An Exploration of the Effects of Age and Gender on the Relationship Between Alcohol Consumption and Impulsivity.

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Abstract
This study sought to investigate the relationship between impulsivity and alcohol use behaviours in a university student sample. The secondary aim of the study was to explore whether age and gender influence this relationship. An on-line anonymous questionnaire, comprising of the Barratt Impulsiveness Scale-11 (BIS-11) and the Alcohol Use Disorders Identification Test (AUDIT), elicited data from 156 students randomly recruited from a university setting, with an age range of 18-59 years ( =22.62 years; SD=6.73 years; M:F=1:1.62). The BIS-11 evaluated impulsivity along three second-order traits (attentional traits, motor traits and non-planning traits) whilst the AUDIT determined the extent of current or potential hazardous alcohol use, dependence symptoms and/or harmful alcohol use. Data analysis revealed that a large proportion of students fell within the medium problem drinking range and within the normal range of impulsiveness. A strong association between impulsivity and patterns of alcohol use was observed, independent of age and gender, for both the 18-20 age range and the 21 and older age range. However, impulsivity accounted for only a moderate amount of total variance in alcohol scores. These findings were considered in light of methodological strengths (e.g. validity of measures) and weaknesses (e.g. limitations for age balance in a student sample), as well as recommendations for further research and policy actions.

Literature Overview
Stanford et al. (2009) raise the concern that the ability of a person to modulate their cognition and behaviour to fit envir-
onmental demands is imperative as most of life’s decisions involve balancing anticipated reward and risk (Zuckerman & Kuhlman, 2000). Understanding the role of impulsiveness for both healthy and harmful behaviours, such as alcohol abuse, is, therefore, of social importance, as once the pattern of gratification becomes habitual, the decision-making process becomes disconnected between opportunity, approach and consummation (Zuckerman & Kuhlman, 2000). Due to the relevance of this topic to current health policies and healthcare practices, the current project set out to uncover the influence of three possible variables, namely impulsivity, age and gender, on the pattern of harmful alcohol use, in a university student sample.

Impulsiveness is a complex construct defined as a predisposition of an individual to engage in non-planned, rapid reactions towards internal and external stimuli, without consideration for the possible negative consequences for themselves or others (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). A further aspect of impulsivity was outlined by Zuckerman & Kuhlman (2000) as a deficit in the inhibition of dangerous reward-seeking behaviour. Both definitions are reflected in Aragues, Jurado, Quinto & Rubio’s (2011) argument that impulsivity is a heterogeneous construct, encompassing both a reduced capacity of behavioural inhibition and the tendency to choose short-term over long-term gains. Similarly, Reynolds, Ortengren, Richards & de Wit (2006) labelled these two components “impulsive disinhibition” and “impulsive decision-making”.

Generally, higher levels of impulsivity have been positively associated with various socially deviant behaviours such as aggression (Ramadan & McMurry, 2005), substance abuse (Dick et al., 2010) and, in particular, alcohol consumption (Grau & Ortet, 2005; Murphy & MacKillop, 2012). Several studies have indicated that impulsivity is a predictor of alcohol use disorders (Tarter & Kirisci, 1997; Clark, Vanyukov & Cornelius, 2002). Whiteside & Lynam (2001) argue that no single personality trait is sufficient to predict the tendency to act and behave impulsively. Depue & Collins (1999) support the view of impulsivity as a heterogeneous construct consisting of a cluster of lower-order traits, including sensation seeking, risk-taking, boldness, adventurism, boredom susceptibility, unreliability, and unorderliness. However, more recent research has suggested five traits of impulsivity (Cyders & Smith, 2007). Two of these are emotion based, namely positive urgency, which refers to the tendency to act rashly while in a positive mood and negative urgency, which is the tendency to act rashly while in a negative mood. Two are presumed to be due to a deficit in conscientiousness, namely lack of planning and lack of perseverance, which is the inability to maintain concentration due to
distraction or boredom. The final trait of impulsiveness, according to Cyders & Smith (2007), is sensation seeking. These five traits, however, display only a moderate positive median intercorrelation with each other of 0.25 (Cyders & Smith, 2007). This differentiation between the five traits of impulsiveness has nonetheless proven useful in understanding problematic alcohol consumption, as the urgency traits appear to predict problem drinking, whereas sensation seeking predicts the frequency of drinking (Dick et al., 2010).

Moffitt, Caspi, Rutter, & Silva (2001) reveal that there is a significant gender difference in impulsivity, with males experiencing increased levels of negative emotionality and lower levels of self-restraint than females, regardless of age. It has been suggested that this gender difference in impulsivity is due to a developmental delay of cognitive and motor skill among males, resulting in a lower threshold for the capacity of delayed gratification (Bruce, Thernlund & Nettelbladt, 2006; as cited in Chapple & Johnson, 2007; Herba, Tranah, Rubia, & Yule, 2006; as cited in Chapple & Johnson, 2007). Chapple & Johnson (2007), however, uncovered two specific predictors of impulsivity for delinquents, namely maternal attachment and positive discipline, suggesting that gender differences in delinquents’ levels of impulsivity can be attributed to the increased adverse effect that a poor family environment appears to have on males over females. However, the focus of literature on the impulsivity profile of offenders reduces the generalisibility of such findings on gender effect.

