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Flexibility, Impulsivity, and Relational Responding:
A study of the relationship between experiential avoidance,
delaying of aversive outcomes, and brief immediate relational
responding

A thesis
submitted partial fulfilment
of the requirements for the degree
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Abstract

The Implicit Relational Assessment Procedure (IRAP) is a relatively new tool for assessing verbal behaviour and shows promise in measuring verbal behaviour that participants may be unable to report otherwise. In this exploratory study, I sought to determine the relationship between responding as measured using the IRAP, a clinical measure of experiential avoidance, and impulsiveness. The first experiment was a first attempt to validate the use of the IRAP in a New Zealand sample by administering three IRAP tasks to undergraduate students. Results in the first experiment were consistent with past research and supported the validity of the IRAP in a New Zealand sample. In the second experiment, participants completed two IRAPs, the Action and Acceptance Questionnaire II, and an aversive delay discounting task. The first IRAP measured relational flexibility around gender roles while the second measured relational flexibility around accepting and avoiding emotions. The results showed that more relational flexibility around gender chores predicted more self-control on the delay discounting task, and more experiential avoidance while more relational flexibility around emotions predicted more impulsiveness. My results from the second experiment represent one of the first attempts at linking the concepts of experiential avoidance, impulsiveness, and relational flexibility and as such my study is an important first step in understanding the relationship between these concepts.

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General Introduction

The study of attitudes has a long history in psychology, particularly in the field of social psychology (Burton, Westen, & Kowalski, 2015). Attitudes have been defined by social scientists as “favourable or unfavourable dispositions toward social objects such as people, places, and policies” (Greenwald & Banaji, 1995, p. 7). Such verbal behaviour allows the prediction of future behaviour toward said object, which is useful as it can be much quicker to observe a relational response, for example, filling in a questionnaire, than observing behaviour in the presence of the object in question. However, what people say, and what they do can be very different (Bamberg & Möser, 2007; Corral-Verdugo, 1997; Fuj, Hennessy, & Mak, 1985; Jenner et al., 2006).

The assumption that attitudes correlate with overt behaviour was challenged very early on with a famous study by LaPiere (1934) who investigated attitudes toward Chinese people. At the time in the USA, the general population’s attitude toward Chinese people was negative (Wicker, 1969) and LePiere travelled around the USA with a Chinese couple, visiting 251 hotels, restaurants, and other establishments (LaPiere, 1934). He identified only one instance in which his companions’ race had a negative effect on their interactions. Six months later, he surveyed many of the establishments he had attended with his Chinese guests, querying them on whether they would accept Chinese guests. Ninety-two percent of the establishments that had previously accepted them replied “No” (LaPiere, 1934). The lack of predictive validity for attitudes led to an ongoing crisis in social psychology (Greenwald, Poehlman, Uhlmann, & Banaji, 2009; Kraus, 1995) around the utility of the attitude concept that took many years to resolve (Greenwald et al., 2009). By the mid-1990s, attitude questionnaires had improved so as to reliably predict many different behaviours (Greenwald et al., 2009; Kraus,

1995), such as voting and use of contraceptives (Kraus, 1995). However some stated attitudes, such as those toward minority groups, were much less reliable in predicting behaviour (Kraus, 1995).

The following section will describe a social cognitive psychology approach to addressing the problem of the predictive validity of attitude measures. I will describe the approach and a commonly used measure. I will then describe a behavioural approach and related measure before discussing an important distinction between the measures.

A Social Cognitive Approach

In order to increase predictive validity, social cognitive psychologists have recently turned their attention to what are termed *implicit* attitudes – a concept associated with the concept of the unconscious (Greenwald et al., 2009). Historically, the concept of the unconscious, popularised by Freud (1899; Ffytche, 2011), helped fuel the idea that explanations of behaviour may not be accessible via introspection. Modern day cognitive scientists have refined the attitude concept and use the term *implicit* to describe several related concepts. Implicit attitudes have been defined as “introspectively unidentified (or inaccurately identified) traces of past experience that mediate favourable or unfavourable feeling, thought, or action toward social objects” (Greenwald & Banaji, 1995, p.8) and have been shown to be a better predictor of some behaviours than *explicit* measures such as questionnaires (Greenwald et al., 2009). A recent meta-analysis (Greenwald et al., 2009) found that the more ‘socially sensitive’¹ an attitude was perceived, the poorer the predictive validity of explicit measures and the better the

¹ Socially sensitive was defined as “the extent to which self-reporting the construct assessed by the measure might activate concerns about the impression that the response would make on others” (Greenwald, Poehlman, Uhlmann, & Banaji, 2009, p.20).

predictive validity of implicit measures. Implicit measures were better predictors of behaviour than explicit measures for attitudes that were rated most socially sensitive, namely attitudes around race, and other group preferences. Various procedures have been developed to measure implicit attitudes (e.g. Go/No-go Association Task; Nosek & Banaji, 2001; the Extrinsic Affective Simon Task; De Houwer, 2003), the most commonly researched of which is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998).

In the IAT, participants are directed to sort words, presented one at a time, as quickly as possible using two response options. The words are normally evaluative words (e.g. good, bad) and words related to the attitude in question. For example, the seminal IAT study (Greenwald et al., 1998) investigated attitudes around flowers and insects, so stimuli such as rose and bee were presented. Figure 1.1 shows two possible screen presentations of an IAT looking at insects and flowers. The IAT measures response latencies in two conditions; in the first condition, one response option indicates flowers and positive evaluative words, and the other response option denotes insects and negative words (Figure 1.1, left panel). In the second condition, evaluative words are swapped so one response option indicates flowers and negative words and the other indicates insects and positive words (Figure 1.1, right panel). The difference between the mean response latencies in the conditions is assumed to indicate which of the two categories is evaluated more positively. Traditionally, the difference in response

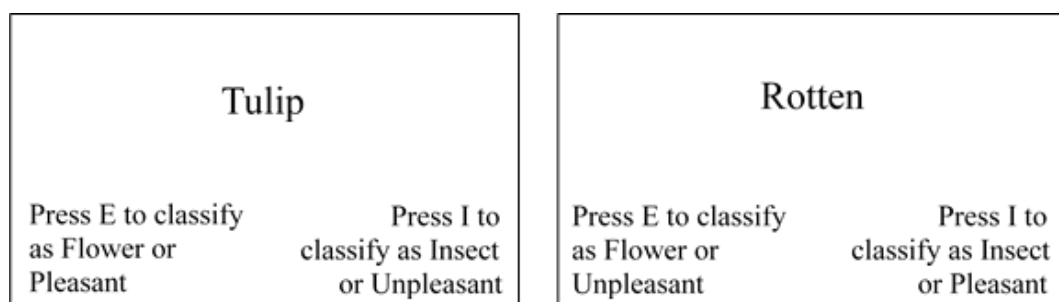


Figure 1.1. Two sample screen presentations of an IAT investigating

latencies is transformed using Greenwald, Nosek, and Banaji's (2003) D-score algorithm to account for individual differences (see Results section for a description of an adaptation of this process used in the present study). In other words, if a participant responds faster when the response options are flower-good and insect-bad than when the options are flower-bad and insect-good, it is assumed the participant's attitude toward flowers is more positive than toward insects. Ideally, we could predict that, given a choice between a flower and an insect, the participant would be more likely to choose the flower. It is important to note that the IAT only gives us a relative measure of a person's attitude (Hughes & Barnes-Holmes, 2013). This will be discussed further below but now I will turn to a conceptual problem with the social cognitive approach to implicit cognition.

