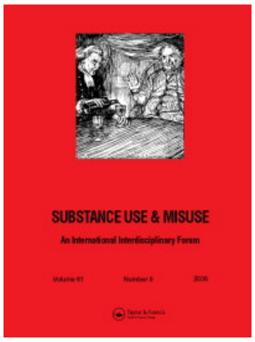

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ORIGINAL ARTICLE

Problematic Alcohol Use and Decision-Making in High-Functioning Young Adults: roles of Fluid Intelligence, Risk Perception and Sex

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ABSTRACT

Background: Problematic alcohol use is common in young adults and may influence decision-making processes, yet evidence in non-clinical populations remains limited. This study examined whether problematic alcohol use predicts decision-making performance in high-functioning young adults, and whether this relationship is moderated by sex.
Methods: A total of 133 participants (18–25 years) completed the Alcohol Use Disorders Identification Test (AUDIT), the DOSPERT-30 health/safety risk perception subscale (RP-HS), the WAIS-IV Matrix Reasoning subtest to assess fluid intelligence (Gf), and a computerized Iowa Gambling Task (IGT). A multiple linear regression model was used to predict IGT from AUDIT, Gf, and RP-HS. Moderation by sex was tested *via* the AUDIT × Sex interaction.
Results: Higher AUDIT scores were associated with poorer IGT performance, whereas Gf positively predicted performance. RP-HS showed a modest negative association. Supplementary analyses indicated that this association was driven primarily by the AUDIT dependence symptoms domain. The relationship between problematic alcohol use and decision-making was moderated by sex, with the association observed primarily in men.
Conclusion: These findings provide novel evidence that even non-clinical problematic alcohol use is associated with disadvantageous decision-making in high-functioning young adults, particularly in men.

KEYWORDS
Problematic alcohol use; decision-making; fluid intelligence; risk perception; sex differences

Introduction

Alcohol use is one of the most prevalent risk behaviors in early adulthood, a developmental period marked by social and academic transitions and frequent participation in events where drinking is common (Slutske, 2005; Vera et al., 2020). Although these patterns often do not meet clinical criteria for alcohol use disorder (AUD), accumulating evidence suggests that even non-clinical alcohol use may be associated with structural alterations in gray and white matter, particularly in prefrontal regions involved in executive control (Nutt et al., 2021). Such findings have raised the question of whether a clearly safe threshold of alcohol use exists, as both moderate intake and episodic heavy drinking could affect cognitive functions such as decision-making.

Decision-making refers to the process of selecting among alternative courses of action when outcomes are uncertain. This multifaceted cognitive function involves evaluating options, anticipating potential consequences, and integrating information from processes such as memory and attention (Levine, 2022). One of the most widely used paradigms to assess decision-making under uncertainty is the Iowa Gambling Task (IGT). In this task, participants repeatedly select cards from four decks that yield fictitious monetary gains and losses: two decks are disadvantageous in the long term and two are advantageous, so performance depends on learning to favor the most beneficial options over time (Bechara et al., 2000).

The IGT has been shown to be sensitive to impairments associated with alcohol use (Bechara et al., 2001, 2002; Bechara & Damasio, 2002). Several studies report that individuals with AUD perform worse on the task compared to healthy controls (Bottesi et al., 2015; Sübay & Sönmez, 2021; for a review, see Kovács et al., 2017). Beyond clinical populations, patterns of heavy drinking have also been linked to poorer IGT performance (Goudriaan et al., 2007). However, studies in non-clinical samples of young adults often show substantial variability in IGT scores, suggesting that individual differences in alcohol use may partly explain variability in decision-making performance.

Although some studies suggest that performance on the IGT is not primarily explained by general intelligence (Bechara et al., 2001; for a review, see Toplak et al., 2010), fluid intelligence (Gf) may still influence decision-making under uncertainty. Gf refers to the capacity to reason, detect patterns, and solve novel problems independently of previously acquired knowledge (Cattell, 1963; Kent, 2017; Perfetti et al., 2009).

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Because the IGT requires learning from feedback, inhibiting disadvantageous choices, and adapting strategies across trials, higher Gf may facilitate task performance. Examining the role of Gf may therefore help clarify individual differences in IGT performance among young adults, a population in which alcohol use is common and executive systems are still developing.

