

# IRAP Attitudes and Alcohol

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## Abstract

This research project aims to explore the relationship between the Implicit Relational Assessment Procedure (IRAP) as a measure of implicit attitude to alcohol and a number of other variables comprising the Alcohol Attitudes Scale (AAS), the Frequency of participant Alcohol Use (FAU), the Quantity of participant Alcohol Use (QAU), the Temptation and Restraint Inventory (TRI), transgenerational problem alcohol use (Gen) and participant willingness to abstain from alcohol use (Abstain) over three research studies. In Study 1, the IRAP was used to determine a) if participant responding ( $n=60$ ) demonstrated a pro-alcohol bias, b) if participant responding demonstrated a pro-alcohol bias between participants when controlling for QAU, c) if Spearman's Rho correlation tests showed a relationship between any of the variables used, d) if Analysis of Variance (ANOVA) tests show gender impacts self-reported alcohol use behaviour and e) if there is convergence or divergence between implicit attitudes to alcohol (IRAP) and explicit self-reported attitudes to alcohol (AAS). A brief ACT-based intervention was delivered and participants ( $n=48$ ) returned thirty days later for repeated measures testing in Study 2 using paired sample  $t$ -tests and repeated measures ANOVAs to determine f) if there was any variation in participant responding in measures that may be attributable to the intervention and g) if participants reported behaviour change they attributed to taking part in the research project. Study 3 ( $n=35$ ) participants completed all measures as in Study 1 and Study 2, but with revised IRAP target images to ensure construct validity and experimental reliability. Overall the research highlights the complex relationship between Brief Implicit Relational Responding (BIRR) and Elaborate Extended Relational Responding

(EERR) and the important role BIRRs play in alcohol use behaviour. Partial replication of research by Ostafin, Kassman, deJong, van Hemel-Ruiter (2014) demonstrates the advantage of the availability of IRAP trial type DIRAP data as well as overall DIRAP scores in results analysis.

## **CHAPTER 1**

### **Introduction**



## **Mechanistic and Contextual Behavioural understanding of Implicit Cognition**

The contextual behavioural researcher conceptualises implicit cognition as private behaviour and explicit cognition and other behaviour as public behaviour. As such, cognition is understood as a functionally defined class of behaviour which can interact with, effect and predict a second class of behaviours (Hughes, Barnes-Holmes & Vahey, 2012). For decades, cognitive, social and behavioural psychologists have been interested in participant attitudes towards various research topics, from gender (Hoyt & Burnette, 2013; Latu, Mast & Stewart, 2015; Rudman, 2000) to attraction (Krause, Back, Egloff & Schmukle, 2014; Murphy, MacCarthaigh & Barnes-Holmes, 2014) to addiction (Hinnant, 1997; Kalampalikis, 2010; Morgan & Wilson, 1973; Nurco, Schaffer, Haulon, Kinlock, Duszynski, Stephenson, 1987). Dual process theory emerged in the mechanistic sphere and allowed researchers to consider cognitions in a new dynamic. It suggested that humans employ two processes for cognition, one which is rapid, powerful and associative with only final products reaching the conscious (corresponding to implicit cognitions); and the other slower, more sequential, conscious and volitional (corresponding to explicit cognitions) (Evans & Coventry, 2006). The significance of implicit cognition and its role in our behaviour cannot be underestimated. A correlational link between implicit attitude measures and subsequent behaviour or as a predictor for future behaviour has been established in many research papers. For example Fazio, Jackson, Dunton & Williams (1995) reported that individual differences in sequential priming were associated with uncomfortable behaviour toward an African American interaction partner. This demonstrated a link between implicit attitudinal measures and subsequent behaviour. Further research has shown correlations between implicit responding and behaviour in studies of gender

(Latu, Mast, Stewart, 2015); interpersonal attraction (Krause, Back, Egloff & Schmukle, 2014) and substance abuse (Ostafin, Kassman, DeJong & van Hemmel-Ruiter, 2014).

Traditionally speaking, studying the inner workings or internal processes of cognition remained in the domain of cognitive and social psychology researchers via mechanistic theory, as seen for example in the work of Greenwald and Banaji (1995). Behavioural researchers struggled to conceptualise such inner behaviour within observable parameters. However more recently, the Relational Elaboration and Coherence Model (REC) and Implicit Relational Assessment Procedure (IRAP) have allowed functional contextual scientists a means not only to conceptualise and explore cognition but also provide a tool to measure it (Hughes, Barnes-Holmes & Vahey, 2012). The emergence of implicit association research in the mechanistic sphere, although vulnerable to issues of its own, eliminated many of threats to validity associated with explicit measures (Chaiken & Trope, 1999). Research in mechanistic psychology now looked at the distinction between swift, automatic thought and slower, more deliberate processes (Chaiken & Trope, 1999; Strack & Deutsch, 2004). Sequential priming is the earliest and most commonly used implicit measure (Cameron, Brown-Iannuzzi & Payne, 2012; Meyer & Schvaneveldt, 1971; Neely, 1977) and involves presenting stimuli to activate a particular topic and measuring the effects of this on performance in some other task (Goto, Bond, Burks & Kamil, 2014). It operates using the premise that the human mind is organised into groups of associations and so activating one idea has the effect of spontaneously drawing to mind associated thoughts, memories, and feelings (Cameron, Brown-Iannuzzi & Payne, 2012; Suzuki & Goolsby, 2003). Thus, sequential priming can be used as a means of exploring

differential associations among participants because the same primes tend to activate different associative links for different people (Cameron, Brown-Iannuzzi & Payne, 2012). However, sequential priming measures were found to have low reliability rates (Cameron Brown-Iannuzzi & Payne, 2012; Fazio & Olson, 2003).

The Implicit Association Test (IAT) (Greenwald, McGhee & Schwartz, 1998) was developed as a more reliable indication of indirect attitude assessment than pre-existing affective priming and word association tasks (Blanton & Jaccard, 2006; Skinner, Blick, Coffin, Dudgeon, Forrest & Morrison, 2013). The effect in an IAT test is defined as the difference between alternating consistent and inconsistent test blocks in terms of participant response latency in each (De Houwer, 2006). That is, participants are presented with stimuli via a computerised programme and respond under time pressure. More rapid responding to, for example alcohol rather than non-alcohol stimuli (Houben & Wiers, 2007) is deemed to demonstrate implicit agreement with former pro-alcohol associations. In this example, a consistent test block would present stimuli to participants and expect them to respond consistent with the rule “alcohol is positive, non-alcohol is negative”. On the contrary participants expected to follow the rule “Non-alcohol is positive, alcohol is negative” would constitute a non-consistent test block. Mean latencies for each trial block are calculated and the smaller mean latency is subtracted from the larger to produce the IAT effect which suggests bias favouring either the consistent or inconsistent relation. The IAT has been effectively applied to a number of research questions since its development, perhaps most notably in the areas of racial and ethnic discrimination. For example, researchers found that implicit race attitude as measured by the IAT correctly predicted US voter intention in the 2008 US presidential election (Greenwald, Tucker Smith, Sriram, Bar-

Anan & Nosek, 2009). Another study found implicit attitudes to the race of a legal representative as measured by the IAT would temper subsequent evaluation of their deposition (Kang, Dasgupta, Yogeeswaran, Blasi, 2010). Both of these studies highlight the validity of the IAT in determining implicit attitudes to race that may impact participant behaviour. The IAT has been effectively applied in other areas, including gender identity (Aidman & Carroll, 2002), disability (Vaughn, Thomas & Doyle, 2011), and self-esteem (Klavine, Schroder-Abe & Schutz, 2012) to name but a few.

However, the IAT is not without its problems and limitations such as its complex structure which may impact its internal validity (Cameron, Brown-Iannuzzi & Payne., 2012). Researchers have also questioned the IATs validity, and whether it actually assesses implicit attitudes or cultural knowledge (Olson & Fazio, 2004). Carlsson & Agerstrom (2016) go so far as to suggest that there is little evidence to suggest that the IAT can predict discrimination in a meta-analysis reviewing eleven recent IAT research studies. Indirect assessments that focus on accuracy of response rather than latency then became a focus for researchers (Anderson, 1981; Balota, Yap, Cortese & Watson, 2008; Kim, Ivry & Robertson, 1999; Payne, 2005). One such example is the Affect Misattribution Procedure (AMP) which presents pleasant and unpleasant photos as primes, followed by Chinese writing symbols. Participants must then decide whether each symbol is pleasant or unpleasant. The frequency of pleasant judgments is then examined rather than participant response times (Cameron, Brown-Iannuzzi & Payne, 2012). Researchers report that such measures are significantly associated with behavioural measures and explicit measures of attitude. However caution must be exercised when using the IAT or similar indirect measure, as a

representation of the mental construct under investigation cannot be inferred from data obtained, but rather the data may be an indication of the interaction of multiple mental processes (Hughes, Barnes-Holmes & Vahey, 2012). Alternatively, outcomes (that is, response latencies elicited from participants via a computerised programme) from indirect measures could be caused by properties of the measure independent of the mental construct that is being studied, for example task-switching (Klauer & Mierke, 2005) or block order (Nosek, Greenwald & Banaji, 2007). Furthermore Gast & DeHouwer (2012) found that IAT effects can be produced without any of the associative pairings between stimuli, the construct on which the measure is theoretically based.

### **Relational Frame Theory**

Contextual behavioural science, based on functional contextualism seeks to explain behaviour with scope, precision and depth (Stewart, Barnes-Holmes & Weil, 2009). Rather than looking for causation in inner processes, the research focus is on functional relations between the environment and behaviour as it unfolds temporally and contextually as it occurs (Stewart, Barnes-Holmes & Weil, 2009). This standpoint effectively eliminates the problem of assuming observed behaviour is caused by inner processes that cannot be empirically verified (Hughes, Barnes-Holmes & Vahey, 2012). Functional contextualism also allows for the environment to include one's internal environment and external environment, treating both with the same behavioural principles. Relational Frame Theory (RFT) emerged to address more abstract or complex behaviours such as language within a functional paradigm (Hayes, Barnes-Holmes & Roche, 2001; Hussey, Barnes-Holmes & Barnes-Holmes, 2015). It posits that individuals respond to one stimulus in terms of another. That is, we learn via

respondent or operant learning to discriminate the relation between stimuli based on a contingency previously trained in our learning history (Torneke, 2010). RFT argues that humans can also learn to relate stimuli to one another in the absence of direct training or reinforcement via derived relations learned in verbal social interactions (Campbell, Barnes-Holmes, Barnes-Holmes & Stewart, 2011; Hayes, Barnes-Holmes & Roche, 2001). There are three core principles of these derived relations, or arbitrarily applicable relational responding. Mutual entailment, referring to the bi-directional relation between two stimuli in the absence of direct training, explains the phenomenon wherein if we learn that A equals B, we derive that B also equals A (Hussey, Barnes-Holmes & Barnes-Holmes, 2015; Torneke, 2010). Combinatorial entailment refers to functional relations between two or more mutually entailed stimuli, that is if we learn that A is greater than B and B is greater than C, we derive that A is also greater than C, and C is less than A (Torneke, 2010). The transformation of stimulus function suggests that a function can be transformed through relation from one stimulus to another (Torneke, 2010). In other words, supposing that stimulus A was experienced as aversive and was trained to equal stimulus B. The transformation of stimulus function means that given requisite contextual cues, B will also come to be experienced as aversive via its relation in coordination to A (Dymond & Whelan, 2010; Hayes, Barnes-Holmes & Roche, 2001). Relational responding can occur through arbitrarily applicable ways such as equivalence, similarity/opposition, hierarchy or through deictic or perspective-taking depending on contextual cues, or contextual control (Barnes-Holmes, McHugh & Barnes-Holmes, 2004)

Research indicates that derived relational responding underpins a multitude of phenomenon, including language and cognition (Hayes, Barnes-Holmes & Roche,

2001) The Relational Elaboration and Coherence (REC) model puts forward that the behavioural outcome on a measurement procedure will reflect the interaction between an individual's learning history with respect to targeted relations and specific features of the context in which they are assessed (Barnes-Holmes, Barnes-Homes, Stewart & Boles, 2010; Hayes, Barnes-Holmes & Roche, 2001). This differs from the mechanistic account described above as mental processes are not considered responsible for behaviour but rather functional relations past and present between behaviour and the environment influence behavioural outcome (Barnes-Holmes, Barnes-Homes, Stewart & Boles 2010; Hayes, Barnes-Holmes & Roche, 2001). That is, behaviour is dependent on the contingencies that governed similar responding in the past. Furthermore, the REC model treats behaviour as an ongoing action to be understood in temporal and contextual terms rather than as separate to mental processes hypothesised to have caused the behaviour as in mechanistic research (Hughes, Barnes-Holmes & Vahey, 2012). In terms of cognition the REC model distinguishes between Brief Immediate Relational Responding (BIRRs) and Extended and Elaborated Relational Responding (EERRs) based on temporal factors (i.e. the time required to derive the relation), the level of derivation used (i.e. how well established a derived relation is in an individual's learning history) and the complexity of the derivation (i.e. whether simple relational or more complex sets of relational responding is required) (Barnes-Holmes, Barnes-Homes, Stewart & Boles, 2010; Hayes, Barnes-Holmes & Roche, 2001; Hughes, Barnes-Holmes & Vahey, 2012). REC suggests that more complex responses take additional time to complete compared to those less complex. Also, the extent to which a response has been derived in the past will also influence the probability of it being emitted quickly. In particular, responses of low level complexity and high history

of derivation tend to be emitted with greater speeds than highly complex, less frequently derived relational responses (Hughes, Barnes-Holmes & Vahey, 2012). It is therefore likely that measures that impose time and accuracy boundaries should increase the likelihood of low complexity low derivation responses. The REC model then implies that behavioural responses on IAT and similar indirect measures are not associative but relational in nature (Barnes-Holmes, Barnes-Homes, Stewart & Boles, 2010; Hayes, Barnes-Holmes & Roche, 2001)

### **The Implicit Relational Assessment Procedure**

The Implicit Relational Assessment Procedure is a computerised programme in which a target image or word is presented with a label typically deemed positive or negative. Participants are asked to press the key “d” if the relational presentation is similar to the rule they are currently following or “k” if it is opposite to the rule they are following on the computer keyboard. During consistent IRAP blocks, Participants are asked to follow the rule that the target topic is positive and other stimuli are negative. In other words, participants should respond to the rule target topic-positive-similar, other stimuli-negative-similar and target topic-negative-opposite, other stimuli-positive-opposite. For example, in a study exploring attitudes to flowers as opposed to insects, a consistent block may require a participant to respond to the rules flowers-positive-similar, flowers-negative-opposite, insects-positive-opposite and insects-negative-similar. During inconsistent IRAP blocks, participants are asked to follow the rule that other stimuli are positive, target topic stimuli are negative, that is other stimuli-positive-similar, target topic-negative-similar, other stimuli-negative-opposite, target topic-positive-opposite. That is, an inconsistent block may require the participant respond to the rules insects-positive-similar, insects-negative-opposite, flowers-



positive-opposite and flowers-negative-similar. Therefore there are four trial types that are being examined in both the consistent and inconsistent test blocks- target topic-positive, target topic-negative, other stimuli-positive, other stimuli-negative. In research on attitudes to flowers then, the four trial types would be flowers-positive, flowers-negative, insects-positive and insects-negative. The IRAP is unique insofar as it automatically calculates mean latency responses for each trial type and produces DIRAP scores for each trial type as well as an overall DIRAP score. Participants complete two practice blocks under instructions to respond as quickly and accurately as possible. If the participant meets criteria of 80% accuracy and a mean response latency of 2000ms, he or she is invited by the programme to complete test blocks. Six test blocks are presented, alternating between consistent and inconsistent blocks so that three pairs of consistent and inconsistent blocks are delivered. Once the test blocks are complete a message on screen prompts the participant to alert the researcher once they have completed the IRAP. Response latency to each of four trial types across each of the three blocks of consistent and inconsistent block pairs is examined. The shorter relational responding latency between consistent and inconsistent blocks is said to point to a participant's BIRRs.

The Implicit Relational Assessment Procedure (IRAP) is designed in a functional paradigm to place the participant's learning history against a response contingency deemed inconsistent with their history of responding (Barnes-Holmes, Barnes-Homes, Stewart & Boles, 2010; Hussey, Barnes-Holmes & Barnes-Holmes, 2015). A great deal of research has been conducted to examine the difference between implicit and explicit attitudes using the IRAP procedure, with varying results. Barnes-Holmes, Waldron & Barnes-Holmes (2009) tested the validity of the IRAP against the

IAT in a study comparing attitudes of rural and city dwellers towards country and city life, finding some correlation between the IRAP and explicit measures but no correlation between the IAT and explicit measures. Whilst Cullen, Barnes-Holmes, Barnes-Holmes & Stewart (2009) found no correlation between implicit attitudes to old people and explicit attitudes in a study on implicit attitudinal malleability. In a study on attitudes to individuals with autism, Kelly & Barnes-Holmes (2013) found that negative scores on the IRAP were predictors for negative scores on the explicit attitude scale, showing a strong relationship between implicit and explicit attitudes to people with ASD.

The IRAP has been used to demonstrate efficacy in studying relational frames by including response options that other implicit measures typically don't utilise (Campbell, Barnes-Holmes, Barnes-Holmes & Stewart, 2011). The IRAP is capable of targeting different types of stimulus relations, not just coordination relations as in the IAT and similar mechanistic indirect measures. It presents participants with target stimuli of the phenomenon under investigation with labels considered either positive or negative in consistent and inconsistent blocks. Therefore, four trial types are examined. For instance, Cullen, Barnes-Holmes, Barnes-Holmes and Stewart (2009) examined the malleability of ageist attitudes and so presented an IRAP to participants with target images of old people and young people with both positive and negative labels. The four trials examined were old people-positive, old people-negative, young people-positive, young people-negative. In the consistent block, participants were asked to respond with the rule similar-positive-young people whilst in the inconsistent block participants were asked to follow the rule similar-positive-old people. Latency in response times between consistent and inconsistent blocks, known as the IRAP effect, is assumed to

provide an index of the strength or probability of various relations (Barnes-Holmes, Barnes-Holmes, Stewart & Boles, 2010; Hussey, Barnes-Holmes & Barnes-Holmes, 2015). Because participants undertaking a latency-based implicit measure respond at a high speed, they are somewhat prevented from manipulating their own responding, that is, using explicit cognition to determine their responses (Campbell, Barnes-Holmes, Barnes-Holmes & Stewart, 2011; Hayes, Barnes-Holmes & Roche, 2003). IRAP procedures are heavily dependent on specific features of the stimulus presentation because of this high speed responding (Barnes-Holmes, Barnes-Holmes, Power, Hayden, Milne & Stewart, 2006; Campbell, Barnes-Holmes, Barnes-Holmes & Stewart, 2011). This dependency may affect IRAP performances more than other implicit measures, because all IRAP blocks are identical in format (Barnes-Holmes, Barnes-Holmes, Power, Hayden, Milne & Stewart, 2006; Campbell, Barnes-Holmes, Barnes-Holmes & Stewart 2011).

The IRAP researcher is seeking to quantify the difference in responding speed between consistent and inconsistent test blocks as discussed above as this may indicate which relational response is more automatic or makes more sense to the participant (Hussey, Thompson, McEnteggart, Barnes-Holmes & Barnes-Holmes, 2015). This is achieved by treating the difference between the rules as an effect and using a variation of Cohen's  $d$  (DIRAP) to calculate the difference between mean reaction times to the correct response on each of the two rules and dividing by the standard deviation of all reaction times in both rules (Hussey, Thompson, McEnteggart, Barnes-Holmes & Barnes-Holmes 2015). A positive DIRAP score indicates quicker responses during rule A blocks than rule B blocks for a particular trial type. Conversely negative DIRAP scores suggest that participants responded quicker on rule B blocks than rule A blocks

for the trial type. IRAP output follows a True-False-False-True format for positive  $D_{IRAP}$  results over the four trial types examined (Hussey, Thompson, McEnteggart, Barnes-Holmes & Barnes-Holmes, 2015). In order to conduct analysis to compare the interaction between IRAP trial-types it is necessary to invert trials three and four so that no comparison is made by researchers between bias towards confirming positive attributes of the topic under investigation and bias towards refuting positive attributes of the topic (Hussey, Thompson, McEnteggart, Barnes-Holmes & Barnes-Holmes, 2015).

High latency in IRAP response times can be obtained with high complex and rarely previously derived relational responding. When the question of higher derivation demands, even in low complexity relational responding, arises what is typically observed by researchers in IRAP studies is initial slow response latencies with a gradual increase in response latency in successive trials as derivation decreases with each exemplar (Hughes, Barnes-Holmes & Vahey, 2012). Longer latency response times can be obtained with higher complex- low derivation relational responding, relative to low complex- low derivation as observed in a study conducted by Nicholson and Barnes-Holmes (2012). In this experiment, the researchers presented an IRAP task that required participants to execute more complex deictic relational responses as well as an IRAP task that demanded low complex-low derivation responses. Separate and significant IRAP effects were noted for both IRAP types, indicating that the IRAP is a suitable tool for measuring more complex relational responding, but it was found that response latency increased for such responses. As complexity increases and derivation decreases along a spectrum, ultimately response latencies will fall outside of time limits

or criterion set by most indirect tools (Hughes, Barnes-Holmes & Vahey, 2012). Direct verbal self-report measures will be necessary to capture these EERRs.

The IRAP has been well utilised to explore many social and clinical phenomena with great effect. Murphy, MacCarthaig & Barnes-Holmes (2014) investigated attractiveness bias using the IRAP and an explicit measure of the successfulness of attractive and unattractive people. The researchers found pro-attractiveness and anti-unattractive bias in both male and female participants but to a larger degree in male participants. Researchers have also used the IRAP to explore gender bias, in one research study typically developing children and children with ADHD completed an IRAP on attitudes to themselves and their own/other gender (Scanlon, McEntegart, Barnes-Holmes, Barnes-Holmes, 2014). The researchers found that typically developing children were neither positive or negative towards the opposite gender, but children with ADHD showed a pro-opposite gender bias. The IRAP has more recently been used to explore ACT-related concepts such as perspective-taking (Barbero-Rubio, Lopez-Lopez, Luciano & Eisenbeck, 2016) and psychological flexibility (Lehnert, 2015) suggesting its versatility in clinical applications. Clinical psychopathologies such as OCD (Nicholson, 2015), phobias (Leech, Barnes-Holmes & Madden, 2016) and suicidality (Hussey, Daly & Barnes-Holmes, 2015) have all been studied with the use of the IRAP. Perhaps the most pertinent example of the use of the IRAP to study social phenomena to this research project is a recent study published in 2016 that explored the impact of environmental cues on implicit attitudes to alcohol via the IRAP (Monk, Pennington, Campbell, Price & Heim). The researchers administered the IRAP task in either a pub or a lecture context and used target pictures that showed an alcoholic beverage in the foreground of either a pub or a lecture hall. They found that participants

more readily related drinking alcohol to positive expectancies when responding to alcohol-congruent stimuli, most especially when they completed the IRAP in a pub. This study not only illustrates the versatility of the IRAP to examine socially significant research topics, but also highlights the power of contextual cues in our implicit attitudes to alcohol.

### **Limitations of Explicit Measures**

Explicit measures are prone to problems that affect validity and reliability including demand characteristic and impression management, where participants fail to report private content as they find they don't endorse it or fear social consequences of reporting it (Holtgraves, 2004). Early research was forced to rely primarily on explicit self-report measures to ascertain participant attitudes, or produce creative means to indirectly assess a research topic (Cameron, Brown-Iannuzzi & Payne, 2002; Webb, Campbell, Schwartz, Sechrest, 1966). This created significant limitations to validity, not least social desirability bias, wherein participants attempted to answer self-report questions in such a way that they would appear favourably to the researcher (Hofmann, Gawronski, Gschwender & Schmitt, 2005; Skinner, Blick, Coffin, Dudgeon, Forrest & Morrison, 2013), or indirect measures relied heavily on assumptions (Cameron, Brown-Iannuzzi & Payne, 2012). Further confounding the valid use of self-report measures is that some psychological aspects are simply not sufficiently available for introspection (Cameron, Brown-Iannuzzi & Payne, 2012). Yet more issues include difficulties in posing questionnaire items in such a way to ensure internal validity and reduce question bias (Greenwald, Poehlman, Uhlmann & Banaji, 2009; Hofmann, Gawronski, Gschwender & Schmitt, 2005). Furthermore, it may be possible that people are at times unable to self-discriminate their private content or comprehend how this content

may relate to their public behaviour hampering their ability to accurately self-report (Hughes, Barnes-Holmes & Vahey, 2012).

### **Relationship between Implicit and Explicit Cognition**

There is a significant body of work established on correlations between implicit and explicit measures relevant to the current research project as it too seeks to understand the relationship between BIRRs and EERRs (Barnes-Holmes, Waldron & Barnes-Holmes, 2009; Campbell, Barnes-Holmes et al., 2011; Cullen, Barnes-Holmes, Barnes-Holmes, Stewart, 2009; Hughes, Barnes-Holmes, 2011; Kelly & Barnes-Holmes, 2013; McKenna, et al., 2007; Nicholson & Barnes-Holmes, 2012). In earlier research, it was thought that a lack of correlation between explicit and implicit (in this case, IAT) attitudes indicated that implicit attitudes were independent from explicit attitudes (Karpinski & Hilton, 2001). However, researchers subsequently modified this stance, as not all researchers found that implicit and explicit measures are independent of one another (Rowatt, Franklin & Cotton, 2005). This indicated that the absence of correlations between implicit and explicit measures can be due to biases in explicit self-reports, lack of introspective access to implicitly assessed representations, cognitive factors influencing the retrieval of information from memory, method-related characteristics of the two measures, or independence of the underlying constructs (Hofmann, Gawronski, Gschwender & Schmitt, 2005).

The REC model offers functional analytic Rule Governed Behaviour (RGB) as an explanation for divergence between direct and indirect measures. RGB can be conceptualised as psychological functions established via the transformation of functions. RGB can be established by the individual or the wider community, and may

be itself a derived relation as all that is required is experience with relational responding and previous contact with the consequences of rule following (Hughes, Barnes-Holmes & Vahey, 2012). Some contextual factors can allow individuals to respond counter to RGB in direct measures, for example when they believe that their responses are anonymous, when they feel that social punishment is unlikely or when the true intent of the question is hidden. However, BIRRs and EERRs can also correspond towards the same stimuli as well as conflict. Relational coherence, in itself a conditional reinforcer, can offer some explanation for correspondence between internal and external behaviour as it refers to all individual elements relating in a way that is consistent with the reinforcement history of an individual typically provided by the verbal community for these responses (Hughes, Barnes-Holmes & Vahey, 2012). When BIRRs and EERRs are not in agreement, the individual may look to additional relations in an attempt to resolve discord, which may lead to discrepant outcomes on implicit and explicit measures.

### **Addiction as Behaviour**

Substance addiction can be viewed as operant behaviour, and is therefore modifiable by its consequences (Bigelow & Silverman, 1999; Dutra, Stathopoulou, Basden, Leyro, Powers & Otto, 2008; Madden, 2008). Addiction or substance misuse as a behaviour may serve one or more functions, in line with Skinnerian theory (Higgins, Silverman & Heil, 2008). The reinforcing functions of substances in animal subjects formed much of the focus of early behaviour analytic researchers (Higgins, Silverman & Heil, 2008). Researchers found that the most commonly abused drugs serve as unconditioned positive reinforcers in laboratory animals (Deneau, Yanagita & Seevers, 1969). This lead clinicians to investigate differential reinforcement of



abstinence as an equivalent function with mixed results. They found that social and tangible reinforcement in many cases was a poor substitute for the sensory reinforcement of many substances of abuse (Higgins, Silverman & Heil, 2008). This difficulty matching stimulus or functional equivalence has proved to be a major challenge to contingency management programmes in addressing substance abuse (Higgins, Silverman & Heil, 2008).

Most focus within the literature on Applied Behaviour Analysis as applied to the treatment of substance abuse is on the direct reinforcement of drug abstinence (Higgins, Silverman & Heil, 2008; Lussier, Heil, Mongeon, Badger & Higgins, 2006; Prendergast, Podus, Finney, Greenwell & Roll, 2006; Silverman, Roll & Higgins, 2008). Other therapeutically significant target behaviours are less typically investigated, for example treatment session attendance (Hays, 2009; Hunter, Ayer, Han, Garner & Godley, 2014; Silverman, Roll & Higgins, 2008). Time and again, Applied Behaviour Analysis is proven to be a highly effective treatment for substance abuse and addictive behaviours (Bigelow & Silverman, 1999; Dutra, Stathopoulou, Basden, Leyro, Powers & Otto, 2008; Higgins, Silverman & Heil, 2008; Lussier, Heil, Mongeon, Badger & Higgins, 2006; Prendergast, Podus, Finney, Greenwell & Roll, 2006; Silverman, Roll & Higgins, 2008). Such is the efficacy of its application to substance abuse, in 2007 the National Institute for Health and Clinical Excellence in the UK published guidelines that included the use of motivational interventions to change addictive behaviour and contingency management programmes in the treatment of substance abuse (NIHCE, 2007; Silverman, Roll & Higgins, 2008). Silverman, Roll & Higgins (2008) highlight that further research is required to improve the effectiveness of contingency management programmes, to ensure long-term

maintenance of contingency management and to increase the clinical use of contingency management interventions. Furthermore, Silverman, Roll & Higgins (2008) stated that motivation to change one's addictive or substance misuse behaviour is necessary, and although contingency management programmes may increase this motivation, a certain amount is pre-requisite, and ambivalence is common among addicts (Higgins, Silverman & Heil, 2008). Contingency Management (CM) interventions typically involve voucher-based reinforcement for abstinence, as determined via urine samples or other bio-medical means (Dunn, Sigmon, Thomas, Heil & Higgins, 2008; Higgins, Delaney, Budney, Bickel, Hughes & Foerg, 1991). Such interventions may require modification when treating poly-drug use (Epstein & Preston, 2008) or addictions to different types of substance (Budney & Stranger, 2008; Higgins, Heil, Randall & Chivers, 2008; Roll & Newton, 2008; Sigmon, Lamb & Dallery, 2008; Wong, Silverman & Bigelow, 2008).

Some interesting, and clinically versatile research has been conducted in the use of inter-dependant group contingencies, wherein one anonymous, randomly selected group member's behaviour determines the level of reinforcement received by the entire group (Kirby, Kerwin, Carpenedo, Rossenwasser, Gardner, 2008). Such contingencies make good use of social reinforcement between group members, but may be open to putting participants at risk of bullying and intimidation by group members (Silverman, Roll & Higgins, 2008). Making group reinforcement contingent on the behaviour of one individual may place excessive social pressure on that individual, and may even make them a target for aggression. This factor may have an impact on the social or ethical appropriateness of the group contingency as an acceptable intervention (Silverman, Roll & Higgins, 2008). An alternative, as mentioned previously, may be

reinforcement-based CM. Studies exploring CM appear to dominate the body of ABA research in addiction and some studies link environmental factors to substance abuse. One such study (Husky, Mazure, Carroll, Barry & Petry, 2008) explores the use of the Experience Sampling Method in CM. This entails researchers making calls to participants within and across days at random intervals to obtain data about the participant's current environment (Silverman, Roll & Higgins, 2008). Although not considered an effective intervention in isolation, Experience Sampling may be useful in developing and improving CM interventions (Silverman, Roll & Higgins, 2008). Given the apparent dominance of reinforcement-based CM in behaviourally-influenced clinical interventions, it seems unsurprising that a body of research has emerged on reducing the financial cost of such interventions, often through the use of prize-based draws (Ghitza, Epstein, Schmittner, Vahabzadeh, Lin & Preston, 2008; Higgins, Delaney, Budney, Bickel, Hughes & Foerg, 1991, Peirce, Petry, Stitzer, Blaine, Kellogg, Satterfield, Schwartz, 2006). However, such prize draws may impact the efficacy of the reinforcement contingency (Ghitza, Epstein, Schmittner, Vahabzadeh, Lin & Preston, 2008). There is also a significant body of research that looks at the use of community-based reinforcers such as drug courts (Marlowe, Festinger, Dugosh, Arabia & Kirby, 2008) and the workplace (Silverman, 2004), both of which wield powerful contingencies around freedom and wages respectively (Silverman, Roll & Higgins, 2008).

### **Alcohol Use Behaviour**

The current research project looks at alcohol use behaviour among participants, specifically at how implicit and explicit attitudes to alcohol as measured by the IRAP and Attitudes to Alcohol Scale (Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014)

respectively may correlate with the frequency and quantity of alcohol use. Further of interest to the current research is participant self-reported ability to control their alcohol use behaviour and the role it plays in explicit and implicit attitudes to alcohol and alcohol use behaviour. Alcohol was identified as an unconditioned reinforcer in early behavioural research on animals (Deneau, Yanagita & Seevers, 1969). This infers that alcohol in terms of reinforcement may be categorised in the same way as food, water and sex (Wong, Silverman & Bigelow, 2008). Many interventions in alcohol-use behaviour have focused on reinforcement that is directly incompatible with alcohol use (Wong, Silverman & Bigelow, 2008). Punishment procedures have also been employed for example the clinical use of Disulfiram, a medication that has little or no effect when used in isolation but causes aversive side effects when even small amounts of alcohol is taken, has proven to be very effective in clinical research trials (Wong, Silverman & Bigelow, 2008). However, not all patients will agree to take it or fully comply with prescriptive instruction. The use of Disulfiram itself may be considered an operant conditioning intervention, but contingency management interventions can also be utilised to encourage administrative compliance (Wong, Silverman & Bigelow, 2008). A further barrier to the behavioural treatment of alcohol use is the difficulty in objective biological testing for alcohol use, as alcohol has a quick elimination rate from the body, thus breath alcohol samples report only very recent alcohol intake.