An important question that researchers on implicit cognition have raised is how to explain the divergence between responses on implicit and explicit attitude measures. When socially sensitive attitudes, such as those around race and homosexuality, are measured using both explicit and implicit methods the results usually diverge. For example, the aforementioned meta-analysis of IAT research (Greenwald et al., 2009) produced much lower correlations between implicit and explicit measures around race ($r = 0.117$) than around political preference ($r = 0.537$). The IAT grew out of research that assumed language to be inherently associative (Barnes-Holmes et al., 2006; Greenwald et al., 1998; Greenwald, Nosek, Banaji, & Christoph, 2005). These associations are said to be mental constructs stored in memory (O'Reilly, Roche, & Cartwright, 2014), and the implicit/explicit divergence was explained by appealing to the nature of memory constructs. A typical associative explanation invokes a 'dual process' model of memory in which implicit attitudes are said to be the product of *automatic* memory processes while explicit attitudes are produced by *controlled* memory

processes (Bargh & Chartrand, 1999; Bargh & Ferguson, 2000). The dual-process explanation presents a problem for behaviourists as mentalistic explanations are at best superfluous (Baum, 2005), and at worst circular (O'Reilly et al., 2014) and can impede enquiry (Baum, 2005; O'Reilly et al., 2014). In order to account for the implicit/explicit divergence behaviourists have turned to a contemporary behavioural account of human language; relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001).

A Behavioural Approach

RFT is a contemporary behavioural account of human language and cognition which grew out of research in stimulus equivalence (Hayes et al., 2001; Sidman & Tailby, 1982). Stimulus equivalence is a description of a behavioural process in which an organism learns to respond to untrained stimuli. For example, an organism is trained to select Stimulus Y when shown Stimulus X. They are then shown Y and are asked to select from an array of stimuli including X. Most verbally competent humans will select X, despite this specific behaviour not having been trained, thus demonstrating stimulus equivalence. RFT explains stimulus equivalence by treating equivalence itself as a generalised operant (Barnes-Holmes & Barnes-Holmes, 2000; Hayes et al., 2001). In this sense the subject is not responding to X per se but is responding to X based on its relation with Y (Hayes et al., 2001). Responding to one stimulus based on its relation with another is termed relational framing and it is this relational framing, RFT suggests, that accounts for human language and cognition.

RFT conceptualises an attitude as a specific kind of relational response under the control of a history of reinforcement and contextual cues. Namely, a relational response between an object and an evaluation. For example, selecting the word “true” when presented with the words “apple” and “tasty” demonstrates

a pro-apple attitude. This still leaves the problem of how to explain the divergence in responses on implicit and explicit attitude measures. In order to account for the divergence through RFT, the Relational Elaboration and Coherence (REC) model (Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2010; Hughes & Barnes-Holmes, 2013) has been proposed.

Rather than appealing to the nature of hypothetical constructs to explain different behaviour, a behaviourist looks to differences in methodologies (O'Reilly et al., 2014). The main methodological feature that distinguishes implicit measures from explicit measures is a response-speed requirement (Hughes & Barnes-Holmes, 2013). In the social cognitive approach, implicit attitudes are said to occur immediately after presentation of the 'attitude object' but are subject to interference from controlled memory processes, and these controlled processes take time (Bargh & Chartrand, 1999). Thus, implicit attitudes can be defined behaviourally as relational responses between an object and an evaluation emitted under high time pressure (Barnes-Holmes, Barnes-Holmes, et al., 2010).

To explain the implicit/explicit measure divergence, the REC model contrasts brief and immediate relational responses (BIRRs), with extended and elaborated relational responses (EERRs). For example, imagine walking down the street on a very hot, sunny day and spotting a coin on the ground in the sun. Immediately you reach for the coin however upon further deliberation, you decide the coin is likely to burn you if touched so you leave it and continue walking. In RFT terms, what has happened is the BIRR (picking up the coin is good) has not *cohered* with previously established relational responses (touching metal exposed to the sun can burn). Thus, additional relational responding has occurred (EERRs) until coherence was achieved, resulting in the coin not having been touched.

Coherence is an important feature of relational responding and is constantly reinforced (and incoherence punished) by the verbal community (Hughes & Barnes-Holmes, 2013). For example, the statement “1 minute is more than 1 second, and 1 second is more than 1 millisecond, but 1 millisecond is more than 1 minute” would be challenged by a verbally competent human as the last relation does not cohere with the first two. RFT considers coherence a powerful conditioned reinforcer and predicts additional relational responding (EERRs) in the presence of incoherence. As relational responses, like any behaviours, take place across time (Hughes & Barnes-Holmes, 2013) the REC model proposes that implicit measures are measuring BIRRs while explicit measures are measuring EERRs. When BIRRs and EERRs cohere, the REC model predicts no divergence and predicts divergence when they do not cohere.

To demonstrate when this divergence might be predicted, consider the measurement of a socially sensitive attitude, say, toward the word ‘Muslim’. In mainstream Western media, ‘Muslim’ is often presented with negative evaluative words like ‘terrorist’ or ‘extremist’. In RFT terms, these pairings signify an equivalence relation, i.e. ‘Muslim’ is the SAME as ‘terrorist’. One could reasonably expect BIRRs to generally be consistent with an anti-Muslim sentiment, and indeed many studies have found such results using implicit measures (e.g. Gonsalkorale, Hippel, Sherman, & Klauer, 2009; Park, Felix, & Lee, 2007; Rowatt, Franklin, & Cotton, 2005). This BIRR is likely to be incoherent with previously reinforced verbal behaviour, such as ‘all people deserve to be treated equally’ or ‘I am not a judgemental person’. So when a person is given time to respond, they are likely to produce a response that does not demonstrate an anti-Muslim sentiment.

I have described an RFT approach to implicit cognition and introduced the REC model, as an RFT-based explanation of the implicit/explicit divergence. Next, I will introduce an RFT-based measure of implicit cognition, a.k.a BIRRs.

The IRAP provides a measure of the strength of a participant's learning history for specific relational responses. Participants are instructed to respond quickly and accurately to word pairs. Figure 2 shows four possible screen presentations for an IRAP used in the first IRAP study (Barnes-Holmes et al., 2006). Participants are presented with a target word (e.g. pleasant or unpleasant) near the top of the screen, an evaluative word (e.g. love or filth) near the middle, and two response options (e.g. similar or opposite) in the lower corners of the screen. In a typical IRAP, two target words and 12 evaluative words are used (exceptions include Roddy, Stewart, & Barnes-Holmes, 2011; Scheel, Fischer, McMahon, Mena, & Wolf, 2011; Vahey, Boles, & Barnes-Holmes, 2010) and these are quasi-randomly paired so that each evaluative word appears once with each target word, resulting in 24 trials per block of trials. Participants complete up to eight practise blocks to ensure they meet accuracy and response speed requirements (discussed below) and once the criteria are met, they complete six test blocks. In half of the trial blocks, participants must respond consistent with pre-experimentally established relations and in the other half, they respond inconsistent with said relations. These block types are alternated and instructions are provided at the start of each block. To use the example in Figure 2, instructions on consistent blocks would say, "Please respond AS IF pleasant and love are similar", and instructions on inconsistent blocks say "Please respond AS IF pleasant and love are opposite". When participants respond in accordance with the block's rule, the stimuli disappear and after a 400ms inter-trial interval, the

next trial begins. If they answer incorrectly, a red ‘X’ appears on the screen and they must press the other (correct) response option to proceed.