Keyes, Grant & Hasain (2008) reveal from an American sample that gender effects in levels of alcohol abuse have decreased in birth cohorts in more recent generations, indicating no difference in susceptibility towards alcohol abuse across gender. Grano, Virtanen, Vahtera, Elovainio & Kivimaki (2004) revealed that higher impulsivity predicted increased likelihood of becoming a heavy drinker in both genders. However, there appears to be a gender difference on other risk-taking behaviours mediated by different impulsivity traits, specifically sensation seeking (Zuckerman & Kuhlman, 2000). Risk behaviours, such as smoking, show a clear gender imbalance associated with impulsivity (Grano et al., 2004). High levels of impulsivity were revealed to predict an increased number of cigarettes smoked per day for women, but not for men (Grano et al., 2004).

However, Stoltenberg, Batien & Birgenheir (2008) claimed that from a sample of 197 college age individuals, higher levels of motor impulsivity accounted for a significant amount of gender difference in risk for alcohol problems, as measured by the Barratt Impulsiveness Scale-11 (Patton, Stanford & Barratt, 1995). However, contrary to this, lower levels of impulsivity...
ity were also found to be associated with greater risk for alcohol consumption problems in both genders, but with a stronger association for men than women, using the Stop Signal Reaction Time. Stoltenberg et al. (2008) claim that these inconsistent findings may be due to heavy alcohol consumption as a coping mechanism for the negative affect associated with behavioural over-control.

Scott Acton (2003) claims that impulsivity is a temperamental vulnerability factor for substance abuse disorders. Longitudinal studies indicate that traits can differ greatly across a lifespan (e.g. Roberts, Walton & Viechtbauer, 2006). These account for the developmental aspect of problem alcohol use patterns, as Littlefield, Sher & Wood (2009) have revealed that drinking problems tend to decrease with maturity, in line with fluctuations of impulsivity. This apparent decrease in the level of impulsivity may be due in part to the findings that reveal that the construct of impulsivity becomes more differentiated with age, resulting in the influence of more lower-order traits on impulsive behaviour with age (Leshem & Glicksohn, 2007). Factor analysis found two impulsivity factors in the age group 14-16 years, namely general impulsivity, which is characterised by trait impulsivity and preservative errors in executive functioning and cognitive impulsivity, characterised by visual-motor scanning abilities, attention functions and flexibility of cognitive sets. Three factors were identified in the age group 20-22 years, which were general impulsivity and cognitive impulsivity, which in itself splits into two factors, that of the younger group as well as errors on the Porteus Maze task (Porteus, 1973) and time spent on the Circle Tracing task (Bachorowski & Newman, 1985). Longitudinal studies reveal a decrease in the intensity and frequency of alcohol consumption with age, suggesting the possible effect of a maturational process (Kandel & Logan, 1984). Similarly, Labouvie (1990) examined 458 young adults for 6 years between the ages of 18 and 24 years, with levels of alcohol consumption peaking at 21 years and decreasing subsequently. These findings are consistent with suggestions by McCrae & Costa Jr. (1994) that personality traits develop with age, reaching mean level at the age of 30 years, with both genders showing decreased levels of thrill-seeking behaviour.

Whether impulsivity actually enhances susceptibility to alcohol dependence, or whether it is a manifestation of the same disposition that predicts alcohol use problems (Dick et al., 2010) is yet to be determined. Krueger et al. (2002) described this as the externalizing spectrum, with alcohol use reflecting one manifestation of this spectrum. The possibility of a reverse predictive or bi-directional relationship, in that health-risk behaviours may predict increasing impulsiveness, must also be considered (Grano et al., 2004). Koob &
LeMoal (1997) revealed that heavy chronic alcohol consumption can lead to homeostatic dysregulation that induces negative affect and weakens self-regulation. Dick et al. (2010) claim that not only can alcohol increase impulsive behaviour, but it can also act chronically to increase the likelihood of impulsivity via the adaptive burden of allostatics.

The multifaceted definition of impulsivity limits the interpretation of findings as it is difficult to determine what specific aspect of impulsivity is under assessment (Leshem & Glicksohn, 2007). Reynolds et al. (2006) reveal that while self-report measures of impulsivity correlate highly amongst themselves, they do not correlate strongly with behavioural tasks assessing aspects of impulsive behaviour. This appears to indicate a failure of behavioural tasks to assess the same constructs as the self-report measures. Reynolds et al. (2006) also claim that a low correlation amongst behavioural tasks implies that these measures assess different traits of impulsive behaviour. Dougherty, Mathias & Marsh (2003) argue that such discrepancies may be attributed to the differentiation between the Barratt Impulsiveness Scale-11’s (Patton et al., 1995) assessment of personality traits exhibited over time and behavioural assessments measure state-dependent aspects of impulsivity.