Risk perception is considered a key factor in decision-making. Because young adults often underestimate health risks, examining this construct is especially relevant in university populations (Crawford et al., 2025). Individuals who perceive lower risks in health and safety contexts are more likely to engage in hazardous behaviors, including excessive drinking, whereas higher risk perception may act as a protective factor (Weber et al., 2002). Evidence also suggests that frequent and problematic drinkers perceive their own alcohol use as less risky, even when meeting criteria for AUD (Choi et al., 2024). Since the IGT assesses decision-making under ambiguity, its association with alcohol use may help clarify whether differences in decision-making are partly explained by health/safety risk perception (RP-HS), as measured by the DOSPERT-30 subscale (Lozano et al., 2017).

Finally, sex differences have been consistently reported in decision-making on the IGT. Meta-analytic evidence indicates systematic sex differences in IGT performance, with males tending to obtain higher net scores than females (Zanini et al., 2025). In parallel, alcohol involvement also differs by sex: males generally report higher levels of alcohol consumption and are more likely to engage in episodic heavy or binge drinking (Bø et al., 2016; Vera et al., 2020), whereas biological and metabolic factors make females more vulnerable to alcohol-related toxicity (Erol & Karpyak, 2015; Flores-Bonilla & Richardson, 2020). Importantly, longitudinal research suggests that the association between decision-making deficits and subsequent heavy alcohol use may be stronger in males than in females (Goudriaan et al., 2011). Together, these findings suggest that the relationship between problematic alcohol use and decision-making may vary by sex, highlighting the importance of examining sex as a potential moderator.

In this context, the present study aimed to examine whether problematic alcohol use, assessed using the Alcohol Use Disorders Identification Test (AUDIT), is associated with decision-making performance in healthy young adults with low problematic alcohol use and medium-to-high educational attainment. Gf and RP-HS were included as additional predictors, and sex was tested as a moderator to clarify how problematic alcohol use relates to decision-making in high-functioning young adults. We hypothesized that higher problematic alcohol use would be associated with poorer decision-making performance on the IGT, even after accounting for fluid intelligence and risk perception.

Methods

Participants

Participants were recruited at the university through convenience sampling, using word-of-mouth advertising and social media posts (Instagram and Facebook). Inclusion criteria were: (a) age between 18 and 25 years, (b) both sexes, and (c) provision of informed consent. Exclusion criteria included abstinence from alcohol use (AUDIT = 0). After applying these criteria (abstinent = 6), the final sample comprised 133 participants.

Procedure

The study was conducted entirely online in two phases. Phase 1 (asynchronous): participants provided informed consent and demographic information (age, sex, years of education, and place of residence), then completed the AUDIT and the DOSPERT-30. Phase 1 typically required approximately 10–15 min to complete. To ensure data quality in the asynchronous portion of the survey, response timestamps were monitored to identify implausibly fast or unusually delayed responses, which were excluded from the analytic dataset.

Phase 2 (synchronous): participants attended a supervised videoconference session lasting approximately one hour. During this session, trained psychologists administered the WAIS-IV Matrix Reasoning subtest following standardized procedures, and participants completed the computerized IGT. The synchronous session typically took place within approximately three days of the asynchronous survey.

The study was approved by the local ethics committee in accordance with the Declaration of Helsinki. All participants provided informed consent after being informed of their right to withdraw at any time. Anonymity was preserved by generating random numerical identifiers for each participant. Participation was voluntary, and no financial incentives were provided.

Alcohol use disorders identification test (AUDIT)

Problematic alcohol use was assessed with the Spanish version of the Alcohol Use Disorders Identification Test (AUDIT) (Alvarado et al., 2009). AUDIT is a 10-item self-report screening questionnaire. The scale comprises three domains: alcohol consumption (items 1–3), dependence symptoms (items 4–6), and alcohol-related consequences (items 7–10). Items 1–8 are scored on a 0–4 Likert scale, whereas items 9–10 are scored 0, 2, or 4.