### **Addiction and Acceptance and Commitment Therapy**

Acceptance and Commitment Therapy (ACT) is emerging as an effective treatment for addictive behaviour in the research literature. Research by Vilagra-Lanza & Gonzalez-Menedez (2013) focused on implementing an ACT intervention to a group of incarcerated women with substance use disorders who were randomly assigned to

the group. A control group was placed on a waiting list for treatment. The researchers found that the experimental group made clinically significant gains after three and six months of treatment. Twohig, Shoenberger & Hayes (2007) used a multiple baseline design to implement an abbreviated ACT treatment to three marijuana-dependent participants. They found that all three participants ceased marijuana use post treatment. Although two participants had resumed use at three-month follow up, their use was at a lower level than at pre-treatment. Based on the principles of Relational Frame Theory (RFT), ACT seeks to address language as the root to human psychological distress (Harris, 2009) including addiction (Hayes & Levin, 2012). Research has been conducted testing the efficacy of ACT in the treatment of a large array of clinical disorders including anxiety (Raj, 2015) depression (Folke, Parling and Melin, 2012) and psychosis (Johns, Morris and Oliver, 2013). DeGroot, Morrens and Dom conducted a literature review of all available published research on ACT as a treatment for addiction in 2014. The researchers found that the majority of the sixteen studies (ten of which were randomised control trials) reported positive results for ACT following treatment and follow-up. The researchers noted that of the sixteen studies they reviewed; only one was specific to alcohol addiction, which may point to a gap in ACT research. Ostafin and Marlatt (2008) found that experiential acceptance via mindfulness weakens positive relations between automatic appetitive responses and hazardous drinking. Other ACT research has focused on avoidance of negative affect and relapse post treatment. A small uncontrolled study conducted by Vieten, Astin, Buscemi & Galloway (2010) found significant improvements in self-reported negative affect, emotional reactivity, perceived stress and a trend towards craving reduction with the

implementation of an acceptance-based coping intervention post alcohol dependence treatment.

The current research project utilises a brief ACT-based intervention comprised of viewing a TEDx talk by Jonathan Bricker “The Secret to Self-Control” and an infographic flyer that participants were asked to review. Dr. Bricker and his colleagues have conducted research developing a web-based ACT intervention for smoking cessation (Bricker, Wyszynski, Comstock, Heffner, 2013). His TEDx talk was selected for use in this research project as it is short, entertaining and aimed at engaging the participant demographic (that is, undergraduate students) and non-specific to alcohol use to minimise participant expectation effects. It is however focused on self-control which may relate to participant ability to control their drinking behaviour, one of the variables examined in the current research project. Dr. Bricker refers directly to Acceptance and Commitment Therapy in his talk, and a number of the themes in his lecture are based on ACT theory. The main theme is that behaviour change can be achieved through willingness to engage in unpleasant bodily sensations (for example food or smoking cravings) rather than avoiding them. Willingness is a concept that has been studied extensively by ACT researchers. Twohig, Hayes & Masuda (2006) implemented an intervention with participants with OCD that aimed to increase willingness to experience obsessions. The researchers reported clinically significant results for all participants by the end of treatment with results maintained at a three-month follow up. Dr. Bricker also implies the use of mindfulness in developing self-control, encouraging his clients and the audience to track cravings and gain a better awareness of what they think and feel before acting. Mindfulness is a topic that is also well documented in ACT literature. It has been applied to the treatment of psychosis

(Morris, Johns & Oliver, 2013) as well as chronic pain (McCracken & Vowles, 2014) as part of ACT treatment packages. Finally, Dr. Bricker introduces cognitive defusion exercises to the audience, encouraging us to create space between ourselves and our thoughts with the aim of maximising control over cravings. Cognitive defusion can be understood as the transfer or reduction of stimulus function (often distress) associated with a thought (Blackledge, 2007). Research conducted by Masuda, Twohig, Stormo, Feinstein, Chou & Wendell (2010) found that cognitive defusion significantly reduced emotional discomfort and believability of negative self-referential thoughts for participants when compared to a control condition. Participants were offered an infographic flyer to take with them after watching the Dr. Bricker TEDx talk that outlined the key points made during the lecture produced by the lead researcher and were asked to review it weekly before attending to participate in Study 2.

### **RFT and Addiction**

We see the importance of RFT when it comes to addiction for example with a study (Farrelly, Heaton, Davis, Messeri, Hersey, & Haviland, 2002) that looked at the effectiveness of counter-marketing of anti-tobacco campaigns. The researchers found that advertising statements that included negations i.e. framed tobacco use in opposition to health (e.g. “don’t smoke”) were less effective than statements that framed tobacco use in coordination with ill-health (e.g. “smoking kills”). Given, as discussed previously, that implicit relational responding may inform or predict our behaviour, it follows that it may influence our substance abuse or addictive behaviour. Functional analytic theories of addiction propose that failure to control alcohol use can result from either strong relations between alcohol-related cues and appetitive motivational responses or difficulty in controlling unwanted behavioural impulses (Deutsch and

Strack, 2006; Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014; Wiers and Stacy, 2006). Relations between cues of the problem substance and response can develop through repeated experience of the reinforcing effects of alcohol with the result that alcohol-related cues become conditioned incentive stimuli (Hughes, Barnes-Holmes & Vahey, 2012; Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014; Robinson and Berridge, 2001; Stewart, de Wit & Eikelboom, 1984). Add to this that researchers have found a narrowing of attention whilst engaging in addictive behaviour with a focus on the experience at hand, and the problem compounds (Evans & Coventry, 2006). This suggests that substance misuse or other addictive behaviour may be employed by the individual as a means to avoid experiencing pain, whether physiological or psychological. Thus the strength of the target addictive behaviour relational responding should be related to the extent to which cues automatically activate appetitive responses (Fazio, 2001, Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014; Strack and Deutsch, 2004; Tiffany, 1990). In early addiction research, explicit measures (i.e., introspective self-report) were used to assess the strength of alcohol relations and expectancies (Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014). Explicit measures have been shown to predict drinking behaviour in a number of studies (Burden & Maisto, 2000; Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014; Stacy, Widaman & Marlatt, 1990) although it has been argued that explicit measure scores can be confounded by processes such as reactivity and self-presentation (Greenwald and Banaji, 1995; Ostafin, 2014). Deutsch and Strack (2006) stress that when it comes to addiction to substances, chronic consumption can cause changes in relational structure which can further influence behaviour. This can occur as behavioural schemata develop specific to a substance, linking typical conditions and consequences of use. Robinson &



Berridge noted that tolerance/withdrawal/satiation cycles suggest that the same mechanisms that regulate impulsive responding in deprivation also operate in addiction, leading to situational cues that facilitate addictive behaviours. Thus, the ambivalent nature of addiction may imply a different outcome for the same participant on an implicit measure of alcohol depending on where that participant lies is in terms of a satiation/deprivation spectrum. That is, when deprived the impulsive system will be primed to focus on positive short-term outcomes of drug use and positive attentional bias will be activated towards situations in which drugs were previously used (Deutsch & Strack, 2006). Research by Carpenter, Martinez, Vadhan, Barnes-Holmes & Nunes (2012) explored the prospective relationship between attentional bias toward cocaine stimuli and beliefs about the consequences of cocaine use using the IRAP. The study found that stronger implicit beliefs about the positive effects of cocaine use prior to treatment were associated with poorer treatment outcomes when a voucher- incentive for abstinence was in place. Furthermore attentional bias for cocaine-related stimuli was associated with better treatment outcome when the voucher-incentive programme was removed.

### **Current Research**

Limited research has been conducted to examine the impact of the use of picture or word target stimuli in the IRAP task on participant responding within the task. Nonetheless, it seems that the choice of target stimuli used in the IRAP can affect IRAP outcomes. Kelly and Barnes-Holmes (2015) noted that with the use of word target stimuli in the IRAP, ABA tutors showed pro-reinforcement bias for both bad and good student behaviours whilst mainstream teachers showed pro-reinforcement bias for good behaviours and pro-punishment bias for bad behaviours. When picture target stimuli

were delivered in place of word stimuli however, both ABA tutors and mainstream teachers showed a pro-punishment bias for bad behaviour and a pro-reinforcement bias for good behaviour. The researchers suggest that as pictures can be processed with greater ease than words (Dasgupta, McGhee, Greenwald & Banaji, 2000) picture target stimuli may have impacted participant relational response latency within the IRAP. Furthermore, they point to potential ecological factors in participant learning histories in which word stimuli may be related to textbook learning about the appropriate use of reinforcement and punishment procedures (Kelly & Barnes-Holmes, 2000). Due to the importance of carefully selecting target stimuli for use in the IRAP, a pre-experimental condition was used in order to examine which stimuli should be used to explore implicit attitudes to alcohol using the IRAP.

Alcohol misuse may be considered behavioural insofar as one must at some point choose to engage in some form of the addictive behaviour in order to misuse. The nature of addiction may lead researchers to wonder about the relational responding (most especially implicit) that may reinforce alcohol misuse and punish abstinence. Thus it is not surprising that a number of behavioural studies have been conducted that look at alcohol misuse and alcoholism (Carpenter, Martinez, Vadhan, Barnes-Holmes & Nunes, 2012; Garland, Boettiger & Howard, 2011; Garland, Froeliger & Howard, 2014; Henden, Melberg & Rogeberg, 2013; Johnson, 2013; Malygin, Khcomeriki, Smirnova & Antonenko, 2013; Redish, Jensen & Johnson, 2008; Sussman & Sussman, 2011; Stacy & Wiers, 2012). A significant body of research has been developed that explores the role of implicit response to alcohol and alcohol/substance abuse. As discussed previously, the distinction between explicit and implicit responding is in line with dual process models, which suggests that addictive behaviours develop as a result

of an imbalance between implicit and explicit or relational associations (Pieters, van der Vorst, Engels & Wiers, 2010). Whereas implicit responding becomes hypersensitive with repeated alcohol use leading to compulsive behaviours, explicit responding is negatively affected by alcohol consumption, resulting in decreased control over the addictive behaviour (Bechara, Noel & Crone, 2006; Deutsch & Strack, 2006; Pieters van der Vorst, Engels & Wiers, 2010; Wiers, van Woerden, Smulders & de Jong, 2002). The interaction between reflective and impulsive behaviour, when associated with addiction manifest with numerous difficulties including the struggle to regulate action (Bandura, 1977), manage rational choice (Becker & Murphy, 1988) and explicit expectancies of drug effects (Goldman, del Boca & Darkes, 1999).

Furthermore, operant learning can influence conditioned withdrawal and tolerance (Siegel, 1979), drug habits (Tiffany, 1990) and incentive sensitisation (Robinson & Berridge, 2003). A study by Houben, Havermans and Wiers (2010) showed that alcohol misuse could be reduced via an evaluative conditioning manipulation of implicit relations to alcohol. Cohn, Cobb, Hagman, Cameron, Ehlke & Mitchell (2014) explored implicit processes in alcohol/nicotine addiction comorbid with depression in order to examine internal behaviour that may underlie the addiction-depression relationship. The researchers found that participants with a history of major depressive disorder have stronger implicit motivation to drink than participants without, which supports their negative reinforcement model of addiction hypothesis (Cohn Cobb, Hagman, Cameron, Ehlke & Mitchell, 2014). McPherson & Harris (2013) compared implicit and explicit measures to alcohol in alcohol dependent and non-dependent samples, suggesting a more recent emphasis in the research literature on the role of implicit and explicit relational responding in alcoholism. Ostafin, Kassman, de Jong,

van Hemel-Ruiter (2014) built on this study by predicting dyscontrolled drinking with the use of implicit and explicit measures to alcohol. Significantly, these studies suggest that examining implicit and explicit bias towards alcohol may point towards a greater understanding of the relational processes that potentially impact addictive behaviours (Wiers, van Woerden, Smulders & de Jong, 2002).

Limited research has been conducted that links participant substance or alcohol use to their bias towards alcohol. Although research is readily available looking at links between lesbianism and alcoholism (Gedro, 2014), nursing students and bias to alcoholism (deVargas, 2012), spirituality as a racial variable in alcoholism recovery (Townsend, Farkas & Krentzman, 2010), none of these studies attempt to correlate participant substance abuse to relational responding to addicts and addiction. A study by deVargas (2014) went as far as to correlate nurses' knowledge of alcoholism and addiction, but stopped short of their personal knowledge as it impacted on their BIRRs to addiction. There is some research available in the literature that investigates participant's level of alcoholism and social support as predictors of abstinence duration, (Blagojevic-Damasek, 2012) but stops short of the current research aims to investigate links between participant alcohol use behaviour and BIRRs and EERRs towards alcohol. Wiers, van Woerden, Smulders & de Jong (2002) conducted a study that directly examined participant alcohol use severity with their implicit attitudes to alcohol via the IAT. They found that heavy drinkers associated alcohol with arousal but interestingly, both heavy and light drinkers showed negative implicit valence on the IAT with alcohol.

Some research conducted by Warner, White and Johnson (2007) looked at correlations between family history of alcohol use and the onset of drinking in

adolescents. Similarly, Pieters, van der Vorst, Engels & Wiers (2010) examined parental alcohol use in relation to implicit (IAT) associations to alcohol among a sample of ten year old children, finding that implicit attitudes were positively correlated with parental alcohol use. Thus implicit relational responding to alcohol may predict future alcohol use behaviour, it follows that onset of alcohol use may be related to BIRRs towards alcohol, as it suggests that child and adolescent attitudes towards alcoholism are contextualised within the alcohol-use behaviour of the family. Houben & Wiers (2008) examined the role of implicit positive associations as a predictor of drinking behaviour using the IAT, and found that implicit pro-alcohol attitudes are related to alcohol use. A measure allow participants to self-report experience of problem alcohol use within primary and secondary family members is included in the current research to explore links between BIRRs and EERRs towards alcohol and prior exposure to problematic alcohol use behaviour. This measure consists of directly asking participants to tick boxes against primary (mother, father, sibling) and secondary (aunt, uncle, grandparent) that they are aware has or has had a problematic relationship with alcohol.

An established explicit measure of bias towards addiction (Hauben & Wiers, 2006b, 2007a, 2008a, 2010; McPherson & Harris, 2013) should be included alongside an implicit measure for comparison. It is also wise to use a self-report measure to evaluate participant's EERRs towards alcohol. In remaining faithful to the Ostafin, Kassman, DeJong, van Hemel-Ruiter (2014) study for the purposes of partial replication of that study, the current research uses the same measure used by those researchers to measure explicit attitudes to alcohol. This self-report measure of Attitude to Alcohol Scale (AAS) is deemed to measure EERRs in the current research and

consists of six items, using a scale ranging from -5 to +5. In order to increase structural similarity, the basis of the questions consisted of the same attribute items used in the IRAP, which also corresponds to the labels used by the original researchers in the IAT. A brief behavioural measure is used within the current research to ascertain if participants would be willing to participate in a hypothetical companion research study that would involve a one week long period of abstinence from alcohol use. This measure consists of a single closed question with a yes/no response option available to participants. Although there has been a good deal of research conducted in the area of implicit and explicit cognition and their correlation, not all of it was conducted using the IRAP measure. Indeed, this is true of the studies that most closely resemble the current research study. McPherson & Harris (2013) compared implicit and explicit attitudes to alcohol in alcohol dependent and non-dependent samples, using the Implicit Association Test.

Ostafin; Kassman, deJong, van Hemel-Ruiter (2014) predicted dyscontrolled drinking with the use of implicit and explicit measures of alcohol attitude, again using the IAT as implicit measure. The researchers claim that dyscontrolled drinking is a defining feature of alcoholism which is supported by the DSM V criteria for substance abuse disorders. Dyscontrolled drinking is therefore an important variable to consider in both research and clinical treatment of alcohol and alcoholism. The researchers use the Govern scale of Temptation and Restraint Inventory (TRI) as a measure for dyscontrolled drinking, and the same measure is used in the current research to the same end. This scale was originally developed by Collins and Lapp (1992) and is scored as the sum of three items on a nine point scale with the anchors “never” and “always”. The items all question participant control over their drinking for example,

“How much effort does it take for you to keep your drinking under control?” Ostafin, Kassman, deJong, van Hemel-Ruiter report that the TRI demonstrated good internal consistency (2014). Collins and Lapp demonstrated that the TRI predicted self-reported weekly alcohol consumption and is consistent with the conceptualisation of drinking restraint (1992). The current research also uses a calendar measure to ascertain the quantity and frequency of alcohol use behaviour among participants, which was also used in the Ostafin, Kassman, deJong, van Hemel-Ruiter study (2014). This measure consists of a calendar month presented with participants asked to self-report the number of occasions and dates they used alcohol and quantities of alcohol consumed on those dates. Sobell and Sobell (1992) report that calendar measures demonstrate good reliability and validity. We identify something of a gap in the research as regards correlating participant substance use to implicit and explicit attitudes towards addiction. This aspect, along with results from the initial study on which classes of stimuli to use in the IRAP should prove an addition to the current body of literature on the use of the IRAP, and contextual behavioural science, especially as it relates to addiction and addictive behaviour.

This research project aims to explore implicit attitudes to alcohol as measured through the IRAP with undergraduate University students ( $n=95$ ). In Study 1 the relationship between BIRRs and EERRs as measured by the IRAP and AAS were examined along with correlations between alcohol use behaviour, willingness to abstain from alcohol use behaviour and transgenerational/familial problem drinking with undergraduate students ( $n=60$ ). A brief ACT based intervention was implemented at the end of Study 1. Participants from Study 1 were invited to return to take part in Study 2 thirty days later ( $n=48$ ). The IRAP, AAS and calendar measure to examine alcohol use

behaviour were administered a second time along with participant willingness to abstain from alcohol use. An additional measure asking participants if they noticed any change in their behaviour they attribute to taking part in the research project was included at this stage. Any impact on participant behaviour of the brief ACT-based intervention was measured using repeated measures analysis to examine any change in participant responses on any of the variables studied. Some evidence emerged as a result of Studies 1 and 2 that indicating that some of the target pictures used in the IRAP potentially difficult to discriminate as either soft drinks or alcohol, despite a pre-experimental condition that examined which pictures to utilise in the IRAP procedure. Study 3 repeated all the measures used in Study 1 but using picture targets in the IRAP that aimed to represent alcohol and soft drinks more explicitly to examine any construct validity issues that could be inferred.

A partial replication of the Ostafin, Kassman, deJong, van Hemel-Ruiter (2014) dyscontrolled drinking study as mentioned previously is conducted, using the same measures as used in the original study except the use of the IRAP rather than the IAT to measure implicit attitudes to alcohol. To this end, all of the labels the researchers used in 2014 were retained for use in the IRAP, with the addition of one positive and one negative label as the IAT requires five each positive and negative labels whilst the IRAP requires six. It should be noted that the original researchers used word targets whilst the current research project uses picture targets. The AAS was used in 2014 to measure explicit attitudes to alcohol and the TRI was used to measure dyscontrolled drinking and both are also used in the current research project. It should be noted that the current research project examines family history of problematic alcohol use and participant willingness to abstain from alcohol use, variables not explored by the



researchers in 2014. Nor did they implement any intervention with participants or conduct repeated measures testing.

## **CHAPTER 2**

### **STUDY 1**

## Introduction

According to Alcohol Action Ireland, alcohol misuse contributes to public health, mental health, road safety and crime problems in Ireland. Understanding the role of implicit cognition on drinking behaviour may inform more effective means of addressing dyscontrolled drinking and treatment for alcohol addiction. This study seeks to explore correlations between participant's implicit attitude towards alcohol as determined via the IRAP and their explicit attitude to alcohol as determined through an explicit measure. Furthermore, the study investigates correlations between the frequency and intensity of participant alcohol use over the previous thirty days and their implicit attitude to alcohol. The participant's perceived level of control over their drinking will also be correlated with their implicit attitude to drinking as well as their frequency and intensity of alcohol use. The results of a behavioural measure that assesses whether participants might be willing to abstain from drinking alcohol for a week will be correlated with their implicit attitude to alcohol, their alcohol use behaviour and their control over their drinking. Finally, whether there is a history of problematic drinking in the participant's family will be correlated with their own control over their drinking, their current drinking behaviour and their implicit attitude to alcohol.

Ostafin, Kassman, deJong & van Hemel-Ruiter (2014) explored correlations between implicit and explicit attitudes to alcohol, participant's ability to control their drinking behaviour and their drinking behaviour itself. Therefore, the current study may be understood as a replication in part of this research, with the addition of a behavioural measure and participant family history of alcohol problems. However, it is important to note that the current study uses the IRAP to measure implicit attitudes to alcohol rather

than the IAT employed by Ostafin et al. Furthermore, this study uses picture rather than word targets in the IRAP following a pre-experimental investigation which noted that participants found visual targets more evocative of alcohol than verbal. As the IRAP effect is sensitive to the exact stimuli that are presented within the procedure, this pre-experimental investigation was used to determine whether a focus group of participants would find picture or word stimuli more evocative of alcohol. The IRAP required a set of stimuli that is coordinated to the topic being investigated, in this case alcohol, as well as a set that is in opposition to it. Labels used in the IRAP were the same labels used by Ostafin, Kassman, deJong & van Hemel-Ruiter (2014).

## **Method**

### **Participants**

In the pre-experimental phase, participants ( $n=10$ ) were invited from an undergraduate participant pool recruited by the Psychology Department in Maynooth University. The sample was made up of four female and six male participants ranging in age from 18 to 24. The mean age is 19.6 years.

Within Study 1 participants ( $n=60$ ) were recruited via the Psychology Department participant pool. They are undergraduate students attending Maynooth University. The sample comprised 34 male and 26 female participants with a mean age of 22.05 years. Participants were split into groups according to their self-reported alcohol use behaviour (quantity of alcohol consumed over the previous thirty days, mean=34.4 units). Group one ( $n=19$ ) comprised non-drinkers and light drinkers, characterised as those participants that consumed ten or less units of alcohol over the

previous thirty days. Moderate drinkers, those that consumed thirty-five or less units of alcohol over the previous month but more than ten made up group two (n=21). Finally, group three, Heavy drinkers (n=19) was made up of those participants that reported drinking in excess of thirty-five units over the previous thirty days.

### **Settings/Materials**

During the pre-experimental investigation into the use of picture or word target stimuli participants were presented with two sets of stimuli typically related to alcohol and soft-drinks (see Appendix 1). Set one comprised eight words and eight pictures of alcohol-related stimuli ordered randomly. Set two comprised eight word and eight pictorial soft-drink-related stimuli ordered randomly. Participants were furnished with a scoring sheet (see Appendix 2) and pen/pencil.

Study 1 was conducted in the Psychology Department in Maynooth University. All participants signed a consent form (see appendix 4) and reviewed a participant information sheet (appendix 3). The implicit attitude of participants was measured via a computerised IRAP (2009 Chelsea Version) programme (Barnes-Holmes, Barnes-Holmes, Power, Hayden, Milne & Stewart, 2006). The IRAP was presented on a standard laptop. The IRAP programme controlled the stimulus presentation of the IRAP tasks and recorded all participant responses. Six labels (words) typically considered positive (e.g. “nice”, “pleasant”) and six labels typically considered negative (e.g. “nasty”, “unpleasant”) were presented along with six picture representations of alcohol and six picture representations of soft drinks (as selected in the pre-experimental phase as discussed above) within the IRAP with the words “similar” and “opposite” on the screen. (See appendix 5 for all labels and targets used

in the IRAP programme). Participants were then asked to complete paper and pen measures including an explicit measure (Attitudes to Alcohol Scale-AAS) that employs the same labels used within the IRAP with a Likert scale (Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014). Please see appendix 6 for the AAS. The Temptation and Restraint Inventory (TRI) (Collins & Lapp, 1992) used by Ostafin Kassman, deJong & van Hemel-Ruiter (2014) to measure dyscontrolled drinking was further presented to participants, please see appendix 7. In order to measure recent alcohol use behaviour, participants were asked to complete a calendar measure indicating the Frequency of Alcohol-Use (FAU) over the previous month and also the intensity of this behaviour by indicating the number of units consumed (Quantity of Alcohol Use-QAU) on each occasion (Sobell & Sobell, 1992). Please see appendix 8. Participants were asked to indicate whether they would be willing to take part in a subsequent research study that would require they abstain from alcohol for a week. This formed a behavioural measure of participant willingness to avoid engaging in drinking behaviour for a week, the Abstinence Scale (Abstain) (see appendix 9). Participants were asked to indicate whether family members had a history of problematic alcohol use (Transgenerational alcohol use-Gen), see appendix 10. Having completed these measures, participants were asked to watch a short video of a talk given by Jonathan Bricker (2014) entitled “The Secret of Self Control”, which stresses Acceptance and Commitment Therapy (ACT) principles in controlling cravings. See appendix 11 for a link to this talk. Finally, participants were given a flyer (see appendix 12) produced by the lead researcher summarising the talk they had watched, and were asked to set themselves a reminder to review the flyer every week in preparation for Study 2.

## Experimental Design

The discrete choice pre-experiment investigation employed a within subjects design preference assessment between two sets of stimulus classes through a focus group. The Independent Variable is the word and picture stimuli as presented to participants. The Dependent variable is the rating attributed by participants indicating to what extent on a scale from 1-10 each stimulus elicited alcohol-related thoughts. The aim of the investigation was to select stimuli that were appropriate for use in the IRAP.

Study 1 employs a mixed-methods design, including a within participants correlational analysis that is, an examination of correlations between implicit (IRAP) and explicit (AAS) attitudes to alcohol and other self-report measures (TRI, Abstain and Gen) as described in the settings and materials section. In addition, participants were assigned to groups based on self-reported quantity of alcohol use behaviour (QAU) and between participants data analysis was conducted to explore variance across the groups (Non/Light drinkers, Moderate drinkers and Heavy drinkers) in each of the measures (IRAP, AAS, TRI, Gen and Abstain). The study also encompasses a replication of the Ostafin, Kassman, deJong & van Hemel-Ruiter (2014) study insofar as it seeks to find correlations between implicit measures (in the current research using the IRAP rather than the IAT as used in the 2014 study) and dyscontrolled drinking. The current research adds to this by exploring correlations among each of the measures outlined in the settings and materials section in addition to examining correlations between the IRAP and dyscontrolled drinking (TRI).

## **Ethical Approval**

A research proposal was submitted for ethical approval to the Departmental Ethics Sub-Committee and approved in October 2015. Potential participant vulnerability was raised by the Sub-Committee, as although participants are over eighteen years of age and typically developed, they are part of a student population. In order to address this issue, steps were taken to maximise the informed consent of participants and stress that they may withdraw their participation at any time. All participants received and reviewed participant information forms prior to participation (Please see appendix 3). All participants reviewed and signed consent forms prior to participation (Please see appendix 4).

The potential risks, discomfort and inconveniences associated with this research project are minimal. As with any visual electronic device (i.e.) computer, television, handheld games, etc.) there exists a risk of potential seizures. Research regarding this issue indicates that this risk is minimal. Participants are informed of this in the consent form and are able to decide whether they should participate based on this knowledge. The design requires a mild deception. As part of the questionnaire in the second study, the behavioural measure will ask participants if they would be willing to participate in a future study (yes/no) that would involve a week's abstinence from alcohol. This is mild deception because no such study is planned; the question is designed to gain information as to participants' willingness to abstain from alcohol for one week. All participants will be told in debriefing that no such study is planned, and will be told the purpose of the question. It is not anticipated that the mild deception will cause participants any concern, especially because the data will be anonymised from the outset. Participation in this study may affect some participants who may be concerned



about their own or a loved one's alcohol misuse. In acknowledgement of this, debriefing sessions will be made available to participants, and information about community-based alcohol support agencies offered if they felt concerned about their relationship with alcohol.

### **Procedure**

All parameters of the research study were explained to each participant and they were asked to read and sign a consent form (see appendix 4). In the pre-experimental investigation, each participant was given materials as previously set out and asked to rate each item from 1-10, where 1 indicated that it made the participant think of alcohol very little and 10 indicated that it made the participant think of alcohol a great deal. On completion, participants returned their materials to the researcher and were discharged of any further participation in the study. Each data sheet was examined and mean scores for each item were calculated over the ten participants' results. Composite mean scores for picture and word stimuli within the stimuli classes of "alcohol" and "soft-drinks" were then calculated and graphed.

The researchers constructed the IRAP programme before commencing the experiment to include the labels and target images (see appendix 5), and included six test blocks and the opportunity for participants to complete practice blocks in advance of test block. Participants were only invited to complete test blocks if they meet an average response latency criterion of 2000ms and accuracy of responses over 80%. See Figure 1 below. On commencing the experiment, participants were first presented with the IRAP task. The task began with a set of generic instructions and an introduction to what the participant would see on the screen in the programme. This comprised of

describing the layout of the screen and explaining response options. It was explained to each participant that they would see a picture representing either alcohol or soft drink on screen, along with a word that is either positive or negative. They would be given two response options- “similar” or “opposite” presented fixed at the bottom left and right of the screen respectively. It was explained to participants that pressing the “d” key on the keyboard selected the “similar” option, whilst pressing the “k” key on the keyboard selected the “opposite” response option. Participants were asked to pick one response option per trial. They were asked to respond to each on screen presentation as quickly and accurately as possible, with a minimum of 80% correct averaging less than 2000ms response latency.

The researcher explained that the participant would complete two practice blocks initially and they would be repeated with the opportunity to complete up to six practice blocks if criteria remained unmet. The lead researcher completed the first IRAP practice block with the participant, emphasising the importance of speed and accuracy. The researcher then remained to help the participant complete the second practice block. The researcher then withdrew allowing participants to complete up to four practice blocks if required.





Figure 2. Example of IRAP on-screen presentation for each trial type; Alcohol-Positive, Alcohol-Negative, Soft Drink-Positive, Soft Drink-Negative.

See Figure 2 for an example of a typical IRAP screen presentation to participants for each trial type. Taking Alcohol-Positive for example, an alcohol target image “Brandy” is presented with a label typically deemed positive “enjoyable”. Participants are asked to press the key “d” if the relational presentation is similar to the rule they are currently following or “k” if it is opposite to the rule they are following. During consistent IRAP blocks, Participants are asked to follow the rule “Soft drinks are positive, alcohol is negative”. So in a consistent block, the correct participant response in the example shown would be “k” for opposite, as the rule is that alcohol is negative but the on-screen presentation shows brandy in relation to a positive label. During inconsistent IRAP blocks, participants are asked to follow the rule “Alcohol is positive, soft drinks are negative”. Now the correct participant response to the example shown would be “d” for similar, as the rule is now alcohol is positive, and so the on-screen presentation is in coordination with the rule. Participants complete six test blocks, alternating between consistent and inconsistent blocks so that three pairs of consistent and inconsistent blocks are presented. Each test block consisted of 24 trials, utilising each of the twelve labels and twelve target pictures. Once the test blocks are complete a message on screen prompts the participant to alert the researcher once they have completed the IRAP.

Participants were then offered the pen-and-paper measures as outlined above to complete. Once completed, the participant was asked to watch a short ACT influenced talk by Jonathan Bricker called The Secret of Self Control. Finally, participants were given a flyer that summarises the talk they had just watched and were asked to review the flyer weekly in preparation for participating in Study 2.

## Results

In the pre-experimental phase to select appropriate target stimuli for the IRAP, in eliciting alcohol related thoughts, participants ( $n=10$ ) rated pictures of alcohol (mean=8.01) as more evocative than words (mean = 6.18), and pictures of soft drinks (mean = 1.4) as slightly more evocative than words (mean = 1.19). A dependent  $t$ -test was conducted to examine differences between participant's ratings of how evocative alcohol-stimuli (pictures and words) were compared to soft drinks-stimuli in eliciting alcohol related thoughts. There was a significant difference between ratings of alcohol-stimuli versus soft drink-stimuli (pictures:  $t = 13.04$ ,  $p = .000$ ; words:  $t = 7.164$ ,  $p = .000$ ), indicating that alcohol-stimuli was significantly more evocative than soft drink-stimuli when eliciting alcohol related thoughts. Paired-sample  $t$ -tests were also conducted to examine whether differences in mean ratings between pictures and words were significant. Results show that participants found images of alcohol significantly more evocative than alcohol-related words ( $t = .013$ ,  $p < .05$ ). The results indicate that stimuli related to alcohol elicit thoughts of alcohol more than stimuli related to soft drinks; and that participants find pictures of alcohol more evocative than words.