However, other studies have implicated various personality traits as predictors of later alcohol dependence. Caspi et al. (1997) revealed from a longitudinal study on adolescents and young adults that alienation appeared to be related to drinking and violent behaviour, while stress was related to alcohol use behaviour only. This profile is supported by previous longitudinal research on men who later became alcoholics (Loper, Kammeier & Hoffman, 1973). Individuals engaging in treatment for alcohol dependence typically display high levels of neuroticism and anxiety on commencement of treatment (Zuckerman & Kuhlman, 2000). However, some researchers hypothesise that this association is a reverse relationship, in that the anxiety and depression results from the stress experienced as a consequence of the alcohol dependence. Conversely, other studies display a strong predictability of sensation seeking personality for alcohol dependence, with a very low correlation with anxiety or neuroticism (Ratliff & Burkhart, 1984, Forsyth & Hundleby, 1987).

Thereby, the present study explores the relationship between self-reported levels of alcohol consumption and impulsivity. Self-report measures are utilised due to a consensus that such measures represent impulsivity as a relatively stable trait (Dougherty et al., 2003) enabling an exploration of the possible effects of age. This is in contrast to behavioural measures which are believed to represent state-dependent variations in impulsivity (Dougherty et al., 2003), under which a comparison of age
groups would be less meaningful. While the UPPS (Urgency, Premeditation, Perseverance & Sensation-seeking) Impulsive Behaviour Scale (Whiteside & Lynam, 2001) is also a widely used self-report measure of impulsivity, the BIS-11 (Patton et al., 1995) was chosen due to the specific dimensions of impulsivity which it categorises, namely motor impulsivity. While sensation seeking has been indicated as a predictor of the frequency of alcohol consumption (Dick et al., 2010), research into the role of motor impulsivity on gender differences in the behaviour is lacking (Bruce et al., 2006; as cited in Chapple & Johnson, 2007), facilitating the secondary aim of the study, in determining whether demographic variables such as age and gender influence this relationship between alcohol consumption and impulsivity.

Methodology

Research Design. This study was a quantitative on-line survey using two standardised scales, the Barratt Impulsiveness Scale-11 (Patton et al., 1995) and the Alcohol Use Disorders Identification Test (Barbor, Higgins-Biddle, Saunders & Monteiro, 2001). The design was an independent group design exploring the relationship between impulsiveness and alcohol use, as well as the effect of the variables of age and gender. The study was approved by the UCD School of Psychology Undergraduate Research Ethics Committee (UREC-SPsy).

Participants. One hundred and fifty six (156) adults with an age range of 18-59 years (M=22.62 years; SD=6.73 years; M:F=1:1.62) were recruited from across the UCD student population, on a volunteer basis. Participants were categorised as either within the young age group (18-20 years) consisting of 32 males and 39 females or the older age group (21-59 years) consisting of 28 males and 56 females. Justification for these age categories derive from Leshem & Glicksohn’s (2007) findings which indicate that the 20-22 years of age category is a distinct grouping divergent from a younger group (14-16 years) by differences in cognitive impulsivity. Labouvie (1990) provides further evidence that age effects related to the relationship between impulsivity and alcohol consumption, present in the early twenties, specifically between 18-24 years, with maximum alcohol consumption peaking at 21 years. The inclusion criteria required all participants to be currently studying in UCD. Participants were informed of the risk involved as participants may have considered the information gathered to be sensitive in nature, for which service contact details were provided. Materials/

Apparatus
• Qualtrics (Qualtrics Labs Inc., Provo, UT).
• Two standardised scales; the Barratt Impulsiveness Scale-11 (BIS-11; Patton et al., 1995) and the Alcohol Use Disorders Identification Scale (AUDIT; Barbor et al., 2001).
Empirical Investigations

EFFECTS OF AGE AND GENDER ON ALCOHOL CONSUMPTION AND IMPULSIVITY.

Barratt Impulsiveness Scale-11 (Patton et al., 1995). This 30 item self-report Likert scale assessed the personality construct of impulsivity. The scale required participants to mark one of four responses that best represented their view on each of the statements. These statements represent three second-order factors of impulsiveness, namely attentional, motor and non-planning impulsivity. Answers ranged from ‘rarely/never’ (score of 1), ‘occasional’ (score 2), ‘often’ (score 3), and ‘almost always/always’ (score 4). On the scale as a whole, a score of between 52 and 71 is within normal limits of impulsiveness, a score of 72 or greater indicates a high level of impulsiveness and a score lower than 52 represents an over-controlled individual. The BIS-11 was further chosen for this study due to the instrument’s sensitivity to distinctions within substance use disorders (Stanford et al., 2009). Stanford et al. (2009) claim that the BIS-11 should be viewed as the point of reference for research into impulsivity due to the scale’s convergent validity and reliability of 0.83 for total scores.