AUDIT total scores range from 0 to 40, with scores between 0 and 7 indicating low-risk drinking. Scores from 8 to 15 are typically interpreted as reflecting hazardous alcohol use, while scores between 16 and 19 suggest harmful drinking. Scores of 20 or higher are generally considered indicative of probable alcohol dependence, although the AUDIT is a screening instrument and not a diagnostic tool (Babor et al., 2001). To maximize variability and preserve statistical power, we included all participants who reported any alcohol use and excluded only abstainers (AUDIT = 0).

DOSPERT-30 health/safety risk perception subscale

The Domain-Specific Risk-Taking Scale (DOSPERT) is designed to assess risk-related attitudes and behaviors across everyday domains, including health and safety, recreation, finance, ethics, and social interactions (Weber et al., 2002).

In the present study, the full Spanish version of the DOSPERT-30 was administered (Lozano et al., 2017), but analyses focused on the health/safety risk perception subscale (RP-HS), given its direct relevance to alcohol-related decision-making. This subscale assesses the extent to which individuals perceive behaviors related to physical well-being and personal safety as risky. Example items include "consuming five or more alcoholic drinks on a single occasion" or "driving without wearing a seatbelt." It consists of 6 items rated on a 1 (not at all risky) to 7 (extremely risky) Likert scale, with higher scores reflecting greater risk perception.

The Iowa gambling task (IGT)

Participants completed a computerized version of IGT (https://www.psytoolkit.org/experiment-library/igt.html), which assesses decision-making under ambiguity (Bechara et al., 1994). In this version, participants chose among four buttons labeled A, B, C, and D (instead of card decks) and had to learn through trial and error which options were advantageous in the long term (C and D) and which were disadvantageous (A and B). At the start, each participant received a fictitious balance of $2000 and was instructed to maximize gains across 100 trials. Buttons A and B always yielded $100, while buttons C and D yielded $50. Each choice carried a 50% chance of a penalty: $250 for A and B, and $50 for C and D.

The primary outcome variable was the IGT net score, calculated as the number of advantageous choices (C + D) minus disadvantageous choices (A + B). Higher scores reflect better task performance, indicating more adaptive long-term decision-making.

WAIS-IV matrix reasoning subtest

Fluid intelligence (Gf) was assessed with the Matrix Reasoning subtest of the WAIS-IV (Wechsler, 2012). This task measures nonverbal abstract reasoning through the completion of visual patterns, where participants must select the option that best completes a series of figures following a logical rule. The subtest is part of the WAIS-IV Perceptual Reasoning Index and is considered a reliable estimator of fluid intelligence (Roca et al., 2010; Tranel et al., 2008). Raw scores, corresponding to the total number of correct responses, were converted into standardized scaled scores using age-adjusted normative tables (Wechsler, 2012; Merz et al., 2021).

Statistical analysis

Analyses followed a prespecified hierarchical plan and were conducted in Python (v3.12.3). Abstainers (AUDIT = 0) were excluded. Continuous predictors were standardized (z-scores), whereas the IGT total score was retained in raw units. Prior to modeling, plausibility checks were applied to key numeric variables based on theoretical ranges; values outside these bounds (<3% across variables) were treated as missing without imputation. All scripts and anonymized data are available in the project repository.

The primary model examined whether problematic alcohol use (AUDIT total score) predicted IGT total score using ordinary least squares (OLS) regression. Predictors included standardized AUDIT scores, fluid intelligence (Gf), and health/safety risk perception (RP-HS). Heteroscedasticity-consistent HC3 standard errors were used. Additional exploratory models examined the three AUDIT domains and binge drinking frequency (item 3).

A secondary moderation model tested whether the association between AUDIT and IGT differed by sex (0 = female, 1 = male) by including the AUDIT × Sex interaction while adjusting for Gf and RP-HS.

Model assumptions were evaluated using standard diagnostics (linearity, normality of residuals, homoscedasticity, multicollinearity, and influential observations). A sensitivity analysis excluded cases exceeding Cook's $D > 4/n$. To assess robustness, 5,000 bootstrap resamples were conducted using both simple and sex-stratified procedures. Percentile-based 95% confidence intervals and empirical two-tailed p-values were computed. Statistical significance was defined as $p < 0.05$.