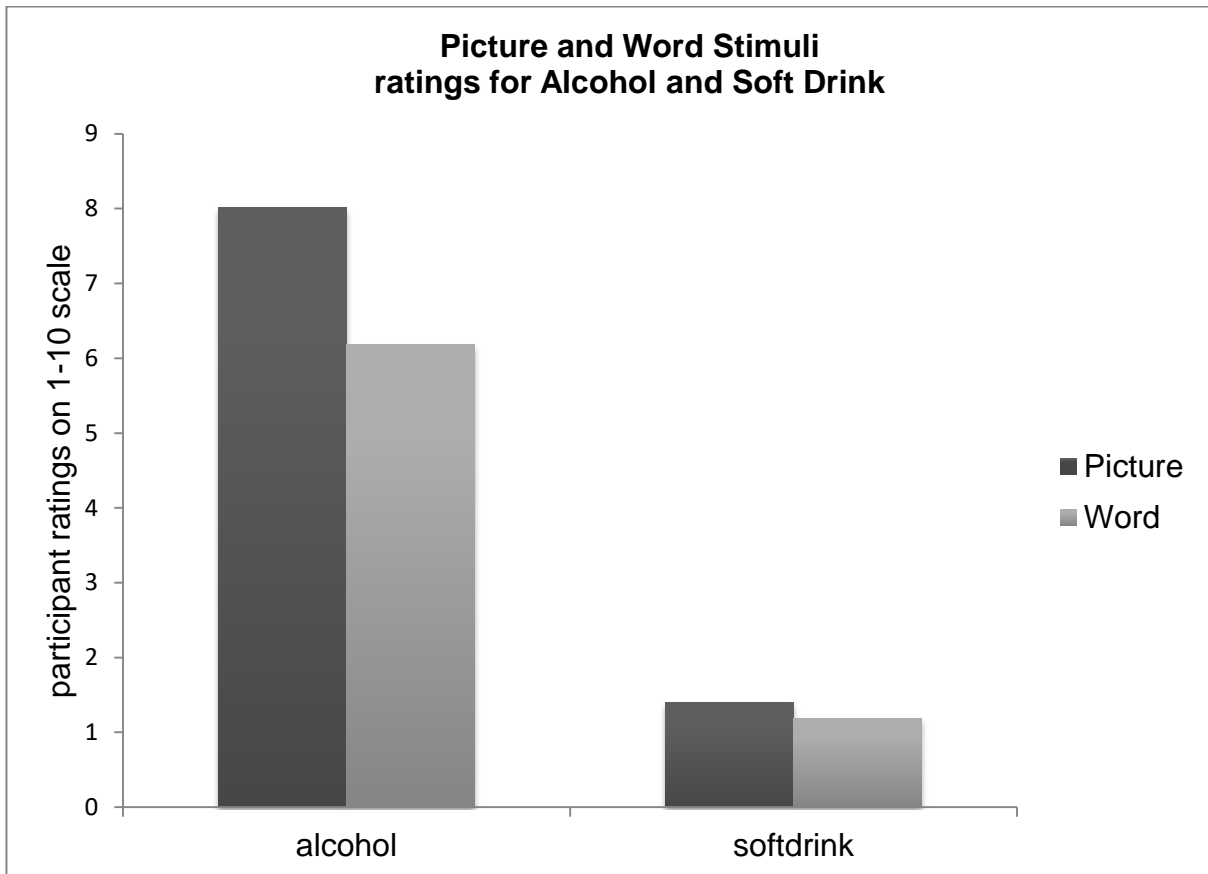


Figure 3. Picture and Word Stimuli ratings for Alcohol and Soft Drink Targets

### **Implicit Relational Assessment Procedure: Data Analysis**

IRAP data were prepared and analysed in line with the latest recommendations (see Hussey, Thompson, McEnteggart, Barnes-Holmes, & Barnes-Holmes, 2015). The primary data produced by the IRAP program are raw latency scores representing time in milliseconds elapsed between the onset of the trial to the emission of a correct response by the participant. Following a standard procedure to control for individual variation (Barnes-Holmes, Waldron, Barnes-Holmes, & Stewart, 2009), the response latency data for each participant were transformed into standardized difference scores,

or *D*-scores, using an adaptation of the Greenwald, Nosek, and Banaji (2003) *D*-algorithm (see Cullen & Barnes-Holmes, 2008; Vahey, Barnes-Holmes, Barnes-Holmes & Stewart, 2009). IRAP *D*-scores are the standardized mean differences in response latencies between consistent and inconsistent trial-blocks across three pairs of trial-blocks. The steps involved in calculating the *D*-IRAP scores were as follows: (1) only response latency data from test blocks were included; (2) latencies above 10,000 ms were not included; (3) if participants' data contained more than 10% of test block trials with latencies less than 300 ms, they were removed; (4) standard deviations for the four trial types were calculated: four for the response latencies from test blocks 1 and 2, four for the response latencies from test blocks 3 and 4, and four for the response latencies from test blocks 5 and 6; (5) 24 mean latencies were calculated for the four trial-types in each test block; (6) difference scores for each of the four trial types were calculated for each pair of test blocks by subtracting the mean latency of the consistent block from the mean latency of the corresponding inconsistent block; (7) each difference score was then divided by its corresponding standard deviation from step 4, yielding 12 *D*-IRAP scores, one score for each trial type for each pair of test blocks; (8) four overall trial-type *D*-IRAP scores were calculated by averaging the three scores for each trial-type across the three pairs of test blocks.

The above data transformation yielded positive *D*-scores that represented soft drink-positive/ alcohol-negative responding, and negative *D*-scores that represented alcohol-negative and soft drink-positive responding. Mean  $D_{IRAP}$  results ( $n=55$ ) show that participants more rapidly affirmed soft-drinks-positive compared to soft drinks-negative; and more rapidly affirmed alcohol-positive compared to alcohol-negative (see Figure 3). One-sample t-tests conducted on each of the four trial types revealed



significant effects for each trial-type [Soft Drink-Positive,  $t(54) = 6.106$   $p = .000$ , two-tailed; Alcohol-Positive,  $t(54) = -6.67$   $p = .000$ , two-tailed; Soft Drink-Negative,  $t(54) = 3.105$   $p = .003$ , two-tailed; Alcohol-Negative,  $t(54) = -2.069$   $p = .043$ , two-tailed). In order to facilitate statistical comparisons in SPSS, and in line with recommendations by Hussey et al. (2015), the data for the trial-types 3 (soft-drink-negative) and 4 (alcohol-negative) were inverted (i.e. multiplied by -1) (see Figure 4).

One-sample  $t$ -tests were also conducted on each of the four trial types for each of the three groups (Group 1: alcohol consumption  $\leq 10$  units in previous month = Non/Light drinkers; Group 2: alcohol consumption  $> 10$  units,  $\leq 35$  units in previous month = Moderate drinkers; Group 3: alcohol consumption  $> 35$  units in the previous month = Heavy drinkers) to compare mean IRAP effect size to zero (see Figure 5). All trial-types were significant for Non/Light drinkers ( $n=16$ ) (Soft Drink-Positive  $t(15) = 2.657$   $p = .018$ ; Alcohol-Positive  $t(15) = -2.210$   $p = .043$ ; Soft Drink Negative  $t(15) = 1.981$   $p = .066$ ; Alcohol-Negative  $t(15) = -3.091$   $p = .007$ ) except Soft Drink Negative ( $p = .066$ ). Alcohol-Positive and Soft Drink-Positive trials were significant for the Moderate drinkers group ( $n=21$ ) (Soft Drink-Positive  $t(20) = 3.345$   $p = .003$ ; Alcohol-Positive  $t(20) = -3.218$   $p = .004$ ; Soft Drink-Negative  $t(20) = 1.936$   $p = .067$ ; Alcohol-Negative  $t(20) = -1.68$   $p = .108$ ), but Soft Drink-Negative ( $p = .067$ ) and Alcohol-Negative ( $p = .108$ ) were not. Alcohol-Positive and Soft Drink-Positive trials were significant for the Heavy drinkers group ( $n=18$ ) (Soft Drink-Positive  $t(17) = 4.724$   $p = .000$ ; Alcohol-Positive  $t(17) = -8.4$   $p = .000$ ; Soft Drink-Negative  $t(17) = 1.452$   $p = .066$ ; Alcohol-Negative  $t(17) = .474$   $p = .642$ ) but Soft Drink-Negative ( $p = .066$ ) and Alcohol-Negative ( $p = .642$ ) were not. Mean D-IRAP scores, standard deviations,  $t$ -values (one sample  $t$ -test) and  $p$ -values for each of the three groups are presented in

Table 1.

*Table 1: Study 1 D-IRAP Scores*

IRAP Trials	Mean D-IRAP Score	Standard Deviation	<i>t</i> -value	<i>p</i> -value
Light Drinkers Alcohol-Positive	-.3344	.6053	-2.210	.043
Light Drinkers Alcohol-Negative	-.3075	.3979	-3.091	.007
Light Drinkers Soft Drink-Positive	.3494	.5259	2.657	.018
Light Drinkers Soft Drink-Negative	.3015	.6087	1.981	.066
Moderate Drinkers Alcohol-Positive	-.3881	.5527	-3.218	.004
Moderate Drinkers Alcohol-Negative	-.2224	.6064	-1.68	.108
Moderate Drinkers Soft-Drink-Positive	.3919	.5370	3.345	.003
Moderate Drinkers Soft-Drink- Negative	.1562	.3697	1.936	.067
Heavy Drinkers Alcohol-Positive	-.7139	.3603	-8.4	.000
Heavy Drinkers Alcohol-Negative	.0628	.5619	.474	.642
Heavy Drinkers Soft-Drink-Positive	.8111	.7285	4.724	.000
Heavy Drinkers Soft-Drink-Negative	.1672	.4888	1.452	.066

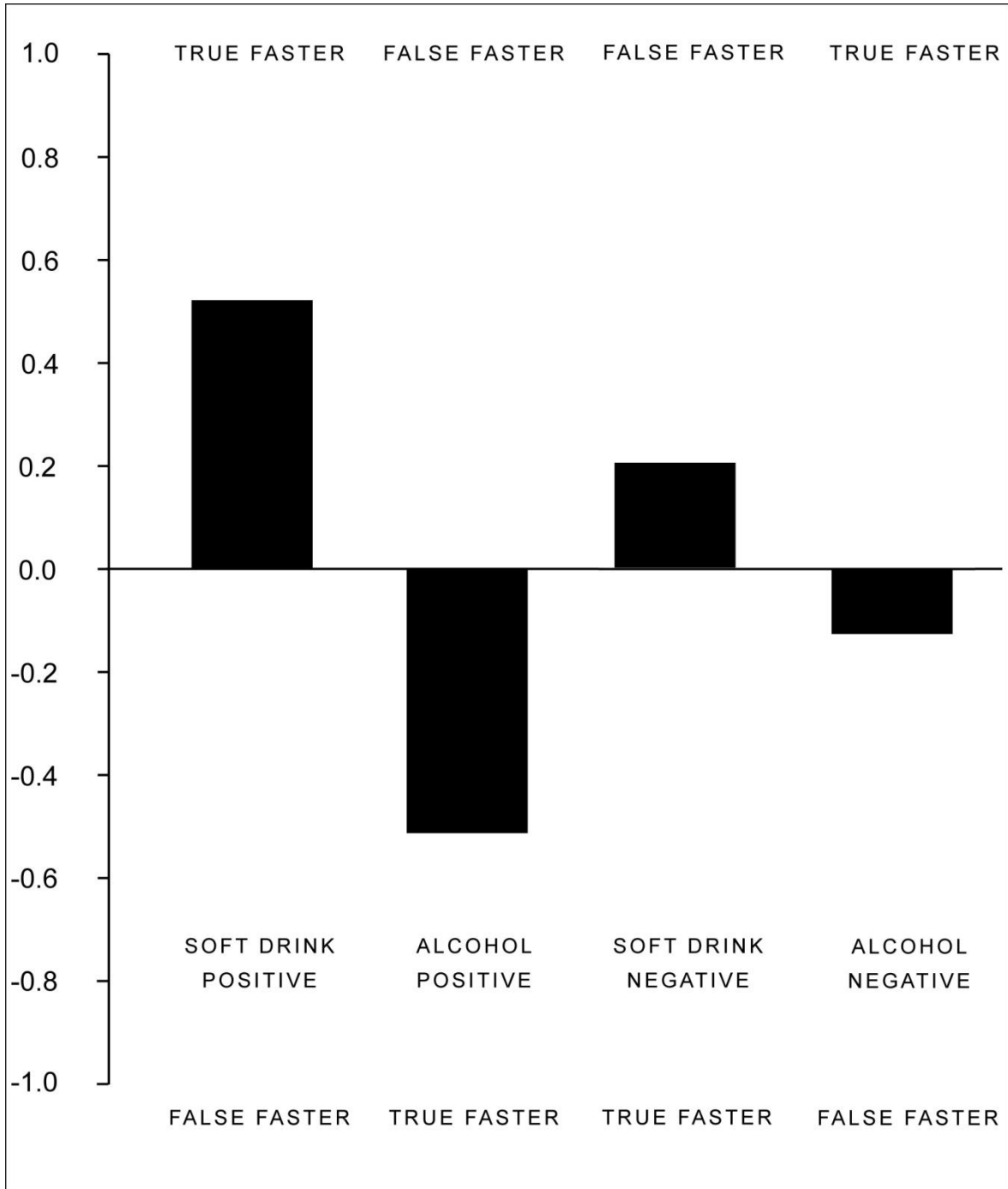


Figure 4. Study 1 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks.

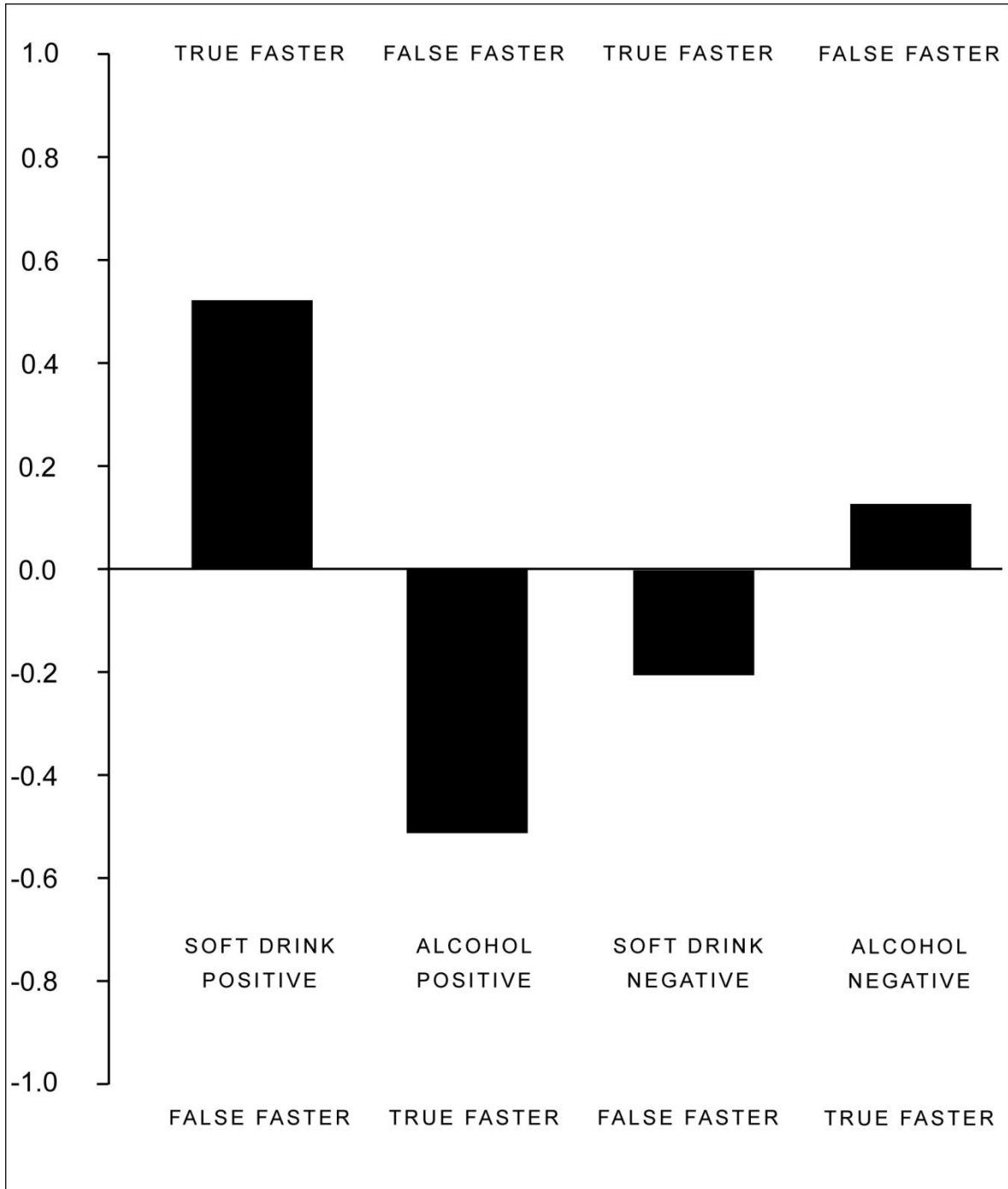


Figure 5. Study 1 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks with soft-drink-negative and alcohol-negative trial types inverted.

**Within and between participants analysis.**

Trial-type analysis at a group level shows attitudes largely consistent with whole sample analysis (see Figure 5). The data were subjected to a 3x4 mixed between-within Analysis of Variance (ANOVA) with group as the between participant variable (Non/Light; Moderate; Heavy) and IRAP trial-type as the within participant variable (Soft Drink-Positive; Alcohol-Positive; Soft Drink-Negative; Alcohol-Negative). This analysis was conducted to assess the impact of self-reported alcohol behaviour (i.e. group: Non/Light, Moderate, or Heavy drinkers) on implicit attitudes towards alcohol and soft drinks across four IRAP trials. There was significant interaction effect between group (Non/Light; Moderate; Heavy) and IRAP trial types, Wilks Lambda = .711,  $F(6,100) = 3.1$ ,  $p = .008$ , partial eta squared = .157, indicating that participant responses to each trial type are influenced by their responses to the other IRAP trial types. There was also a significant main effect for IRAP trial type, Wilks' Lambda = .31,  $F(3, 50) = 36.4$ ,  $p < .001$ , partial eta squared = .69 indicating that overall, participant responses differed across the four IRAP trial types. Pairwise comparisons showed significant differences between all of the trial-types: Soft Drink-Positive and Alcohol-Positive ( $p = .022$ ); Soft Drink-Positive and Soft Drink-Negative ( $p = .000$ ), Soft Drink-Positive and Alcohol-Negative ( $p = .000$ ); Alcohol-Positive and Soft Drink-Negative ( $p = .000$ ); Alcohol-Positive and Alcohol-Negative ( $p = .001$ ); Soft Drink-Negative and Alcohol-Negative ( $p = .012$ ). The main effect for Group was not significant,  $F(2,52) = .583$ ,  $p = .56$ , partial eta squared = .02, suggesting no difference between the three groups as assigned by quantity of alcohol intake.

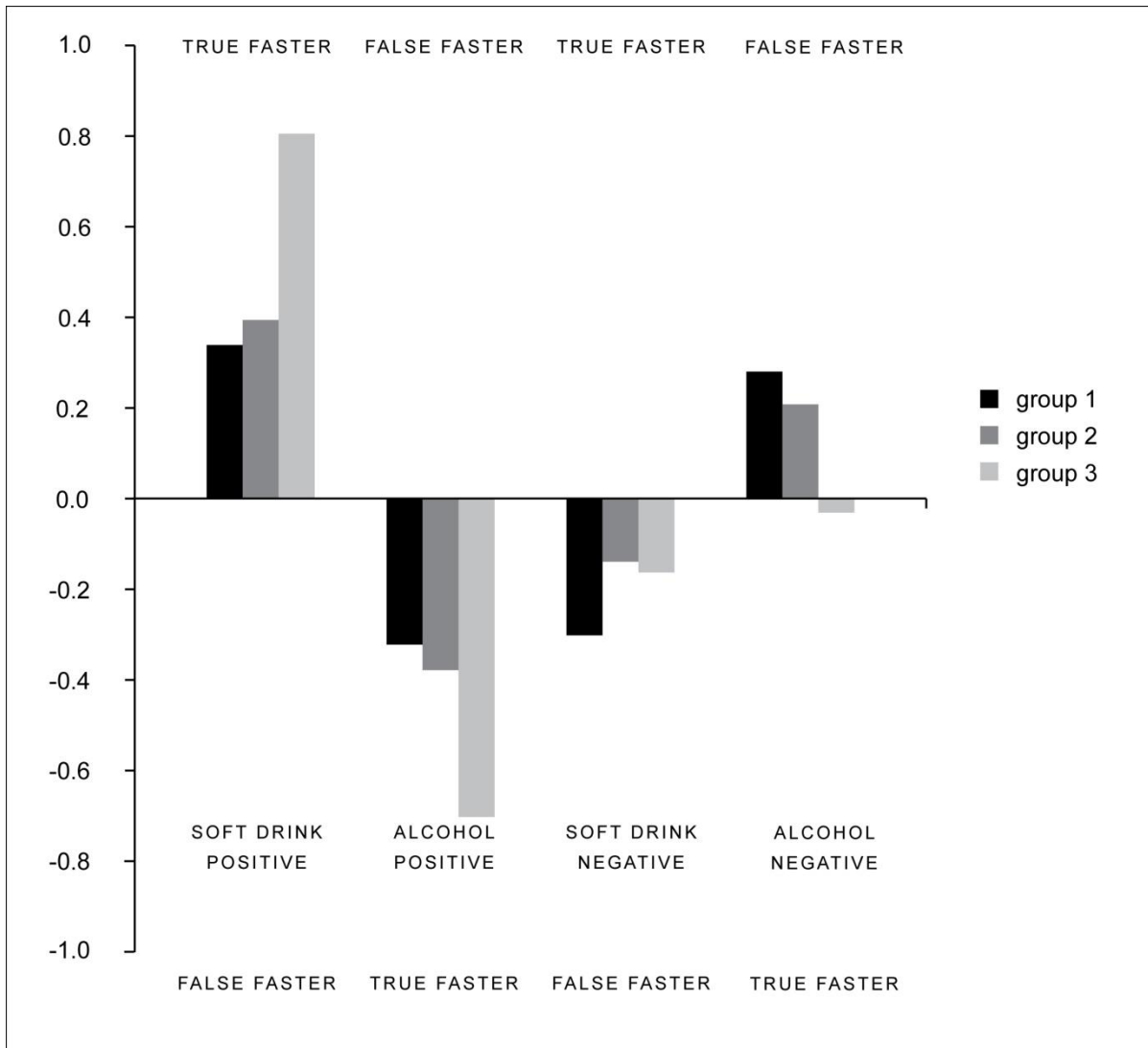


Figure 6. Study 1 Between participants DIRAP Scores showing participant attitudes to alcohol and soft drinks as light/non-drinkers (group 1), moderate drinkers (group 2) and heavy drinkers (group 3), soft-drink-negative and alcohol-negative trial types inverted.

### Explicit Measures Analysis

A one-way between-participants ANOVA was conducted to explore the impact of alcohol behaviour on the self-report Attitude to Alcohol scale (AAS). There was a statistically significant main effect for Group  $F 3(60) = 22.554, p=.000, \eta^2 = .44$ . Post hoc comparisons showed significant differences between Non/Light ( $M=-7.1$ ) and Heavy ( $M=16.6$ ),  $p = .000$ ; between Non/Light and Moderate ( $M=8.22$ ),  $p=.000$ ; and between Moderate and Heavy drinkers,  $p= .049$ .

A one-way between-participants ANOVA was conducted to examine TRI across the three groups. There was a statistically significant main effect in participant ability to control their drinking between groups:  $F 3(60) = 6.145, p=.004, \eta^2 = .177$ . Post hoc comparisons indicated that scores on the TRI for the Non/Light group ( $M=6.26$ ) were significantly different to TRI scores for Heavy drinkers ( $M=12.63$ ),  $p = .003$ . There was no difference between the Non/Light TRI and Moderate TRI scores ( $M=9.54$ ),  $p = .156$  or between Moderate and Heavy TRI scores,  $p = .192$ .

A one way between-participants ANOVA was conducted to explore participant's ratings of abstinence as measured by the Abstain Scale across the three groups. Levene's test for homogeneity of variances showed a violation of the assumption of homogeneity, however, both the Welsh and Brown-Forsythe tests indicate a significant main effect for Group. Post hoc comparisons indicated that the mean score for Non/Light ( $M=.9474$ ) was significantly different from Heavy ( $M=.4737$ ),  $p = .004$  and Moderate drinkers scores ( $M=.5909$ ),  $p = .032$ ; but scores between Moderate and Heavy drinkers were not significantly different,  $p = .672$ .

One-way between-participants ANOVA was conducted to examine the impact Gen (sum of primary and secondary family members with alcohol related problems) across the three groups. There was no statistically significant difference between groups:  $F(3,60) = 1.459, p = .241$ . However, there was a significant difference in the number of primary family members participants reported as problem drinkers across the groups:  $F(3,60) = 7.167, p = .002, \eta^2 = .2$ . Post hoc comparisons indicated that the mean score for Non/Light ( $M = .2632$ ) was not significantly different from Moderate ( $M = .0455$ ),  $p = .209$  but Moderate was significantly different to Heavy ( $M = .5263$ ),  $p = .001$ . Non/Light was not significantly different to Heavy,  $p = .121$ .



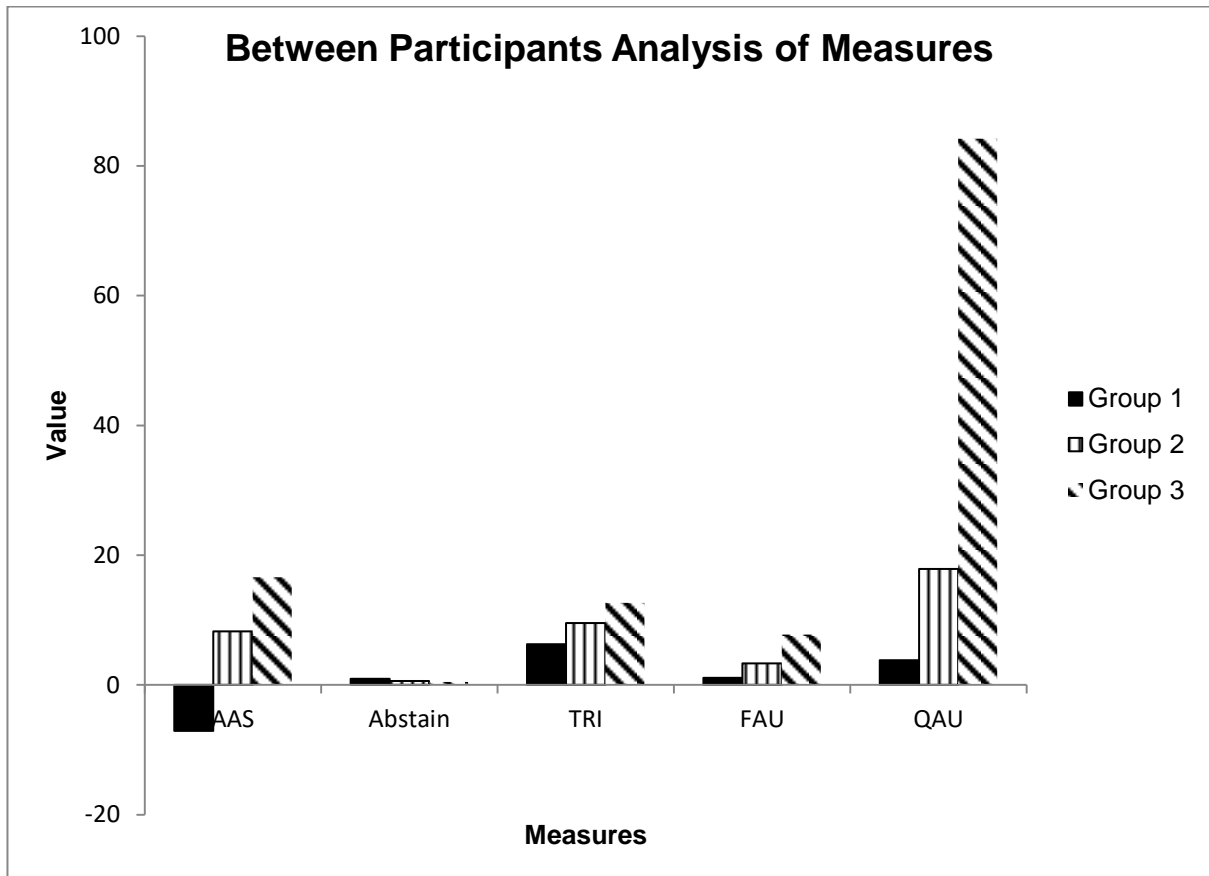


Figure 7. Study 1 Between-Participants: Group Means showing the impact of alcohol behaviour across explicit measures.

### Correlational Analysis

Kolmogorov-Smirnov tests for normality showed that all of the explicit measures used in this study violated the assumption of normality. For this reason the non-parametric Spearman's Rho correlation rubric was used. (See Table 2).

**Explicit/implicit correlations.** The relationship between the AAS and each of the four IRAP trial types was investigated. There was no significant correlation between the any of the variables (all  $p$ 's > 0.05).

**Quantity of alcohol use/implicit correlations.** There was a significant negative correlation between the QAU and the Alcohol-Positive trial-type ( $\rho = -.268$ ,  $n = 55$ ,  $p = .048$ ) with high levels of QAU associated with weak Alcohol-Positive-Similar responding. The QAU did not correlate with any remaining trial-types (all  $p$ 's  $> 0.05$ ).

**Frequency of alcohol behaviour/implicit correlations.** The relationship between FAU and each of the four IRAP trial types was investigated. There was no significant correlation between any of the variables (all  $p$ 's  $> 0.05$ ).

**Temptation and Restraint Inventory/implicit correlations.** The relationship between TRI and each of the IRAP trial types was investigated. There was no significant correlation between the variables (all  $p$ 's  $> 0.05$ ).

**TRI/ Alcohol Use Behaviour correlations.** A strong significant positive correlation was observed between both FAU ( $\rho = .494$ ,  $n = 60$ ,  $p = .000$ ) and QAU ( $\rho = .522$ ,  $n = 60$ ,  $p = .000$ ) with TRI in a positive direction, with high levels of both FAU and QAU associated with high levels of dyscontrolled drinking.

**Abstain/implicit correlations.** There was a significant correlation between Abstain and Alcohol-positive in a positive direction ( $\rho = .361$ ,  $n = 55$ ,  $p = .007$ ), with high levels of willingness to abstain from alcohol use associated with stronger Alcohol-positive-similar IRAP responding. Abstain correlated negatively with Alcohol-negative ( $\rho = -.364$ ,  $n = 55$ ,  $p = .006$ ), suggesting high levels of willingness to abstain from alcohol use is associated with low levels of Alcohol-Negative-Similar IRAP responding.

**Abstain/ Alcohol Use Behaviour correlations.** There was a significant correlation between both FAU ( $\rho = -.359$ ,  $n=60$ ,  $p = .005$ ) and QAU ( $\rho = -.392$ ,  $n=60$ ,  $p = .002$ ) with Abstain in a negative direction, implying high levels of willingness to abstain from alcohol use is associated with low levels of both alcohol use frequency and quantity.

**Abstain/TRI correlations.** There was a significant negative correlation between Abstain and TRI ( $\rho = -.272$ ,  $n=60$ ,  $p = .035$ ), with high levels of willingness to abstain from alcohol use associated with low levels of dyscontrolled drinking.

**Gen/Implicit correlations.** There were no significant correlations found between any of the variables (all  $p$ 's  $> 0.05$ ).

**Gen/Alcohol Use Behaviour correlations.** There were no significant correlations found between any of the variables (all  $p$ 's  $> 0.05$ ).

**Gen/TRI correlation.** There were no significant correlations found between any of the variables (all  $p$ 's  $> 0.05$ ).

Table 2 Study 1 Correlation Summary Table (n=60)

Variables	1	2	3	4	5	6	7	8	9	10
1. AAS	-									
2. TRI	.370**	-								
3. FAU	.657**	.494**	-							
4. QAU	.764**	.522**	.874**	-						
5. Abstain	-.321*	-.272*	-.359**	-.392**	-					
6. Gen	.006	.050	.076	.113	-.064	-				
7. Alcohol-Positive	-.179	-.056	-.145	-.268*	.361**	.018	-			
8. Alcohol-Negative	.181	.129	.233	.252	-.364**	.245	-.194	-		
9. Soft Drink-Positive	.059	.203	.250	.242	-.043	.024	-.002	-.081	-	
10. Soft Drink-Negative	-.196	-.218	-.214	-.225	.030	-.118	.146	.199	.081	-

Measure	AAS	FAU	QAU	TRI	Abstain
IRAP Alcohol-positive	-	-	-.268*	-	.361**
IRAP Alcohol-negative	-	-	-	-	-.364**
AAS	-	.657**	.764**	.370**	-.321*
FAU	.657**	-	.874**	.494**	-.359**
QAU	.764**	.874**	-	.522**	-.392**
TRI	.370**	.494**	.522**	-	-.272*

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

Table 3. Study 1 Correlations between implicit and explicit measures that reached statistical significance

### Gender Analysis

One way between participants ANOVA were carried out to explore any variance between male and female participants in AAS, TRI, Gen, Abstain and alcohol use behaviour (FAU and QAU). There was a statistically significant main effect for gender in alcohol use behaviour, in both FAU,  $F(2,60) = 4.463$ ,  $p = .039$ ,  $\eta^2 = .07$  and QAU,  $F(2,60) = 4.964$ ,  $p = .030$ ,  $\eta^2 = .08$ . Post hoc comparisons indicated that the mean score for male participants' FAU ( $M = 4.82$ ) was significantly higher than female FAU ( $M = 2.96$ ). Male participants' QAU ( $M = 45.3$ ) was also significantly higher than female QAU ( $M = 20.1$ ). This indicates that male participants

report consuming significantly more alcohol than female participants during more frequent drinking episodes.

There was a significant main effect in one IRAP trial-type (Alcohol-Positive) between male and female participants,  $F(2,55) = 6.381, p = .015$ , eta squared = .11. The mean  $D_{IRAP}$  score for male participants in the Alcohol-Positive trial ( $M = -.63$ ) was significantly higher than the mean  $D_{IRAP}$  score for females ( $M = -.28$ ) indicating that males had a stronger positive bias towards alcohol than females. No significant gender differences were observed in the other three IRAP trials (all  $p$ 's < .05.)

