and perceived vulnerability was further examined with the Johnson-Neyman technique.

[Figure 1 near here]

Results

The means, standard deviations (*SD*), and correlation coefficients among the key variables of this study are shown in Table 1. Overall, participants perceived that peers consumed significantly more alcohol than themselves ($t(496) = -14.76, p < .001$). These differences were also detected for both men ($t(108) = -7.06, p < .001$) and women ($t(387) = -12.94, p < .001$). Moreover, risk perception was higher than perceived vulnerability for the total sample ($t(534) = -17.83, p < .001$) and for both men ($t(117) = -7.58, p < .001$) and women ($t(415) = -16.09, p < .001$).

[Table 1 near here]

The moderation models with perceived vulnerability ($F(5,490) = 53.09, p < .001$) and risk perception ($F(5,491) = 71.222, p < .001$) as independent moderators accounted for 35.1% and 42% of the total variance in drinking quantity, respectively. In both models, risk perception ($\beta = -.087, t = -11.840, p < .01$) and perceived vulnerability ($\beta = -.075, t = -9.117, p < .01$) significantly moderated the relationship between perceived peer drinking and personal drinking quantity. The Johnson-Neyman analysis (see Figure 2, panel A) showed that the positive effect of perceived peer drinking on drinking quantity decreased as risk perception increased. Indeed, among college students with very high risk perception (the 12.1% with values greater than 9.05) the relationship between perceived peer drinking and drinking quantity became statistically non-significant. When we analyzed the moderation effect of perceived vulnerability, the results of Johnson-Neyman technique (Figure 2, panel B) showed that the effect of perceived peer drinking was positive for most of the students (the 83.7% with values less than 8.25 in perceived vulnerability), but became non-significant for those with relatively high values in perceived vulnerability (the 11.9% of students with values between 8.25 and

9.97) and even changed to negative for those with extremely high values of perceived vulnerability (the 4.4% with values greater than 9.97).

[Figure 2 near here]

The moderated-moderation model with perceived vulnerability as the primary moderator and gender as the secondary moderator accounted for 40.1% of the total variance in drinking quantity ($F(8,487) = 40.824, p < .001$). The three-way interaction between perceived peer drinking, perceived vulnerability and gender was statistically significant ($\beta = -.051, t = -3.135, p < .01, \Delta R^2 = .012$). The positive effect of perceived peer drinking decreased as the level of perceived vulnerability increased, both for men and women (Figure 3, panel B). However, the moderation effect of perceived vulnerability was greater for men ($\beta = -.106, F(1,487) = 74.742, p < .001$) than for women ($\beta = -.055, F(1,487) = 27.517, p < .001$). The Johnson-Neyman procedure showed that the negative effect of perceived peer drinking became non-significant for women when their perceived vulnerability scores were greater than 7.96 (17.6% of the women in the sample) and for men when their perceived vulnerability scores were greater than 8.63 (9.7% of the men in the sample).

The moderated-moderation model with risk perception for alcohol use as the primary moderator and gender as the secondary moderator accounted for 46.1% of the variance in drinking quantity ($F(8,488) = 52.107, p < .001$). The three-way interaction between perceived peer drinking, risk perception, and gender was statistically significant ($\beta = -.034, t = -2.345, p < .05, \Delta R^2 = .006$). The positive effect of perceived peer drinking decreased as the level of risk perception increased, both for men and women (Figure 3, panel A). The moderation effect of risk perception was greater for men ($\beta = -.107, F(1,488) = 86.505, p < .001$) than for women ($\beta = -.072, F(1,488) = 62.009, p < .001$). The Johnson-Neyman procedure showed that the positive effect of

perceived peer drinking became non-significant for women when their risk perception scores were greater than 8.69 (11.9% of the women in the sample) and for men when their risk perception scores were greater than 9.58 (3.2% of the men in the sample).

[Figure 3 near here]

Discussion

There is ample evidence that descriptive drinking norms predict personal alcohol use (Merrill & Carey, 2016) and that greater perceived risk of alcohol use (for oneself and for others) is related to lower alcohol use (Wild et al., 2001). However, to the best of our knowledge, no study has analyzed the moderating role of perceived risk of alcohol use and perceived vulnerability to alcohol-related consequences in the relationship between descriptive drinking norms and alcohol use. The present study therefore aimed to address this gap in the literature. Moreover, since previous research has shown that alcohol descriptive norms (Lewis & Neighbors, 2004), risk perception, and perceived vulnerability (Wild & Cunningham, 2001) differ according to gender, we also examined whether these relationships vary as a function of this variable. Overall, our results revealed that the positive relationship between descriptive drinking norms and personal alcohol use was weaker among college students with higher risk perception and perceived vulnerability. Moreover, in light of our moderated moderation analyses, we found that high levels of risk perception and perceived vulnerability nullified the effect of descriptive drinking norms on personal alcohol use among both men and women. However, higher levels of risk perception and perceived vulnerability were necessary to nullify this effect among men.