Alcohol Use Disorders Identification Test (Barbor et al., 2001). This is a 10 item self-report Likert scale that measured the pattern of problematic alcohol use. Participants were required to mark one of four responses for each of the statements, which best represented their experience. Scores ranged from 0-4. An overall score of 8 or more is indicative of possible hazardous drinking, harmful drinking, and/or alcohol dependence. Specifically, a score of 8-15 indicates a medium alcohol problem, while 16+ is indicative of a high level of problematic alcohol use.

The AUDIT was chosen as the measure of alcohol consumption as Fleming, Barry & MacDonald (1991) demonstrated, on a college sample, that the AUDIT appears to have important advantages over other alcohol screening instruments, such as the CAGE (Cut, Annoyed, Guilty, Eye-opener) and the MAST (Michigan Alcohol Screening Test). Similarly, O’Hare & Sherrer (1999) claim that the AUDIT (Babor et al., 2001) is a valid and reliable screening device with college students. Reinert & Allen (2002) determined that the AUDIT (Babor et al., 2001) is a highly sensitive measure for criteria of current hazardous alcohol use and lifetime alcohol dependence, with internal consistency of 0.8.

Procedure. Participants were provided with a link directing them to the on-line survey. The study required them to read an information sheet and confirm their consent, prior to gaining access to the scales. Demographic information on age and gender was elicited first, followed by administration of the BIS-11 and then the AUDIT. See Appendix A-D for a copy of the information sheet and the questionnaire.

Approaches to Statistical Analysis.
As a precursor to data analysis by means of a range of inferential statistics, reliability of both the AUDIT and the BIS-11 scales, within the context of an Irish university sample, was determined in order to establish the suitability of these measures in an Irish student sample. These data (AUDIT and BIS-11) were then subjected to a range of inferential analyses using SPSS.

Two-way between groups analyses of variance were performed to explore whether there was an impact of gender (k=2) and age (k=2; 18-20 year olds and 21 year olds and over) on the reported total alcohol use and total impulsivity scores. Two-way between-groups analyses of variance were also employed to examine the effects of age and gender on the individual dimensions of impulsivity (attentional, motor and non-planning). Chi-squared analyses were performed in order to determine whether categorisation of alcohol use (low, medium or high problem) was dependent upon age or gender. Pearson product-moment correlations were computed to determine the strength and direction of possible linear relationships between impulsiveness and alcohol use (raw score).

Results

Reinert & Allen (2002) reported an internal consistency on AUDIT of 0.8. In the current study, the Cronbach alpha coefficient was 0.83 for the sample as a whole and ranged between .78 and .87 for subgroups. Thus, based on these data, the AUDIT can be considered reliable although reliability is reduced somewhat for younger males (18-21 years) to .78.

According to Stanford et al. (2009), the BIS-11 has good internal consistency, with a reported Cronbach alpha coefficient of 0.83. In the current study, Cronbach’s alpha was 0.85 for the sample as a whole and ranged between .76 and .87 for subgroups, with a reduction in reliability for younger males (.76).

Taken together, reliability analyses of both the AUDIT and BIS-11 data, for the sample as a whole and for the age and gender subgroups, revealed that, for both scales, alpha coefficients were within the acceptable range for reliability (i.e. >.7). However, reliability decreased somewhat on both scales for males in the category of 18-20 years.

Table 1 below presents summary data for the AUDIT. Raw scores are presented, together with data relating to the score distribution for the total sample and also for each of the age and gender subgroups.
Empirical Investigations

EFFECTS OF AGE AND GENDER ON ALCOHOL CONSUMPTION AND IMPULSIVITY.

Table 1: Summary data for the AUDIT.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Gender</th>
<th>Mean</th>
<th>S.D.</th>
<th>Low*</th>
<th>Medium*</th>
<th>High*</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20 years</td>
<td>Male</td>
<td>9.75</td>
<td>4.36</td>
<td>15 (46.9%)</td>
<td>12 (40.6%)</td>
<td>4 (12.5%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>10.49</td>
<td>5.18</td>
<td>14 (35.9%)</td>
<td>15 (38.5%)</td>
<td>10 (25.6%)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>10.15</td>
<td>4.81</td>
<td>29 (39.4%)</td>
<td>28 (38.5%)</td>
<td>14 (19.7%)</td>
</tr>
<tr>
<td>21 and over</td>
<td>Male</td>
<td>9.56</td>
<td>5.35</td>
<td>10 (37.0%)</td>
<td>12 (44.4%)</td>
<td>5 (18.5%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>9.76</td>
<td>4.66</td>
<td>14 (25.5%)</td>
<td>37 (67.3%)</td>
<td>4 (7.3%)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>9.70</td>
<td>4.86</td>
<td>24 (29.3%)</td>
<td>49 (59.8%)</td>
<td>9 (11.0%)</td>
</tr>
<tr>
<td>Total Sample</td>
<td>Overall</td>
<td>9.91</td>
<td>4.83</td>
<td>53 (34.6%)</td>
<td>77 (59.3%)</td>
<td>23 (15.0%)</td>
</tr>
</tbody>
</table>

* Low problem: 0-7; Medium problem: 8-15; High problem: 16+

Inspection of this table reveals that, across the sample as a whole, the mean score on AUDIT fell within the medium range of alcohol problems ( =9.91, SD=4.83). Mean scores were also within the medium range of alcohol problems for males in both age groups (18-20 years: = 9.75, SD= 4.36; 21 and over: =9.56, SD=5.35) and for females in both age groups (18-20 years: =10.49; SD=5.18; 21-20 years: =9.76, SD=4.67).