The IRAP presents four different stimulus relations, and these are termed the trial types. In Figure 1.2, these are pleasant-love, pleasant-filth, unpleasant-love, and unpleasant-filth. The time to first correct response (hereafter response latency) is recorded and the means for each trial type are compared across block

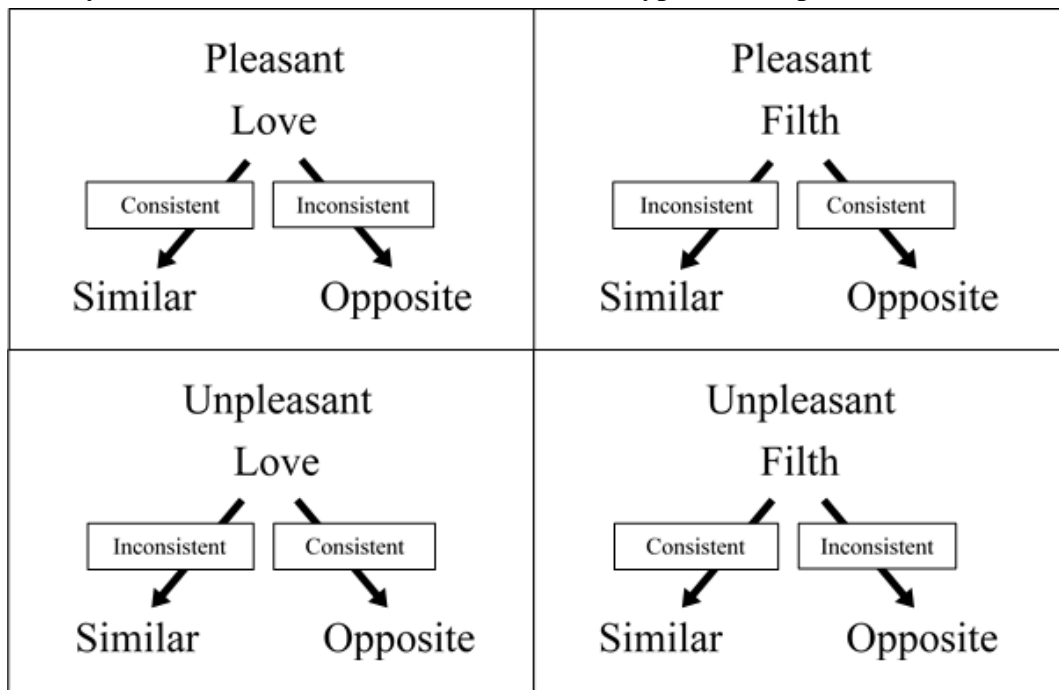


Figure 1.2. Four possible screen presentations of the IRAP used by Barnes-Holmes et al. (2006) showing the four trial types. The ‘consistent’ and ‘inconsistent’ labels represent the pre-experimentally established relations and are not shown to participants.

types. In other words, response latencies on consistent blocks are compared with response latencies on inconsistent blocks for each of the four trial types, to determine which relational response has the strongest learning history. This difference in response latencies shows, for example, whether the behaviour of relating *pleasant* and *love* with *similar* has been reinforced more often (and/or punished less often) than relating *pleasant* and *love* with *opposite*. In line with IAT research, most recent IRAP studies also transform the difference in response latencies with an adaptation of Greenwald et al.’s (2003) D-scoring algorithm to

minimise the effect of individual differences in reaction time (see Results section for a description of this process). When the difference between the mean response latencies of the blocks, after they are transformed using the D-algorithm, are significantly different from zero, this is termed *the IRAP effect*.

I have presented two accounts and measures of implicit attitudes. The following section will compare the usefulness of the two measures in the prediction of behaviour.

Comparison of the IRAP and IAT

The results of an IRAP give an absolute measure of a participant's attitude toward some object (Barnes-Holmes et al., 2006). On the other hand, the IAT provides only a relative measure of said attitude which makes it more difficult to predict behaviour. To illustrate, one study (Roddy et al., 2010) used the IRAP and the IAT to measure attitudes around body image to determine whether these implicit measures could measure an hypothesised pro-slim/anti-fat attitude. For the IAT, the researchers presented images consistent with the body weight labels 'slim' and 'fat', positive adjectives like 'good', and negative adjectives like 'bad'. As with other IATs, response latencies were compared between blocks when the response options were good-thin and bad-fat to blocks with response options bad-thin and good-fat. Figure 1.3's right panel shows the resulting D-score from the IAT, with a positive D-score representing a pro-slim/anti-fat attitude and a negative D-score representing an anti-slim/pro-fat attitude. Consistent with their hypothesis, the results from the IAT produced a significant positive D-score. This result meant participants were significantly faster to respond when the 'slim' images and positive adjectives shared a response option than when and the 'thin' images shared a response option with the negative adjectives, thus demonstrating

a pro-slim/anti-fat bias (Roddy et al., 2010). The IRAP results, however, produced a more nuanced measure of these attitudes.

For the IRAP, the target words were ‘good’ and ‘bad’ and the evaluative stimuli were 12 body images, six of which were consistent with the label ‘thin’, and the other six consistent with the label ‘fat’. The response options were ‘similar’ and ‘opposite’. Figure 1.3 left panel shows the results from the IRAP. Positive D-IRAP scores on the outer two trial types (good-slim and bad-fat) would indicate participants were faster to press ‘similar’ than ‘opposite’ while positive D-IRAP scores for the inner two trial types (bad-slim and good-fat) would mean they were faster to press ‘opposite’. As shown in Figure 1.3 left panel, participants were significantly faster to respond with ‘similar’ to good-thin trial types than they were to respond with ‘opposite’. They were also significantly faster to respond with ‘opposite’ to bad-thin than they were to respond with ‘similar’. Interestingly, there were no significant differences for the good-fat or bad-fat trial types (Roddy et al., 2010). Taken together, the IRAP results indicate a positive attitude toward ‘thin’, but neither a positive nor negative attitude toward ‘fat’.

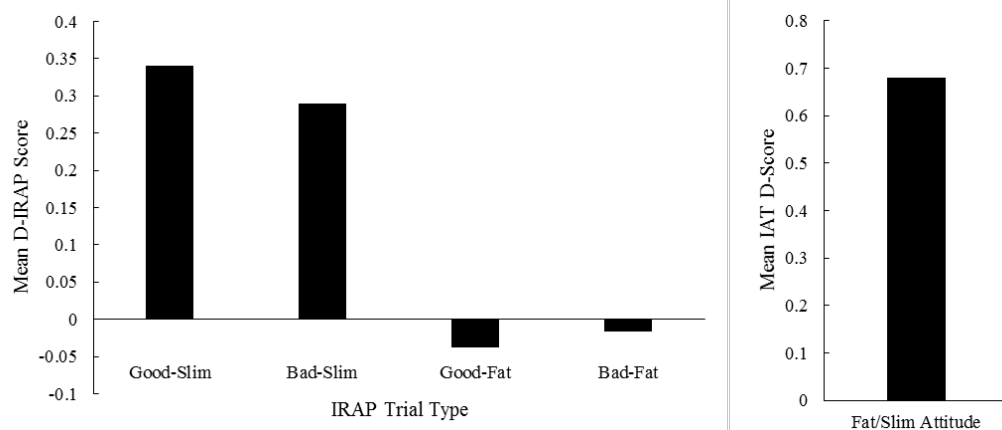


Figure 1.3. Results of an IRAP (left panel) and an IAT (right panel) designed to measure attitudes toward ‘fat’ and ‘slim’ body images from Roddy et al. (2010). For the IRAP, positive D-IRAP scores on the good-slim and bad-fat trial types would mean participants were faster to press ‘similar’ than ‘opposite’, while positive D-IRAP scores for the bad-slim and good-fat trial types would mean they were faster to press ‘opposite’. For the IAT, a positive D-score would indicate participants were faster to respond when the response options were thin-good and fat-bad than they were to respond when the options were thin-bad and fat-good.

To summarise, the results from the IAT demonstrated a pro-thin/anti-fat attitude, and the results from the IRAP demonstrated a pro-thin but not anti-fat attitude. The difference between the results highlights a useful advantage of the IRAP over the IAT. Given the IAT only tells us the relative strength of the associations between the stimuli (Hughes & Barnes-Holmes, 2013), it is still difficult to say how a participant will respond in the presence of the stimuli in question. Consider an IAT comparing venomous snakes with venomous kittens. It is likely the IAT will show venomous kittens are considered more positive than venomous snakes. However, in the unlikely event the participant encountered a venomous kitten or a snake, they would likely avoid both, though possibly working harder to avoid the snake as per the IAT results. This highlights two related limitations with the IAT; firstly, it can only predict behaviour *in the presence of both* stimuli, rather than each stimulus in isolation. Secondly, even when both stimuli are present, as in the above example, the IAT cannot determine if participants avoid *both* (or conversely, approach both). These limitations reduce the number of contexts in which the IAT can be expected to reliably predict behaviour. The IRAP, however, could detect whether or not venomous snakes were considered positive **and** whether or not venomous kittens were considered positive. This would allow specific predictions around behaviour in the presence of the stimuli in isolation. Additionally, by comparing the D-IRAP scores on the snake trial types with the D-IRAP scores on the kitten trial types, behavioural predictions in the presence of both stimuli can be generated. Indeed, the usefulness of the IRAPs individual trial type analysis has already been shown in several studies.