Results

Participants were young adults with high levels of education and predominantly within the low-risk drinking range according to AUDIT (78.95%), allowing examination of variability in problematic alcohol use within a non-clinical spectrum (see Table 1 and Tables S1–S3). IGT performance showed substantial interindividual variability, with scores ranging from markedly disadvantageous to clearly advantageous decision-making.

Across AUDIT domains, a substantial proportion of participants reported at least one alcohol-related indicator (i.e., at least one non-zero response; see Table S4). However, among participants with non-zero responses, most responses corresponded to the lowest frequency category ("less than monthly"), with relatively few participants reporting higher-frequency responses (see Table S5).

Table 2 presents sample characteristics by sex. No significant sex differences were observed in age, years of education, AUDIT total score, or Gf. Males obtained higher IGT scores ($p = 0.025$), whereas females reported higher RP-HS ($p = 0.004$).

The multiple regression model predicting IGT performance from AUDIT, Gf, and RP-HS was statistically significant, $F(3, 129) = 9.04$, $p < 0.001$, explaining approximately 16% of the variance ($R^2 = 0.155$; Table 3), indicating a

Table 1. Demographic and cognitive characteristics ($n = 133$).

	Mean (SD)
Age	21.85 (2.14)
Years of education	14.79 (2.15)
AUDIT	5.19 (3.26)
RP-HS	32.73 (4.27)
IGT	9.02 (30.24)
Gf	101.58 (14.31)

Note. AUDIT = Alcohol Use Disorders Identification Test; RP-HS = Risk Perception in health and safety subscale (DOSPERT-30); IGT = total score on the Iowa Gambling Task; Gf = standardized fluid intelligence score (WAIS-IV).

modest but statistically significant model fit. Higher problematic alcohol use was associated with poorer IGT performance (β = −5.05, $p = 0.024$), whereas Gf was a strong positive predictor ($\beta = 8.94$, $p < 0.001$). RP-HS showed a modest negative association with IGT performance in the primary model (β = −4.96, $p = 0.047$). Model assumptions were satisfied, and results remained unchanged in sensitivity analyses excluding influential observations (see Tables S6–S8 and Figures S1–S3).

To explore which dimensions of problematic alcohol use were associated with decision-making performance, additional models examined the three AUDIT domains separately (consumption, dependence symptoms, and consequences). Only the dependence symptoms domain was associated with poorer IGT performance (β = −5.91, $p = 0.006$), whereas consumption and alcohol-related consequences were not significant predictors (see Table S9). When entered simultaneously, the dependence symptoms domain remained the only significant predictor (β = −5.52, $p = 0.039$) (see Tables S10–11). Analyses of binge drinking frequency (AUDIT item 3) were also nonsignificant (see Table S12).

To clarify what "dependence symptoms" represented in this sample, we examined the distribution of responses to the three dependence symptoms items (AUDIT items 4–6; see Table S13). Among participants reporting any non-zero response, the majority of responses corresponded to the lowest frequency category (i.e., "less than monthly"). Only a small proportion of participants reported more frequent symptoms (scores ≥ 2), ranging from 1.5% (item 5) to 6.0% (item 4). Reporting was not evenly distributed across items: item 5 (increased salience of drinking) showed the highest frequency (21.1%), followed by item 4 (impaired control over drinking; 18.0%), whereas item 6 (morning drinking) was least frequently reported (12.8%). This pattern indicates that the "dependence symptoms" domain in this sample was primarily driven by low-frequency endorsement of items reflecting functional consequences or occasional loss of control (particularly item 5), rather than more severe indicators such as morning drinking.

The moderation model was also significant, F(5, 127) = 9.16, $p < 0.001$, explaining approximately 24% of the variance (R^2 = 0.235; see Table 4). The structure of this model is summarized in Figure 1. The AUDIT × Sex interaction was significant (β = −16.59, $p = 0.004$), indicating that higher alcohol use predicted poorer IGT performance in males, but not in females (see Figure 2). Gf remained a robust positive predictor ($\beta = 8.78$, $p < 0.001$), and RP-HS was not significant (β = −4.34, $p = 0.100$). At average AUDIT levels, males performed better than females overall ($\beta = 14.94$, $p = 0.016$).