**Partial Replication of the Ostafin, Kassman, DeJong & van Hemel-Ruiter (2014) Study.**

There is no significant correlation between TRI and Alcohol-Positive ( $\rho = -.056, n = 55, p = .362$ ), but there is a significant correlation between the TRI and AAS measures reported ( $\rho = .370, n = 55, p = .011$ ). Controlling for non-drinkers, ( $n = 47$ ), there is no statistically significant correlation between TRI and AAS ( $\rho = .209, n = 47, p = .096$ ) or TRI and Alcohol-Positive ( $\rho = -.058, n = 47, p = .348$ ). In the Heavy drinkers group, there is no statistically significant correlation between TRI and AAS ( $\rho = -.226, n = 19, p = .239$ ), or TRI and Alcohol-Positive ( $\rho = .051, n = 19, p = .840$ ). Correlation analysis (Spearman's Rho) was conducted with the overall DIRAP score to explore any correlations between overall DIRAP scores and AAS and TRI in Study 1. Controlling for non-drinkers, no significant correlations are reported (TRI and AAS,  $\rho = .209, n = 47, p = .096$ ; TRI and Overall DIRAP scores,  $\rho = -.056, n = 47, p = .683$ ).

## Discussion

### Interpretation of Results

Study 1 IRAP results imply that participants have positive attitudes to alcohol and don't believe alcohol is negative and have positive attitudes to soft drinks and don't believe soft drinks are negative. DIRAP scores indicate that when presented with alcohol stimuli relationally framed in coordination with labels typically considered to be positive (Alcohol-Positive), e.g. "nice", "pleasant" and asked to follow the rule "alcohol is positive", participant response latency was less than when required to follow the rule "alcohol is negative", suggesting their BIRRs were in coordination to the relational presentation alcohol-positive-similar. That is, Participants implicitly agree when presented with Alcohol-Positive. When presented with soft drink stimuli relationally framed in coordination with the same labels typically considered positive (Soft Drink-Positive), DIRAP scores suggested that participant's implicit attitude to soft drinks accords with the relational presentation. That is, they responded with briefer latency on trials in which they were required to follow the rule "soft drinks are positive" than "soft drinks are negative". When participants were presented with alcohol stimuli framed in coordination with labels typically considered negative (Alcohol-Negative), e.g. "nasty", "unpleasant", they responded with longer latency when asked to follow the rule "alcohol is positive" than "alcohol is negative", suggesting that participant BIRRs are in coordination with alcohol-negative-opposite. When presented with soft drink target stimuli framed in coordination with the same negative labels (Soft Drink-Negative), participants responded quicker when following the "soft drinks are positive" than the "soft drinks are negative" rule, suggesting participant BIRRs are in coordination with soft drink-negative-opposite. There was a

significant difference in each IRAP trial type when compared to zero, which implies that overall, participant attitudes towards both alcohol and soft drinks were significantly strong, as a zero score would suggest an indifferent attitude.

The relationship between TRI and QAU and FAU showed a strong significant correlation in a positive direction. That is, as alcohol behaviour frequency and/or quantity increases, difficulty in controlling alcohol behaviour also increases. Perhaps the converse is more accurate, as the inability to control drinking behaviour increases, larger quantities of alcohol are consumed on more frequent occasions. The relationship between Abstain and TRI suggests that as difficulty controlling drinking behaviour increases, participants are less willing or perhaps less able to abstain from alcohol use. The relationship between Abstain and self-reported alcohol behaviour suggests as alcohol consumption increases, willingness to abstain from alcohol use decreases, or perhaps that as willingness to abstain from alcohol use decreases it infers that alcohol consumption increases.

### **Research questions**

**Picture or word target stimuli.** The results of the pre-experimental investigation show that participants find picture stimuli evoke alcohol-related associations more readily. This suggests that it is most appropriate to use picture target stimuli in designing an IRAP measure for studies within this research project. Furthermore, scoring on each of the images allowed the researcher to eliminate those images that participants found least evocative of alcohol. A potential limitation to this pre-experimental investigation is that the use of a larger set of images with a greater



number of participants may have allowed for further refinement in the selection of target images for the IRAP measure.

**Divergence or convergence between explicit attitudes towards alcohol (as measured by the AAS) and implicit attitudes towards alcohol (as measured by the IRAP).** In this study there is no significant correlation between the implicit attitudes towards alcohol and explicit attitudes towards alcohol variables. We report that Heavy drinkers have a more positive self-reported attitude towards alcohol than Non/Light and Moderate drinking peers on the AAS. Given that we found no significant difference across the groups in implicit attitudes towards alcohol in the IRAP, this finding highlights variance between implicit and explicit measures across the same sample.

**Differences between Non/Light, Moderate and Heavy drinkers.**

Between participant IRAP analysis suggests a trend whereby the more alcohol participants report consuming, the stronger their attitude that alcohol is positive. Conversely, the more alcohol participants report consuming, the more they tend towards believing that alcohol is negative. Thus some ambivalence towards alcohol is implied in Heavy drinking respondents, as results show this group has the strongest attitude that alcohol is negative of the three groups, but also the strongest attitude that alcohol is positive. This is consistent with the research literature that suggests that a major barrier to alcohol misuse treatment is the patient's ambivalent relationship with alcohol. Heavy drinkers self-report significantly greater difficulty controlling their alcohol use behaviour than Light/Non-drinkers on the TRI scale. Our findings further suggest that non-drinkers and light drinkers find it easiest to commit to abstaining from alcohol, whilst those participants who engage in more regular drinking behaviour are

more hesitant. Perhaps it could be said that the response effort in willingness to abstain from alcohol use is greater for moderate and heavy drinkers than for light/non-drinkers.

**Correlations between implicit and explicit measures.** In this study a significant correlation is found between Alcohol-Positive and QAU, suggesting that as participants report consuming higher quantities of alcohol, they respond quicker to target images of alcohol when relationally framed in coordination with labels typically considered positive as “similar” rather than as “opposite”. This may suggest that these participant BIRRs sit more comfortably with the relation Alcohol-Positive than peers who reported consuming lower quantities of alcohol. In fact overall the heavier the alcohol use, the stronger the implicit responding is in coordination with Alcohol-Positive. Conversely, we could say that the stronger the participant’s implicit response is in agreement with Alcohol-Positive, the more alcohol they are likely to report consuming. There are significant correlations between Abstain and Alcohol-Positive in a positive direction and Abstain with Alcohol-Negative in a negative direction. This implies that the more implicitly in coordination with Alcohol-Positive, the less willing a participant is to abstain from alcohol behaviour and conversely the more in coordination with Alcohol-Negative the less likely a participant is to agree to abstain from alcohol behaviour. A strong significant correlation is reported between both FAU and QAU with dyscontrolled drinking (TRI) in a positive direction. This suggests that the greater difficulty participants report in controlling their alcohol use behaviour, the more frequently and the higher the quantity of alcohol they use. Or perhaps their self-reported alcohol use behaviour dictates their self-reporting when it comes to controlling their alcohol use behaviour. A significant correlation is reported between both FAU and QAU with Abstain in a negative direction. This suggests that the more frequent and the

greater the quantity of alcohol participants report consuming over the previous 30 day period the more reluctant they are to agree to abstain from alcohol for a week long period. A significant inverse correlation was reported between Abstain and TRI. This suggests that the greater the difficulty in controlling one's alcohol use behaviour participant's reported, the less inclined participants are to abstain from alcohol use for a week.

**Differences by gender.** A significant difference in self-reported male and female FAU and QAU is found and it is notable that male participants report consuming alcohol more than 1.5/2 times as frequently as female participants over the previous thirty day period ( $M= 4.82$  versus  $M= 2.96$ ). Male participants report consuming more than 2/2.5 times the quantity of alcohol units than their female peers ( $M= 45.3$  versus  $M= 20.1$ ). Further research is required to examine whether perceived social acceptability tempered male and female responses on this self-report measure, or whether biological differences (that is, standardised weekly recommended unit allowances for a male is 21 units compared to 14 units for a female) between the genders mean that males in this sample tend to consume larger quantities than females and more frequently (or at least did so over the thirty day period examined). There is a significant difference in one IRAP trial (Alcohol-Positive) between male and female participants that suggests that males respond to Alcohol-Positive "similar" quicker than "opposite" on compatible trials more than female participants. This suggests that the BIRRs of male participants were more in coordination with Alcohol-Positive than BIRRs of female participants, perhaps as previously stated for social or cultural reasons.

**The impact of transgenerational problem drinking on alcohol use behaviour.** We find higher numbers of Non/Light-drinkers and Heavy-drinkers self-report primary family members (mother, father or sibling) as problem drinkers compared to Moderate drinkers. This may suggest that experiencing a close family member's struggle with alcohol can either lead to avoiding alcohol use altogether or using it heavily. Results from this study suggest that not experiencing this is most likely to result in more moderate alcohol use.

## **Study 2**

The aim of Study 2 is to explore whether the brief behavioural intervention (comprised of a brief ACT-based TEDx talk plus infographic pamphlet-see appendix 12) delivered to participants at the end of Study 1 will have any impact on participant scoring on any of the variables explored in Study 1, or on correlations reported in Study1.

**CHAPTER 3**

**STUDY 2**

This study seeks to examine whether a brief intervention grounded in Acceptance and Commitment Therapy (ACT) philosophy will affect participant self-reported alcohol use behaviour, implicit or explicit attitudes towards alcohol, or their perceived ability to control their drinking behaviour. Study 1 detailed a number of correlations found between measures examined. Study 2 will apply those same measures and investigate whether the same correlations are found. Study 2 data is obtained from participants within thirty days of Study 1 data. This Study therefore investigates whether retesting participants using the IRAP within thirty days will affect response latency times, that is will difficulty in derivation of relational frames decrease with multiple exemplars over a relatively short temporal period.

## **Method**

### **Participant recruitment**

Participants (n=48) were recruited via the Psychology Department participant pool, as in Study 1 however four sets of IRAP data were discarded as they did not meet the inclusion criteria as previously outlined. All participants took part previously in Study 1 of this research project and were invited to return to take part in Study 2 thirty days after participating in it. The sample comprised 26 male and 22 female participants with a mean age of 21.65 years. Participants remained in groups according to their self-reported alcohol use behaviour (quantity of alcohol consumed over the previous thirty days, mean=34.4 units) as assigned in Study 1.

### **Settings/Materials**

The study was conducted in the Psychology Department in Maynooth University. All participants were offered a continued consent form (please see appendix 13) and reviewed a participant information sheet (appendix 3). Participants were given the same materials as set out in Study 1 but no intervention was implemented, i.e. participants were not required to re-watch the Jonathan Bricker TEDx talk nor given another flyer.

### **Experimental Design**

This study employed the same experimental design and had the same aims as Study 1 but included a repeated measures analysis of pre and post intervention (The Jonathan Bricker TEDx talk and accompanying flyer, see appendices 11 and 12) data.

### **Procedures**

Participants were presented with the same IRAP task and pen and paper measures as detailed in Study 1.

## **Results**

### **Implicit Relational Assessment Procedure: Data Analysis**

As in Study 1, IRAP data were prepared and analysed with reference to latest recommendations (Hussey, Thompson, McEnteggart, Barnes-Holmes & Barnes-Holmes, 2015). The response latency data for each participant were transformed into standardised difference scores,  $D$ -scores, using an adaptation of the Greenwald, Nosek, and Banaji (2003)  $D$ -algorithm (see Cullen & Barnes-Holmes, 2008; Vahey, Barnes-Holmes, Barnes-Holmes & Stewart, 2009).

The above data transformation yielded positive  $D$ -scores that represented Soft Drink-Positive/Alcohol-Negative responding, and negative  $D$ -scores that represented Alcohol-Negative and Soft Drink-Positive responding. Mean  $D_{\text{IRAP}}$  results ( $n=44$ ) indicate that participants more rapidly affirmed Soft Drink-Positive compared to Soft Drink-Negative; and more rapidly affirmed Alcohol-Positive compared to Alcohol-Negative. However participants respond more neutrally to Alcohol-Negative and Soft Drink-Negative relations than in Study 1 (see Figure 8). One-sample  $t$ -tests conducted on each of the four trial types indicated significant effects for only Alcohol-Positive and Soft Drink-Positive. (Soft Drink-Positive,  $t(44) = 3.558$   $p = .001$ , two-tailed; Alcohol-Positive,  $t(44) = -2.519$   $p = .016$ , two-tailed; Soft Drink-Negative,  $t(44) = 1.972$   $p = .055$ , two-tailed; Alcohol-Negative  $t(44) = -.012$   $p = .990$ , two-tailed). In order to facilitate statistical comparisons in SPSS, and in line with recommendations by Hussey et al. (2015), the data for the trial-types 3 (Soft Drink-Negative) and 4 (Alcohol-Negative) were inverted (i.e. multiplied by -1) (see Figure 9).



Table 4: Study 2 D-IRAP Scores

IRAP Trials	Mean D-IRAP Score	Standard Deviation	<i>t</i> -value	<i>p</i> -value
Light Drinkers Alcohol-Positive	.03	.59	.192	.851
Light Drinkers Alcohol-Negative	.046	.59	.292	.775
Light Drinkers Soft Drink-Positive	.364	.56	2.415	.031
Light Drinkers Soft Drink-Negative	.364	.49	1.7	.113
Moderate Drinkers Alcohol-Positive	-.393	.47	-3.161	.008
Moderate Drinkers Alcohol-Negative	-.05	.50	-.374	.715
Moderate Drinkers Soft-Drink-Positive	.136	.57	.888	.391
Moderate Drinkers Soft-Drink- Negative	.131	.53	.907	.381
Heavy Drinkers Alcohol-Positive	-.199	.36	-2.187	.045
Heavy Drinkers Alcohol-Negative	.001	.40	.012	.990
Heavy Drinkers Soft-Drink-Positive	.353	.48	2.931	.010
Heavy Drinkers Soft-Drink- Negative	.069	.37	.726	.479

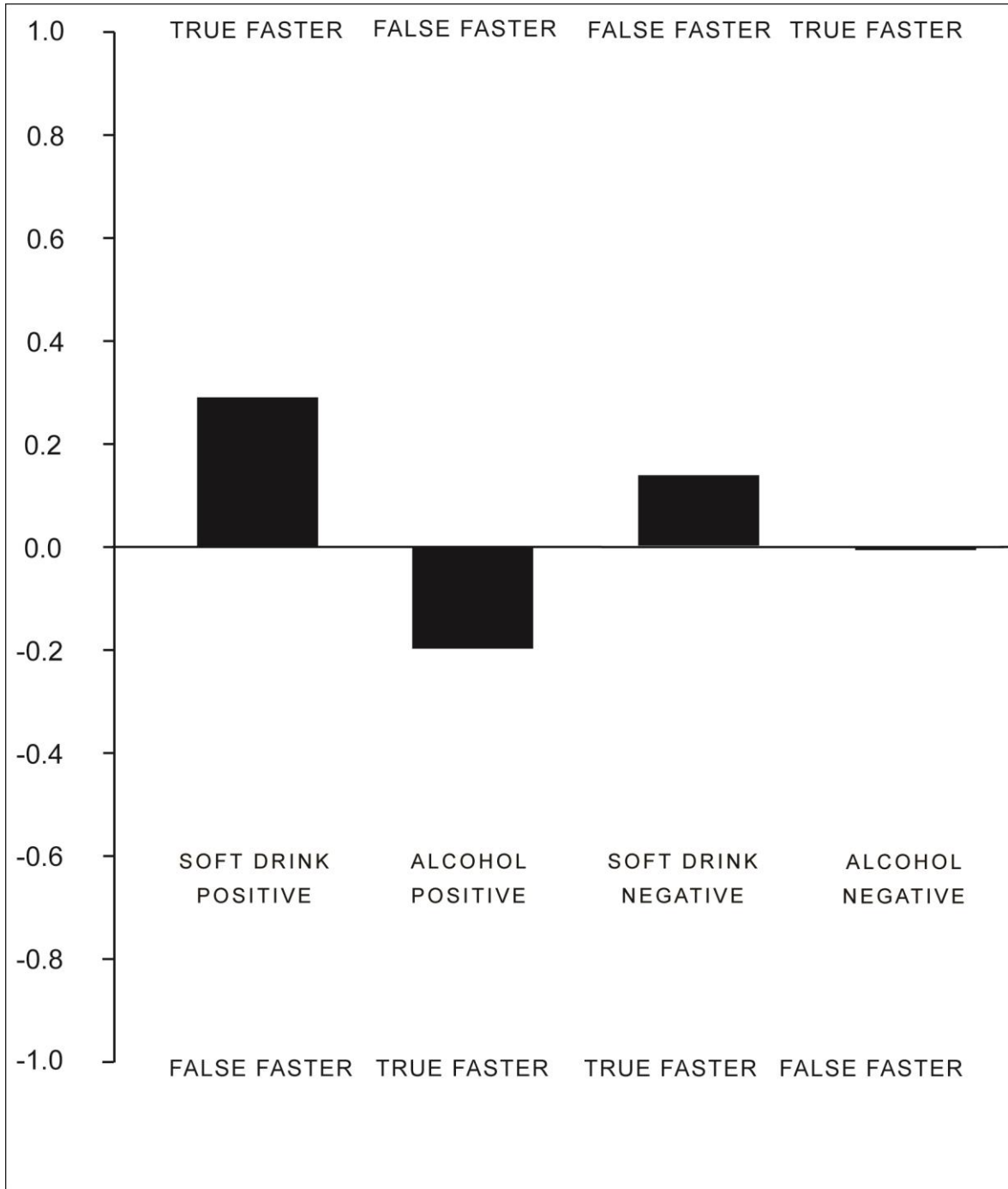


Figure 8. Study 2 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks.

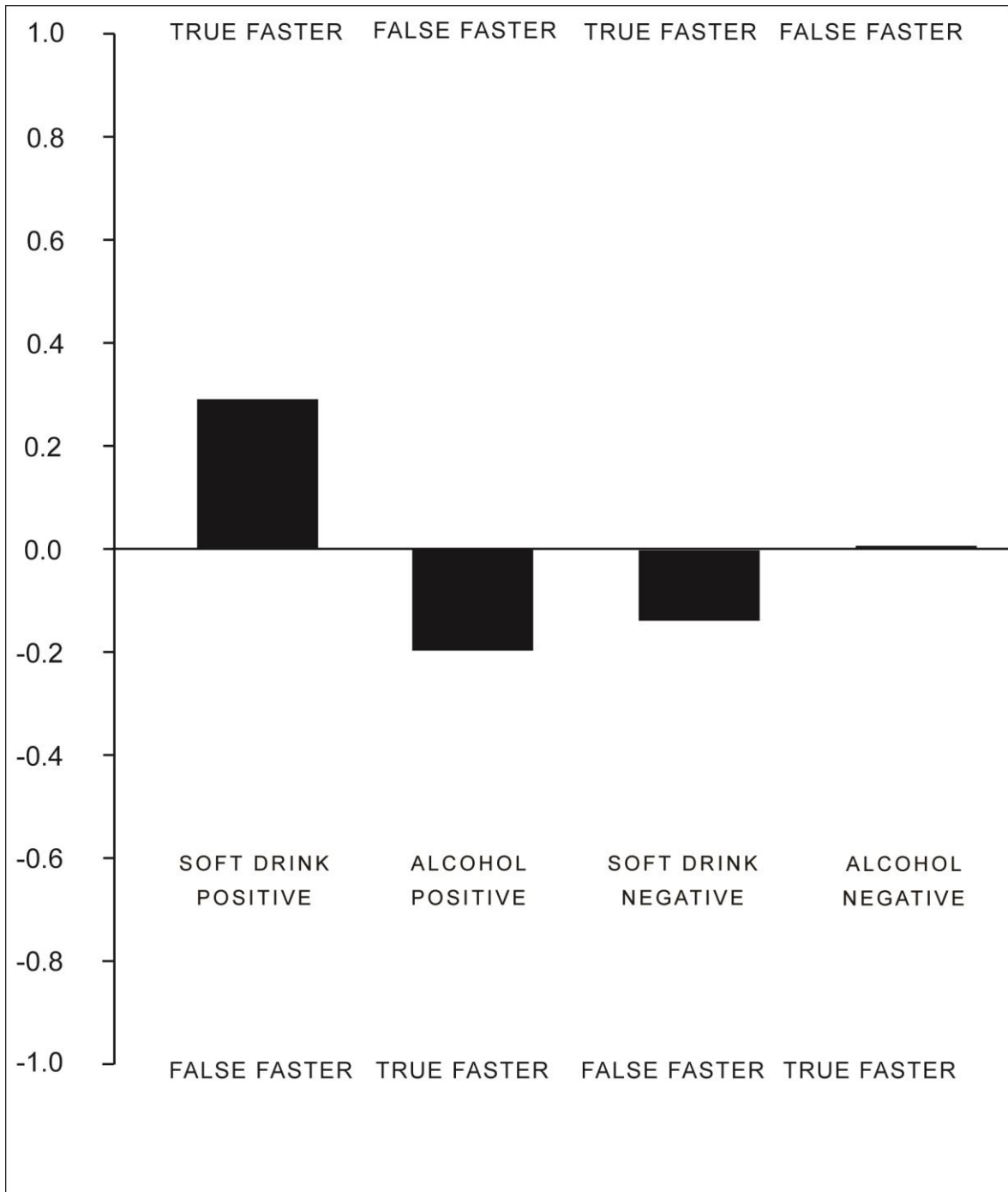


Figure 9. Study 2 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks with Soft Drink-Negative and Alcohol-Negative trial types inverted.

One sample *t*-tests were conducted on each of the four trial types for each of the three groups (group 1: alcohol consumption  $\leq 10$  units in previous month= Non/Light drinkers, group 2: alcohol consumption  $>10$  units,  $\leq 35$  units in previous month= Moderate drinkers, group 3: alcohol consumption  $> 35$  units in the previous month= Heavy drinkers) to compare mean IRAP effect size to zero. Results were not consistently significant at group level (see Figure 10). Soft Drink-Positive was the only IRAP trial type that was significant for the Non/Light drinkers group ( $n=14$ ) (Soft Drink-Positive  $t(13) = 2.415$   $p=.031$ ; Alcohol-Positive  $t(13) = .192$   $p=.851$ ; Soft Drink-Negative  $t(13) = 1.701$   $p=.113$ ; Alcohol-Negative  $t(13) = .292$   $p=.775$ ). Alcohol-Positive was the only IRAP trial type that was significant for the Moderate drinkers group ( $n=14$ ), (Soft Drink-Positive  $t(13) = .888$   $p=.391$ ; Alcohol-Positive  $t(13) = -3.161$   $p=.008$ ; Soft Drink-Negative  $t(13) = .907$   $p=.381$ ; Alcohol-Negative  $t(13) = -.374$   $p=.715$ , two-tailed). Soft Drink-Positive and Alcohol-Positive were significant for the Heavy drinkers group ( $n=16$ ) (Soft Drink-Positive  $t(15) = 2.931$   $p=.010$ ; Alcohol-Positive  $t(15) = -2.187$   $p=.045$ ; Soft Drink-Negative  $t(15) = .726$   $p=.479$ ; Alcohol-Negative  $t(15) = .012$   $p=.990$ ), but Soft Drink-Negative ( $p=.479$ ) and Alcohol-Negative ( $p=.990$ ) were not significant.

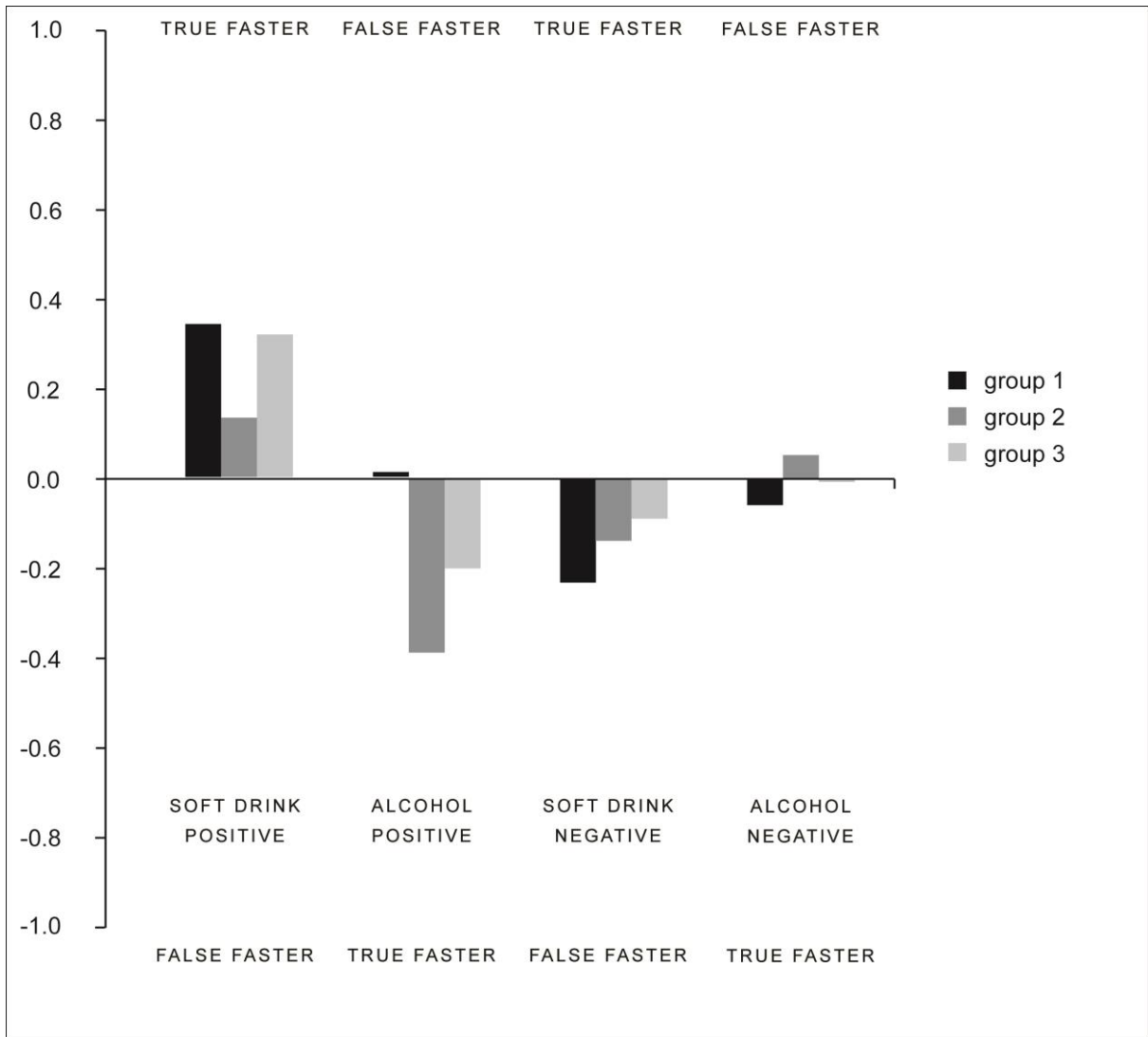


Figure 10. Study 2 Between participants mean DIRAP Scores showing participant attitudes to alcohol and soft drinks as light/non-drinkers (group 1), moderate drinkers (group 2) and heavy drinkers (group 3), soft-drink-negative and alcohol-negative trial types inverted.

**Within and between participants Analysis.** The data were subjected to a 3x4 mixed between-within Analysis of Variance (ANOVA) with group as the between participant variable (Non- Light; Moderate, Heavy) and IRAP trial-type as the within participant variable (Soft Drink-Positive; Alcohol-Positive; Soft Drink-Negative; Alcohol-Negative). This analysis was conducted to assess the impact of self-reported alcohol behaviour (i.e. group: non/light, moderate, or heavy drinkers) on implicit attitudes towards alcohol and soft drinks across four IRAP trials. There was no significant interaction between group (Non/Light; Moderate; Heavy) and IRAP trial types, Wilks Lambda = .93,  $F(6,78) = .47$ ,  $p = .83$ , partial eta squared = .035 indicating that participant responding on each IRAP trial type was independent of their responding on the other IRAP trial types. There was a significant main effect for IRAP trial, Wilks' Lambda = .6,  $F(3, 39) = 8.8$ ,  $p < .001$ , partial eta squared = .4 indicating that overall, participant responses differed across the four IRAP trial types. Pairwise comparisons showed no significant difference between Soft Drink-Positive and Alcohol-Positive ( $p = .602$ ); Alcohol-Positive and Soft Drink-Negative ( $p = .080$ ); Alcohol-Positive and Alcohol-Negative ( $p = 1$ ) and Soft Drink-Negative and Alcohol-Negative ( $p = 1$ ). Soft Drink-Positive and Soft Drink- Negative ( $p = .000$ ); Soft Drink-Positive and Alcohol-Negative ( $p = .010$ ) were significantly different. The main effect for Group was not significant,  $F(2, 41) = 2.5$ ,  $p = .095$ , partial eta squared = .109, suggesting no difference between the three groups as assigned by quantity of alcohol intake.

### Explicit Measures Analysis

A one-way between-participants ANOVA was conducted to explore the impact of alcohol behaviour on the self-report Attitude to Alcohol Scale (AAS). There was a statistically significant main effect for group,  $F_{3(48)} = 6.547$ ,  $p = .003$ ,  $\eta^2 = .23$ . Post hoc comparisons using the Tukey HSD test indicated significant differences between Non/Light ( $M = -3$ ) and Moderate ( $M = 6.3$ ),  $p = .041$ , Non/Light and Heavy ( $M = 9.56$ ),  $p = .003$  but not between Moderate and Heavy drinkers.

One-way between-participants ANOVA was carried out to examine the impact of TRI on alcohol use behaviour across the three groups. There was a statistically significant main effect for group,  $F_{3(48)} = 5.175$ ,  $p = .009$ ,  $\eta^2 = .19$ . Post hoc comparisons using the Tukey HSD test indicated that scores on the TRI for the Non/Light group ( $M = 5.63$ ) were significantly different to TRI scores for Heavy drinkers ( $M = 11.47$ ),  $p = .007$ . There was no difference between Non/Light drinkers TRI and Moderate drinkers TRI ( $M = 9.07$ ),  $p = .172$ ; or TRI scores of Moderate drinkers and Heavy drinkers ( $p = .405$ ).

A one way between-participants ANOVA was conducted to examine the impact of alcohol use behaviour on the Abstinence Scale. Data analysis showed a violation of the assumption of homogeneity via Levene's test for homogeneity of variances. However, both the Welsh and Brown-Forsythe tests indicate no significant difference between the groups for willingness to abstain from alcohol use. Post hoc comparisons indicated that the mean score on the Abstinence Scale for Non/Light drinkers ( $M = .88$ ) were not significantly different to Heavy drinkers ( $M = .65$ ),  $p = .317$ ; Non/Light drinkers mean score on the abstinence scale were not significantly different to Moderate

drinkers scores ( $M=.67$ ),  $p=.403$  and Moderate drinkers abstinence scores were not significantly different to Heavy drinkers scores,  $p=.992$ .

One-way between-participants ANOVA was conducted to examine Gen (sum of primary and secondary family members with alcohol related problems) problem drinking across groups. Although this test was conducted in Study 1, it is repeated in this Study in acknowledgement of the modest attrition rate. There was a significant difference in the number of primary family members participants reported as problem drinkers across the groups:  $F 3(48) = 8.046$ ,  $p=.002$ , eta squared = .2. Post hoc comparisons indicated that the mean score for Non/Light drinkers of primary family members reported as problem drinkers ( $M=.2632$ ) was not significantly different to Moderate drinkers ( $M=.0455$ ),  $p=.209$  but Moderate drinkers rate of self-reporting primary family members as problem drinkers was significantly different to Heavy drinkers ( $M=.5263$ ),  $p=.001$ . Non/Light drinkers mean score for self-reporting primary family members as problem drinkers was not significantly different to Heavy drinkers,  $p=.121$ .



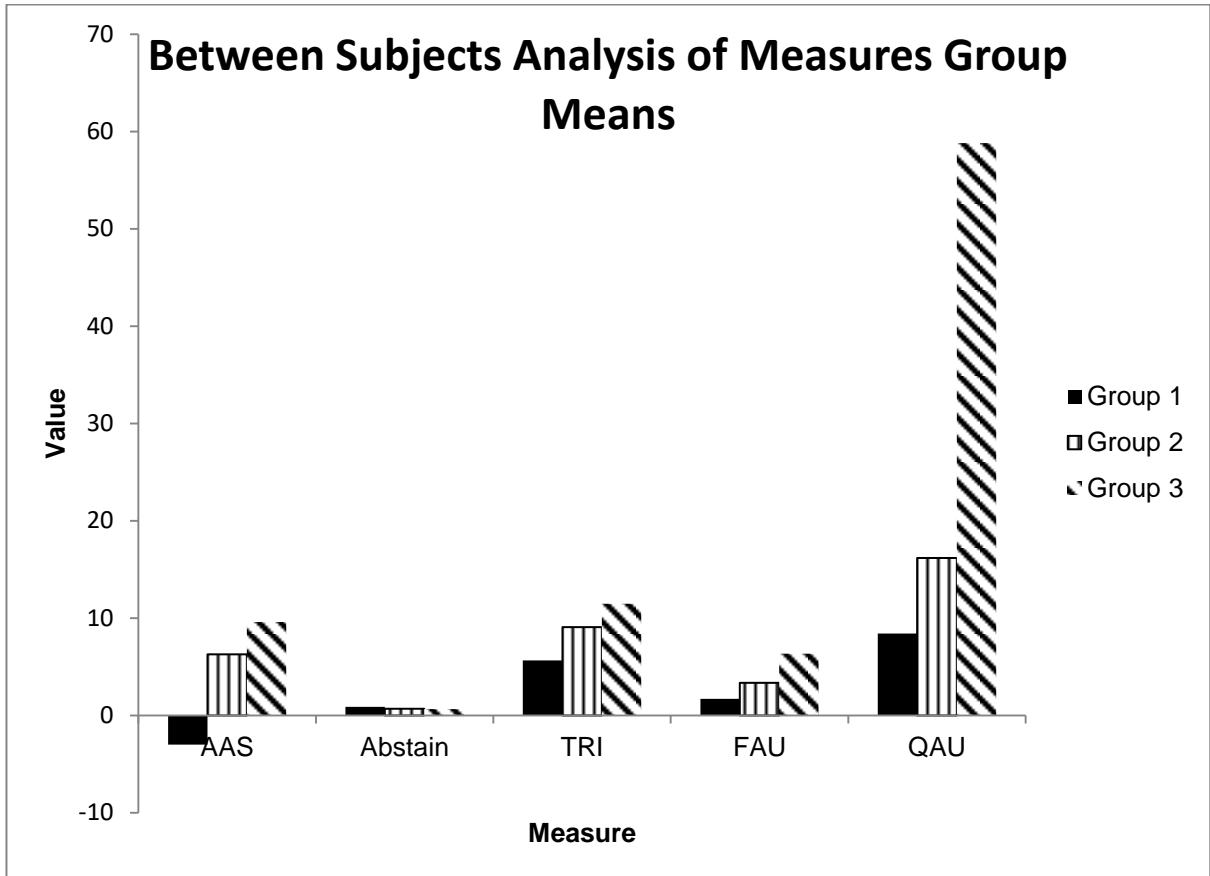


Figure 11. Study 2 Between-Participants: Group Means showing the impact of alcohol use behaviour across explicit measures.