Earlier research with the IAT (e.g. Snowden, Wichter, & Gray, 2008) had successfully distinguished between participants self-identifying as heterosexual and those identifying as homosexual. Figure 1.4's right panel shows the results

from Snowden et al.'s (2008) study with positive D-scores indicating a heterosexual-consistent result, and a negative D-score indicating a homosexual-consistent result. The group identifying as heterosexual showed a clear pro-opposite sex/anti-opposite sex attitude while the group identifying as homosexual showed the reverse. This group difference was significant and the effect size was large, $t(73) = 11.40$, $p < .001$, $d = 2.73$) thus successfully distinguishing between the groups (Snowden et al., 2008). The IRAP, however, allowed a more detailed analysis. In one study (Ronspies et al., 2015), heterosexual and homosexual men were recruited. The target stimuli were 'man' and 'women', and the evaluative stimuli were 'attractive' words like 'erotic' and 'seductive', and 'unattractive' words like 'dull' and 'non-erotic'. Figure 1.4's left panel shows the results from this study with positive D-IRAP scores indicating a heterosexual-consistent result, and a negative D-IRAP score indicating a homosexual-consistent result. Figure 2.4 shows a clear distinction between the pattern of responding for each group and all four trial types produced significantly different D-IRAP scores between the groups (all $ps < 0.001$) and strong effect sizes (ds from 0.98 to 1.37). Interestingly, on the man-attractive trial type, both groups produced negative D-IRAP scores meaning they were faster to respond with 'right' than with 'wrong'. As the authors discussed, this could be explained in that heterosexual relationships involve both men and women. This additional information afforded by the IRAP's trial type analysis allows a more precise analysis of verbal behaviour and represents a significant strength over other implicit measures like the IAT.

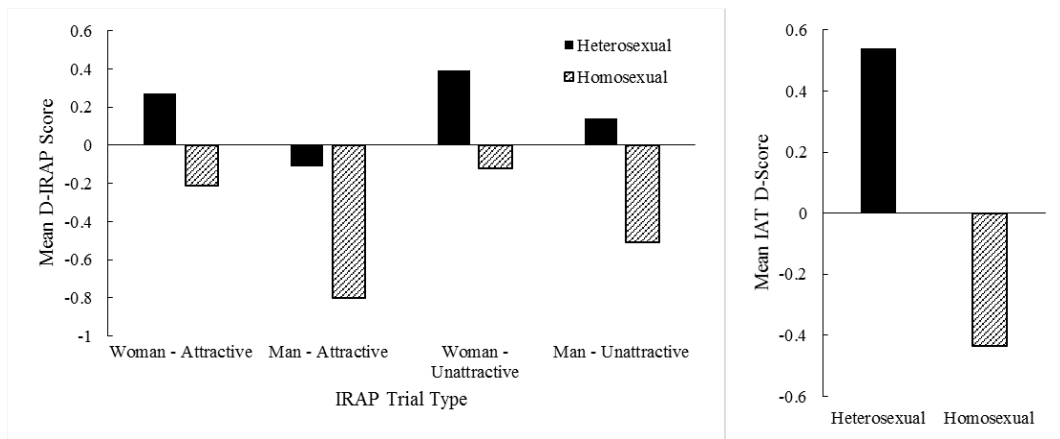


Figure 1.4. Results of an IRAP (left panel; Ronspies et al., 2015) and an IAT (right panel; Snowden et al., 2008), both designed to measure attitudes around sexual preferences. For the IRAP, positive D-IRAP scores on the woman-attractive and man-unattractive trial types would mean participants were faster to press ‘right’ than ‘wrong’ while positive D-IRAP scores for the man-attractive and woman-unattractive trial types would mean they were faster to press ‘wrong’. For the IAT, a positive D-score would indicate participants were faster to respond when the response options were same sex-attractive and opposite sex-unattractive than they were to respond when the options were opposite sex-unattractive and same sex-attractive.

Preliminary evidence shows the IRAP is as good, if not better, than other implicit and explicit measures in predicting real life behaviour (Nicholson & Barnes-Holmes, 2012). One study (Barnes-Holmes, Murtagh, Barnes-Holmes, & Stewart, 2010) used both the IRAP and the IAT to try to predict vegetarianism and found both measures predicted eating preferences. Another study (Barnes-Holmes, Waldron, Barnes-Holmes, & Stewart, 2009) tried to predict whether participants were city or rural dwellers by measuring attitudes toward city and country life. The IAT was unable to discriminate city and rural dwellers whereas the IRAP was able to do so successfully. A reason for this was provided by the results from the IRAP. The results showed that while the groups didn’t differ in their attitudes toward the city – both groups had significant ‘pro-city’ IRAP effects – the rural dwellers were significantly more ‘pro-country’ than the city dwellers.

I have now established an argument for the increased usefulness of the IRAP and RFT approach to the study of implicit cognition over the IAT and the

cognitive-social approach, both conceptually and practically. I have argued that RFT's rejection of explanatory mentalistic constructs and the REC model offer a more useful understanding of implicit cognition. I have also argued the additional information resulting from the trial type analysis in an IRAP represent an advantage over the IAT. Finally, I have presented preliminary evidence showing the IRAP can be as good, if not better, a predictor of behaviour as the IAT. The present study contains two experiments. In the first, I will attempt to replicate the IRAP effect in a sample of New Zealand university students as the IRAP effect has not been well demonstrated outside Ireland and the USA. In the second, I will attempt to use the IRAP to predict behaviour on a clinical measure of psychological flexibility – the Action and Acceptance Questionnaire II (AAQ-II; Bond et al., 2011), and an aversive delay-discounting task (for details on both of these measures, see the introduction section of experiment 2).

Experiment 1

Since the seminal study (Barnes-Holmes et al., 2006), the IRAP has been included in over 30 published studies and administered to over 1,500 participants. The IRAP effect has been demonstrated in a multitude of subject areas from simple valenced words (Barnes-Holmes et al., 2006; Campbell, Barnes-Holmes, Barnes-Holmes, & Stewart, 2011; Levin, Hayes, & Waltz, 2010; McKenna, Barnes-Holmes, Barnes-Holmes, & Stewart, 2007), to racism or other biases (Barnes-Holmes et al., 2006; Drake et al., 2010; Power, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009; Roddy et al., 2010; Vahey et al., 2010), and more recently, to attitudes toward the self (Bast & Barnes-Holmes, 2014; Remue, De Houwer, Barnes-Holmes, Vanderhasselt, & De Raedt, 2013; Timko, England, Herbert, & Forman, 2010; Vahey, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009). However in a recent chapter-length review of research in this area, Hughes & Barnes-Holmes, 2013 note the unsystematic and highly variable way in which IRAP studies are reported. Specifically, in order to more effectively answer questions regarding the IRAP's validity and reliability, researchers need to report accuracy and latency criteria, number of participants who passed the IRAP, and internal consistency (e.g., split-half reliability, test re-test reliability; Hughes & Barnes-Holmes, 2013). I will now address these points by reviewing research pertaining to these areas.

Accuracy and latency criteria are important as there is evidence showing that changes in these variables affect performance on, and the reliability of, the IRAP (Barnes-Holmes, Murphy, Barnes-Holmes, & Stewart, 2010). In a typical IRAP, participants are required to meet specific accuracy and latency criteria across two successive practise blocks before beginning the test blocks. Data from these practise blocks are not normally included in analyses. Accuracy criteria have

ranged from 65% (Drake et al., 2010; Timko et al., 2010) to 95% (Hughes & Barnes-Holmes, 2011) correct responses, with most studies using 80%. Response-speed requirements range from 5s (Dawson, Barnes-Holmes, Gresswell, Hart, & Gore, 2009) to 2s (e.g. Bast & Barnes-Holmes, 2014; Roddy et al., 2011), with most studies before 2012 using 3s, and more recent research using 2s. Barnes-Holmes, Murphy, et al. (2010) found changing the response speed requirement from 3s to 2s significantly increased the strength of the IRAP effect, and almost doubled the internal reliability. For this reason, I will use a 2-s criterion.