Bootstrap resampling (5,000 iterations) confirmed the stability of all key effects. The AUDIT × Sex interaction was consistently significant in both simple ($p = 0.010$; 95% CI [−27.6, −5.1]) and sex-stratified bootstrap procedures ($p = 0.008$; 95% CI [−27.4, −4.8]). Gf remained a significant predictor across all bootstraps ($p < 0.001$). Bootstrap estimates closely matched HC3 coefficients, supporting the robustness of the findings (see Table S14).

Table 2. Demographic and cognitive characteristics by sex.

	Male	Female	*p* (Welch's t-test)
n (%)	31 (23.3%)	102 (76.7%)	–
Age	21.7 ± 2.2	21.9 ± 2.1	0.615
Years of education	14.5 ± 1.9	14.9 ± 2.2	0.327
AUDIT	5.3 ± 2.7	5.1 ± 3.4	0.768
IGT	21.0 ± 34.1	5.4 ± 28.1	0.025*
Gf	100.3 ± 14.3	102 ± 14.4	0.578
RP-HS	30.8 ± 4.1	33.3 ± 4.2	0.004**

Note. AUDIT = Alcohol Use Disorders Identification Test; IGT = total score on the Iowa Gambling Task; Gf = standardized fluid intelligence score (WAIS-IV). RP-HS = Risk Perception in health and safety subscale (DOSPERT-30).
**p* < 0.05.
***p* < 0.01.

Table 3. Linear regression analysis for predictors of IGT estimated with HC3.

	β	95%CI	*p*
AUDIT	−5.05	[−9.44, −0.67]	0.024*
Gf	8.94	[4.57, 13.31]	<0.001**
RP-HS	−4.96	[−9.85, −0.06]	0.047*
	Rsquared = 0.155 Adj. Rsquared = 0.135 *p* < 0.000**		

Note. AUDIT = Alcohol Use Disorders Identification Test; Gf = standardized fluid intelligence score (WAIS-IV); RP-HS = Risk Perception in health and safety subscale (DOSPERT-30). All variables are presented in standardized form.
**p* < 0.05.
***p* < 0.01.

Table 4. Moderation model estimated with HC3.

	β	95%CI	*p*
AUDIT	−2.54	[−7.2, 2.12]	0.285
Sex	14.94	[2.77, 27.11]	0.016*
AUDIT × Sex	−16.59	[−27.84, −5.33]	0.004**
Gf	8.78	[4.45, 13.1]	<0.001**
RP-HS	−4.34	[−9.5, 0.83]	0.100
	Rsquared = 0.235 Adj. Rsquared = 0.205 *p* < 0.000**		

Note. AUDIT = Alcohol Use Disorders Identification Test; Gf = standardized fluid intelligence score (WAIS-IV). RP-HS = Risk Perception in health and safety subscale (DOSPERT-30). All variables presented in standardized form.
**p* < 0.05.
***p* < 0.01.

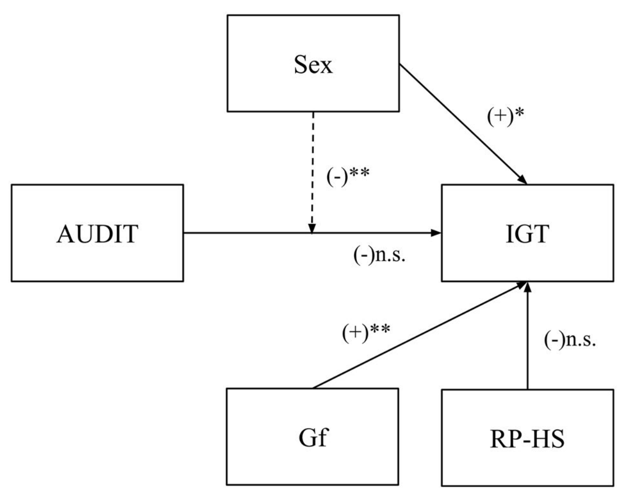

Figure 1. Moderation model of the association between AUDIT and IGT by sex. Solid arrows represent direct effects, and the dashed arrow represents the moderation effect of Sex on the AUDIT–IGT association. Signs next to each arrow indicate the direction of the standardized coefficients: (+) positive; (–) negative. Asterisks denote statistically significant paths *p < 0.05; **p < 0.01; while "n.s." indicates non-significant paths. Results are based on the HC3-corrected moderation model.
Note. AUDIT = Alcohol Use Disorders Identification Test; Gf = standardized fluid intelligence score (WAIS-IV); RP-HS = Health/Safety Risk Perception subscale of DOSPERT-30.