Table 2 presents summary data for a 2-way ANOVA, examining the impact of age and gender on AUDIT total scores.

Table 2: ANOVA summary table for AUDIT

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>7.217</td>
<td>1</td>
<td>7.217</td>
<td>.318</td>
<td>.574</td>
<td>.002</td>
</tr>
<tr>
<td>Gender</td>
<td>7.070</td>
<td>1</td>
<td>7.070</td>
<td>.337</td>
<td>.562</td>
<td>.002</td>
</tr>
<tr>
<td>Age*Gender</td>
<td>2.497</td>
<td>1</td>
<td>2.487</td>
<td>.105</td>
<td>.746</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>3522.338</td>
<td>149</td>
<td>23.640</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18562.000</td>
<td>153</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared=.005 (Adjusted R Squared=.015)

In terms of total raw scores for alcohol use problem rating, no statistically significant interaction was observed between age and gender, F(1, 149)= .106, p=.746. There was also no statistical significant main effect of age group, F(1, 149)= .318, p=.574 or gender, F(1, 149)= .337, p=.562. Based on these findings, it would appear that alcohol use problem rating, as determined by means of AUDIT raw scores, did not differ as a function of either age category or gender.

For the total sample, the percentages of participants scoring in the low, medium and high problem category of alcohol
consumption were 34.6%, 50.3% and 15.0% respectively (see Table 3).

For these categorical data, chi-squared analyses did not reveal any evidence that alcohol use depended on gender in either the younger or older age groups [18-20 years: chi-squared=2.08, df=2, p=.354; 21 and over: chi-squared=4.496, df=2, p=.106]. Inspection of the data reveals that within each age group, a significant minority of both males and females obtained scores that fell within the ‘high’ problem category.

Within the male subgroup, chi-squared analysis did not reveal any evidence that alcohol use depended on age [chi-squared=0.73, df=2, p=.693]. In contrast, chi-squared analysis revealed that, for females, alcohol use did depend on age (chi-squared=9.43, df=2, p=.009]. Inspection of the data indicate that the majority of females categorised as ‘high’ in terms of level of alcohol use problem fall within the younger age group (10/14).

Table 3 below presents summary data for the BIS-11. In this table, raw scores are presented, together with data relating to the score distribution for the total sample and also for each of the age and gender subgroups.

Table 3: Summary data for the BIS-11

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Gender</th>
<th>Mean</th>
<th>S.D.</th>
<th>Overcontrolled*</th>
<th>Normal*</th>
<th>Highly Impulsive*</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20 years</td>
<td>Male</td>
<td>66.44</td>
<td>9.02</td>
<td>1 (3.1%)</td>
<td>24 (75.0%)</td>
<td>7 (21.9%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>65.50</td>
<td>11.45</td>
<td>2 (5.3%)</td>
<td>25 (65.8%)</td>
<td>11 (28.9%)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>65.92</td>
<td>10.34</td>
<td>3 (4.8%)</td>
<td>49 (70.0%)</td>
<td>18 (25.7%)</td>
</tr>
<tr>
<td>21 and over</td>
<td>Male</td>
<td>61.75</td>
<td>10.87</td>
<td>5 (17.9%)</td>
<td>16 (57.1%)</td>
<td>7 (25.0%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>63.64</td>
<td>11.58</td>
<td>10 (17.9%)</td>
<td>23 (58.9%)</td>
<td>12 (23.2%)</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>63.01</td>
<td>11.32</td>
<td>15 (17.9%)</td>
<td>49 (58.3%)</td>
<td>20 (23.5%)</td>
</tr>
<tr>
<td>Total Sample</td>
<td></td>
<td>64.54</td>
<td>10.95</td>
<td>11.5%</td>
<td>62.0%</td>
<td>24.4%</td>
</tr>
</tbody>
</table>

* Overcontrolled: 30-51; Normal: 52-71; Highly Impulsive: 72+.

Inspection of this table reveals that, across the sample as a whole, the mean score on BIS-11 fell within the normal range of impulsiveness ( =64.34, SD=10.95). The mean BIS-11 score also fell within the normal range for males within both age categories (18-20 years: =66.44, SD=9.02; 21 and over: =61.75, SD=10.87) and for females within both age categories (18-20 years: =65.5, SD=11.45; 21 and over: =63.642, SD=11.58).
Effects of Age and Gender on Alcohol Consumption and Impulsivity.