Order effects in IRAP research typically refer to the order in which the consistent/inconsistent blocks are presented. By default, the IRAP software presents the consistent block first and some research has investigated whether changing this will affect performance on the IRAP. Out of the ten studies to have tested for order effects (Barnes-Holmes, Hayden, Barnes-Holmes, & Stewart, 2008; Drake et al., 2010; Kelly & Barnes-Holmes, 2013; McKenna et al., 2007; Parling, Cernvall, Stewart, Barnes-Holmes, & Ghaderi, 2012; Power et al., 2009; Scheel et al., 2011; Stockwell, Walker, & Eshleman, 2010; Vahey et al., 2009, 2010), only one (Power et al., 2009) reported a significant difference between participants that had the consistent block presented first and those that had the inconsistent block presented first. However, that particular study did not transform the raw response-latencies using the D-IRAP algorithm which makes this result difficult to compare with most recent research. In any case, the authors found significant IRAP effects regardless of which block was presented first suggesting block order does not affect the conclusions drawn from IRAP results. As the early (pre-2010) IRAP research failed to find any evidence of order effects, it has been suggested (Barnes-Holmes, Barnes-Holmes, et al., 2010; Nicholson & Barnes-Holmes, 2012) that this variable has no effect on IRAP results. However, none of

the pre-2010 studies in which order effects were tested for used the now commonplace practise criteria of 80% accuracy and 2s response latency, and only one study since has used these criteria and tested for order effects (Kelly & Barnes-Holmes, 2013) – however the results were not reported. Thus it will be worth investigating in the present study. I will also test to see whether the order in which the IRAP tasks are presented will affect D-IRAP scores.

The number of participants who pass the IRAP refers to the participants who succeed in meeting the practise criteria within the practise blocks. Participants typically complete up to four practise blocks and if they have not achieved the criteria at this point, they are dismissed from the experiment. Pass rates average 86.5% ($SD = 8.74$, $N = 23$), though this is across a range of practise criteria (Hughes & Barnes-Holmes, 2013). Variables affecting pass rate have not been systematically studied (Hussey, Thompson, McEnteggart, Barnes-Holmes, & Barnes-Holmes, in press). Accuracy and response-speed criteria may affect pass rate, but an analysis of the data in Hughes and Barnes-Holmes' (2013) review of IRAP research shows no significant correlations between either response-speed or accuracy requirements and pass rates (all $ps > .05$). However, only 56% of the studies reported all three variables, reinforcing Hughes and Barnes-Holmes' (2013) call for consistent reporting of this data.

Internal consistency for the IRAP is typically calculated using split-half correlations while one study (Cullen, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009) reported test-retest reliability ($r = 0.49$). Nine studies (Barnes-Holmes, Murtagh, et al., 2010, 2010; Barnes-Holmes et al., 2009; Carpenter, Martinez, Vadhan, Barnes-Holmes, & Nunes, 2012; Drake et al., 2010; Juarascio et al., 2011; Levin et al., 2010; Remue et al., 2013; Ronspies et al., 2015) have reported internal consistency data for the D-IRAP score. Reliabilities for the D-IRAP score

range from 0.221 (Remue et al., 2013) to 0.840 (Carpenter et al., 2012), with a mean of 0.613 ($SD = 0.20$, $n = 10$) which is satisfactory for a response latency based measure (Nosek, Greenwald, & Banaji, 2007). Interestingly, the two studies (Barnes-Holmes, Murphy, et al., 2010; Juarascio et al., 2011) that used the 2s practice criteria reported higher internal consistency (r s of 0.810 & 0.720 respectively). The one study (Carpenter et al., 2012) reporting a higher internal consistency ($r = 0.840$) did not report their practise criteria.

My main focus was to replicate the IRAP effect in a sample of New Zealand university students using IRAPs investigating dog breeds, age, and gender. Using the dog breed IRAP, I will look at attitudes toward Pitbull and Labrador breeds which are well-known dog breeds in New Zealand, with the former generally considered vicious and dangerous, while the latter considered friendly and safe. Using the age IRAP, I will look at attitudes toward age categories 'old' and 'young'. Finally, I will use the gender IRAP to look at attitudes toward household chores, testing the idea that some chores are generally considered masculine, and others feminine. The stimuli for the gender IRAP were taken from Drake et al. (2010) with some modifications (see Method section) and I developed the stimuli for the other two IRAPs.

One of my primary foci will be to report results relevant to the reliability and validity of the IRAP as per Hughes & Barnes-Holmes (2013). To increase the internal validity of the IRAP (discussed above), I used an accuracy criterion of 80% and response-speed criterion of 2s.

My hypothesis was the overall IRAP effect will be found for all three IRAPs. That is, I predict faster responding in trials that are consistent with the presumed social norms, than in trials that are inconsistent with said norms. For the dog breed and age IRAPs, I hypothesise the IRAP effect will be found across all

four trial types, and for the overall mean. For the gender chores IRAP, Drake et al., (2010) reported the IRAP effect in only one of the four trial types and for the overall mean, so I hypothesise the IRAP effect will be found for the overall mean, but not for all trial types. Finally, I predict pass rates and internal consistency to be in line with the aforementioned means and that no order effects will be found.

Method

Participants

I recruited 35 psychology students through the University of Waikato's research participant database and word-of-mouth. I offered participants the choice of either credit toward their chosen undergraduate psychology course, or to enter a draw to win a department store gift voucher. Twenty-three were female and 12 were male, with a median age of 21 years. The majority of participants had grown up in New Zealand (71%) and less than half (42%) were dog owners.

Apparatus

I administered the IRAP on a Dell 9020 (Intel 3.2Ghz processor, 4 GB of RAM) IBM-compatible computer running a 32-bit Windows 7 Enterprise operating system. A Dell 22" LCD monitor positioned at eye level presented the stimuli. I used the 2012 Update II IRAP, written by Dr. Dermot Barnes-Holmes, which was downloaded from the IRAP research website (<http://irapresearch.org>). Participants used a standard US keyboard to respond to the IRAP trials. Sessions were run in one small, quiet, lit, temperature-controlled room at the University of Waikato, and only myself and the participant were present. I sat behind and to the side of the participant and observed their responses on a second, identical monitor.

Conditions

Three IRAP conditions were used in this experiment though not all were completed by all participants due to failure to meet the practise criteria (discussed further below).

Dog breeds. Twenty-two participants completed an IRAP contrasting two dog breeds; one often referred to in the media as dangerous (Pitbull), and the other generally considered safe (Labrador). Table 1 shows the response options and evaluative stimuli.

Age. Twenty-two participants completed an IRAP contrasting two age group categories; old and young. ‘Old’ was paired with generally negative terms, and ‘young’ with generally positive terms. Table 1 shows the response options and evaluative stimuli.

Gender chores. Twenty-nine participants completed an IRAP contrasting household chores as either male or female tasks. These stimuli were taken from Drake et al. (2010) with slight changes made to make the stimuli more appropriate to a New Zealand sample. For example, the word ‘trash’ was changed to ‘rubbish’ as this is the more commonly used term. Table 1.1 shows the stimuli used for this IRAP.