Consistent with other studies conducted with college students (Dumas et al., 2018; Rinker & Neighbors, 2014), our results showed that both men and women perceived that their peers drank significantly more alcohol than they actually did, and that higher

levels of perceived peer drinking were related to a higher quantity of alcohol consumed in a typical week. Through the moderation analyses, our results also revealed that the strength of the association between descriptive drinking norms and alcohol use varied as a function of perceived vulnerability and risk perception levels. Actually, the positive effect of descriptive drinking norms on drinking behavior was no longer statistically significant among those with high levels of perceived vulnerability and risk perception. Previous research has highlighted the protective role of perceived vulnerability and risk perception on alcohol use through both cross-sectional (Chen, 2017; Jurcik et al., 2013; Pilatti et al., 2017) and longitudinal studies (Grevenstein et al., 2014). Our results support these previous findings by showing that the effect of drinking norms, a widely supported risk factor for alcohol use (Merril & Carey, 2016), was weaker among college students characterized by high levels of risk perception and perceived vulnerability.

Interventions focused on correcting descriptive drinking norms have shown to be effective in reducing alcohol consumption and related consequences, but most of these effects have been moderate or small (Foxcroft et al., 2015; Stockings et al., 2016). A recent review on social norms and how they shape behavior has highlighted the importance of identifying modifiable moderators that could attenuate the impact of social norms on behavior, as such information could provide the opportunity to improve the effectiveness of norms-based interventions (Chung & Rimal, 2016). Our study can make a contribution in this regard. The present findings show that alcohol risk perception and perceived vulnerability to alcohol-related harms, two variables that can be modified through prevention messages and information-based interventions (Chen, 2017; Miller et al., 2000), could be included as components of those interventions aimed at reducing excessive drinking among college students. Thus, these interventions could focus not only on correcting misperceptions about peer alcohol use, but also on

increasing perceived risk of alcohol use and vulnerability to alcohol-related consequences.

Interestingly, our results showed that, high levels of risk perception and perceived vulnerability nullified the effect of perceived peer drinking on drinking quantity among both men and women, but higher values on these variables were necessary to nullify this effect among men. These findings indicate that risk perception and perceived vulnerability appear to be more protective in women than men and, thus, changing risk perception and perceived vulnerability may be more likely to reduce alcohol use among women. These results are consistent with previous findings highlighting the importance of designing gender-specific interventions (Lewis & Neighbors, 2007; Petronella Croisant et al., 2013; Schulte et al., 2009) to reduce health-risk behaviors.

Some limitations should be considered when interpreting our results. The non-probabilistic sampling procedure employed here restricts the representativeness of our sample and the generalizability of our results to other Spanish college students and young adults. Another limitation concerns self-reported data. These measures might be affected by the participants' ability to recall and, thus, affect the validity of the results. Moreover, a bidirectional relationship between risk perception and substance use has been proposed (Grevenstein et al., 2014). Specifically, while perceived vulnerability and risk perception may influence alcohol use, alcohol consumption could cause individuals to re-evaluate their perceptions of risk (for themselves and others). However, the cross-sectional design of our study limits the ability to interpret our findings in terms of predictability and does not allow us to disentangle the directionality of this relationship. Thus, longitudinal studies should be designed to clarify these associations. Finally, because the size of the three-way interaction effects was small and the design was not balanced in terms of gender, it is indeed likely that the actual statistical power for

detecting three-way interactions was less than desired.. Thus, future studies should include larger and more gender-balanced samples.

Despite these limitations, our findings suggest that risk perception and perceived vulnerability appear to be useful variables for identifying specific subgroups of college students, that seem to be more vulnerable to the effects of descriptive drinking norms on drinking behavior. Besides, due to their modifiability, risk perception and perceived vulnerability might be effective ways of mitigating the impact of descriptive drinking norms on alcohol use among college students, and could be incorporated into norm-based interventions in order to improve their effectiveness. Moreover, our results show that this strategy could be more useful among women than men, highlighting the importance of designing gender-specific interventions to reduce the potential negative impact of alcohol consumption. Thus, the present results provide valuable information that could equip policymakers with useful strategies for improving college students' health and offer useful material for public health practitioners when designing health interventions.

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Conflict of Interest

The authors report there are no competing interests to declare.

Data Availability Statement

Materials and data used in this manuscript will be available by emailing the corresponding author.