Table 4: ANOVA summary table for BIS-11

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>383.40</td>
<td>1</td>
<td>383.40</td>
<td>3.224</td>
<td>.075</td>
</tr>
<tr>
<td>Gender</td>
<td>8.21</td>
<td>1</td>
<td>8.21</td>
<td>.069</td>
<td>.794</td>
</tr>
<tr>
<td>Age*Gender</td>
<td>72.08</td>
<td>1</td>
<td>72.08</td>
<td>.603</td>
<td>.439</td>
</tr>
<tr>
<td>Error</td>
<td>17033.48</td>
<td>150</td>
<td>119.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>657598.00</td>
<td>154</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inspection of this table reveals no evidence of a significant interaction between age and gender on total impulsivity scores, F(1,150)=.603, p=.439. There was also no statistically significant main effect for age, F(1,150)=3.224, p=.075 or gender, F(1,150)=.069, p=.794. It can, therefore, be inferred from this that total scores on impulsivity did not differ as a function of age category or gender.

This finding was confirmed by results of chi-squared analyses. Chi-squared analyses did not reveal any evidence that impulsivity depended on age in either the male or female subgroups [males: chi-squared=4.02, df=2, p=.13; females: chi-squared=3.28, df=2, p=.19]. Similarly, chi-squared analyses did not reveal any evidence that impulsivity depended on gender in either the younger or older age groups [18-20 years: chi-squared=0.73, df=2, p=.69; 21 and over: chi-squared=0.04, df=2, p=.98].

Inspection of the data reveals that in the total sample, the majority of participants (62.8%) obtained scores that placed them within the normal range of impulsivity. 24.4% scored within the highly impulsive range whilst the remainder (11.5%) fell within the overcontrolled range. Inspection of the data also reveals a broadly similar pattern of scores for both males and females across both age groups.

Additional analysis was then performed in order to explore potential age and gender differences on impulsivity dimensions.

Table 5 presents the summary data for the 2-way ANOVA, examining the impact of age and gender on the attentional dimension of impulsivity.
A statistical significant disordinal interaction between age and gender was observed on the attentional dimension $F(1,152)=4.185$, $p=.043$ (see Figure 1 below). However, the effect size of this interaction is small (partial eta squared=0.27).

Inspection of Figure 1 suggests that impulsivity scores decrease somewhat as a function of age for males, but not for females. This finding was confirmed by means of independent samples t-tests. Direct comparison of younger and older males revealed that scores declined significantly across the age groups [18-20 years: $M=18.13$, $SD=3.26$; 21 and over: $M=15.50$, $SD=3.26$; $t=3.11$, $df=58$, $p=.003$]. In contrast, for females, scores did not differ significantly across age groups [18-20 years: $M=17.21$, $SD=4.49$; 21 and over: $M=17.07$, $SD=3.44$; $t=0.17$, $df=94$, $p=.868$]. Within the younger age group, scores for males and females did not differ significantly [male: $M=18.13$, $SD=3.26$; female: $M=17.21$, $SD=4.49$; $t=0.97$, $df=69$, $p=.336$]. However, within the older age group, males scored significantly below the level of females [male: $M=15.50$, $SD=3.26$; female: $M=17.07$, $SD=3.44$; $t=-2.01$, $df=83$, $p=.048$].

Table 6 presents the summary data for the 2-way ANOVA, examining the impact of age and gender on the motor dimension of impulsivity.
The interaction between age and gender on the dimension of motor impulsivity was not statistically significant, $F(1,150)=.433$, $p=.512$. There was also no statistically significant main effect for age, $F(1,150)=.467$, $p=.495$ or gender, $F(1,150)=.168$, $p=.682$.

Table 7 presents the summary data for the 2-way ANOVA, examining the impact of age and gender on the non-planning dimension of impulsivity. As with motor impulsivity, no statistically significant interaction between age and gender was observed on the non-planning dimension, $F(1,152)=.177$, $p=.675$. There was also no statistically significant main effect for either age, $F(1,152)=2.731$, $p=.100$ or gender, $F(1,152)=.080$, $p=.778$.

Taken together, these results provide little evidence that age and gender impact on overall impulsivity or on the motor or non-planning aspects of impulsivity. In contrast, there is evidence to suggest that age and gender are of relevance when the attentional dimension of impulsivity is considered.

**Relationships between Alcohol Consumption and Impulsivity.** A strong positive correlation was observed between total impulsiveness scores and total scores on the AUDIT, $r=.511$, $n=151$, $p<.01$, with high levels of impulsivity associated with high levels of harmful alcohol use. A strong positive association was also observed between motor impulsivity and AUDIT scores, $r=.506$, $n=151$, $p<.01$. A moderate positive correlation was observed between the attentional trait of impulsiveness and total AUDIT scores,
r = .324, n=153, p <.01 and between non-planning impulsivity and AUDIT scores, r=.400, n=153, p<.01.

Due to the influence of age and gender on the attentional dimension of impulsivity, as detailed above, together with the observation that high levels of problem alcohol use is associated with younger age in females, correlations between AUDIT scores and impulsivity were also computed for each age and gender subgroup separately. A summary of these analyses is presented in Table 8 below.