Table 1.1
Stimuli Used Across Three IRAP Tasks. Evaluative Stimuli are Consistent/Inconsistent with Sample 1

	Dog Breed	Age	Gender Chores
Sample 1	Pitbull	Old	Male
Sample 2	Labrador	Young	Female
Consistent Evaluative Stimuli	Deadly	Sad	Waterblasting
	Dangerous	Forgetful	Cleaning Gutters
	Vicious	Boring	Lawn Mowing
	Bad	Useless	Taking Out Rubbish
	Mean	Worthless	Car Maintenance
	Killer	Unattractive	Chopping Wood
Inconsistent Evaluative Stimuli	Harmless	Happy	Cooking
	Good	Fun	Mopping
	Friendly	Sexy	Ironing
	Cuddly	Energetic	Sewing
	Gentle	Valuable	Laundry
	Safe	Exciting	Dusting
Response Option 1	Similar	True	Right
Response Option 2	Opposite	False	Wrong

Procedure

I systematically varied the order of the IRAP tasks and blocks using the Latin squares technique (McBurney & White, 2004) to control, and test for order effects. The order was varied across two variables; IRAP order, and block order. The IRAP order simply determined which IRAP task was administered first, and a

fixed sequence determined the order of the remaining two. The sequence was dog, age, gender. For example, if the age IRAP was presented first, this would be followed by the gender IRAP, and finally the dog IRAP. The order of the blocks could be varied in that each IRAP task could be presented with either the consistent block or the inconsistent block first. Table 1.2 shows the six combinations of IRAP and block orders that were used, and these were applied systematically across participants.

Table 1.2

The six order conditions used in the present experiment.

	<u>First IRAP</u>	<u>Second IRAP</u>	<u>Third IRAP</u>
1	Dog – Inconsistent	Age – Consistent	Gender – Inconsistent
2	Age – Consistent	Gender – Inconsistent	Dog – Consistent
3	Gender – Inconsistent	Dog – Consistent	Age – Inconsistent
4	Dog – Consistent	Age – Inconsistent	Gender – Consistent
5	Age – Inconsistent	Gender – Consistent	Dog – Inconsistent
6	Gender – Consistent	Dog – Inconsistent	Age – Consistent

I welcomed participants to the session, assigned a participant number to preserve confidentiality and asked them to read through the brief (Appendix A). The brief explained they were required to sort words and the task was designed to investigate language and cognition. The brief also mentioned they were not being asked for their opinions or beliefs, just to sort the words as directed. I then answered any questions and, once satisfied, the participant signed the consent form (Appendix B) and completed a short demographic form (Appendix C). This form asked for age, gender, country in which they spent most of their childhood (up to age 18), whether they own a dog, and whether they smoke cigarettes. The question regarding country was asked to test whether participants who grew up in New Zealand would respond differently to those who were raised outside New Zealand. Similarly, the question around dog ownership was asked to test whether owning a dog would affect results on the dog IRAP. The question around cigarette

smoking was included because an IRAP around cigarette smoking was planned, though not run, and as such the question was not included in the analysis.

I used the IRAP experimenter's script (Version 1.51; Appendix D) as a guide when instructing participants. I directed participants to read the rule on the screen and then gave two examples of a correct response, using stimuli from whichever IRAP would be presented first. During the first two blocks of trials, the participants were not made aware of the 80% accuracy and 2,000ms response-speed practise criteria. Upon completion of the first two blocks (first block-pair), the IRAP presented feedback on screen that stated the accuracy and median response latencies for the two blocks. I explained the practise criteria by saying "Go as slowly as you need to get them all correct according to the rule". I explained that from the second block-pair onward, when their response latency exceeded the 2,000ms target on a trial, an exclamation mark would appear on the screen. Participants completed up to four practise block-pairs and if they still did not achieve the practise criteria, that IRAP was concluded and the next IRAP began. When the participant achieved the practise criteria across one block-pair, I explained they were completing the experiment proper, and would have three more block-pairs of trials. At any point in the experiment, if participants responded incorrectly on three consecutive trials, I would remind them to slow down and to focus on responding accurately.

Once the first IRAP was completed, the participant completed the remaining two in the predetermined order and, upon completion, was debriefed and the experimental session ended. Figure 1.5 shows a schematic diagram of the experimental process. Participants took approximately 45 minutes to complete the three IRAPs though this varied by about 15 minutes depending on how many

practice block-pairs the participant required to achieve the practise criteria, and whether the practice criteria was met.

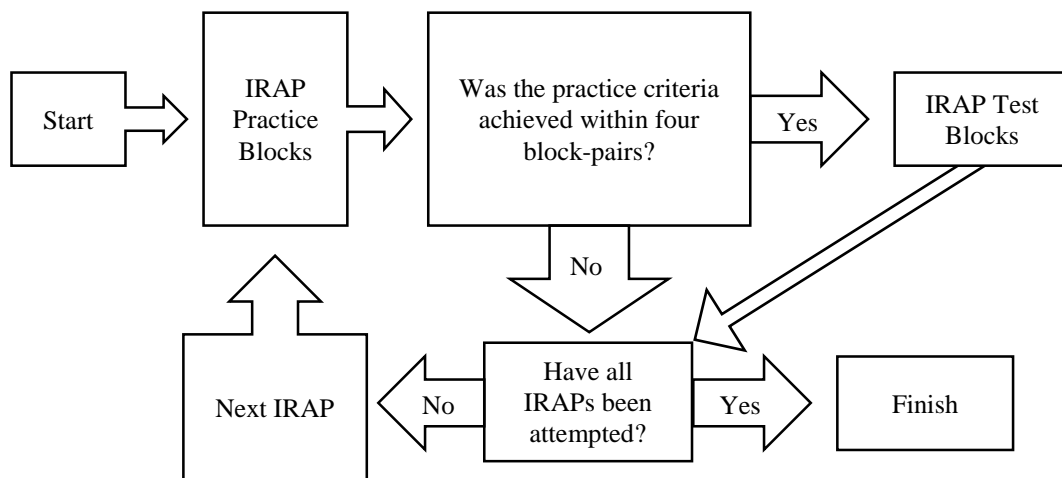


Figure 1.5. A schematic diagram of the experimental process.

Results

Data Preparation

The raw data were time to first correct response (response latency) and whether or not the first response was correct (accuracy). In line with recent IRAP research, I transformed the raw latencies using the D-IRAP algorithm to account for individual differences in motor and cognitive skills (Bast & Barnes-Holmes, 2014). Table 1.3 shows the steps involved in transforming raw latencies to D-IRAP scores. Put simply, the D-IRAP score is a measure of the difference between response latencies on the consistent trial blocks and the response latencies on the inconsistent trial blocks. The IRAP program calculated the D-IRAP scores for each of the four trial types, and the overall D-IRAP was an average of the four. I excluded data from the analysis if the participant failed to

Table 1.3

Calculation Steps for D-IRAP Scores Commonly Used in Recent IRAP Research

Step	Description
1	Only test block data are used.
2	Latencies over 10,000ms are removed from the dataset.
3	Participant's data are removed if 10% or more of their latencies are at or below 300ms.
4	Twelve standard deviations are calculated. One for each of the four trial types repeated for each of the three test block-pairs.
5	Twenty-four means are calculated. One for each of the four trial types repeated for each of the six test blocks.
6	Twelve mean differences are calculated. For each of the four trial types, the mean latency of the consistent test block is subtracted from the mean latency of the inconsistent test block.
7	Twelve D-IRAP scores are calculated. The 12 mean differences from step 6 are divided by the corresponding standard deviations from step 4 resulting in one D-IRAP score for each of the four trial types per test block-pair. The result is three D-IRAP scores per trial type. Mathematically, $D = \frac{M_{INCON} - M_{CON}}{SD_{INCON \& CON}}$.
8	Remove data from participants who failed to maintain accuracy and latency criteria. Median latencies and overall accuracy were calculated for each test block. If the median latency exceeded 3,000ms or accuracy was under 70% for either block in a block-pair, then the block-pair was removed. If more than one block-pair was removed, the participant's dataset was excluded.*
9	Calculate D-IRAP score for each trial type. The three D-IRAP scores for each trial type calculated in step 7, and excluding any removed in step 8, were averaged across block-pairs. Mathematically, $D_{Final} = \frac{D_{Pair 1} + D_{Pair 2} + D_{Pair 3}}{3}$ †

Notes. * These exclusion criteria were chosen to reduce participant attrition. Many studies have not reported their exclusion criteria for this step and alternatives have been suggested to the criteria used in the present study (see Hussey et al., in press).