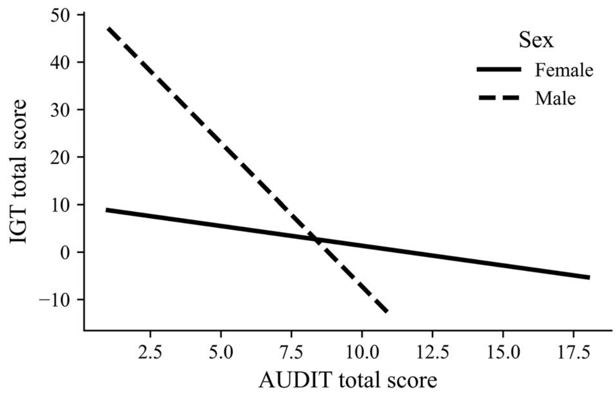

Figure 2. Interaction between sex and AUDIT as predictors of IGT.
Lines show linear fits of IGT net score as a function of AUDIT score for females (solid) and males (dashed). A negative association was observed in both groups, but it reached statistical significance only in males. Higher IGT values reflect more advantageous choices; higher AUDIT indicates greater problematic alcohol use.
Note. AUDIT = Alcohol Use Disorders Identification Test; IGT = Iowa Gambling Task.

Discussion

The present study examined whether problematic alcohol use is associated with decision-making performance in young adults. In the primary model, higher AUDIT scores were associated with poorer IGT scores, whereas Gf emerged as a strong positive predictor of IGT performance. RP-HS also showed a modest negative association with IGT scores, indicating that individuals reporting higher perceived risk tended to perform less advantageously on the task.

The present findings both align with and extend previous research linking disadvantageous decision-making to problematic alcohol use in non-clinical populations. Prior work in university samples has shown that poorer IGT performance is associated with trajectories of binge drinking (Goudriaan et al., 2007). In the present study, however, when problematic alcohol use was examined dimensionally using the AUDIT, this association was specific to the dependence symptoms domain (items 4–6), which captures early indicators of impaired control over alcohol use, and was not explained by the frequency of heavy drinking episodes (AUDIT item 3). It is important to note that the relatively high proportion of participants who reported at least one point in the dependence symptom domain (38%) primarily reflected low-frequency responses (predominantly in the "less than once a month" category), with only a small proportion of participants reporting more frequent symptoms (≥2). These responses contributed minimally to total AUDIT scores, such that participants largely remained within the low-risk category. Accordingly, the dependence domain in this sample reflects subclinical variability in alcohol-related control processes rather than clinically significant dependence.

Another central finding was the robust association between Gf and IGT performance. This result suggests that stronger fluid reasoning abilities may facilitate the flexibility and feedback integration required for decision-making under ambiguity. Although previous studies have often reported weak or inconsistent associations between intelligence and IGT performance (Bechara et al., 2001; Barry & Petry, 2008; see also Toplak et al., 2010), our findings support the view that fluid intelligence may represent an important cognitive component of adaptive performance on the task.

RP-HS also showed a modest association with IGT performance, with higher perceived risk related to poorer task performance. One possible interpretation is that individuals with greater sensitivity to potential harm may adopt more conservative strategies under uncertainty, limiting the exploratory learning required to identify advantageous options in the IGT. This pattern does not necessarily contradict prior evidence linking higher perceived risk to reduced engagement in hazardous behaviors (Choi et al., 2024; Crawford et al., 2025; Weber et al., 2002). Rather, it suggests that explicit risk perception and performance in reinforcement-learning tasks may rely on partly distinct processes. Consistent with this view, research on the "description–experience gap" shows that decisions based on experience can diverge from those based on explicitly described risks (Hertwig & Erev, 2009), and self-reported risk attitudes often correlate only weakly with behavioral measures of risk-taking (Frey et al., 2017).