## Correlational Analysis

Kolmogorov-Smirnov tests for normality showed that all of the explicit measures used in this study violated the assumption of normality. For this reason the non-parametric Spearman's Rho correlation rubric was used. (See Table 5).

**Explicit/implicit correlations.** The relationship between the AAS and each of the four IRAP trial types was investigated. There was no significant correlation between the any of the variables (all  $p$ 's>0.05).

**Quantity of alcohol use/implicit correlations.** The relationship between QAU and each of the four IRAP trial types was investigated. There was no significant correlation between the any of the variables (all  $p$ 's>0.05).

**Frequency of alcohol behaviour/implicit correlations.** The relationship between FAU and each of the four IRAP trial types was investigated. There was no significant correlation between any of the variables (all  $p$ 's>0.05).

**Temptation and Restraint Inventory/implicit correlations.** The relationship between TRI and each of the IRAP trial types was investigated. There was no significant correlation between the variables (all  $p$ 's>0.05).

**TRI/ Alcohol Use Behaviour correlations.** A strong significant positive correlation was observed between both FAU ( $\rho=.577, n=48, p=.000$ ) and QAU ( $\rho=.578, n=48, p=.000$ ) with TRI in a positive direction, with high levels of both FAU and QAU associated with high levels of dyscontrolled drinking.

**Abstain/implicit correlations.** The relationship between Abstain and each of the IRAP trial types was investigated. There was no significant correlation between the variables (all  $p$ 's>0.05).

**Abstain/ Alcohol Use Behaviour correlations.** The relationship between Abstain and FAU and QAU was investigated. There was no significant correlation between the variables (all  $p$ 's>0.05).

**Abstain/TRI correlations.** The relationship between Abstain and TRI was investigated. There was no significant correlation between the variables (all  $p$ 's>0.05).

**Gen/Implicit correlations.** There were no significant correlations found between any of the variables (all  $p$ 's>0.05).

**Gen/Alcohol Use Behaviour correlations.** There were no significant correlations found between any of the variables (all  $p$ 's>0.05).

**Gen/TRI correlation.** There were no significant correlations found between any of the variables (all  $p$ 's>0.05).

Table 5 Correlation Summary Table Study 2 (n=48)

Variables	1	2	3	4	5	6	7	8	9	10
1. AAS	.									
2. TRI	.492**	.								
3. FAU	.558**	.577**	.							
4. QAU	.572**	.578**	.830**	.						
5. Abstain	-.136	-.130	-.264	-.213	.					
6. Alcohol-Positive	-.039	-.061	-.132	.002	.177	.				
7. Alcohol-Negative	.068	.047	.033	.018	.071	-.105	.			
8. Soft Drink-Positive	-.122	.076	-.129	-.07	.198	.172	.037	.		
9. Soft Drink-Negative	-.049	.156	.076	.036	-.027	.191	.007	-.88	.	
10. BxChange	.067	.123	.343*	.162	-.055	-.204	-.096	-.029	.171	.

Measure	AAS	FAU	QAU	TRI
AAS	-	.558**	.572**	.492**
FAU	.558**	-	.83**	.577**
QAU	.572**	.83**	-	.578**
TRI	.492**	.577**	.578**	-

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

Table 6. Study 2 Correlations between implicit and explicit measures that reached statistical significance

### Gender analysis

One way between-participants ANOVAs were carried out to explore main effects between male and female participants in AAS, TRI, Gen, Abstinence Scale and drinking behaviour (FAU and QAU). A significant gender difference was observed in FAU,  $F(2,48) = 5.53$ ,  $p = .017$ ,  $\eta^2 = .05$  and QAU  $F(2,48) = 4.39$ ,  $p = .032$ ,  $\eta^2 = .09$ . Post hoc comparisons indicated that the mean score for male participants' frequency of alcohol use behaviour ( $M = 5$ ) was significantly different from female frequency ( $M = 2.5$ ),  $p = .023$ . Male participants quantity of alcohol consumed over the month ( $M = 40$ ) differed significantly from female alcohol consumption ( $M = 15.3$ ),  $p = .042$ . There was no significant difference in any IRAP trial between male and female participants, all  $p$ 's  $> .05$ .

### **Analysis of self-report behaviour change variable.**

41.67% ( $n=20$ ) of participants reported noticing some change in behaviour that they attributed to taking part in this research project. The relationship between self-reported behaviour change as a result of participating in this research project and FAU ( $\rho=.343$   $n=48$   $p=.017$ ) shows the only significant correlation between this measure and all other variables examined, all other  $p$ 's  $>.05$ . The direction of the relationship is positive, with high levels of FAU associated with high levels of self-reported behaviour change.

A one way between-participants ANOVA was conducted to explore the impact of alcohol use behaviour on self-reported behaviour change. There was no significant difference between the groups, all  $p$ 's  $>.05$ .

### **Repeated Measures Analysis between Studies 1 and 2**

Paired-samples t-tests were conducted on each of the four IRAP trials to evaluate the impact of the intervention on participant implicit attitudes to alcohol and soft drinks. There was a statistically significant shift in participant attitude to alcohol when paired in relation to positive labels (Alcohol-Positive) DIRAP scores from Study 1 ( $M= -.4979$ ,  $SD= .45$ ) to Study 2 ( $M= -.1917$ ,  $SD= .48$ ),  $t(42)=-3.35$ ,  $p=.002$ , eta squared = .22. The mean decrease in Alcohol-Positive DIRAP scores was .3062.

There was a statistically significant change in Soft Drink-Positive IRAP D scores from Study 1 ( $M= .5624$ ,  $SD= .64$ ) to Study 2 ( $M= .2912$ ,  $SD= .55$ ),  $t(42)= 2.265$ ,  $p=.029$ , eta squared = .11. The mean decrease in Soft Drnk-Positive  $D_{IRAP}$  scores was .2712. Alcohol-Negative,  $t(42)= -.996$ ,  $p=.325$  and Soft Drink-Negative,  $t(42)=$

1.99,  $p = .053$ , trial types showed no statistically significant difference between Study 1 and Study 2.

Paired sample t-tests conducted on all other measures; AAS,  $t(48) = .291$ ,  $p = .772$ ; TRI,  $t(48) = 1.429$ ,  $p = .168$ ; Alcohol use behaviour (FAU)  $t(48) = .449$ ,  $p = .655$ ; (QAU)  $t(48) = 1.192$ ,  $p = .239$ ; Abstain  $t(48) = .00$ ,  $p = 1$  showed no statistically significant changes in data obtained in Study 1 when compared to data from Study 2.

A repeated Measures ANOVA showed no main effect in pre and post IRAP trials across Non/Light, Moderate and Heavy drinkers, with the only significant result in trial type and group, which is consistent with Study 1 findings as outlined above.

Between-subjects paired sample t-tests conducted on each measure presented the following results:

**Group 1: Non/light drinkers.** Paired-samples t-tests were conducted on each of the four IRAP trials to evaluate the impact of the intervention on participant attitudes to alcohol and soft drinks. There was no statistically significant shift in participant attitude to alcohol when paired in relation to positive labels from Study 1 to Study 2. Alcohol-Positive,  $t(11) = -1.852$ ,  $p = .091$ ; Alcohol-Negative,  $t(11) = -2.067$ ,  $p = .063$ ; Soft Drink-Positive,  $t(11) = .245$ ,  $p = .811$ ; Soft Drink-Negative,  $t(11) = 2.068$ ,  $p = .063$ .

Statistically significant differences were noted between Study 1 and 2 in AAS, FAU and QAU in Light/Non-drinking participants. There was a statistically significant shift in AAS from Study 1 ( $M = -9.13$ ,  $SD = 14.7$ ) to Study 2 ( $M = -3$ ,  $SD = 12.93$ ),  $t(16) = -2.8$ ,  $p = .013$ , eta squared = .34. The mean increase in AAS scores was 6.13. There

was also a statistically significant change in FAU in this group from Study 1 ( $M = .87$ ,  $SD = 1$ ) to Study 2 ( $M = 1.69$ ,  $SD = 10.11$ ),  $t(16) = -2.45$ ,  $p = .027$ ,  $\eta^2 = .29$ . The mean increase was .82. As alcohol behaviour frequency increased, so too did quantity from Study 1 ( $M = 3.19$ ,  $SD = 3.69$ ) to Study 2 ( $M = 8.4$ ,  $SD = 10.11$ ),  $t(16) = -2.47$ ,  $p = .26$ ,  $\eta^2 = .29$ . The mean increase in AlBxQ was 5.21 units. There were no statistically significant changes in Light/Non drinkers in TRI,  $t(16) = .759$ ,  $p = .759$  or Abstain  $t(16) = 1.464$ ,  $p = .164$ .

**Group 2: Moderate drinkers.** No difference between Studies 1 and 2 are reported in the moderate drinkers' group data. There were no statistically significant changes observed in AAS,  $t(14) = .440$ ,  $p = .667$ , in FAU,  $t(14) = .202$ ,  $p = .843$  or in QAU,  $t(14) = .346$ ,  $p = .735$ . Paired sample t-tests in TRI,  $t(14) = 1.7$ ,  $p = .110$ ; Abstain  $t(14) = .00$ ,  $p = 1$ ; IRAP Alcohol-Positive  $t(13) = -.314$ ,  $p = .758$ ; IRAP Alcohol-Negative  $t(13) = -.737$ ,  $p = .474$ ; IRAP Soft Drink-Positive  $t(13) = 1.08$ ,  $p = .3$  or IRAP Soft Drink-Negative  $t(13) = .224$ ,  $p = .826$  were not statistically significant.

**Group 3: Heavy drinkers.** Statistically significant differences are reported between Study 1 and 2 in AAS, IRAP Alcohol-Positive and IRAP Soft Drink-Positive measures in Heavy drinking participants via paired sample t-tests. There was a statistically significant shift in AAS from Study 1 ( $M = 15.59$ ,  $SD = 7.1$ ) to study 2 ( $M = 9.6$ ,  $SD = 8.7$ ),  $t(17) = 2.22$ ,  $p = .41$ ,  $\eta^2 = .23$ . The mean decrease in explicit ASS scores was 5.99. Alcohol-Positive IRAP  $D$  scores changed significantly from Study 1 ( $M = -.6794$ ,  $SD = .36$ ) to Study 2 ( $M = -.2$ ,  $SD = .36$ ),  $t(16) = -4.48$ ,  $p = .000$ ,  $\eta^2 = .56$ . The mean decrease in Alcohol-Positive  $D$  scores was .4794. Heavy drinkers' Soft Drink-Positive  $D$  scores also changed significantly from Study 1 ( $M = .7981$ ,  $SD = .74$ ) to Study 2 ( $M = .35$ ,  $SD = .48$ ),  $t(16) = 2.27$ ,  $p = .038$ ,  $\eta^2 = .24$ . The mean decrease in



Soft Drink-Positive  $D$  scores was .4481. There were no statistically significant changes observed in FAU,  $t(16)=1.468$ ,  $p=.162$  or in QAU,  $t(16)=1.971$ ,  $p=.066$ . Paired sample  $t$ -tests in TRI,  $t(16)=.717$ ,  $p=.483$ ; Abstain  $t(16)=1$ ,  $p=.332$ ; IRAP Alcoho-Negative,  $t(15)=.538$ ,  $p=.598$ , or IRAP Soft Drink-Negative  $t(15)=1.078$ ,  $p=.299$  were not statistically significant.

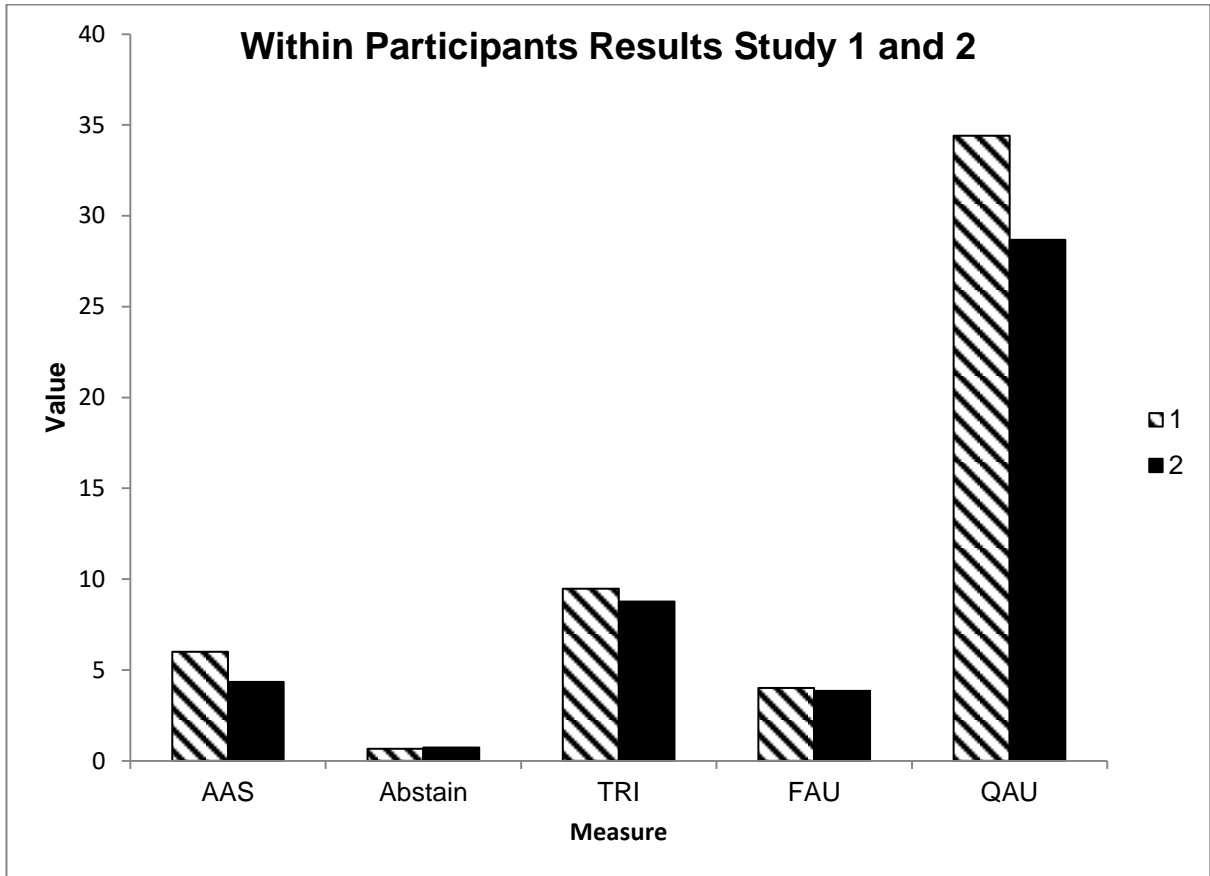


Figure 12. Study 1 and Study 2 Repeated Measures showing a comparison of explicit measures means.

**Repeated Measures Within Participants Analysis by Gender.** Paired-sample t-tests were conducted on all measures to examine if there were changes in the data between Study 1 and Study 2 when participants are grouped by gender. Analysis highlighted a statistically significant change in the male group in IRAP Alcohol-Positive and IRAP Soft Drink-Positive trials. There was a statistically significant shift in male Alcohol-Positive *D* scores from Study 1 ( $M = -.6, SD = .39$ ) to Study 2 ( $M = -.15, SD = .54$ ),  $t(23) = -3.39, p = .003$ , eta squared = .34. The mean decrease in scores was .45. Male Soft Drink-Positive *D* scores also changed significantly from Study 1 ( $M = .58, SD = .46$ ) to Study 2 ( $M = .28, SD = .54$ ),  $t(23) = 2.232, p = .036$ , eta squared = .19. The mean decrease in *D* scores is .3. There were no statistically significant changes observed in AAS,  $t(26) = 1.02, p = .317$ , FAU,  $t(26) = .08, p = .937$  or in QAU,  $t(26) = .491, p = .628$ . Paired sample t-tests in TRI,  $t(26) = .925, p = .364$ , Abstain  $t(26) = .57, p = .574$ , Alcohol-Negative  $t(23) = .491, p = .628$ , or Soft Drink-Negative  $t(23) = 1.99, p = .059$  were not statistically significant.

Repeated measures between participants analysis by gender highlighted a statistically significant change in the female group in the IRAP Alcohol-Negative trial only. There was a statistically significant shift in female Alcohol-Negative *D* scores from Study 1 ( $M = -.31, SD = .48$ ) to Study 2 ( $M = -.04, SD = .53$ ),  $t(19) = -2.41, p = .027$ , eta squared = .24. The mean decrease in scores was .27. There were no statistically significant changes observed in AAS,  $t(21) = -.585, p = .565$ , FAU,  $t(21) = .631, p = .535$  or in QAU,  $t(21) = 1.715, p = .101$ . Paired sample t-tests in TRI,  $t(21) = 1.151, p = .262$ , Abstain  $t(21) = -.44, p = .665$ ; Alcohol-Positive  $t(19) = -1.18, p = .252$ ; Soft Drink-Positive

$t(19)=1.115, p=.28$  or IRAP Soft Drink-Negative  $t(19)=-.778, p=.447$  were not statistically significant.

### Discussion

Study 2 IRAP results imply that participants continue to believe that alcohol is positive, but show a more indifferent attitude that alcohol is negative. Participants continue to believe that soft drinks are positive but have a weaker attitude that soft drinks are not negative. DIRAP scores indicate that when presented with Alcohol-Positive and asked to follow the rule “alcohol is positive”, participant response latency is greater than when required to follow the rule “alcohol is negative”, suggesting participant BIRRs are in accord with the relational presentation. That is, participants implicitly agree when presented with Alcohol-Positive. When presented with Soft Drink-Positive, DIRAP scores suggest that participant’s implicit attitude to soft drinks accord with the relational presentation. That is, they respond quicker on trials in which they are required to follow the rule “soft drinks are positive” than “soft drinks are negative”. When participants are presented with Alcohol-Negative, they respond with greater latency when asked to follow the rule “alcohol is positive” than “alcohol is negative”, however only to a slight degree. When presented with Soft Drink-Negative, participants respond quicker when following the “soft drinks are positive” than the “soft drinks are negative” rule, indicating BIRRs in opposition to the relational presentation Soft Drink-Negative. There is a significant difference in Alcohol-Positive and Soft Drink-Positive trial types when compared to zero, suggesting participant attitudes in these trials are significantly strong. However, there is no significant

difference in Alcohol-Negative and Soft Drink-Negative trials when compared to zero, which indicates that participant attitudes are weak when both alcohol and soft drinks are presented in coordination with labels that could be considered negative. .

Within participants repeated measures analysis shows a significant shift in Alcohol-Positive IRAP trial type. Participants in both studies implicitly agree with the relational frame Alcohol-Positive, however we see that post intervention, participants agree with Alcohol- Positive significantly less. There are a number of potential reasons for this shift. In Study 1 we report that Alcohol-Positive is in a negative correlation with QAU and a positive correlation with Abstain, which suggests that BIRRs are associated with alcohol use behaviour. In Study 2 these correlations were no longer significant but we do note that the 20% participant attrition rate, and or the reduction in difficulty deriving relational frames due to exposure to a second IRAP may impact these findings. Assuming that implicit responding to Alcohol-Positive is a predictor for QAU in a negative direction, we should find that as DIRAP scores decrease in Study 2, Mean QAU should increase. This is not the case ( $M=34.4$  to  $M=28.7$ ) but the decrease was not statistically significant.

### **Research questions**

**Divergence or convergence between explicit attitudes towards alcohol (as measured by the AAS) and implicit attitudes towards alcohol (as measured by the IRAP).** There was no significant correlation between the IRAP and explicit attitudes towards alcohol variables in Study 2. There was no statistically significant shift in explicit attitudes to alcohol from Study 1 to 2. However, we find that Non/Light drinkers show a statistically significant increase in AAS and Heavy drinkers had a

significant reduction in AAS between the studies, potentially as a result of the ACT-based intervention, or some participant expectation factors.

**Correlations between implicit and explicit measures.** A strong significant correlation is reported between both FAU and QAU with TRI in a positive direction. This suggests that the greater difficulty participants report in controlling their alcohol use behaviour, the more frequently and the higher the quantity of alcohol they use. Or perhaps their self-reported alcohol use behaviour dictates their self-reporting when it comes to controlling their alcohol use behaviour, consistent with Study 1 findings. The relationship between TRI and self-reported alcohol behaviour is explored. A significant correlation is observed between both FAU and QAU with TRI in a positive direction. That is, as alcohol consumption increases, difficulty in controlling alcohol consumption also increases, or as the inability to control drinking behaviour increases, larger quantities of alcohol are consumed on more frequent occasions. A significant correlation is noted between AAS and TRI in a positive direction. This may imply that the more positive a participant's self-reported attitude to alcohol, the more difficulty they report in controlling their alcohol use, or the more out of control their alcohol use behaviour is the more explicitly positive an attitude towards alcohol they report.

**Differences by gender.** A significant difference in self-reported male and female FAU and QAU is found. It is noted that male participants report consuming alcohol twice as frequently as female participants over the previous thirty day period ( $M= 5$  versus  $M= 2.5$ ). Male participants report consuming more than 2.5 times the quantity of alcohol units than their female peers ( $M= 40$  versus  $M= 15.3$ ). As discussed in Study 1, further research investigating whether perceived social acceptability

influences male and female responses on alcohol use behaviour self-reports, or biological differences mean that male participants tend to report consuming larger quantities of alcohol than females and more frequently. In Study 1 there is a significant difference in one IRAP trial (Alcohol-positive) between male and female participants suggesting that the BIRRs of male participants were more in coordination with Alcohol-Positive than BIRRs of female participants. In Study 2 no statistically significant gender difference was reported in any of the IRAP trial types.

**Differences between Non/Light, Moderate and Heavy drinkers** AAS across the three groups is progressively positive with a large effect size indicated and significant variance between all three groups (Non/Light, Moderate and Heavy). That is, the heavier the reported QAU, the more positive the explicit self-reported attitude towards alcohol. There is a significant difference in TRI between Non/Light and Heavy drinkers, indicating that Heavy drinking participants reported greater difficulty controlling their drinking behaviour than light/non-drinkers

**Differences between Study 1 and Study 2.** No significant correlation or correlation approaching significance is found in Study 2 between IRAP Alcohol-Positive and QAU, which represents a departure from Study 1 results. This suggests that the action of some variable between the collection of Study 1 and Study 2 data potentially had an effect on either implicit attitudes to alcohol, participant alcohol use behaviour or both. In the IRAP, participants continued to respond to Alcohol-Positive consistent blocks faster than inconsistent blocks but at a much slower rate in Study 2 than in Study 1. Between participants analysis also showed no significant variance between the groups, with Alcohol-Negative and Alcohol-Positive results across the groups more homogenised than in Study 1. Although participant willingness to take

part in further research that would require abstinence from alcohol use behaviour is found to be associated with FAU and QAU in Study 1, no significant correlation was noted between abstinence and FAU or QAU in Study 2. Nor was any difference noted between in willingness to abstain in Non/Light, Moderate or Heavy drinkers in Study 2. It may be worth noting that as study 2 was the second occasion that participants attended to participate in the research, some participation fatigue may have influenced the participant's willingness to participate in further research extraneous to their willingness to abstain from alcohol use behaviour. No correlation was found between willingness to abstain from alcohol use and TRI in Study 2, despite a strong inverse correlation between the two measures reported in Study 1. There was no significant change in alcohol use behaviour between Study 1 and Study 2. However at group level there was some significant change in alcohol use behaviour. Non/Light FAU doubled and QAU more than doubled from Study 1 to Study 2. There are a number of suggested reasons for this increase. For instance, Study 1 data was collected at the beginning of February, meaning that January's alcohol use behaviour was examined and some participants disclosed anecdotally to the lead researcher that they were taking part in "dry January", a social phenomenon where individuals avoid consuming alcohol following overindulgence over the festive period in December. This may have given a falsely low mean QAU and FAU, particularly for group one participants as some participants may have been incorrectly grouped as Non/Light drinkers based on misleading "dry January" data. There was no statistically significant change in Heavy drinkers FAU and QAU, however there was a decrease noted in QAU that approached significance from Study 1 ( $M= 84.18$  units) to Study 2 ( $M= 58.79$  units). Considering the maximum weekly Government recommended alcohol intake is 14 units for females



and 21 for males, this suggests monthly unit consumption (if we assume four weeks in a month) shouldn't exceed 56 units for females and 84 for males, or a mean of 70 units per month for males and females. The Study 1 Heavy drinker's group QAU mean of 84.18 units exceeded this recommended limit, but the Study 2 QAU mean of 58.79 does not. Although not a statistically significant change, it could be argued that there is a socially significant change in Heavy drinkers QAU between the studies.

**Self-report behaviour change participants attribute to taking part in the research project.** In Study 2, participants are asked to self-report any changes in behaviour they notice and attribute to participation in this research project in an open-ended question format. Researchers were cautious not to ask only about target alcohol use behaviour, in acknowledgement that the short video clip that formed the basis of the intervention was not specific to changing alcohol use behaviour. Whilst 41.67% of participants do report some change in behaviour that they attribute to taking part in the study, it is worth noting that no significant reduction in participant alcohol use behaviour is noted in repeated measures analysis. Participants do however report what they consider to be positive changes in healthy eating, smoking cessation, improved studying behaviour and increased exercise behaviour. We must consider participant expectations and eagerness to please the researcher as a substantial factor in this finding. However, as discussed above, a repeated measures change in FAU and QAU was not significant between Study 1 and Study 2. Therefore if alcohol use behaviour reduction was the aim of the study it could not be said to be achieved. Thus it is important to consider the structure of the intervention presented to participants. It should be noted that the intervention focused on encouraging participants to tolerate cravings and temptation not specific to alcohol use behaviour. If then the intervention

targeted temptation, for it to be understood as effective a significant decrease in TRI should have been observed between Study 1 and Study 2, which is not supported by the findings. Yet there is some shifts in participant responding in both the IRAP and explicit measures in Study 2 when compared to Study 1. Suggested causal factors for these shifts are participation fatigue, a decrease in the difficulty of deriving relations in the IRAP task due to repeated exposure to test blocks over a relatively short period of time (thirty days) and observer effect reactivity.

**Study 3.** A pre-experimental investigation was conducted prior to Study 1 that indicated that the use of pictorial target stimuli is found to be more evocative of alcohol than word stimuli for use in the IRAP. Thus picture images deemed most evocative of alcohol and soft drinks by participants in the pilot study were used in the IRAP procedure in Study 1 and 2. However anecdotal evidence is noted of some participant difficulty discriminating between alcohol and soft drink target stimuli in the IRAP task. For example, four participants disclosed to the lead researcher that they struggled to discriminate the “whiskey” image as alcohol and wondered if it might represent apple juice. Other participants reported that they wondered if the “cola” image actually contained alcohol, as they had previous relational experience of pairing cola used as a mixer with alcoholic beverages. One participant found he was unable to complete the IRAP task, and disclosed to the lead researcher that as a recovering addict he found that he was inclined to assume alcohol is present in every IRAP target picture. His IRAP data was not used for the purposes of data analysis as he failed to complete the task and could not reach accuracy criteria required in the IRAP. Nonetheless, his bias towards alcohol stimuli is reported as it may suggest attentional bias for alcohol as a result of individual learning history, that is, his prior experience with alcohol stimuli cues, as

discussed in the literature review. Some participants mentioned that the image they had least difficult discriminating as either soft drink or alcohol was the “vodka” image, where the beverage is presented in bottles and is labelled “vodka”. This potential target image discrimination issue highlights the importance of carefully choosing IRAP stimuli due to the rapid presentation of these stimuli in the IRAP task. There is the possibility that unintended relational frames factor in Studies 1 and 2 as a result of this discrimination issue that may have impacted response latency rates. If this is the case it risks impacting the construct validity of the research project. To examine this potential limitation, a further study is necessary that uses target IRAP images that may be more easily identifiable as either alcohol or soft-drink target stimuli. Based on participant feedback that the “vodka” picture was most easily discriminated as an alcohol target stimulus, new IRAP target images are presented in Study 3 that comprise an image along with a word to label each target stimulus.

**CHAPTER 4**

**STUDY 3**

In Study 2 we report a difference between IRAP trial data obtained from the same sample of participants in Study 1. However, it is necessary to explore a potential threat to construct validity before we can draw conclusions on these differences. Some participants reported difficulty discriminating between alcohol and soft drink target images used in the IRAP task, despite the use of a pilot study to select target images deemed to best represent alcohol and soft drinks. Such difficulty discriminating between the images could impact latency responses examined in the analysis of IRAP data, such is the sensitivity of the measure. Therefore, the purpose of this study is to replicate Study 1 with a new sample of participants using new target images in the IRAP. These new target images were chosen based on participant feedback that highlighted that the image participants found most easy to discriminate as alcohol was “vodka”. This image happens to contain bottles of vodka, and the word “vodka” is visible on the bottle labels. For this reason, in the interest of making target images represent more overtly either soft drink or alcohol, images are used in Study 3 that contain not only an image of the target stimulus, but also a word that describes it. See appendix 15 for Study 3 target images and labels. Furthermore, replicating Study 1 with a new cohort of participants may elucidate whether prior exposure to IRAP trials reduced the difficulty of relational derivations that impacted response latency and so IRAP trial results in Study 2.

## **Method**

### **Participant Recruitment**

Participants ( $n=35$ ) were recruited via the Psychology Department participant pool in the same manner as in Study 1. The sample comprises 18 male and 17 female participants with a mean age of 26.8 years. Participants were split into groups

according to their self-reported alcohol use behaviour (quantity of alcohol consumed over the previous thirty days, mean=44.35 units). Group one ( $n=13$ ) comprised non-drinkers and light drinkers, characterised as those participants that consumed twenty or less units of alcohol over the previous thirty days. Moderate drinkers, those that consumed forty-five or less units of alcohol over the previous month but more than twenty made up group two ( $n=11$ ). Finally, group three ( $n=11$ ) was made up of those participants that reported drinking in excess of forty-five units over the previous thirty days.

### **Settings/Materials**

The Study was conducted in the Psychology Department in Maynooth University and all participants used the same materials as participants in Study 1. Please see appendix 15 for labels and new target pictures used in the IRAP programme in Study 3.

### **Experimental Design**

This Study employs a the same design as Study 1, and includes replication of Study 1 with the use of new picture targets in the IRAP.

### **Procedures**

The researchers constructed the IRAP programme to include the labels and new target images (see appendix 15), and included six test blocks and the opportunity for participants to complete practice blocks in advance of test blocks. Participants are only invited to complete test blocks if they meet an average response latency criterion of 2000ms and accuracy of responses over 80%.

Participants are presented with the IRAP task. The researcher completes the first IRAP practice block with the participant, emphasising the importance of speed and accuracy. The researcher then remains to help the participant complete the second practice block. The researcher then withdraws allowing the participant to complete the remaining four practice blocks. If the participant responds with accuracy and speed within specified limits, they progress to the IRAP test blocks. See Figure 13 for an example of a typical IRAP screen presentation to participants. In this example, an alcohol target image “Brandy” is presented with a label typically deemed negative “bad”. Participants are asked to press the key “d” if the relational presentation is similar to the rule they are currently following or “k” if it is opposite to the rule they are following. During consistent IRAP blocks, Participants are asked to follow the rule “Soft drinks are positive, alcohol is negative”. So in a consistent block, the correct participant response in the example shown would be “d” for similar, as the rule is that alcohol is negative and the on-screen presentation shows brandy in relation to a negative label. During inconsistent IRAP blocks, participants are asked to follow the rule “Alcohol is positive, soft drinks are negative”. Now the correct participant response to the example shown would be “k” for opposite, as the rule is now alcohol is positive, and so the on-screen presentation is in opposition with the rule. Participants complete six test blocks, alternating between consistent and inconsistent blocks so that three pairs of consistent and inconsistent blocks are presented. Once the test blocks are complete a message on screen prompts the participant to alert the researcher that they have completed the IRAP. It is important to note that the only aspect of the IRAP task that has been altered from the IRAP used in Studies 1A and 1B is the target images used. All labels, rules and other parameters (number of test and practice blocks, latency and accuracy criteria

etc.) are unchanged. Participants are then asked to complete the pen-and-paper measures as outlined above to complete.