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Table 1*Correlations among study variables and descriptive statistics for the total sample and as a function of gender*

Variables	1	2	3	4	Mean (SD)			<i>t</i>
					Total	Men	Women	
1. SDUs typical week	---				11.42 (13.40)	12.73 (17.60)	11.07 (12.01)	-1.15
2. Perceived peers drinking quantity	.469***	---			27.13 (26.61)	29.13 (29.78)	26.56 (25.64)	-.91
3. Perceived vulnerability	-.077	-.026	---		6.59 (2.02)	6.53 (2.04)	6.62 (2.01)	.41
4. Risk perception	-.191***	-.054	.462***	---	8.01 (1.34)	7.77 (1.48)	8.08 (1.30)	2.22*

* $p < .05$, ** $p < .01$, *** $p < .001$

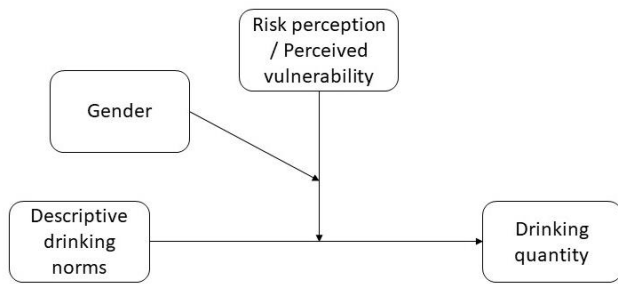


Figure 1. Conceptual model of the moderated moderation mode

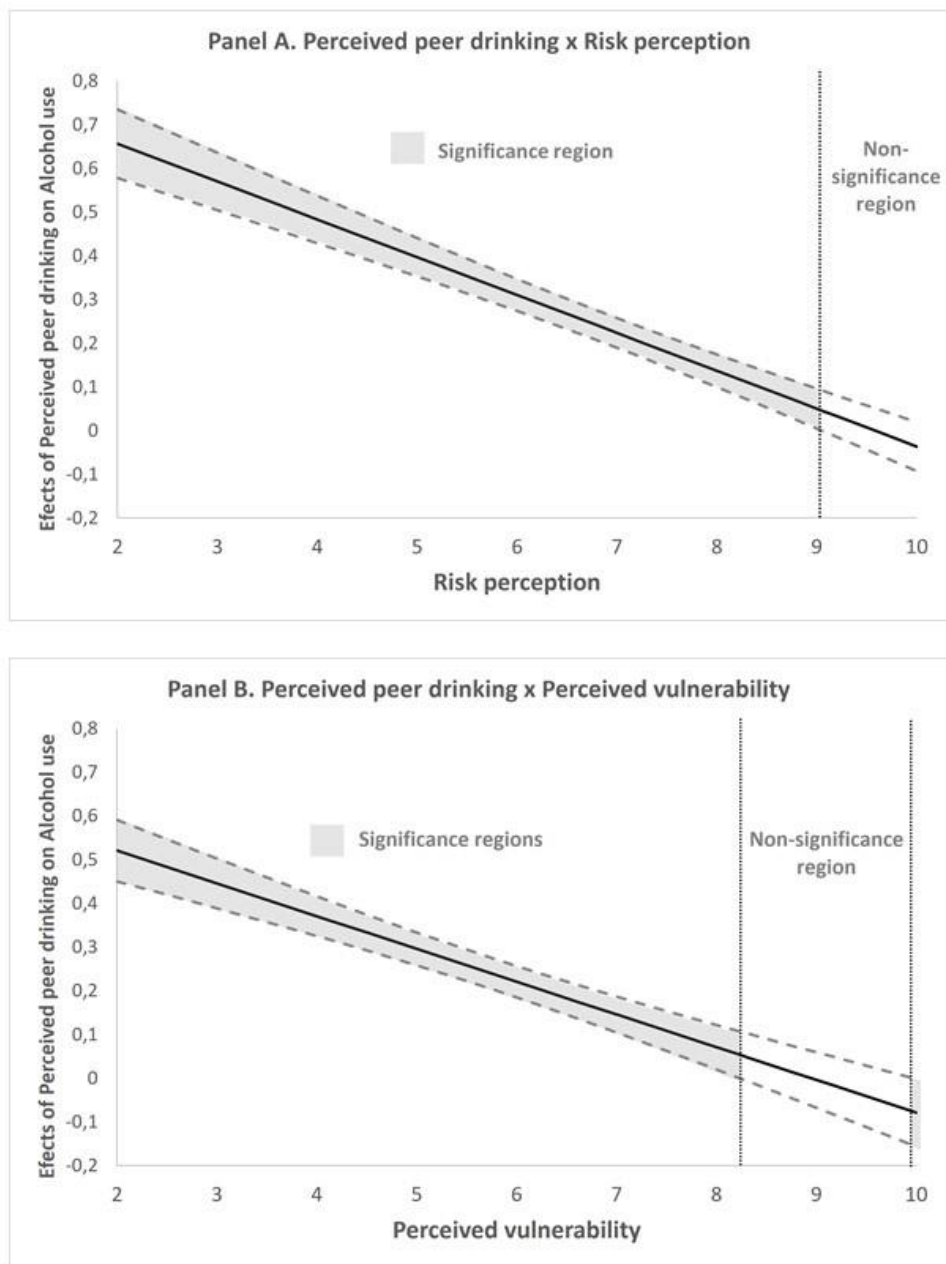


Figure 2. Moderating effect of risk perception/perceived vulnerability on the relationship between perceived peer drinking and personal alcohol use