Inspection of these data confirmed that there is a significant association between total impulsiveness and alcohol score for both males and females. Furthermore, this significant association is observed regardless of age group. However, males within the older age range (21 years and over) display the strongest correlation with total BIS-11 scores (r=.701, p<.001).

Similarly, data confirms that a significant association between each of the subscales of impulsivity (attentional, motor and non-planning) and total AUDIT scores on levels of problematic alcohol use exists for both males and females, regardless of age category. Again, a pattern emerges, in which males within the older age category, display the strongest correlation between each of these subscales and total AUDIT scores (attentional, r=.649, p<.001; motor, r=.600, p<.001; non-planning, r=.595, p<.001).

Table 8 Correlation coefficients exploring the relationship between total alcohol use (AUDIT) and impulsiveness (BIS-11) for age and gender subgroups.

<table>
<thead>
<tr>
<th></th>
<th>Males (r)</th>
<th>Females (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Impulsiveness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-20 years</td>
<td>.483***</td>
<td>.498***</td>
</tr>
<tr>
<td>21 years and over</td>
<td>.701***</td>
<td>.440***</td>
</tr>
<tr>
<td>Overall</td>
<td>.592***</td>
<td>.466***</td>
</tr>
<tr>
<td><strong>Attentional</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-20 years</td>
<td>.345*</td>
<td>.233</td>
</tr>
<tr>
<td>21 years and over</td>
<td>.449***</td>
<td>.260*</td>
</tr>
<tr>
<td>Overall</td>
<td>.494***</td>
<td>.245**</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-20 years</td>
<td>.422**</td>
<td>.532***</td>
</tr>
<tr>
<td>21 years and over</td>
<td>.600***</td>
<td>.496***</td>
</tr>
<tr>
<td>Overall</td>
<td>.515***</td>
<td>.508***</td>
</tr>
<tr>
<td><strong>Non-planning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-20 years</td>
<td>.499*</td>
<td>.352*</td>
</tr>
<tr>
<td>21 years and over</td>
<td>.595***</td>
<td>.326**</td>
</tr>
<tr>
<td>Overall</td>
<td>.514***</td>
<td>.342***</td>
</tr>
</tbody>
</table>

* p<.05; ** p<.01; *** p<.001
It can be inferred from this that males in the 21 years and over age range display a stronger positive association between impulsivity and harmful alcohol use on all three dimensions of impulsivity, as well as on total impulsivity scores, than both males in the younger age category and females, regardless of age category.

It can also be observed from the data that the correlation coefficients between total impulsivity, motor and non-planning scores and total AUDIT scores remain relatively constant when determined from the sample as a whole, or from across the subgroups. The same effect, however, is not observable with regards to the attentional dimension. The strength of the correlation decreases for females, regardless of age category. This may be viewed as a consequence of the age-gender interaction on the attentional dimension, which was observable from the 2-way between group ANOVA (see Table 5 and Figure 1).

**Discussion**

This study aimed to uncover whether there is an association between levels of impulsivity and patterns of alcohol use behaviours and whether such an association has a gender or age effect.

Findings reveal that the majority of participants fell within the medium range of alcohol use problems, as measured by the AUDIT, and the majority of the total sample fell within the normal range of impulsiveness, as measured by the BIS-11, independent of age and gender. This finding is at variance with the results of past research that claimed that both an age and gender effect exists, both on patterns of alcohol consumption and on levels on impulsiveness (Littlefield et al., 2009). This could, potentially, be attributable to the relatively low total variance in alcohol scores for which impulsivity scores were accountable. As Stoltenberg et al. (2008) claim, present findings may be due to heavy alcohol consumption as a coping mechanism for the negative affect associated with behavioural over-control.

The strong correlation observable between total impulsivity and problem alcohol use corroborates past research that indicated a positive association between impulsivity and substance abuse, in particular alcohol misuse (Grau & Ortet, 2005; Murphy & MacKillop, 2012). A strong association between motor impulsivity, as well as a moderate association between attentional and non-planning impulsivity and problem alcohol use is also evident from the present findings.

Overall, evidence emerges that males display a stronger correlation between impulsivity (total, attention, motor and non-planning) and alcohol use across age groups. With regards to the motor dimension, this is in accordance with Stoltenberg et al. (2008), who revealed, using the
BIS-11, that motor impulsivity is a select dimension of the impulsivity construct that directly influences a gender effect in terms of alcohol use. This contradicts Grano et al. (2004) who revealed that higher impulsivity predicted increased likelihood of becoming a heavy drinker in both genders. However, if using an experimental measure, rather than a self-report measure, Stoltenberg et al. (2009) uncovered that while both genders displayed an association between alcohol use and impulsivity, this correlation was stronger for males than females. This finding is reflected in the current study. Grano et al. (2004), however, claimed that while a gender effect is evident on impulsivity, in relation to risk-taking behaviours, such as cigarette smoking or sexual deviance, no such effect is evident for alcohol use as a specific form of risk taking behaviour.