Figure 13. Study 3 Example of IRAP on-screen presentation for each trial type

## Results

### Implicit Relational Assessment Procedure: Data Analysis

IRAP data were prepared and analysed in line with the latest recommendations (see Hussey, Thompson, McEnteggart, Barnes-Holmes, & Barnes-Holmes, 2015) as in Study 1 and Study 2. This data transformation yielded positive *D*-scores that represented soft drink-positive/ alcohol-negative responding, and negative *D*-scores that represented alcohol-negative and soft drink-positive responding. Mean  $D_{IRAP}$  results ( $n=33$ ) show that participants more rapidly affirmed soft-drinks-positive compared to soft drinks-negative; and rapidly affirmed alcohol-positive whilst denying alcohol-negative (see Figure 14). One-sample *t*-tests conducted on each of the four trial types revealed significant effects for two trial-types [Soft Drink-Positive,  $t(33) = 2.298$   $p = .028$ , two-tailed; Alcohol-Positive,  $t(33) = -3.069$   $p = .004$ , two-tailed] but not for Alcohol-negative or Soft Drink-Negative trials [Soft Drink-Negative,  $t(33) = -.363$   $p = .719$ , two-tailed; Alcohol-Negative,  $t(33) = -.148$   $p = .884$ , two-tailed]. In order to facilitate statistical comparisons in SPSS, and in line with recommendations by Hussey et al. (2015), the data for the trial-types 3 (soft-drink-negative) and 4 (alcohol-negative) were inverted (i.e. multiplied by -1) (see Figure 15).

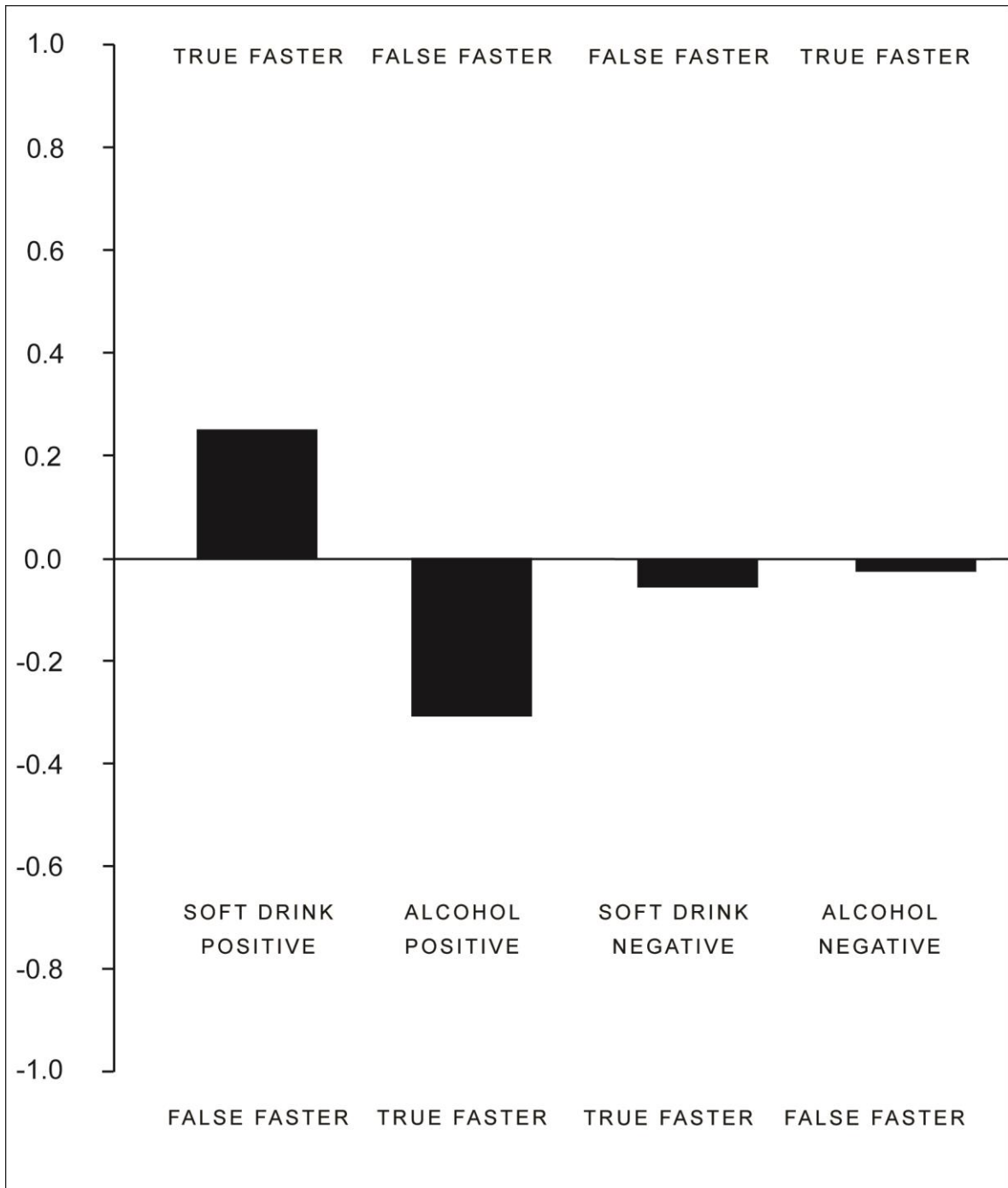


Figure 14. Study 3 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks.

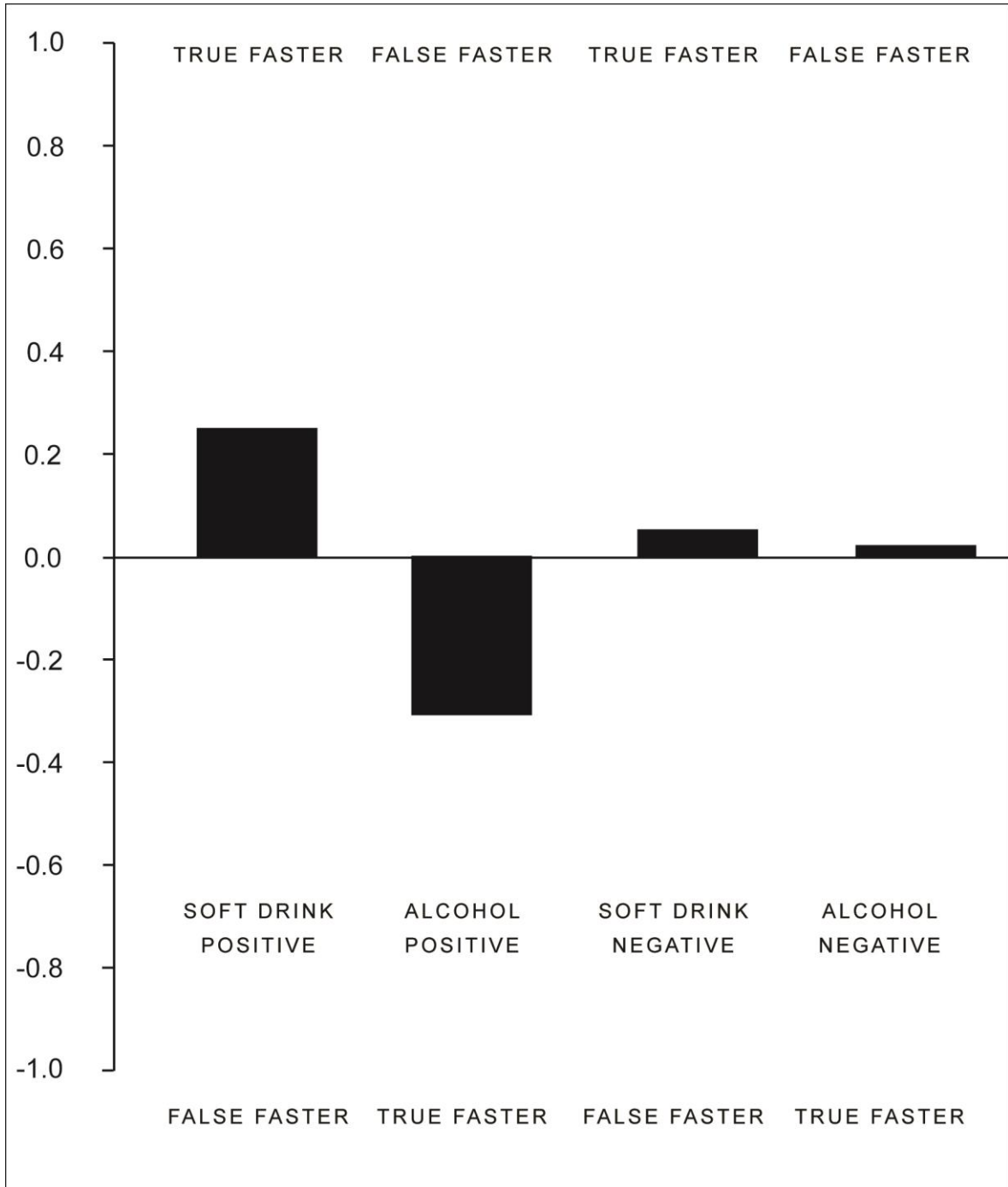


Figure 15. Study 3 Within participants mean D-IRAP scores showing implicit participant attitudes towards alcohol and soft drinks with soft-drink-negative and alcohol-negative trial types inverted.

One-sample *t*-tests were conducted on each of the four trial types for each of the three groups (Group 1: alcohol consumption  $\leq 20$  units in previous month = Non/Light drinkers; Group 2: alcohol consumption  $>20$  units,  $\leq 45$  units in previous month = Moderate drinkers; Group 3: alcohol consumption  $> 45$  units in the previous month = Heavy drinkers) to compare mean IRAP effect size to zero (see Figure 16). Soft Drink-Positive was the only significant trial type for the Light/Non-drinkers group ( $n=13$ ) [Soft Drink-Positive  $t(13) = 2.656$   $p=.022$ ; Alcohol-Positive  $t(13) = -.083$   $p=.935$ ; Soft Drink-Negative  $t(13) = 1.096$   $p=.297$ ; Alcohol-Negative  $t(13) = -1.367$   $p=.199$ ]. Alcohol-Positive was the only significant trial type for the Moderate drinkers group ( $n=11$ ): [Soft Drink-Positive  $t(11) = .768$   $p=.462$ ; Alcohol-Positive  $t(11) = -3.757$   $p=.005$ ; Soft Drink-Negative  $t(11) = .035$   $p=.973$ ; Alcohol-Negative  $t(11) = -.147$   $p=.886$ ]. Alcohol-Positive and Alcohol-Negative were significant for the Heavy drinkers group ( $n=11$ ) [Soft Drink-Positive  $t(11) = .569$   $p=.582$ ; Alcohol-Positive  $t(11) = -2.601$   $p=.026$ ; Soft Drink-Negative  $t(11) = -1.856$   $p=.093$ ; Alcohol-Negative  $t(11) = 2.42$   $p=.036$ ]. Mean D-IRAP scores, standard deviations, *t*-values (one sample *t*-test) and *p*-values for each of the three groups are presented in Table 7.

Table 7: Study 3 D-IRAP Scores

IRAP Trials	Mean D-IRAP Score	Standard Deviation	<i>t</i> -value	<i>p</i> -value
Light Drinkers Alcohol-Positive	-.14	.591	-.083	.935
Light Drinkers Alcohol-Negative	-.212	.538	-1.367	.199
Light Drinkers Soft Drink-Positive	.402	.524	2.656	.022
Light Drinkers Soft Drink-Negative	.17	.54	1.096	.297
Moderate Drinkers Alcohol-Positive	-.593	.499	-3.757	.005
Moderate Drinkers Alcohol-Negative	-.028	.603	-.147	.886
Moderate Drinkers Soft-Drink-Positive	.13	.535	.768	.462
Moderate Drinkers Soft-Drink- Negative	.007	.634	.035	.973
Heavy Drinkers Alcohol-Positive	-.326	.416	-2.601	.026
Heavy Drinkers Alcohol-Negative	.198	.271	2.42	.036
Heavy Drinkers Soft-Drink-Positive	.094	.546	.569	.582
Heavy Drinkers Soft-Drink- Negative	-.305	.544	-1.856	.093

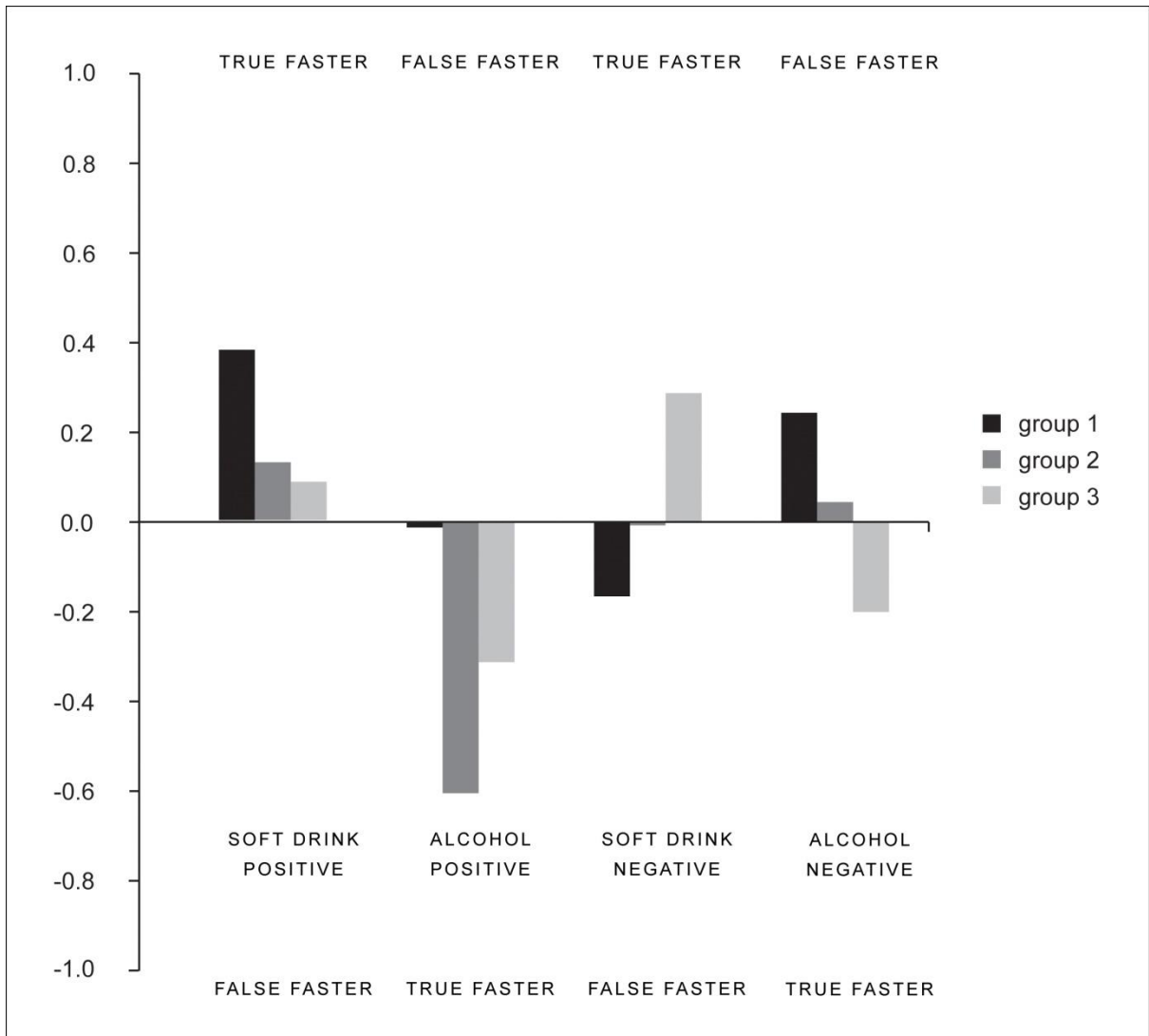


Figure 16. Study 3 Between participants mean DIRAP Scores showing participant attitudes to alcohol and soft drinks as light/non-drinkers (group 1), moderate drinkers (group 2) and heavy drinkers (group 3), soft-drink-negative and alcohol-negative trial types inverted.

**Within and between participants analysis.**

The data were subjected to a 3x4 mixed between-within Analysis of Variance (ANOVA) with group as the between participant variable (Non/Light; Moderate; Heavy) and IRAP trial-type as the within participant variable (Soft Drink-Positive; Alcohol-Positive; Soft Drink-Negative; Alcohol-Negative). This analysis was conducted to assess the impact of self-reported alcohol behaviour (i.e. group: non/light, moderate, or heavy drinkers) on implicit attitudes towards alcohol and soft drinks across four IRAP trials. There was no significant interaction between group (Non/Light; Moderate; Heavy) and IRAP trials, Wilks Lambda = .655,  $F(6,56) = 2.2$ ,  $p = .056$ , partial eta squared = .191 indicating that participant responses in each trial type did not impact their responding in the other trial types. There was a significant main effect for IRAP trial types, Wilks' Lambda = .608,  $F(3, 28) = 6$ ,  $p = .003$ , partial eta squared = .39 indicating that overall, participant responses differed across the four IRAP trial types. Pairwise comparisons showed no significant difference between Soft Drink-Positive and Alcohol-Positive ( $p = .107$ ); Soft Drink-Positive and Alcohol-Negative ( $p = .214$ ); Alcohol-Positive and Soft Drink-Negative ( $p = .624$ ); Soft Drink-Negative and Alcohol-Negative ( $p = .442$ ) and Alcohol-Positive and Alcohol-Negative ( $p = 1$ ), but there was a significant difference between Soft Drink-Positive and Soft Drink-Negative ( $p = .001$ ). The main effect for Group was not significant,  $F(2, 30) = .556$ ,  $p = .194$ , partial eta squared = .104, suggesting no difference between the three groups as assigned by quantity of alcohol intake.



### Explicit Measures Analysis

A one-way between-participants ANOVA was conducted to explore the impact of alcohol behaviour on the self-report Attitude to Alcohol scale (AAS). There was a statistically significant main effect for Group  $F(3,35) = 10.374, p = .000, \eta^2 = .39$ . Post hoc comparisons showed significant differences between Non/Light ( $M = 2.77$ ) and Heavy drinkers ( $M = 19.73$ ),  $p = .000$ ; and between Moderate and Heavy drinkers,  $p = .021$ . Non/Light and Moderate drinkers were not statistically different,  $p = .276$ .

A one-way between-participants ANOVA was carried out to examine TRI across the three groups. There was a statistically significant main effect in participant ability to control their drinking between groups:  $F(3,35) = 18.856, p = .000, \eta^2 = .54$ . Post hoc comparisons indicated that scores on the TRI for Non/Light drinkers ( $M = 4.3$ ) were significantly different for Heavy drinkers ( $M = 14.3$ ),  $p = .000$ . Scores on the TRI for Non/Light drinkers were not significantly different to Moderate drinkers ( $M = 8$ ),  $p = .076$  but Moderate drinkers and Heavy drinkers scores were significantly different,  $p = .002$ .

A one way between-participants ANOVA to explore scores on the Abstinence Scale across the groups showed a violation of the assumption of homogeneity via Levene's test for homogeneity of variances. However, both the Welsh and Brown-Forsythe tests indicate a significant difference between the groups. Post hoc comparisons indicated that the mean score for Non/Light drinkers ( $M = .9231$ ) was significantly different from Heavy drinkers ( $M = .1818$ ),  $p = .000$  and Moderate drinkers

( $M=.4545$ ),  $p = .022$ ; but Moderate and Heavy drinkers were not significantly different,  $p = .271$ .

One-way between-participants ANOVA was carried out to examine the impact Gen (sum of primary and secondary family members with alcohol related problems) has on alcohol use behaviour. There was no statistically significant difference between groups:  $F 3(35) = 2.36$ ,  $p=.111$ .

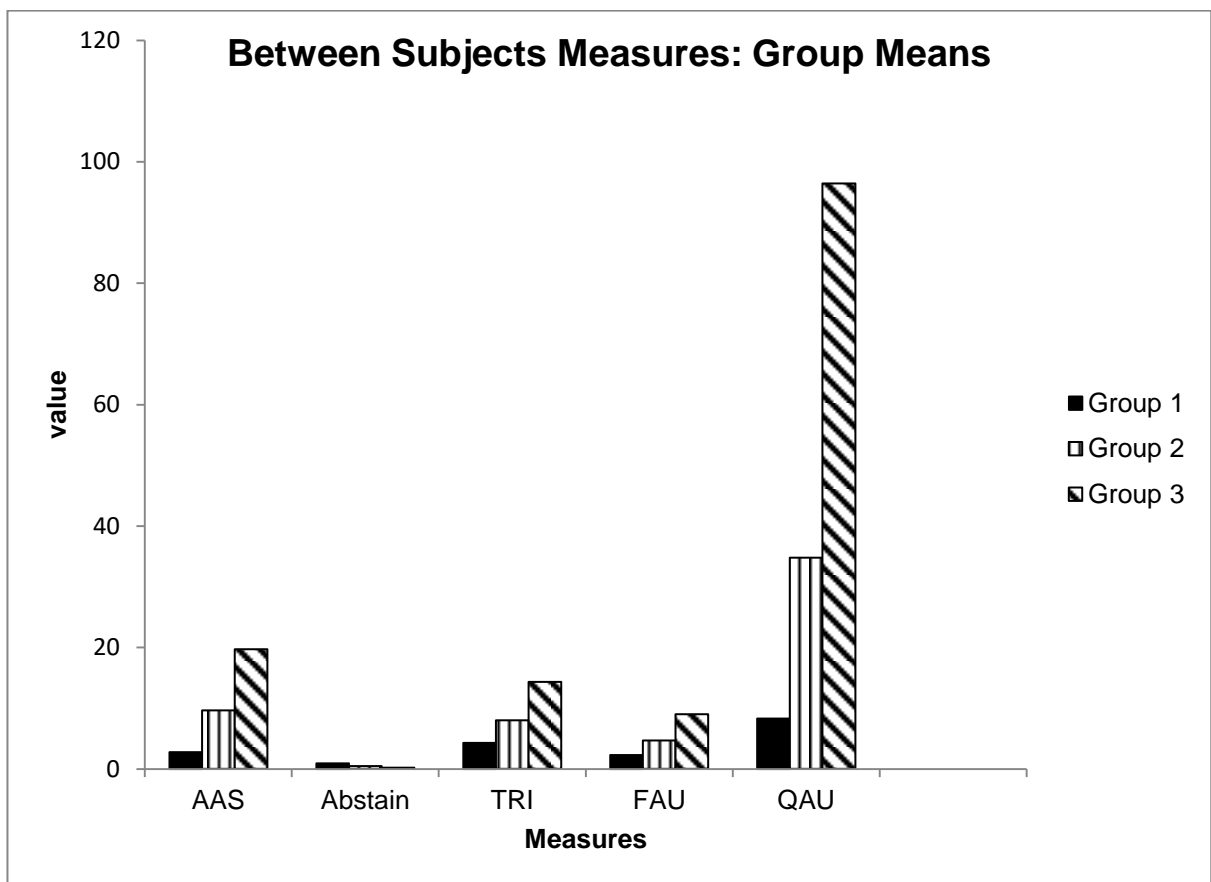


Figure 17. Study 3 Between-Participants: Group Means showing the impact of alcohol behaviour across measures.

## Correlational Analysis

Kolmogorov-Smirnov tests for normality showed that all of the explicit measures used in this study violated the assumption of normality. For this reason the non-parametric Spearman's Rho correlation rubric was used. (See Table 8).

**Explicit/implicit correlations.** The relationship between the AAS and each of the four IRAP trial types was investigated. There was no significant correlation between the any of the variables (all  $p$ 's>0.05).

**Quantity of alcohol use/implicit correlations.** The relationship between QAU and each of the four IRAP trial types was investigated. There was no significant correlation between the any of the variables (all  $p$ 's>0.05).

**Frequency of alcohol behaviour/implicit correlations.** The relationship between FAU and each of the four IRAP trial types was investigated. There was no significant correlation between any of the variables (all  $p$ 's>0.05).

**Temptation and Restraint Inventory/implicit correlations.** The relationship between TRI and each of the IRAP trial types was investigated. There was a significant correlation between Soft Drink-Negative and TRI in a negative direction ( $\rho=-.345$ ,  $n=33$ ,  $p=.049$ ), with high levels of Soft Drink-Negative-Similar responding associated with low levels of dyscontrolled drinking.

**TRI/ Alcohol Use Behaviour correlations.** A strong significant positive correlation was observed between both FAU ( $\rho=.663$ ,  $n=35$ ,  $p=.000$ ) and QAU ( $\rho=.748$ ,  $n=35$ ,  $p=.000$ ) with TRI in a positive direction, with high levels of both FAU and QAU associated with high levels of dyscontrolled drinking.

**Abstain/implicit correlations.** There was a significant correlation between Abstain and Alcohol-positive in a positive direction ( $\rho=.460, n=33, p = .019$ ), with high levels of willingness to abstain from alcohol use associated with stronger Alcohol-positive-similar IRAP responding. Abstain correlated negatively with Soft Drink-Positive ( $\rho= -.361, n=33, p = .039$ ), suggesting high levels of willingness to abstain from alcohol use is associated with low levels of Soft Drink-Positive-Similar IRAP responding.

**Abstain/ Alcohol Use Behaviour correlations.** There was a significant correlation between both FAU ( $\rho=-.682, n=35, p = .000$ ) and QAU ( $\rho= -.617, n=35, p = .000$ ) with Abstain in a negative direction, implying high levels of willingness to abstain from alcohol use is associated with low levels of both alcohol use frequency and quantity.

**Abstain/TRI correlations.** There was a significant negative correlation between Abstain and TRI ( $\rho=-.383, n=35, p = .023$ ), with high levels of willingness to abstain from alcohol use associated with low levels of dyscontrolled drinking.

**Gen/Implicit correlations.** There were no significant correlations found between any of the variables (all  $p$ 's > 0.05).

**Gen/Alcohol Use Behaviour correlations.** There were significant correlations found between both FAU ( $\rho=-.402, n=35, p = .017$ ) and QAU ( $\rho= -.338, n=35, p = .047$ ) with primary family members with problem drinking history in a negative direction, implying reporting that a close family member has a problematic alcohol history is associated with low levels of both alcohol use frequency and quantity.

**Gen/TRI correlation.** There were no significant correlations found between any of the variables (all  $p$ 's > 0.05).

Table 8 Study 3 Correlation Summary Table (n=35)

Variables	1	2	3	4	5	6	7	8	9	10
1. AAS	-									
2. TRI	.620**	-								
3. FAU	.693**	.663**	-							
4. QAU	.640**	.748**	.881**	-						
5. Abstain	-.552**	-.383*	-.682**	-.617**	-					
6. Gen	-.067	.004	-.260	-.115	-.125	-				
7. Alcohol-Positive	-.341	-.151	-.309	-.168	.406*	.140	-			
8. Alcohol-Negative	.268	.339	.342	.323	-.211	-.035	-.157	-		
9. Soft Drink-Positive	-.265	-.163	-.256	-.235	.361*	-.074	.186	-.151	-	
10. Soft Drink-Negative	-.228	-.345*	-.260	-.292	.192	.090	.267	-.070	.096	-

Measure	AAS	FAU	QAU	TRI	Abstain
IRAP Alcohol- positive	-	-	-	-	.406*
IRAP Soft Drink Positive	-	-	-	-	-.361*
AAS	-	.693**	.640**	.620**	-.552**
FAU	.693**	-	.881**	.663**	-.682**
QAU	.640**	.881**	-	.748**	-.617**
TRI	.620**	.663**	.748**	-	-.383*
Gen1	-	-.402*	-.338*	-	-

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

*Table 9.* Study 3 Correlations between implicit and explicit measures that reached statistical significance

### Gender Analysis

One way between participants ANOVA were carried out to explore any variance between male and female participants in AAS, TRI, Gen, Abstain and alcohol use behaviour (FAU and QAU). There was a statistically significant main effect for gender in alcohol use behaviour, in both FAU,  $F_{2(35)} = 10.684$ ,  $p = .003$ , eta squared = .25 and QAU,  $F_{2(35)} = 7.032$ ,  $p = .012$ , eta squared = .18. Post hoc comparisons indicated that the mean score for male participants' FAU ( $M = 6.8$ ) was significantly different from female FAU ( $M = 3.5$ ). Male participants' QAU ( $M = 61.7$ ) differed significantly from female QAU ( $M = 26$ ).

There was no significant main effect by gender in IRAP trials (all  $p$ 's  $> .05$ ). There was a statistically significant main effect between male and female participants in AAS,  $F_{2(35)} = 5.977$ ,  $p = .020$ , eta squared = .15. AAS for male participants ( $M = 14.2$ ) was significantly higher than the AAS score for females ( $M = 5.4$ ). There was a statistically significant main effect between male and female participants in TRI,  $F_{2(35)} = 11.041$ ,  $p = .002$ , eta squared = .25. TRI for male participants ( $M = 11.3$ ) was significantly higher than the TRI score for females ( $M = 5.7$ ).

### Comparison of Study 3 results with the findings of Study 1.

Study 3 is a replication of Study 1 with a change in the target pictures used in the IRAP as discussed in the Study 2 methodology chapter.

**IRAP Trials.** Independent samples t-tests were carried out on each of the IRAP trial types. There was no significant difference noted between Study 1 Alcohol-Positive ( $M = -.4791$ ,  $SD = .53$ ) and Study 3 Alcohol-Positive ( $M = -.2936$ ,  $SD = .55$ ;  $t(88) = -1.563$ ,  $p = .122$ , two-tailed). Nor was there a significant difference between Study 1



Alcohol-Negative ( $M = -.1538$ ,  $SD = .55$ ) and Study 3 Alcohol-Negative ( $M = -.0124$ ,  $SD = .48$ ;  $t(88) = -1.218$ ,  $p = .227$ , two-tailed). However there was a statistically significant difference between Study 1 Soft Drink-Positive ( $M = .5167$ ,  $SD = .63$ ) and Soft Drink-Negative ( $M = .2021$ ,  $SD = .48$ ) and Study 3 Soft Drink-Positive ( $M = .2145$ ,  $SD = .54$ ;  $t(88) = 2.305$ ,  $p = .024$ , two-tailed) and Soft Drink-Negative ( $M = -.0373$ ,  $SD = .59$ ;  $t(88) = 2.071$ ,  $p = .041$ , two-tailed).

**AAS.** There was no significant difference noted between Study 1 AAS ( $M = 6.02$ ,  $SD = 14.52$ ) and Study 3 AAS ( $M = 9.94$ ,  $SD = 11.4$ ;  $t(95) = -1.370$ ,  $p = .174$ , two-tailed).

**TRI.** There was no significant difference noted between Study 1 TRI ( $M = 9.48$ ,  $SD = 6.06$ ) and Study 3 TRI ( $M = 8.6$ ,  $SD = 5.7$ ;  $t(95) = .7$ ,  $p = .486$ , two-tailed).

**Alcohol Use Behaviour.** There was no significant difference noted between Study 1 FAU ( $M = 4.01$ ,  $SD = 3.48$ ) and Study 3 FAU ( $M = 5.17$ ,  $SD = 3.39$ ;  $t(95) = -1.574$ ,  $p = .119$ , two-tailed). There was no significant difference noted between Study 1 QAU ( $M = 34.4$ ,  $SD = 44.84$ ) and Study 3 QAU ( $M = 44.4$ ,  $SD = 43.19$ ;  $t(95) = -1.057$ ,  $p = .293$ , two-tailed).

**Abstain.** There was no significant difference noted between Study 1 Abstain ( $M = .67$ ,  $SD = .48$ ) and Study 3 Abstain ( $M = .54$ ,  $SD = .5$ ;  $t(95) = 1.196$ ,  $p = .235$ , two-tailed).

**Gen.** There was no significant difference noted between Study 1 Gen ( $M = 1.23$ ,  $SD = 1.9$ ) and Study 3 Gen ( $M = .8$ ,  $SD = 1.4$ ;  $t(95) = 1.153$ ,  $p = .252$ , two-tailed).

The two samples used in Study 1 and Study 3 comprised different participants who reported consuming different QAU. The mean QAU reported in Study 1 was 34.4 units over the previous 30 days (in January 2016). This mean was used to split the sample into groups, where light drinkers/non-drinkers (group 1) reported drinking  $\leq 10$  units of alcohol over the previous 30 days, moderate drinkers (group 2) reported drinking  $> 10$  units of alcohol but  $\leq 35$  units over the previous 30 days and heavy drinkers reported consuming above average  $> 35$  units of alcohol over the previous 30 days. However the mean QAU reported in Study 3 was 44.4 units over the previous 30 days (in January 2017). This presented a problem when splitting the groups, as in order to remain faithful to Study 1 methodology, it was necessary to group light drinkers/non-drinkers (group 1) as drinking  $\leq 20$  units of alcohol over the previous 30 days, moderate drinkers (group 2) drinking  $> 20$  units of alcohol but  $\leq 45$  units over the previous 30 days and heavy drinkers that consumed above average  $> 45$  units of alcohol over the previous 30 days. Whilst this gives the most fidelity to Study 1 in terms of Study 3 between within participant analysis, it means that it is inappropriate to compare Study 1 and Study 3 between within participant findings.