† If test block-pair data were excluded under step 8, the calculation would only sum the D-IRAP scores from the remaining block-pairs and divide by two.

maintain 70% accuracy and a median response time of 3,000ms across the three test blocks as per step 8 in the D-IRAP calculation (reported below in the Pass Rates section).

Internal Consistency

I measured internal consistency using the split-half method, calculating D-IRAP scores for odd and even numbered trials for each of the three IRAPs. I produced Pearson correlations which were corrected using the Spearman-Brown formula. Internal consistency for all IRAPs were acceptable and significant ($r_{\text{DOG}} = .858, p < .001$; $r_{\text{AGE}} = .821, p < .001$; $r_{\text{GENDER}} = .640, p = .013$).

Order Effects

I calculated one-way ANOVAs to determine whether presenting the consistent block or inconsistent block, first would affect D-IRAP scores. The assumption of homogeneity of variances was met for all trial types and overall means. There was no effect for any of the IRAPs, both at the trial type and overall mean levels of analysis (all $ps \geq .312$). To determine whether the order in which IRAPs were presented had an effect on D-IRAP scores, one-way ANOVAs were calculated. Again, there was no significant effect for any of the IRAPs, at either level of analysis (all $ps \geq .083$).

Pass Rates

Thirty-three participants attempted the Dog Breed IRAP and 22 (66.7%) achieved the practice criteria to complete the test blocks. One participant failed to stay within the 70/3000 criteria on the test blocks and their data were discarded. Thirty-five participants attempted the Age IRAP, and 22 (62.9%) passed. None of the test block data were beyond the 70/3000 criteria for this IRAP. Finally, 33 participants attempted the Gender Chore IRAP and 29 (87.9%) passed. Two participants had their test block data excluded for exceeding the 70/3000 criteria.

Trial Type Analysis

One-sample t-tests were completed for overall mean D-IRAP and the four trial types to determine whether they were significantly different from zero, and Cohen's *d* effect sizes were calculated. Table 1.4 shows the mean D-IRAP score, *SEM*, *N*, *t*, *p*, and Cohen's *d* values for each of the trial types and overall mean for each of the three IRAPs. Across all three IRAPs, the mean overall D-IRAP scores were all positive and significantly different from zero, showing the participants were significantly faster to respond in the consistent blocks than they were to respond in the inconsistent blocks. For the Dog Breed IRAP (Table 1.4, top section), the means ranged from 0.22 to 0.45, and only Trial Type 3's D-IRAP score was not significantly different from zero ($p = .056$). I found the strongest effect sizes on Trial Types 1 ($d = 1.11$) and 4 ($d = 1.21$). I found the same pattern for the Age IRAP (Table 1.4, middle section) where Trial Types 1 ($d = 0.71$) and 4 ($d = 1.05$) had the strongest effect sizes. The means ranged from 0.10 to 0.38, and Trial Type 2's D-IRAP score was the only trial type not significantly different from zero ($p = .405$). The Gender Chore IRAP (Table 1.4, bottom section) showed the smallest range of means (0.23 to 0.45), and all trial type D-IRAP scores were significantly different from zero ($ps \leq 0.010$). The strongest effect sizes were

Table 1.4
Mean D-IRAP Score, SEM, N, t, p, and Cohen's d Scores for all Trial Types and Overall Mean across Three IRAP Tasks.

<u>Trial Type</u>	<u>Mean D-IRAP</u>	<u>SEM</u>	<u>N</u>	<u>t</u>	<u>p</u>	<u>Cohen's d</u>
Dog 1: Pitbull – Dangerous	.37	.07	21	5.1	<.001	1.11
Dog 2: Pitbull – Harmless	.28	.11	21	2.4	.025	0.53
Dog 3: Labrador – Dangerous	.22	.11	21	2.0	.056	0.44
Dog 4: Labrador – Harmless	.45	.08	21	5.6	<.001	1.21
Dog Breed Overall	.33	.07	21	4.5	<.001	0.98
Age 1: Old – Negative	.38	.12	22	3.3	.003	0.71
Age 2: Old – Positive	.10	.11	22	0.8	.405	0.18
Age 3: Young – Negative	.26	.12	22	2.2	.037	0.48
Age 4: Young – Positive	.37	.07	22	4.9	<.001	1.05
Age Overall	.28	.08	22	3.4	.002	0.73
Gender 1: Men – Male Chore	.35	.08	27	4.4	<.001	0.85
Gender 2: Men – Female Chore	.42	.08	27	5.4	<.001	1.04
Gender 3: Women – Male Chore	.23	.08	27	2.8	.010	0.54
Gender 4: Women – Female Chore	.45	.08	27	5.3	<.001	1.01
Gender Chore Overall	.36	.06	27	5.7	<.001	1.10

Trial Types 2 ($d = 1.04$) and 4 ($d = 1.01$) which was a different pattern than the other two IRAPs.

Figure 1.6 shows the mean D-IRAP scores and standard error of the mean across trial types and for the overall mean for the dog, age, and Gender Chore IRAPs. We can see the highest D-IRAP scores are found for Trial Type 4. Trial Types 1 and 3 are the most consistent across the three IRAPs, and Trial Type 2 shows the most variation between IRAPs.

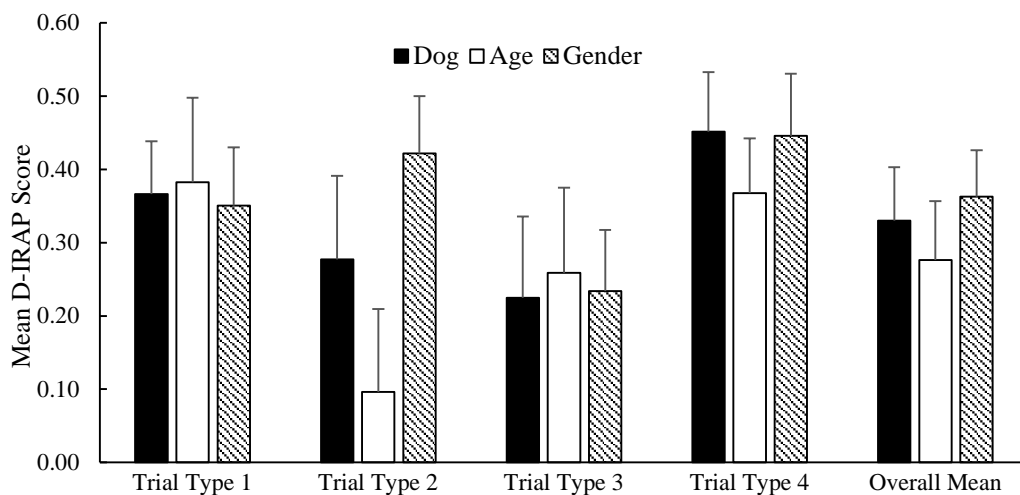


Figure 1.6. Mean D-IRAP scores across trial types and overall mean for dog, age, and Gender Chore IRAPs. Error bars show the standard error of the mean. Positive scores mean participants responded faster in the consistent blocks than in the inconsistent blocks.

Demographic Analysis

Table 1.5 shows the demographic information of the 31 participants who completed at least one IRAP. Most participants were female (68%), from New Zealand (71%), and not dog owners (58%).

To test for gender differences in D-IRAP scores, I calculated a one-way between-subjects MANOVA with gender as the factor and the overall mean and individual trial types as the dependent variables. I also conducted Levene's homogeneity of variance tests and when the data violated the assumption of

homogeneity, I conducted an independent-sample t-test and didn't assume equality of variances. Female students accounted for 68% of the sample. For the Dog Breed IRAP, I found no significant differences between men and women's

D-IRAP scores for any trial type, or the overall mean (all

$ps \geq .193$). For the Age

IRAP, again I found no

significant differences

Table 1.5

Demographic Information of the Participants that Completed at Least One IRAP (N = 31)

Category		N (%)
Gender	Male	10 (32%)
	Female	21 (68%)
Country	New Zealand	22 (71%)
	Not New Zealand	9 (29%)
Dog Owner	Yes	13 (42%)
	No	18 (58%)

between men and women's D-IRAP scores for any trial type, or the overall mean

(all $ps \geq .564$). For the Gender Chore IRAP, I found a significant difference

between men and women's D-IRAP scores on Trial Type 4, $F(1,25) = 7.22$, p

$= .013$, with higher D-IRAP scores for women ($M = 0.59$) than for men ($M =$

0.16). Additional one-sample t-tests showed women's D-IRAP scores for this trial

type were significantly different from zero, $t(17) = 5.87$, $p < .001$, while men's D-

IRAP scores were not, $t(8) = 1.46$, $p = .181$. I found no significant differences

between men and women's D-IRAP scores for the remaining trial types, or the

overall mean ($ps \geq .096$).