Discussing alcohol levels separately from impulsiveness, further inspection revealed that a significant minority of males and females in both age categories fell within the high range of problematic alcohol use. This adheres to Keyes et al. (2008) who argued that there is no gender difference is susceptibility to alcohol abuse disorders, independent of impulsivity. Littlefield et al. (2009) also claimed that the prevalence of problematic levels of alcohol consumption decreases with age, in line with maturity. However, reported harmful alcohol use for females was dependent on age, with the majority of females categorised as having high levels of problematic alcohol use being within the younger age range. The failure of the present study to reveal an age effect for males on alcohol use may be due to the reduced reliability of the AUDIT for the younger males within the current sample due to the insufficient age difference between the two age cohorts for the impact of increased age to be revealed.

Referring to total levels of reported impulsiveness, the current study revealed no age or gender bias in impulsiveness. This contradicts findings of Moffitt et al. (2001) and Chapple & Johnson (2007), which claimed that males experienced more impulsiveness than females, regardless of age. However, the generalisability of the latter’s findings is questionable considering the delinquent nature of the sample. The present study also contradicts findings revealing an age effect on levels of impulsiveness due to a differentiation of the construct of impulsivity across the lifespan, resulting in the influence of more lower-order traits reducing impulsive behaviour with age (Leshem & Glicksohn, 2007).

Considering impulsivity as a complex construct, encompassing various dimensions, attentional, motor and non-planning impulsivity were also investigated. Similar to total reported impulsivity, findings reveal no age, gender or age and gender interaction on motor or non-planning impu-
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lsivity. However, attentional impulsivity provides evidence that while no independent age or gender effect on this dimension is observable; a significant age and gender interaction emerges. This interaction provides evidence that attentional impulsivity does not differ across genders for the younger age category, but declines significantly with age for males, but not for females. Evidence of such a finding is not apparent in former research.

Various aspects of the current findings both corroborate and contest former research, therefore, the current methodological limitations must be considered. As noted, the majority of research into the age effect on impulsivity and alcohol use has reached a general consensus that both reduce in line with age (Scott-Acton, 2003; Littlefield et al., 2009; Leshem & Glicksohn, 2007). Restrictions of the sample limited the age range obtainable within a university setting. Consequently, the age categories elicited may not reflect the age effect that is evident in the studies of Labouvie (1990) and McCrae & Costa Jr. (1994). Labouvie (1990) determined that alcohol consumption peaks at 21 years, decreasing subsequently. The incorporation of 21 years within the older category within the present study may have increased the older categories reported impulsiveness and alcohol use, reducing significance between the groups. Similarly, McCrae & Costa Jr. (1999) outline that mean consumption occurs at age 30, which may have caused a distorted differentiation of effect between age groups in the current study.

As well as the limitations in regards to the age range, potential confounding variables, such as substance abuse as a consequence of externalising problems, could be controlled for in future research. Kruegar et al. (2002) referred to this as an externalising spectrum, in which both impulsivity and alcohol abuse may be a behavioural manifestation of a third, unknown variable such as current stress levels. A further feature of the study that could be altered is the inclusion of a more differentiated definition of impulsivity along further dimensions outside of those addressed by the BIS-11. Various studies have indicated a high correlation between the sensation-seeking trait of impulsivity and alcohol dependence (Ratlliff & Burkhardt, 1984, Forsyth & Hundleby, 1987). However, the BIS-11 fails to isolate sensation-seeking as a distinct dimension. A more comprehensive knowledge of impulsivity as a complex construct would be obtained by incorporating other reliable measures of impulsivity into the study, such as the UPPS (urgency, preméditation, perseverance and sensation seeking; Whiteside & Lynam, 2001), the Eysenck Impulsiveness Scale (Eysenck & Eysenck, 1878), or non-psychometric measurements such as the Porteus Maze (Porteus, 1973), or the Circle Drawing Task (Bachorowski & Newman, 1985).
The results of current study suggest some practical implications for future research and policy measures in the area of alcohol misuse in an Irish context. The current findings are indicative of a less pessimistic view of alcohol use in an Irish university setting than was initially anticipated. However, since the majority of the sample report within the medium range of problematic drinking, potential action must be considered as such behaviours may be indicative of future hazardous drinking. Age cannot be viewed as the predominant variable mediating such behaviours, as a higher proportion of the older age category report in the medium range of alcohol problems than the younger age category. However, neither can this relationship be exclusively deemed as a consequence of individual differences in personality, as confounding influences such as stress must be controlled for in future research. Potentially, a measure taken to reduce alcohol misuse, as a cultural phenomenon in Ireland, may be to implement education to elicit such coping strategies and awareness of the aversive nature of impulsiveness on risk-taking behaviours, rather than a sole emphasis on price incentives in order to reduce consumption.

References


EFFECTS OF AGE AND GENDER ON ALCOHOL CONSUMPTION AND IMPULSIVITY.