## **Discussion**

### **Interpretation of Results**

Study 3 IRAP results imply that participants have a positive attitude towards alcohol and don't believe that alcohol is negative, which is consistent with Study 1 IRAP findings. DIRAP scores indicate that when presented with alcohol stimuli relationally framed in coordination with labels typically considered to be positive (Alcohol-Positive), e.g. "nice", "pleasant" and asked to follow the rule "alcohol is positive", participant response latency was less than when required to follow the rule

“alcohol is negative” in the consistent rule block, suggesting participant BIRRs are in coordination with the relational presentation alcohol-positive-similar. When participants are presented with alcohol stimuli framed in coordination with labels typically considered negative (Alcohol-Negative), e.g. “nasty”, “unpleasant”, they responded with longer latency when asked to follow the rule “alcohol is positive” than “alcohol is negative”, suggesting that participant BIRRs are in coordination with alcohol-negative-opposite. However, Study 3 soft drink IRAP trials differ from Study 1, with participants responding with a positive attitude to soft drinks (Soft Drink-Positive) but with significantly less strength than in Study 1, and agreeing that soft drinks are negative (Soft Drink-Negative) which is not the case in Study 1. When presented with soft drink stimuli relationally framed in coordination with the same labels typically considered positive (Soft Drink-Positive), DIRAP scores suggest that participant’s implicit attitude to soft drinks accords with the relational presentation. That is, they respond with briefer latency on trials in which they were required to follow the rule “soft drinks are positive” (in consistent blocks) than “soft drinks are negative” (in inconsistent blocks). When presented with soft drink target stimuli framed in coordination with negative labels (Soft Drink-Negative), participants respond quicker when following the “soft drinks are negative” (inconsistent block) than the “soft drinks are positive” rule (consistent block), suggesting participant BIRRs are in coordination with soft drink-negative-similar. There was a significant difference in Alcohol-Positive and Soft Drink-Positive IRAP trial types when compared to zero, which implies that overall, participant attitudes towards both Alcohol-Positive and Soft Drink-Positive are significantly strong, as a zero score would suggest an indifferent attitude. However, Alcohol-Negative and Soft Drink-Negative were both not

statistically significant scores when compared to zero, indicating weaker attitudes that alcohol is not negative and soft drinks are negative.

Between-participant analysis of the IRAP trial types across groups shows implicit agreement on attitudes to Alcohol-Positive but some disagreement on Alcohol-Negative between groups. Non/Light and Moderate drinkers disagree with the relation Alcohol-Negative but Heavy drinkers agree with the relational frame alcohol-negative-similar. This divergence is important, as it suggests that the heavier the reported alcohol use quantity, the stronger the implicit alcohol-negative-similar BIRR, which is consistent with Study 1 findings. In Study 1 we note that all groups reported BIRRs consistent with soft drink-positive-similar, but with Heavy drinkers responding strongest and Non/Light weakest. These results are in sharp contrast to Study 3 findings (see Figures 4 and 13 for graphic representation). This divergence in implicit attitudes to soft drinks both within and across studies could point to theoretical issues in the use of soft drink targets in implicit tests as a foil or control for alcohol targets.

No statistically significant correlations are noted between IRAP trials and QAU, which is a departure from Study 1 findings which suggested an inverse correlation between AI+ and QAU. We report a statistically significant correlation between TRI and Soft Drink-Negative in Study 3 but note no such significant finding between any of the IRAP trials and TRI in Study 1.

### **Research questions**

**Divergence or convergence between explicit attitudes towards alcohol (as measured by the AAS) and implicit attitudes towards alcohol (as measured by the IRAP).** In Study 3 there was no significant correlation between the IRAP and explicit

attitudes towards alcohol variables. There was a statistically significant difference by gender in explicit attitudes towards alcohol with male participants self-reporting a much more positive explicit attitude to alcohol than female participants. It is possible that social constructs mentioned previously affect male and female self-reporting when it comes to explicit attitudes to alcohol as much as it appears to in alcohol use behaviour. However, that there was no significant gender difference in terms of implicit attitudes to alcohol noted may point to divergence between BIRRs and EERRs by gender.

**Differences between Non/Light, Moderate and Heavy drinkers.** The correlation between QAU and TRI is maintained at between participants analysis, as a statistically significant variance was found between Non/Light and Heavy drinkers in TRI. Willingness to abstain from alcohol use behaviour is found to be significantly different across the groups with Non/Light drinkers more willing to abstain from alcohol use than Moderate or Heavy drinkers.

**Correlations between implicit and explicit measures.** In Study 3 there was a significant inverse correlation obtained between Soft Drink-Negative and TRI. This implies that as participants report greater difficulty controlling their alcohol use behaviour they respond quicker to Soft Drink-Negative relations as “similar” rather than “opposite” within the IRAP task (BIRR biased towards soft drink-negative-similar). A strong significant correlation was observed between both FAU and QAU with dyscontrolled drinking in a positive direction in Study 3. This suggests that the greater difficulty participants reported in controlling their alcohol use behaviour, the more frequently and the higher the quantity of alcohol they used. Or perhaps their self-reported alcohol use behaviour dictates their self-reporting when it comes to controlling

their alcohol use behaviour. In Study 3 there was a significant correlation between Abstain and Alcohol-Positive in a positive direction, and Abstain correlated negatively with Soft Drink-Negative. This implies that participants that respond slower in the IRAP task to Alcohol-Positive relational frame-“similar” (that is, are less comfortable than their peers with the relation Alcohol-Positive) are more willing to agree to take part in an experiment that would require they abstain from alcohol use for a one week period. Those participants that respond faster to the relation Soft Drink-Negative “similar” rather than “opposite” (that is are more comfortable than their peers with the relation Soft Drink-Negative) are more reluctant to agree to abstain from alcohol use for a one week period. A significant correlation was observed between both FAU and QAU with Abstain in a negative direction. This suggests that the more frequent and the greater the quantity of alcohol participants report consuming over the previous 30 day period the more reluctant they are to agree to abstain from alcohol for a week long period. A significant inverse correlation is reported between Abstain and TRI. This suggests that the greater the difficulty in controlling one’s alcohol use behaviour participants reported the less inclined to abstain from alcohol use for a week.

**Differences by gender.** A significant difference in self-reported male and female FAU and QAU is reported. It was noted that male participants report consuming alcohol more than 1.5 times as frequently as female participants over the previous thirty day period. Male participants report consuming more than two times the quantity of alcohol units than their female peers also. As mentioned in the Study 1 and Study 2 discussion sections, further research to examine whether perceived social acceptability tempered male and female responses on this self-report measure, or whether biological differences between the genders mean that males in this sample tend to report

consuming larger quantities of alcohol than females and more frequently (or at least did so over the thirty day periods examined). There was a statistically significant difference by gender in explicit attitudes towards alcohol with male participants self-reporting a much more positive explicit attitude to alcohol than female participants. It is possible that social constructs mentioned previously affect male and female self-reporting when it comes to explicit attitudes to alcohol as much as it appears to in alcohol use behaviour. However, that there was no significant gender difference in terms of implicit attitudes to alcohol noted may point to divergence between BIRRs and EERRs by gender. There was a statistically significant difference by gender in TRI in Study 3, indicating that male participants report significantly more difficulty controlling their alcohol use behaviour than female participants. This is in line with general findings that suggest that increased alcohol use behaviour correlates positively with higher scores on the TRI, and as mentioned above, as male participants reported significantly higher alcohol use behaviour than females, increased male TRI follows.

**The impact of transgenerational problem drinking on alcohol use behaviour.** There was a significant inverse correlation between alcohol use frequency and quantity and primary family members with problem drinking histories. The result suggests that those that reported having primary family members with a history of problematic drinking report consuming lower quantities of alcohol less frequently than their peers.

**Study 1 and Study 3 differences and similarities.** The purpose of Study 3 is to replicate Study 1 using IRAP target images that participants may find easier to discriminate as either alcohol or soft drink based on anecdotal participant feedback from Studies 1 and 2. As Study 2 involved post-intervention data analysis, we suggest

comparison of findings of only Study 1 (pre-intervention) and Study 3 (no intervention). Although comparison of all Study 1 and Study 3 findings is relevant in terms of replication and experimental control, IRAP trial differences are a particular potential source of information on whether or not participant difficulty discriminating between alcohol and soft drink target images affected mean latency response times in the IRAP task. We find that there is no significant difference between Alcohol-Positive and Alcohol-Negative trials from Study 1 to Study 3, which may suggest that mean latency response times were unaffected by the somewhat more ambiguous target images used in the Study 1 IRAP, or that the target images used in Study 3 were equally as difficult to discriminate as those in Study 1 where implicit attitudes to alcohol are concerned. However, we report statistically significant differing Soft Drink-Positive and Soft Drink-Negative IRAP results in Study 3 when compared to Study 1, which at first glance could imply that the change in target images in the Study 3 IRAP did affect mean DIRAP scores. This assumption is problematic as within the IRAP tasks participants are required to discriminate only between two sets of target images, soft drinks and alcohol. If the change in Soft Drink-Positive and Soft Drink-Negative DIRAP scores is as a result of easier discrimination of target stimuli, we would expect Alcohol-Positive and Alcohol-Negative DIRAP scores to change significantly also, which is not the case. Potential explanations for this phenomenon will be discussed in the following chapter as it may not be as a result of the potential construct validity issue proposed in Chapter 3.

We see in Study 1 that participants are more likely to belong to either Non/Light drinkers or Heavy drinkers group if they reported having primary family members with history of problem drinking. Study 3 findings partially support Study 1



in the Non/Light drinkers group but not the Heavy drinkers group. Certainly the findings of both studies point to some relationship between experiencing problematic alcohol-use history of a primary family member and one's own alcohol use behaviour. As outlined in the results section above, the findings of Study 3 are similar to results obtained in Study 1 with the notable exception of Soft Drink-Negative and Soft Drink-Positive IRAP trials. Despite heavier mean QAU reported in the Study 3 sample (44.4 units over the previous 30 days compared to 34.4 units in Study 1) there is no statistically significant difference reported in any of the other measures examined (AAS, TRI, Abstain, Gen, FAU, QAU). This consistency across two different samples of participants and temporal points may somewhat strengthen the findings of Study 1 by pointing to good experimental control, validity and reliability within the measures and generality of findings in undergraduate populations.

## **CHAPTER 5**

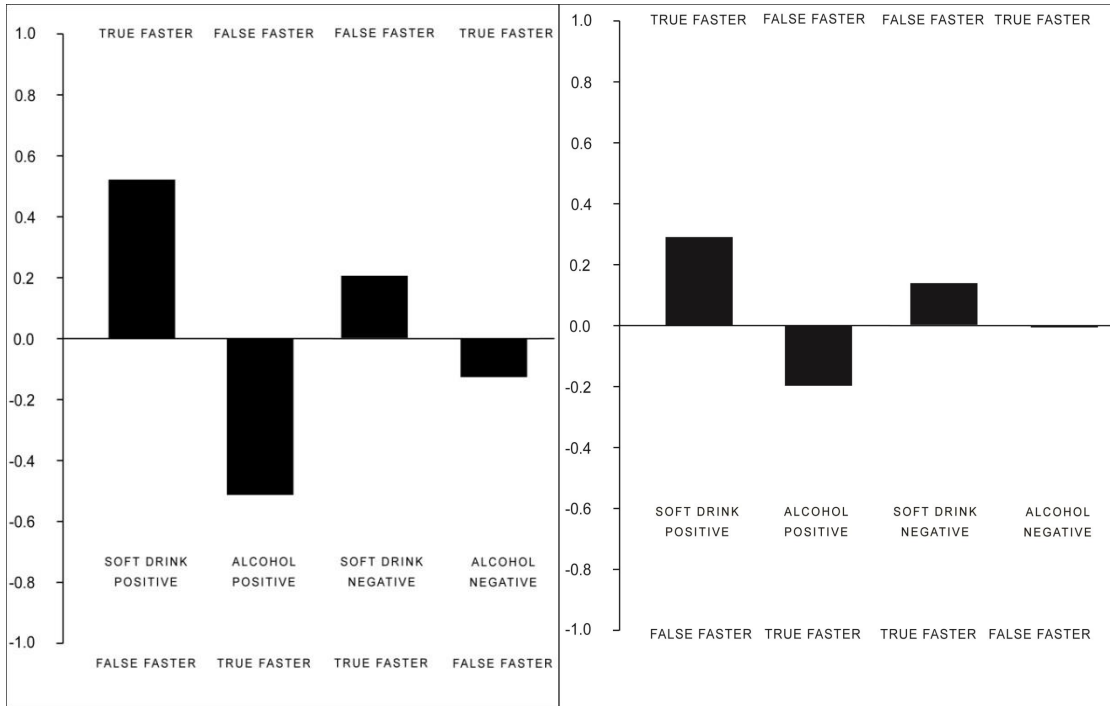
### **DISCUSSION AND CONCLUSION**

The aims of the current research were to explore participant implicit and explicit attitudes to alcohol within the context of their alcohol use behaviour and any convergence or divergence between BIRRs and EERRs, investigate the relationship between implicit and explicit attitudes to alcohol (AAS) and other variables (Abstain, Gen QAU and FAU) and dyscontrolled drinking (TRI) ( as in the Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014 study), deliver a brief ACT based intervention and examine any post-test changes that may result and explore a potential threat to construct validity through the use of target pictures in the IRAP that may have been difficult to discriminate as either alcohol or soft drinks. Investigation of the impact of self-reported family members with a history of problematic alcohol use and post hoc exploration of differences by gender in the sample were also conducted.

### **Implicit attitudes to alcohol**

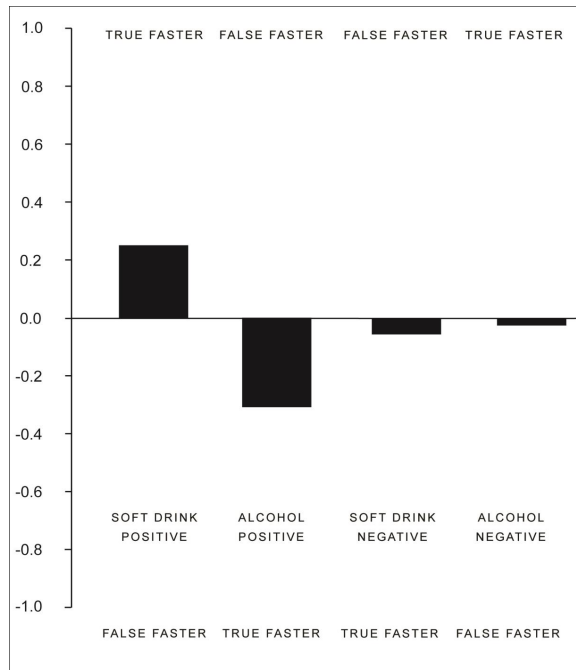
As discussed in the literature review chapter, the IRAP has been applied to the study of many clinical issues including cocaine dependence (Carpenter, Martinez, Vadhan, Barnes-Holmes & Nunes, 2012) but has not yet been employed to examine attitudes to alcohol. The current study therefore adds to the IRAP research by giving a sense of how an undergraduate population responds to both Alcohol-Negative and Alcohol-Positive relations within the IRAP task, and explores how this relational responding correlates with a number of potentially related variables including alcohol use behaviour and an explicit measure of participant attitude to alcohol (looking at the relationship, if any, between BIRRs and EERRs). In Study 1 we found that participants had pro-alcohol, pro-soft drink attitudes to alcohol and soft drinks. They also rejected alcohol-negative and soft drink-negative relations (see Figure 18). In Study 2 the same

participants continued to have pro-alcohol and soft drink attitudes but to a significantly lesser extent. Participants also show some ambivalence to alcohol when paired with negative labels in Study 2, indicating they are less willing to reject alcohol-negative relations in Study 2 than they were in Study 1. In Study 3, conducted with a separate sample, participants had pro-alcohol and pro-soft drink implicit attitudes as measured by the IRAP, however pro-soft drink attitudes were significantly reduced compared to Study 1. These participants rejected alcohol-negative relations but supported soft drink-negative relations which represents a shift from both Study 1 and Study 2 results.



Study 1

Study 2



Study 3

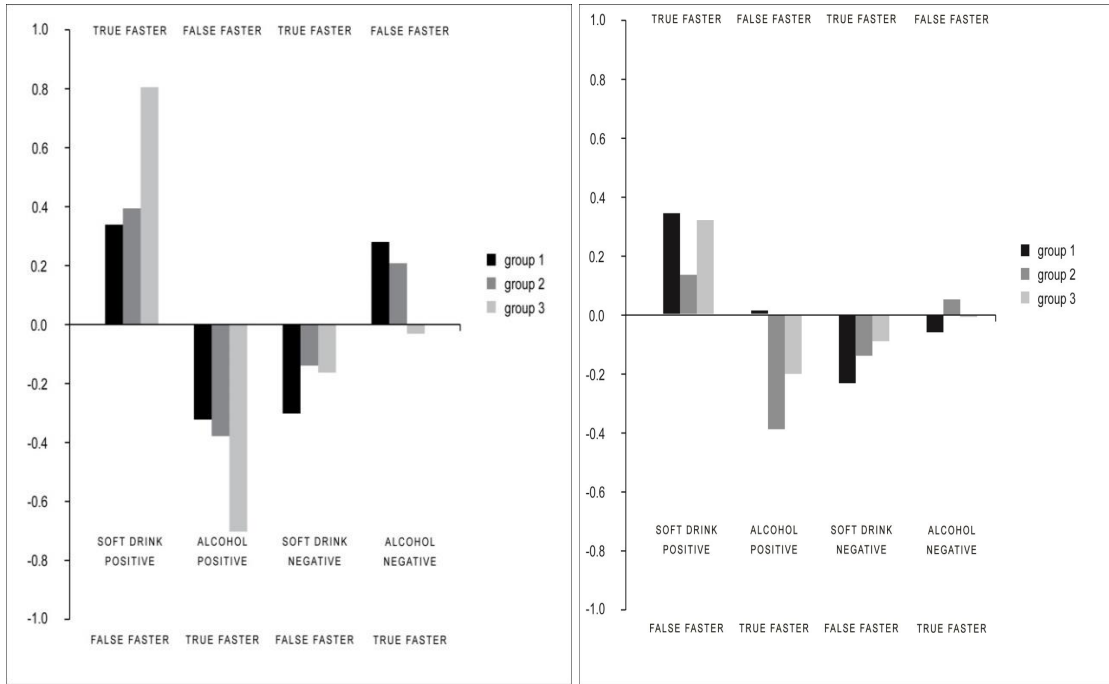
Figure 18. Implicit attitude to alcohol and soft drink target stimuli as measured by the IRAP in Studies 1, 2 and 3.

Behaviour is dependent on our previous learning experience with a particular stimulus set so it follows that participant behaviour in completing the IRAP task could be influenced by their recent alcohol use behaviour. This effect was observed in Study 1 insofar as a correlation was reported between the IRAP Alcohol-Positive trial type and quantity of alcohol use participants self-reported recently consuming, however results of Study 2 didn't show the same phenomenon. When controlling for the quantity of alcohol participants reported consuming over the previous thirty days (Group 1- Non/Light drinkers, Group 2- Moderate drinkers, Group 3- Heavy drinkers), Study 1 results showed that largely speaking between-participant implicit attitudes to alcohol remained similar to the overall sample. That is, participants are pro-alcohol and pro-soft drink and reject Soft Drink-Negative relations. However we see some divergence by group as Heavy drinkers support Alcohol-Negative relations whilst Non/Light drinkers reject that relation (see Figure 19). It is noteworthy that Heavy drinkers are most strongly pro-alcohol-positive and most strongly pro-alcohol-negative of the three groups in Study 1, suggesting some ambivalence towards alcohol in the Heavy drinkers group. In Study 2, the same participants show greater divergence by group when it comes to implicit attitudes to alcohol and soft drinks than they did in Study 1. All groups show pro-soft drink attitudes but to a lesser degree than in Study 1. Non/Light drinkers show anti-alcohol attitude in Study 2, whilst Moderate and Heavy drinkers continue to respond pro-alcohol on the IRAP, although Heavy drinkers pro-alcohol attitude significantly reduced compared to their pro-alcohol attitude in Study 1. All groups continue to reject Soft Drink-Negative relations as they did in Study 1. However both Non/Light drinkers and Heavy drinkers affirm Alcohol-Negative relations in

Study 2 whilst only Moderate drinkers reject Alcohol-Negative. This represents a change in implicit attitude by group for Non/Light drinkers from Study 1 to Study 2. The Non/Light group attitude to alcohol changed from pro-Alcohol-Positive to anti-Alcohol-Positive and anti-Alcohol-Negative to pro-Alcohol-Negative from Study 1 to Study 2. Moderate drinker's attitudes to alcohol and soft drinks remained consistent between Study 1 and Study 2 but Heavy drinker's pro-Alcohol-Positive and pro-Soft Drink-Positive reduced significantly. A new comparable sample of participants completed the IRAP task in Study 3 with revised target pictures deemed more readily discriminable as either soft drink or alcohol utilised, to ascertain if target pictures used in Studies 1 and 2 were ambiguous and affected IRAP outcomes. It was hoped that a comparison of Study 3 IRAP results to Study 1 IRAP results would elucidate any construct validity issues that may have arose as a result of the choice of target pictures, whilst replicating Study 1 in terms of participant implicit attitudes to alcohol. When controlling for QAU, there was considerable divergence in attitudes to soft drinks and alcohol across the groups in Study 3. All three groups show pro-Alcohol-Positive and pro-Soft Drink-Positive attitudes but at varying intensities. Non/Light drinkers show the weakest pro-Alcohol-Positive attitude whilst Moderate drinkers show the strongest. Non/Light drinkers have the strongest pro-Soft Drink-Positive attitude of the three groups. Non/Light drinkers and Moderate drinkers both reject Soft Drink-Negative relations whilst Heavy drinkers affirm them. Non/Light drinkers reject Alcohol-Negative relations but Heavy drinkers affirm them. In all three studies we note implicit pro-Alcohol-Positive and pro-Alcohol-Negative attitudes from self-reported Heavy drinkers highlighting ambivalent attitudes to alcohol amongst heavy drinkers, a

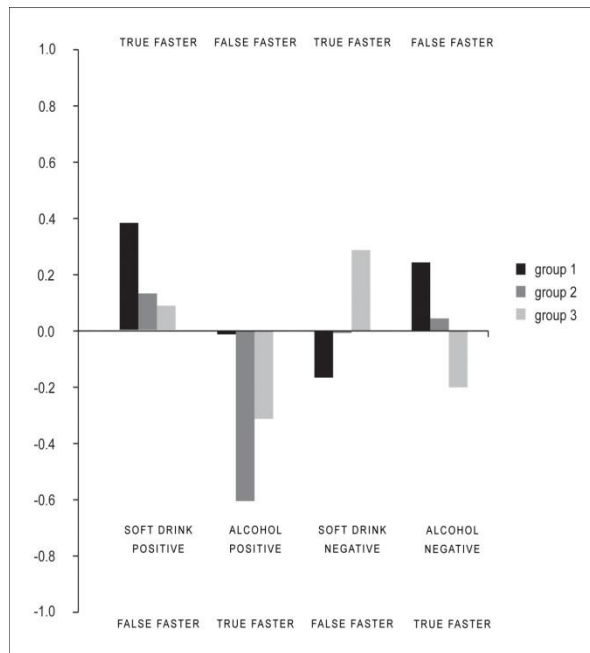
phenomenon not observed in either the Non/Light drinkers or Moderate drinkers groups  
(see Figure 19).





Study 1

Study 2



Study 3

Figure 19. Between-Participants implicit attitudes to alcohol and soft drink as measured by the IRAP (soft drink-negative and alcohol-negative trial types inverted) for Studies 1, 2 and 3.

**Convergence or Divergence between Implicit and Explicit attitudes to Alcohol.**

The relationship between BIRRs (implicit internal behaviour as measured by the IRAP) and EERRs (explicit behaviour as measured by AAS) is very pertinent to this research study and may offer something to contextual behavioural science. Past IRAP research has found both convergence and divergence between explicit and implicit measures. This research finds no statistically significant correlation between IRAP output and explicit attitudes to alcohol. It finds a relationship approaching significance in both Study 1 and repeated in Study 3 suggesting quicker participant responses to Alcohol-Positive related to more positive explicit attitudes to alcohol. So in this regard we report some non-significant convergence between IRAP implicit attitudes to alcohol and explicit attitudes to alcohol. However, it should also be noted that in Study 3, when examining the sample by gender, we report that there was no significant difference in IRAP trials between male and female, but there was a statistically significant difference by gender in AAS. This suggests some divergence in gender between BIRRs and EERRs, and may further highlight gender-based social expectations when it comes to reporting explicit attitudes to alcohol that may have impacted other measures such as QAU and FAU. Overall, as we note no significant convergence between BIRRs and EERRs we report divergence between them. As discussed in Chapter 1, a number of factors can lead to such divergence including biases in explicit self-reports and difficulty accessing memory or lack of personal introspection (Hofmann, Gawronski, Gschwender & Schmitt, 2005). Contextual Behavioural Science offers Relational Coherence and Rule Governed Behaviour as explanations for divergence between BIRRs and EERRs. Relational Coherence refers

to the drive within the individual to have one's BIRRs and EERRs correspond which can be experienced as reinforcement. When they are in opposition to one another, we seek additional relations to resolve the opposition and attain reinforcement (Hughes, Barnes-Holmes & Vahey, 2012). Consider Heavy drinkers implicit and explicit responding in the current research. We see that Heavy drinkers respond pro-alcohol-positive and pro-alcohol-negative on the IRAP task but consistently self-report strong pro-alcohol attitudes on the AAS. This ambivalence on the IRAP may perhaps be experienced as aversive and could explain why Heavy drinkers scored so highly on the self-reported AAS, perhaps as a means to resolve opposition in BIRRs. Rule Governed Behaviour via the transformation of stimulus function could account for some of the divergence between BIRRs and EERRs. If participants believe that certain responding is expected of them on a self-report explicit measure albeit anonymised, they may be more likely to be governed by these expectations in their response behaviour. In the current research, this factor is significant, as there are a number of social stigmas associated with excess alcohol use behaviour and dyscontrolled drinking. Conversely, some participants may have an expectation that they should inflate their alcohol use behaviour or explicit attitude to alcohol to correspond to a stereotypical undergraduate student perception.

### **Ostafin, Kassman, DeJong & van Hemel-Ruiter (2014) replication**

As discussed in Chapter 1 and method section in Chapter 2, this study seeks to add to the wider body of implicit attitude research as well as IRAP-specific research. To that end, it may be useful to explore this study as a partial replication of the Ostafin, Kassman, DeJong & van Hannel-Ruiter (2014) study. The study in question sought to

predict dyscontrolled drinking (TRI) with implicit (IAT) and explicit (AAS) measures of alcohol attitude. The researchers found that both IAT (alcohol-positive associations) results and AAS results predicted alcohol dyscontrol. The current research study employed the same AAS and TRI questionnaire measures as the researchers in 2014, but used the IRAP rather than IAT to examine implicit alcohol-positive attitudes, albeit using the same labels (pleasant-unpleasant, good-bad, enjoyable-awful etc.) and the same control, i.e. attitude to Soft drinks. The current study therefore explores whether the use of the IRAP will also serve as a predictor for dyscontrolled drinking, along with the same AAS measure as used by Ostafin, Kassman, DeJong & van Hennel-Ruiter. It should be noted that the current research is described as a partial replication of the IAT study as the Ostafin study did not include the repeated measures element of the current research study design, nor examined additional variables such as transgenerational problem drinking and willingness to abstain from alcohol use behaviour. Nonetheless, results of Study 1 (*n*-60 undergraduate University students) should be comparable to the Ostafin, Kassman, DeJong & van Hennel-Ruiter (*n*-62 undergraduate University students) and will remain the focus of further analysis in this section. Ostafin, Kassman, DeJong & van Hennel-Ruiter determined that difficulty controlling alcohol consumption would be best examined with participants who drink. They therefore analysed data through the whole sample, through those that consumed alcohol over the previous thirty days (drinkers) and those that consumed less than five drinks at least once a week (which corresponds to Heavy drinkers as described in the current study). They found significant correlations with each group between IAT and TRI and AAS and TRI. As discussed in the results sections, in the current research project at a whole sample level there is no significant correlation between TRI and Alcohol-Positive, but

there is a strong significant correlation between TRI and AAS measures reported. Controlling for non-drinkers, we found no statistically significant correlation between TRI and AAS or TRI and Alcohol-Positive. In the Heavy drinkers group, we also find no statistically significant correlation between either TRI and AAS or TRI and Alcohol-Positive. The current research study therefore finds that neither Alcohol-Positive nor the AAS measure was a reliable predictor for dyscontrolled drinking as measured via the Temptation and Restraint Index using the same parameters as Ostafin, Kassman, DeJong & van Hennel-Ruiter, 2014. The IRAP allows researchers to examine research questions at the trial type level as discussed later in this chapter. However, it is versatile enough to also produce an overall DIRAP score for each participant that may be more suitably comparable to the overall mean composite score produced by the IAT as used in the Ostafin, Kassman, DeJong & van Hennel-Ruiter Study. Correlation analysis (Spearman's Rho) was conducted with this overall DIRAP score to explore any correlations between overall DIRAP scores and AAS and TRI in Study 1. Controlling for non-drinkers, no significant correlations are reported. These findings are significant as although the IAT was substituted for the IRAP in the current research, the same measure for both dyscontrolled drinking and explicit attitudes to alcohol were used on a demographically similar population as in the Ostafin, Kassman, DeJong & van Hennel-Ruiter study with dissimilar results obtained.

### **Correlations between Implicit and Explicit Measures**

Correlations are consistently reported in the three Studies that make up the current research between alcohol use behaviour (frequency and quantity), self-reported dyscontrolled drinking and explicit attitudes to alcohol. In Studies 1 and 3 participants

willingness to abstain from alcohol use for a one week period also correlated with AAS, FAU, QAU and TRI. This suggests that self-reported difficulty controlling alcohol use behaviour is related not only to explicit attitudes towards alcohol but recent past alcohol use behaviour (participants were asked to report their alcohol use frequency and quantity over the previous thirty day period) and also their anticipated future alcohol use (willingness to abstain from alcohol use for a one week period in the future). As discussed in Chapter 1, difficulty controlling alcohol use behaviour can be caused by a strong relationship between alcohol related cues and an appetitive motivational response (Ostafin, Kassman, deJong & van Hemel-Ruiter, 2014). This can arise as a result of repeated experience of the reinforcing effects of alcohol, which may explain the strong relationship reported in the current research between alcohol use behaviour (both frequency and quantity) and dyscontrolled drinking.

Correlations between IRAP trial types and the other measures are less consistent across the three studies. In Study 1 a correlation was reported between Alcohol-Positive and self-reported QAU and willingness to abstain from alcohol use, whilst Alcohol-Negative also correlated with willingness to abstain. In Study 2 however, IRAP trial types didn't correlate with any other measure scores. In Study 3 Alcohol-Positive and Soft Drink-Positive both correlated with self-reported participant willingness to abstain from alcohol use behaviour. The findings in Study 1 and Study 3 support previous research (as discussed in Chapter 1) that link BIRRs to the individual's external behaviour. That is, the relationship found between self-reported QAU and Alcohol-Positive trial type suggests that participant recent self-reported alcohol use behaviour are linked, whilst in Study 3 the findings suggest that Alcohol-Positive trial type is associated with participant self-reported intent or willingness to abstain from alcohol

use behaviour at some point in the future. The inconsistency across the three studies means it is not appropriate to draw conclusions about the relationship between implicit attitudes to alcohol and soft drinks and the other variables other than to note that this lack of consistent correlation is in sharp contrast to the correlations between scores on the direct measures, AAS and TRI, FAU, QAU and Abstain (in studies 1 and 3).

### **Brief ACT-Based Intervention**

Immediately after taking part in Study 1 participants received a brief ACT-based intervention consisting of viewing a short ACT-based TEDx talk delivered by Jonathan Bricker (see appendix 11 for a link to this talk) and taking an infographic flyer outlining the key points of the talk (see appendix 12). Participants were asked to review this flyer weekly before returning to participate in Study 2 thirty days later. The TEDx talk was not specific to alcohol use in order to confound participant research expectations, but rather focused on tools to gain control of cravings in general (the talk referred to smoking and food cravings, although the infographic flyer includes alcohol-based images among smoking and food images). Post-test analysis showed a significant reduction in pro-Alcohol-Positive and pro-Soft Drink-Positive trial types as measured by the IRAP. As the intervention was not specific to alcohol cravings, it seems reasonable that attitudes to unhealthy sugary soft drinks may also have been impacted by it. There was no significant change on any of the direct measures (AAS, FAU, QAU, TRI). This is significant as the IRAP as the only indirect measure, is the measure least susceptible to manipulation. When controlling for QAU, there was a significant increase in FAU, QAU and AAS in the Non/Light drinkers group, which suggests that had the goal of the intervention was to reduce overall alcohol use behaviour, the

intervention was unsuccessful. The Moderate drinker's group results on all measures remained consistent across the two studies. This may suggest that adopting a moderate approach to one's alcohol use behaviour is associated with consistent implicit and explicit attitudes to alcohol over time. Heavy drinkers pro-Alcohol-Positive, pro-Soft Drink-Positive and AAS reduced significantly from Study 1 results to Study 2 results. Heavy drinkers QAU did reduce but not to a statistically significant extent. The QAU reduction was substantial however (a mean reduction of 25 units in a thirty day period), and so may be considered socially significant.