Secondary analyses suggested a moderating effect of sex: higher problematic alcohol use was associated with poorer IGT performance in men, whereas no such association was observed in women. This finding is broadly consistent with longitudinal evidence showing that disadvantageous IGT performance predicts higher levels of heavy drinking over time particularly among male students (Goudriaan et al., 2011). Sex differences in decision-making on the IGT have also been reported in meta-analytic evidence, with men typically obtaining higher net scores than women (Zanini et al., 2025). In parallel, previous research indicates that men generally report higher levels of alcohol consumption and more frequent episodic heavy drinking (Bø et al., 2016; Vera et al., 2020). Together, these findings suggest that behavioral differences in alcohol use patterns may contribute to sex-specific associations between problematic alcohol use and decision-making.

From a neurocognitive perspective, performance on the IGT has been linked to prefrontal systems involved in value evaluation and adaptive decision-making, including the dorsolateral and ventromedial prefrontal cortex and the anterior cingulate cortex (Bechara et al., 2001). These systems are also implicated in inhibitory control and the regulation of goal-directed behavior, processes that may be relevant to the association observed between problematic alcohol use and decision-making in the present study. These regions, as well as white-matter pathways such as the corpus callosum, are known to be vulnerable to alcohol-related neurotoxicity (Nutt et al., 2021). The positive association between Gf and IGT performance observed in this study is consistent with this perspective, as Gf has been linked to the integrity of frontoparietal control networks that support cognitive flexibility and complex reasoning (Caudle et al., 2023; Perfetti et al., 2009; Roca et al., 2010).

Beyond theoretical implications, these findings may also have practical relevance. Problematic alcohol use was associated with poorer decision-making performance, particularly among men, suggesting that certain patterns of alcohol-related problems may be linked to suboptimal decision processes even in non-clinical young adults. These results highlight the potential value of prevention strategies aimed at promoting healthier decision-making and alcohol-related behaviors in this population.

This study has several limitations. Although the overall sample size was adequate, the sex distribution was unbalanced, which may have affected the precision of sex-specific estimates. Additionally, the sample was non-clinical and most responses of the dependence symptoms domain were of low frequency, which limits the generalizability of the findings to more severe populations. Finally, the cross-sectional design precludes causal inference. Although the present results show an association between problematic alcohol use and decision-making performance, longitudinal evidence indicates that disadvantageous IGT performance may also prospectively predict increases in alcohol use (Goudriaan et al., 2011). Therefore, the direction of the relationship between problematic alcohol use and decision-making cannot be determined from the present data.

Conclusions

Taken together, these findings indicate that decision-making performance on the IGT is associated with problematic alcohol use, fluid intelligence, and risk perception in high-functioning young adults. Importantly, this association was not explained by alcohol consumption or binge drinking frequency, but was specifically associated with the AUDIT dependence symptoms domain.

These results suggest that disadvantageous decision-making may be linked to early or subtle manifestations of early impaired control over alcohol use, even in non-clinical populations. Additional analyses indicated that this relationship was present in men but not in women, pointing to potential sex differences in how alcohol-related processes relate to decision-making.

Overall, the findings highlight the importance of considering both cognitive factors and early manifestations of impaired control, as well as sex differences, when examining the relationship between alcohol involvement and decision-making in young adults.

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Ethical statement

The study was approved by the relevant institutional ethics committee, in accordance with the Declaration of Helsinki.

Author contributions

CRediT: **Nicolás Guillermo González**: Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Sofia Rodriguez Lopez de Osornio**: Data curation, Investigation; **Sofia Lynch**: Data curation, Investigation; **Paula Mennella Caggiano**: Data curation, Investigation; **Lucía Alba-Ferrara**: Conceptualization, Supervision, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

All data and materials associated with this study are available in an anonymized, view-only OSF repository created for peer review. The repository includes the dataset, analysis scripts, output tables, and figures. Access link: https://osf.io/h4faw/?view_only=107b693e7e1a4085bf2284c9e800332e

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