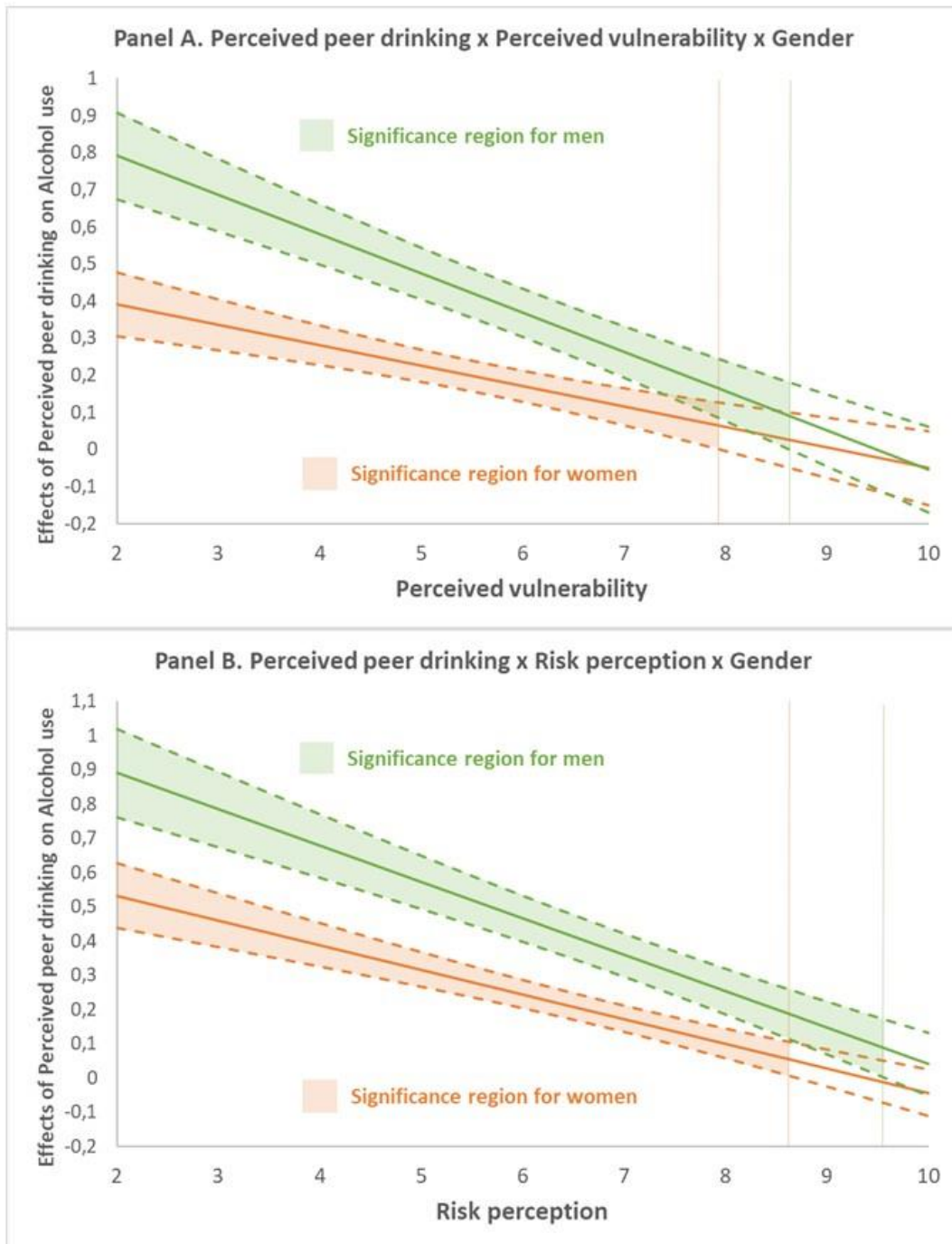


Figure 3. Three-way interaction (moderated moderation) between perceived peer drinking quantity, gender, and perceived vulnerability/risk perception for quantity of alcohol consumed in a typical week