As the intervention was based on taking control of one's appetitive impulse (cravings), some change in TRI scores from Study 1 to Study 2 were anticipated. However there was no significant change in TRI across the sample or in any of the groups as delineated by QAU. The significant reduction in implicit pro-Alcohol-Positive attitudes among the sample between Study 1 and Study 2 is important, as it implies that the ACT-Based intervention, albeit brief, had an impact on participant BIRRs when responding to alcohol targets paired in relation to positive labels. Although participant relational responding can be impacted by repeating the IRAP as the relations may be more easily derived, as there was no significant change in the trial types Soft Drink-Negative and Alcohol-Negative it would appear that this was not a confounding factor in Study 2. As it is established that an individual's BIRRs can be linked subsequent behaviour (as discussed in Chapter 1, later in this Chapter and supported by our findings in Study 1 and Study 3), the post-test reduction in implicit pro-Alcohol-Positive attitudes points to the importance of future research on the clinical role of BIRRs in alcoholism treatment. Furthermore the efficacy of ACT intervention's impact on BIRRs requires more investigation, given that the brief



intervention utilised in Study 1 involved key ACT elements including cognitive diffusion, willingness and mindfulness.

### **Differences by Gender**

Gender differences were noted in all three studies in self-reported quantity and frequency of alcohol use behaviour, with male participants consistently reporting 2-2.5 times the alcohol use behaviour of female participants. Biological differences between the sexes must be considered a factor in this phenomenon. For instance, public health guidelines typically recommend no more than fourteen units of alcohol per week for females and twenty-one for males which implies that males might typically be expected to drink 1.5 times the number of alcohol units than females. The findings of the current research suggest that males report drinking considerably more. Rule Governed Behaviour may play a role in male and female self-report behaviour when it comes to alcohol use. If participant self-reporting in this research project is accurate, it may be possible that actual participant substance misuse behaviour is impacted by societal rules when it comes to male and female alcohol use acceptability. That is, males have perhaps learned that it is acceptable for them to drink to excess indeed they are perhaps reinforced by peers, mentors or by alcohol itself whilst females may have learned that it is not or less acceptable for them to drink to excess. If participant self-reporting in FAU and QAU is inaccurate, that is that males exaggerate the quantity and frequency of their alcohol use behaviour and females underreport their alcohol use behaviour, this too may be a feature of Rule Governed Behaviour. In other words, it may be that male and female alcohol use behaviour is in reality similar, but when it comes to reporting that

behaviour, males perhaps inflate their FAU and QAU whilst females underestimate it, to meet perceived societal norms.

### **Family Problem Alcohol Use and Participant Alcohol Use Behaviour**

That previous life experience may affect future behaviour is demonstrated through transgenerational contextualisation of problem drinking and its impact on participants' drinking behaviour. Results suggest that participants that reported primary family members with a history of problematic alcohol use were inclined to have been assigned to either the Light/Non-drinkers group or heavy drinkers group based on their self-reported QAU in Study 1, but not to the moderate drinkers group. In Study 3, this was partially upheld insofar as a negative correlation is reported between alcohol use behaviour and reporting primary family members with problematic alcohol histories, implying that those participants who experienced life with a close family member managing an alcohol problem tend to report they avoid/engage in minimal alcohol use behaviour. This perhaps indicates that observing or experiencing life with a family member with a problem with alcohol influences participant future alcohol use behaviour, or at least self-reported alcohol use behaviour.

### **Advantage of using the IRAP: Data Analysis at Trial Type Level**

This research study highlights the utility of the IRAP in examining topics of interest at trial level. As discussed in Chapter 1, a theoretical limitation of the IAT and other implicit measures is that they produce a composite mean score of participant attitudes to a topic plus their attitude to a counter-topic, a theme that is assumed or supposed to be the antithesis of the target topic. For some research questions, such

counter-topics may be fairly intuitive, for example when exploring racism one may use words or pictures that depict a minority demographic versus targets that depict a majority race in an implicit test. However when examining the current topic, attitudes to alcohol it is more challenging to arrive at a suitable counter-topic. In the current research, soft drink target pictures are used as counter to alcohol target pictures in order to remain faithful to the replication of the Ostafin et al (2014) study (as discussed below). However, it is worth examining whether soft drinks actually represent an opposite relation to alcohol. Certainly, the two stimuli classes share key characteristics, they are both typically in liquid form and both considered beverages. But the stimuli classes are not exclusive of one another, they have too great a degree of commonality, indeed they can share the one stimulus class and as such cannot be said to be opposites. To illustrate this point, I refer to the anecdotal evidence offered to the lead researcher by a number of participants during Studies 1 and 2. These participants commented that they struggled to discriminate between some of the target pictures in the IRAP task. At first glance, it seemed that perhaps target pictures weren't clearly defined as either alcohol or soft drinks, for example some participants wondered if the "brandy" image in Study 1 and Study 2 was intended to represent apple juice as it showed a glass containing a brownish liquid (please see appendix 5). However, some participants went on to explain that they wondered if the "cola" picture contained alcohol, as they are used to using cola in a mixed drink with spirits such as rum, vodka or whiskey. Therefore we find that some soft drink pictures act as cues or are paired via classical conditioning with alcohol, and so cannot be related completely in opposition with alcohol by all participants. This interaction of the variables alcohol and soft drink both used within the one implicit test could therefore confound results. A related factor that

requires examination is that soft drinks could constitute as a target topic for investigation in their own right. That is, soft drinks are not neutral stimuli insofar as they court controversy in our society due to typically high sugar contents and associated health risks. So we may expect that a composite mean score on an implicit test would not only consist of participant attitude to alcohol, but also attitude to soft drinks, depending on their previous exposure to soft drinks, awareness of health studies and advice on soft drink consumption and their own level of health consciousness. Study 3 was designed to ensure that participants could easily define which target picture is intended to represent alcohol and which represent soft drinks. We report that there was no significant difference between Alcohol-Positive and Alcohol-Negative IRAP trials in Study 1 and Study 3 which would appear to indicate that any difficulty participants had discriminating between target alcohol stimuli in Study 1 did not impact their response latency on the IRAP. However, we report that Soft Drink-Positive and Soft Drink-Negative were significantly different in Study 3 when compared to Study 1. As discussed previously, one might expect that this change, if attributable to the change in target pictures would be matched with a similar change in Alcohol-Positive and Alcohol-Negative IRAP trial DIRAP scores. Rather, as Alcohol-Positive and Alcohol-Negative DIRAP scores didn't change significantly it is worth considering whether the change observed in soft drink IRAP trials in the Study 3 sample confirms that attitudes to soft drinks are as varied or contentious as attitudes to alcohol, or perhaps even more so. If this is the case, it highlights the importance of studying attitudes to alcohol and soft drinks at trial level (that is, Alcohol-Positive, Alcohol-Negative, Soft Drink-Positive, Soft Drink-Negative rather than one overall composite mean score representing all four trials) so that attitudes to alcohol, the research question, is not

confounded by attitudes to soft drinks. The IRAP is valuable therefore to the contextual behavioural researcher as it affords this luxury where other mechanistic implicit tests, like the IAT, do not.

### **Potential Limitations of the Current Research Study**

A number of potential limitations to this study are noted, despite best efforts to minimise all confounding variables and maximise experimental control. For instance the studies relied on some explicit measures, including participant self-report on alcohol use behaviour (frequency and quantity), explicit attitude to alcohol, self-report of primary and secondary family members' problem drinking, the restraint and temptation inventory which asked participants to rate their ability to control their alcohol use behaviour, willingness to participate in a further research project that would require alcohol use abstinence and an open ended question asking if a change in behaviour had been noticed that the participant attributed to taking part in the research project. As discussed in Chapter 1, with the use of explicit measures, data can be influenced by response bias, demand characteristics and associated extraneous variables. Efforts to minimise the effect of these variables include the anonymization of data, all participants were informed before taking part in both studies that their responses would be anonymous, and the use of mild deception in one measure. Rather than asking participants directly if they would be willing to abstain from alcohol use for a week, participants were asked if they would be willing to participate in a fictitious future research study that would involve their abstaining from alcohol use for a week. Certainly, in terms of the key experimental questions it is important that some response bias is present in order to examine EERRs about alcohol in the explicit measure of

alcohol attitude, however when asking participants to report their alcohol use behaviour, over or underestimation of frequencies and quantities could compromise subsequent group allocation and so impact between subject data analysis. As mentioned above, the substantial difference in gender alcohol use behaviour may suggest that participant's social expectations of appropriate alcohol use for males and females tempered responses in that measure. Participant shame or denial of alcohol use behaviour may also have influenced data obtained from that measure. This factor may also influence the measure that asked participants to disclose family history of problematic alcohol use. It is possible that participants are either unaware of primary or secondary family members alcohol use behaviour, or feel shame that impedes disclosure on the measure, albeit anonymous.

The researchers made a considerable effort in selecting the time of the year in which to collect data to avoid months that are socially or culturally associated with higher or lower than typical alcohol consumption. For instance, taking data at the start of January that required participants to report alcohol use over the previous thirty days was avoided so as not to include excess alcohol consumption that may occur over the festive season. However, despite these efforts Study 1 data collected in February that asked participants about January's alcohol use may have been affected by a "dry January" trend, wherein individuals avoid alcohol consumption post over indulgence over the festive season. This phenomenon may have affected some participant's alcohol use behaviour data in Study 1 and may explain why light and non-drinkers in group 1 reported consuming more alcohol in February than in January.

The intervention used in the study is not specific to the reduction of alcohol use behaviour, but rather targeted craving management generally in changing behaviour.

Future research that employs a targeted alcohol use reduction intervention may show a greater impact on participant alcohol use behaviour in repeated measures. Furthermore, when considering the intervention, it should be noted that researchers have no way of verifying whether participants complied with instructions to review intervention materials made available to them as directed between data collection from study 1 to study 2. The 20% attrition rate between repeated measures may also have impacted the results obtained. As data is anonymised, there was no means for the researchers to control for these missing participants in study 1 in line with study 2 for more accurate repeated measures analysis.

It is worth considering that as the same sample completed the same IRAP twice with only a thirty day period between procedures in Study 1 and then again in Study 2, it is possible that relational responding was affected in Study 2 by participant prior experience with the same relational derivations, which can affect response latency as discussed in the literature review chapter. As IRAP behaviour is dependent on the contingencies that governed similar responding in the past, the extent to which a response has been derived in the past will influence the probability of it being emitted quickly making it a legitimate consideration in repeated measures studies (Hughes, Branes-Holmes & Vahey, 2012) .

A further consideration is the use of soft drink stimuli as counter-stimuli to alcohol targets within the IRAP task and what implications this may have on our findings. Soft drinks were used against alcohol in the IRAP measure in coordination with the Ostafin et al (2014) study which used both soft drink and alcohol targets within its IAT procedure. In order to maximise fidelity to that study for replication purposes, soft drinks were assumed an appropriate opposite to alcohol in the current

research. However in more typical IAT/IRAP studies that explore, for example racism (Michell et al. 2003) we could claim that results obtained find that participants respond as either racist or not rather than both racist and not racist. That is, typically participants respond as more so one than the other. A potential issue arises in attempting to conceptualise a stimulus set that could be considered mutually in opposition to alcohol, where bias towards alcohol would imply bias against the counter stimulus class. Soft drinks do not exactly meet criterion as a stimulus set in opposition to alcohol, as one tends not to dislike soft drinks if we favour alcohol, nor vice versa. Indeed, soft drinks can act as a cue for alcohol use behaviour, as both share membership in a beverage stimulus set and soft drinks can play a role in alcohol consumption (i.e. as mixers in alcoholic drinks and cocktails). Further confounding this argument is that soft drinks as a stimulus class are not neutral. Recent popular culture has campaigned against the sugar and caffeine typically associated with some soft drinks, meaning that participants may react with bias to soft drink targets for health conscious reasons in the IRAP task. Results obtained in the IRAP in the current research study show that participants have implicit positive attitudes to both alcohol and soft drinks. The as the intervention used between Study 1 and Study 2 focused on managing cravings and temptation in order to change problem behaviours, it is possible that participants understood that the target of the study is to reduce sugary soft-drink consumption rather than alcohol use behaviour. This potential ambiguity may be observed in so far as there was a significant reduction in both Alcohol-Positive and Soft Drink-Positive IRAP trials in repeated measures analysis. In addition, 20% of participants self-reported an increase in behaviours conducive with healthy eating options such as avoiding sugar, fat and junk food in Study 2 that they attributed to taking part in this research project. All participants were



thanked for their participation in the research project with a packet of sweets at the end of both Studies 1 and 2. At the end of Study 1, .03% of participants declined the sweets. But at the end of Study 2 12.5% of participants didn't accept sweets. This perhaps suggests erroneous demand characteristics were assumed by some participants.

### **The Role of BIRRs and EERRs in Alcohol Use Behaviour**

The findings of the current research project consistently show that explicit attitudes to alcohol (EERRs to alcohol) are associated with both the self-reported frequency and quantity of recent alcohol use behaviour and self-reported future willingness to abstain from alcohol use for a one week period. Furthermore, Studies 1 and 3 show correlations between Alcohol-Positive IRAP trial type and willingness to abstain from alcohol use for a week and Study 1 shows that it is also associated with self-reported quantity of alcohol use. Add to this Study 2 findings which show Heavy drinkers had a significant post-intervention reduction in pro-Alcohol-Positive attitude and also had a substantial although not statistically significant reduction in self-reported quantity of alcohol use and we can claim that both BIRRs and EERRs are linked to self-reported alcohol use behaviour. These findings support the results of a number of other studies as discussed in Chapter 1. The REC model holds that behaviour is dependent on individual learning history, the current context and contingencies that governed similar responding in the past (Hayes, Barnes-Holmes & Roche, 2001). This implies that not only alcohol use behaviour but also participant responding on both direct and indirect measures was governed by context and learning history. It may therefore be relevant to consider participant alcohol tolerance/withdrawal/satiation cycles as a potential influence on participant responding both in the IRAP and on direct measures. Heavy drinkers would likely be most influenced by this factor if it did indeed

impact responding, unless Non/Light drinkers and Moderate drinkers reported consuming less alcohol than they typically would, in which case they may have been influenced by alcohol deprivation, for example if taking part in “dry-January”. It may be possible that an increase in cravings brought on by deprivation or a decrease in cravings brought on by satiation could have influenced participant BIRRs and EERRs to alcohol. As discussed in Chapter 1, EERRs can be negatively affected by alcohol consumption which can lead to decreased control over alcohol use behaviour. The current research project consistently finds links in all three Studies between pro-alcohol EERRs (as measured by the AAS) and dyscontrolled drinking (as measured by TRI).

### **Implications for Problematic Alcohol Use Treatment and Future Research**

As discussed earlier in this chapter, the results of Study 2 suggest that the brief ACT-based intervention delivered immediately after Study 1 had an impact on participant responding to alcohol target pictures when presented in coordination with labels typically deemed positive. As we know that the BIRRs of an individual are linked to their external behaviour, and indeed we found in Studies 1 and 3 that participant BIRRs are associated with their self-reported recent past alcohol use behaviour and self-reported willingness to abstain from future alcohol use behaviour for a one week period in the current research, there is scope for clinical application of the study of BIRRs and their impact on substance misuse treatment, specifically alcoholism treatment. As alcohol use behaviour should be related to the extent to which cues automatically activate appetitive responses (BIRR cravings), there is a potential future research opportunity to condition manipulation of implicit BIRRs related to the implicit motivation to consume alcohol and explore any impact on subsequent alcohol use behaviour. That the intervention was based on ACT principles suggests that further

research on the clinical implementation of ACT treatments in alcoholism and addiction may yield important results. The finding of the current research of the ambivalence of implicit attitudes to alcohol amongst Heavy drinkers warrants further empirical investigation, as it highlights a considerable stumbling block for clinical practitioners to overcome in the treatment of chronic alcohol use. Rule Governed Behaviour that may have an impact on male and female self-reports of alcohol use behaviour could be further investigated using the IRAP to explore any social stigma on gender specific alcohol use.

### **Conclusion**

Overall, the sample comprising undergraduate students showed pro-alcohol and pro-soft drink attitudes as measured by the IRAP. Heavy drinking participants have an ambivalent implicit attitude to alcohol but respond pro-alcohol on direct measures. Male participants report that they consume twice as much alcohol as female participants. They also report drinking twice as frequently as females. Reporting having a close family member with a history of problem alcohol use affects one's own reported alcohol use behaviour. The Ostafin, Kassman, deJong & van Hemel-Ruiter (2014) study replication failed to support the original Authors' findings that implicit and explicit attitudes to alcohol serve as predictors for dyscontrolled drinking when controlling for non-drinkers. In fact no significant correlation is reported between dyscontrolled drinking and IRAP Alcohol-Positive or overall DIRAP scores, and dyscontrolled drinking and explicit attitudes to alcohol among participants that drink alcohol. Repeated measures following a brief ACT- based intervention that aimed to maximise participant control over cravings showed a significant reduction in alcohol-

positive implicit attitudes to alcohol and a non-significant but potentially socially significant reduction in the quantity of alcohol use behaviour among Heavy drinkers.

This study stresses the versatility of the IRAP in allowing researchers to examine research topics at a trial level as well as with an overall DIRAP scores rather than only providing a composite mean score as is the case with other implicit attitude measures. This is especially important when examining phenomena without clearly defined relationally opposite stimulus classes. Caution is advised when selecting opposing stimuli for use within the IRAP task as the use of stimuli that evokes relational responding with the potential to confound the relational responding under examination should be avoided. Furthermore, target pictures and words used in the IRAP task need to be clearly defined and easily discriminated from one stimulus set to another due to the rapid presentation of stimuli during the task.

The current research found divergence between BIRRs and EERRs in relation to participant attitudes to alcohol. However both BIRRs and EERRs were shown to be in association with self-reported recent alcohol use behaviour and self-reported willingness to abstain from alcohol use for a one week period.

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**Appendix 1 Pilot Study: Word and Picture Stimuli**

For each item below, please indicate on a scale from one to ten how much each item makes you think of alcohol. (Where 1 indicates it makes me think about alcohol very little, and 10 indicates it makes me think of alcohol a great deal.)



3. **Whiskey**

4. **Vodka**

5.



6.

**Beer**



7.

8.

**Wine**

9.

**Tequila**



12.  
**Cider**

13.  
**Champagne**



14.



15.

16.

**Brandy**

For each item below, please indicate on a scale from one to ten how much each item makes you think of soft drinks. (Where 1 indicates it makes me think about soft drinks very little, and 10 indicates it makes me think of soft drinks a great deal.)

1.

**Milk**

2.

**Water**



3.



4.

5.

Tea





6.  
7.

## Orange Juice

8.  
**Milkshake**



9.



10.



11.

12.

**Lemonade**

13.

**Smoothie**



14.

15.

**Cola**



16.

**Appendix 2 Study 1 Scoring Sheet**

Please indicate on a scale from 1 – 10 below.

	Section 1	Section 2
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

### **Appendix 3 Participant Information Form**

#### **Details about Researcher:**

**Name:** Ruth Callaghan, B.A. Psych.; M.A., Dip. Couns., Doctoral Student

**Address:** 2 Dromin Manor, Dromin, Co. Louth

**Contact Number:** 0866631316

**Email:** ruth.callaghan.2015@nuim.ie

#### **Details about Supervisor:**

**Name:** Dr. Carol Murphy

**Address:** Department of Psychology, Maynooth University, Maynooth, Co. Kildare

**Please note that this research should not be considered to be a treatment of any description.**

#### **What is the purpose of the research?**

The way we form attitudes towards alcohol may impact our decision-making around our own alcohol use. This research project aims to investigate this using the Implicit Relational Assessment Procedure (IRAP). It will look at participant's alcohol use as well as exploring participant attitudes towards alcohol. Furthermore, it will examine whether a brief behavioural alcohol misuse intervention has any impact on participant alcohol use or our attitudes towards alcohol.

**What will the research involve for me?**

Firstly, a group of participants will be asked to assess how much some words and pictures make them think about alcohol. Once they have completed these tests, this group will have completed their participation in this study. Participants will be assigned to this group at random.

A second larger group of participants will be asked to complete the some self-report measures on attitudes to alcohol, and an IRAP on attitudes to alcohol. These tests will take approximately forty minutes to complete in one session. Participants will then be asked to watch a brief behavioural video on self-control. This will take approximately fifteen minutes. Finally, participants will be asked to take the explicit measures and IRAP procedure mentioned above for a second time after watching the video. Again, this will take approximately one forty minute session.

**When will the research be conducted?**

The research will commence in early January 2016 and will end no later than October 2016.

**Where will the research be conducted?**

The research study will be conducted in the Department of Psychology, Maynooth University, Maynooth, Co. Kildare.

**What if I don't want to participate?**

If you prefer not to participate, please be assured that there is no obligation, nor is there a penalty of any kind for not participating. If you consent now and later change your mind, please note that you are free to withdraw your participation at any time. In order

to withdraw your participation, please contact the researcher immediately using the details above.

If during the course of your participation in this research project you experience some concern or distress about your own alcohol use or that of a loved one, you can of course terminate your participation in this research project. Information about services that may be of use in such an event will be made available and a referral to counselling services will be available on request.

**How will my data be kept safe?**

Your data will be given a false name from the outset and will be stored in encrypted (protected) files on the researcher's computer for a period of ten years and only the researcher will have access to the data. All data will be encrypted using Microsoft's "encryption file system". All data on collected on paper will be stored in a locked metal filing cabinet in the researcher's home. When time to be destroyed, all data on paper will be shredded and all computerised data will be expunged.

It will not be possible to disclose individual results from any measures used in this study to participants as all results will be anonymised.

**Thank you for taking the time to read this information sheet.**

### Appendix 4 Participant Consent Form

**Title:** An investigation of Implicit and Explicit Attitudes to Alcohol Addiction/misuse, Participant Alcohol Use/Misuse as an Indicator for Implicit Alcohol Misuse Attitude Bias; the Effect of a Brief Behavioural-Based Intervention on Participant Alcohol Misuse and Implicit Attitudes to Alcohol Misuse.

The current research will be conducted by Ruth Callaghan, B.A. (Hons) Psych., M.A. Addiction Studies, Dip. Counselling and Psychotherapy; who is a doctoral student at the Department of Psychology, Maynooth University, Maynooth, Co. Kildare.

She can be contacted via telephone on 0866631316 or email ruth.callaghan.2015@nuim.ie. The research will be supervised by Dr. Carol Murphy, Department of Psychology, Maynooth University, Maynooth, Co. Kildare

In agreeing to participate in a research study carried out by a Doctoral student at Maynooth University, Maynooth, I \_\_\_\_\_, understand the following:

- In conducting the current research the student and supervisor are responsible for adhering to ethical guidelines set out by the Psychological Society of Ireland and the Behaviour Analyst Certification Board in all dealings with me.
- That the attached information sheet will tell me what procedures will be completed with me as part of this research project.
- My identity will not be provided in any subsequent presentation or publications of the data. All data will be assigned false names and will be stored in encrypted (protected) files on the researcher's computer for a period of ten years after which the files will be deleted.
- I may have my alcohol-use behaviour assessed using two standardised tests (the Addiction Severity Index (alcohol) and the Structured Clinical Interview for DSM-V (alcohol use). Individual results from the ASI and SCID will not be made available to participants as all participant information is anonymised. If I have any concerns about my participation I understand that I may refuse consent to participate, or may withdraw my consent at any stage without any negative consequences for me in either case.
- I will be reminded that I can withdraw my participation after a period of approximately twelve weeks.



**Important:**

- If I have a history of any seizure disorder or have experienced discomfort when viewing a computer or television screen; I should notify the researcher of this condition/circumstance and consider carefully my involvement in this project.
- If I plan to have my alcohol use behaviour tested for clinical reasons, the measures that may be carried out in this study may interfere with any other assessments carried out within the following 6-12 months. In this case I should exclude myself from participating in the research.

I confirm that I have read and understood the accompanying information sheet and that I agree to participate in this study.

I understand that this research should not be considered to be a treatment of any description.

Signed:

\_\_\_\_\_Participant

\_\_\_\_\_Researcher

\_\_\_\_\_Date

**Please note**

Should you have any further questions do not hesitate to contact either the researcher, Ruth Callaghan at [ruth.callaghan.2015@nuim.ie](mailto:ruth.callaghan.2015@nuim.ie) or Dr. Carol Murphy, Department of Psychology, Maynooth University, Maynooth, Co. Kildare

If during your participation in this study you feel the information and guidelines that you were given have been neglected or disregarded in any way, or if you are unhappy about the process please contact *Dr. Andrew Coogan, Head of the Department, Department of Psychology (email: Andrew.coogan@nuim.ie)*. Please be assured that your concerns will be dealt with in a sensitive manner.

**Appendix 5 Study 1A & 1B IRAP Labels and Targets**

Labels:

As taken from the Ostafin et al. (2014) study, the proposed labels are:

Enjoyable	Awful
Good	Bad
Happy	Unhappy
Like	Dislike
Pleasant	Unpleasant

As the aforementioned study used the IAT, only five sets of labels were required. As a sixth is required with the IRAP, it is proposed that the following is added:

Nice	Nasty
------	-------

Targets:

The following are the targets that most strongly elicited alcohol/soft drink-related thoughts among the participants of study 1:

Alcohol:







Soft-drink:







**Appendix 6 Explicit Measure**

Please indicate how you feel about alcohol on each of the scales below:

**Circle one number for each item**

A.

Like Dislike  
 -5   -4   -3   -2   -1   0   1   2   3   4   5

B.

Bad Good  
 -5   -4   -3   -2   -1   0   1   2   3   4   5

C.

Unpleasant Pleasant  
 -5   -4   -3   -2   -1   0   1   2   3   4   5

D.

Happy Unhappy  
 -5   -4   -3   -2   -1   0   1   2   3   4   5

E.

Awful Enjoyable  
 -5   -4   -3   -2   -1   0   1   2   3   4   5

F.

Nice Nasty  
 -5   -4   -3   -2   -1   0   1   2   3   4   5



**Appendix 7 Dyscontrolled Drinking Measure Temptation and Restraint  
Inventory (TRI)**

Please circle one answer for each of the items below:

1. Do you ever find that once you start drinking it is difficult for you to stop?

Never

Always

1    2    3    4    5    6    7    8    9

2. How much difficulty do you have controlling your drinking?

None

Great

1    2    3    4    5    6    7    8    9

3. How much effort does it take for you to keep your drinking under control?

None

Great

1    2    3    4    5    6    7    8    9

**Appendix 8 Calendar Measures used to Explore Alcohol Use Behaviour**

1. Please indicate on the calendar below, the number of times you drank *any* alcohol last month. (please place an “x” in the date box to indicate a day you consumed alcohol)
2. Using the scale below, please indicate how many units of alcohol you consumed on each occasion. (please indicate a figure in the date box alongside the “x” to indicate the number of units consumed)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>January 2016</b>					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	Notes:					



1. Please indicate on the calendar below, the number of times you drank *any* alcohol last month. (please place an “x” in the date box to indicate a day you consumed alcohol)
2. Using the scale below, please indicate how many units of alcohol you consumed on each occasion. (please indicate a figure in the date box alongside the “x” to indicate the number of units consumed)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>February 2016</b>						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
29	29	Notes:				

Blank February 2016 Calendar Printable calendars available from [www.blankcalendarprintout.com](http://www.blankcalendarprintout.com)



**Appendix 9 Behavioural Measure (Abstain)**

Please indicate below if you would be willing to participant in a further study on alcohol use which requires a period of seven days abstinence from alcohol.

*Circle one option:*

Yes

No

**Appendix 10 Transgenerational Alcohol problems**

Have any of your blood-related relatives had what you would call a significant drinking problem? Specifically, was there a problem that did or should have led to treatment? (In cases where there is more than one person for a category, record the occurrence of problems for *any* in that group.)

Please tick the appropriate box:

relative	yes	no
Mother		
Father		
Sibling		

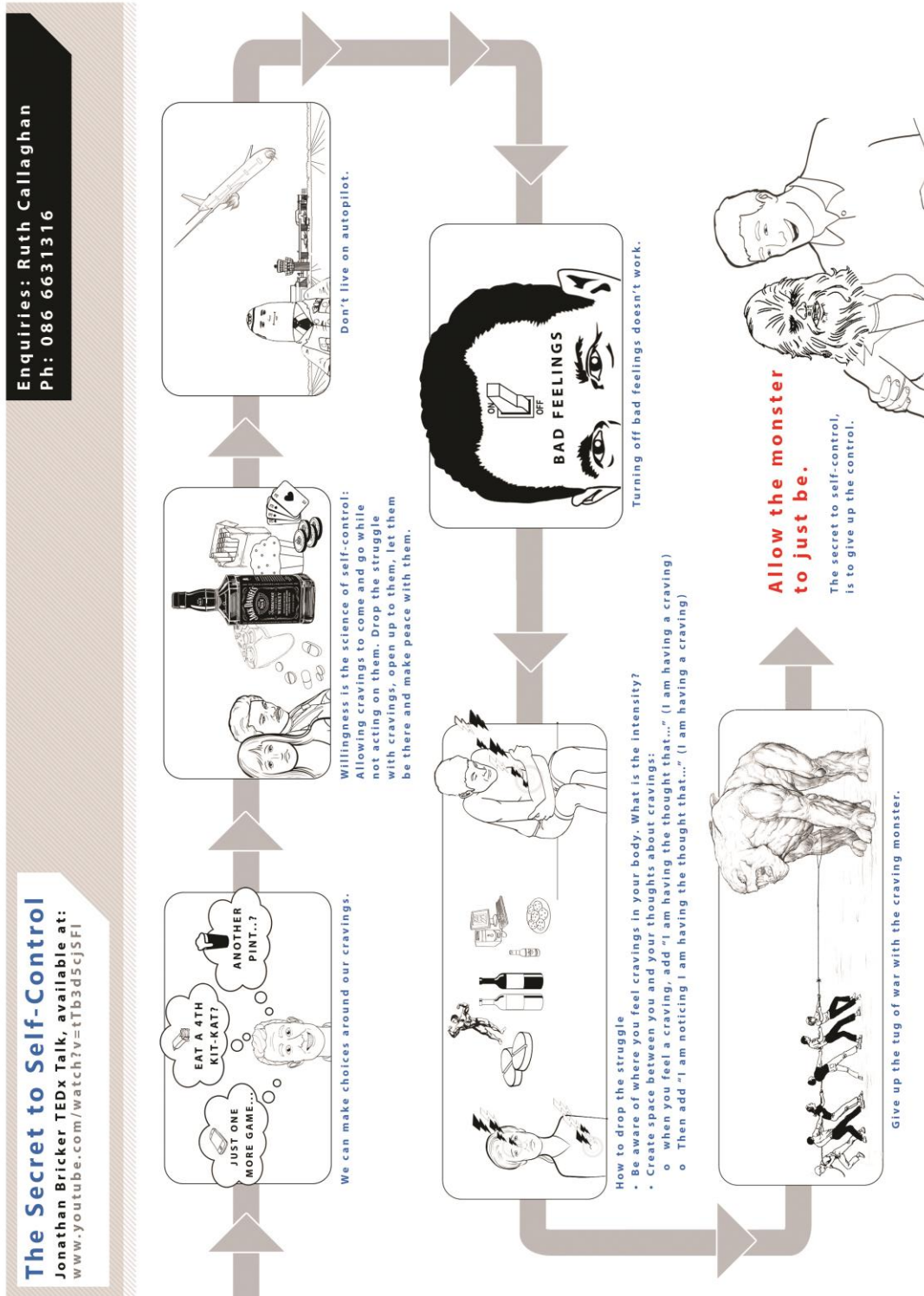
Please tick to record the occurrence of alcohol problems for any of the following:

Relative	Mother's side	Father's side
Grandfather		
Grandmother		
Aunt		
Uncle		

**Appendix 11 Link to TedX Talk as used in Behavioural Intervention**

<https://www.youtube.com/watch?v=tTb3d5cjSFI>

Appendix 12 Flyer used as part of Behavioural Intervention



### **Appendix 13 Continued Consent Form**

#### **Details about Researcher:**

**Name:** Ruth Callaghan, B.A. Psych.; M.A., Dip. Couns., Doctoral Student

**Address:** 2 Dromin Manor, Dromin, Co. Louth

**Contact Number:** 0866631316

**Email:** ruth.callaghan.2015@nuim.ie

#### **Details about Supervisor:**

**Name:** Dr. Carol Murphy

**Address:** Department of Psychology, Maynooth University, Maynooth, Co. Kildare

We would like to thank you for your cooperation with the current piece of research for which you have provided consent for your participation. At this point in the research programme, which we are approximately half way through we would like to make sure you are still comfortable with your continued participation. If you have any concerns please do not hesitate to contact the researcher using the above details. The researcher is always willing to answer questions you may have and will try to address any issues which may have arisen since the research has commenced.

Given your progress through the first half of the research procedure we estimate that a further two one-hour sessions will be the potential time commitment to complete the procedure. Please note that the research procedure will not carry on past the end of October 2016.

If you wish to withdraw consent for your participation, please sign below and return this form immediately. If you wish to continue, you do not need to do anything further.



Please only sign below if you wish to **WITHDRAW** from the study.

Signed:

\_\_\_\_\_Participant

\_\_\_\_\_Researcher

\_\_\_\_\_Date

**Appendix 14 Additional Retest Measure**

Have you noticed that your participation in this research project has led to any changes in your behaviour? Briefly describe changes you have noticed.

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Please tick any changes in behaviour below:

Behaviour	increase	decrease
Drinking (alcohol)		
Eating		
Smoking		
Social media use		
Exercising		
Gambling		
Studying		
Gaming		
Other		
(Please specify)		

---



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**Appendix 15 Study 2 IRAP Labels and Targets**

Labels:

As taken from the Ostafin et al. (2014) study, the proposed labels are:

Enjoyable	Awful
Good	Bad
Happy	Unhappy
Like	Dislike
Pleasant	Unpleasant

As the aforementioned study used the IAT, only five sets of labels were required. As a sixth is required with the IRAP, it is proposed that the following is added:

Nice	Nasty
------	-------

Target Images:

Beer:



Tequila:



Wine:



Brandy:



Whiskey:



Vodka



Smoothie



Cola



Tea



Milk



Lemonade



Milkshake