I calculated Pearson correlations to determine the effect of participant's

age on D-IRAP scores. Ages ranged from 18 to 54 years (Median = 21). All trial

types and overall mean for the Dog Breed IRAP were positively correlated with

age, and the correlation between Trial Type 1 and age was significant, $r(21)$

$= .435$, $p = .049$. Negative correlations were found between age and all the Age

IRAP trial types and overall mean though none were significant. For the Gender

Chore IRAP, all trial types and the overall mean were positively correlated with

age and one significant correlation was found between Trial Type 3 and age, $r(27)$

$= .439$, $p = .022$.

To test whether owning a dog affected D-IRAP scores on the Dog Breed IRAP, I calculated a one-way between-subject MANOVA, with dog ownership as the independent variable and the D-IRAP scores on the Dog Breed IRAP as dependent variables (all four trial types and the overall mean). Almost half of the sample (42%) were dog owners. No significant differences were found in D-IRAP scores for any trial type or the overall mean between dog owners and non-dog owners (all $ps \geq .233$).

I conducted one-way between-subject ANOVAs to determine whether growing up in New Zealand affected D-IRAP scores. The independent variable was whether or not the participant identified as having grown up in New Zealand and the dependent variables were the D-IRAP scores for the trial types and the overall means. I didn't use 'country' as my independent variable as half of the countries had only one participant recorded, thus limiting statistical power and compromising anonymity. Most participants (71%) identified as New Zealanders. For the Dog Breed IRAP, there were no significant differences in D-IRAP scores between New Zealanders and non-New Zealanders ($ps \geq 0.155$). For the Age IRAP, two significant differences in D-IRAP scores were found. The difference in D-IRAP scores for Trial Type 2 was significant, $F(1,20) = 6.90$, $p = .016$, with higher D-IRAP scores for New Zealanders ($M = 0.31$) than non-New Zealanders ($M = -0.22$). Additional one-sample t-tests showed New Zealander's D-IRAP scores for this trial type were significantly different from zero, $t(12) = 2.52$, $p = .027$, while non-New Zealander's D-IRAP scores were not, $t(8) = -1.33$, $p = .221$. The difference in D-IRAP scores for the overall mean was also significant, $F(1,20) = 5.12$, $p = .035$, with higher D-IRAP scores for New Zealanders ($M = 0.42$) than non-New Zealanders ($M = 0.08$). For the Gender Chore IRAP, there

were no significant differences in D-IRAP scores between New Zealanders and non-New Zealanders ($ps \geq 0.164$).

In summary, on the Dog Breed IRAP participants were significantly faster to respond on consistent blocks than on inconsistent blocks for three of the four trial types and overall. On the Age IRAP, participants were significantly faster to respond on consistent blocks for three of the four trial types and overall. On the Gender Chore IRAP, participants were significantly faster to respond on consistent blocks for all trial types and overall. Women had significantly higher D-IRAP scores on Trial Type 4 (Female – Female Chore) of the Gender Chore IRAP. Age was positively correlated with D-IRAP scores on Trial Type 1 (Pitbull – Dangerous) of the Dog Breed IRAP and positively correlated with D-IRAP scores on Trial Type 3 (Female – Male Chore) of the Gender Chore IRAP. No significant differences were found in D-IRAP scores on the Dog Breed IRAP between dog owners and non-dog owners. Finally, participants who grew up in New Zealand had significantly higher D-IRAP scores for Trial Type 2 (Old – Happy) and overall for the Age IRAP.

Discussion

My hypothesis was the overall IRAP effect would be found for all three IRAPs. This hypothesis was confirmed. For the dog breed and Age IRAPs, I hypothesised the IRAP effect would be found across all four Trial Types, and for the overall mean. This hypothesis was confirmed for the Dog Breed IRAP, but not for the Age IRAP which found the IRAP effect in three of the four trial types and for the overall mean. For the Gender Chore IRAP, I hypothesised the IRAP effect would be found for the overall mean, but not for all trial types. The IRAP effect was found for the overall mean, consistent with my hypothesis, but the IRAP effect was also found for all four trial types. Finally, I predicted pass rates and internal consistency would be in line with previous research and that no order effects would be found. Pass rates for the dog breed and Age IRAPs were lower than the average of those reported in past research, and the Gender Chore IRAP's pass rate was slightly higher. Internal consistency for the Dog Breed and Age IRAPs was much higher than the mean of previous research, and the internal consistency of the Gender Chore IRAP was slightly above the mean of previous research. No order effects were found across the three IRAPs, neither for block order (consistent or inconsistent first), or for IRAP task order (Dog Breed, Age, or Gender Chore IRAP first), consistent with my hypothesis.

One important note is that this discussion will not include analysis of the overall mean D-IRAP scores. Through the RFT view of implicit cognition, the IRAP measures four separate attitudes or BIRRs, a.k.a. the four trial types. Thus, combining the results of the trial types loses specificity and this specificity, as discussed in my introduction section, is an advantage of the IRAP over other implicit measures such as the IAT. The overall mean D-IRAP scores were

reported in my results section to aid in comparison with past IRAP research, and with IAT research.

Dog Breed IRAP

The results of Dog Breed IRAP showed participants were significantly faster to respond on the consistent blocks than to respond on the inconsistent blocks across all trial types. When presented with ‘Pitbull’ and words like ‘Dangerous’ (Trial Type 1) participants were significantly faster to respond when instructed to press ‘Similar’ than when instructed to press ‘Opposite’. They were also faster to respond when instructed to press ‘Similar’ when presented with ‘Labrador’ and words like ‘Harmless’ (Trial Type 4). Participants were faster when instructed to press ‘Opposite’ in trials that presented ‘Pitbull’ with words like ‘Harmless’ (Trial Type 2), and in trials that presented ‘Labrador’ with words like ‘Dangerous’ (Trial Type 3). Broadly speaking, measurements of participant’s BIRRs were consistent with the statement: Pitbulls are dangerous *and* not safe while Labradors are safe *and* not dangerous. This was consistent with my hypothesis. While experimental analyses of domestic dog behaviour typically find no difference between dog breeds (For a review, see Mehrkam & Wynne, 2014), most of the popular literature (e.g. American Kennel Club, 2006), observational research and media reports draw distinctions between breeds (Mehrkam & Wynne, 2014). Indeed, research on dog attacks has shown dog breed to be a poor predictor of likelihood to attack humans (R. Ellis & Ellis, 2014; Sacks, Sinclair, Gilchrist, Golab, & Lockwood, 2000). Taken together, we could conclude that BIRRs are unlikely to have been learned through their direct experience with dogs, but rather are learned through exposure to media and the popular literature. The finding that D-IRAP scores did not significantly differ between dog owners and non-dog owners may add weight to this hypothesis.

Age IRAP

The results of the Age IRAP showed that on three of the four trial types, participants were faster to respond on the consistent blocks than to respond on the inconsistent blocks. Participants were significantly faster to respond when instructed to press 'True' than when instructed to press 'False' on trials in which 'Old' and words like 'Sad' were presented (Trial Type 1), and on trials in which 'Young' and words like 'Happy' were presented (Trial Type 4). Participants were also significantly faster to respond when instructed to press 'False' on trials that presented 'Young' and words like 'Sad' (Trial Type 3). They were not, however, significantly faster to press either option on trials presenting 'Old' and words like 'Sad' (Trial Type 2). That is, participant's BIRRs were in line with the attitudes: Old people are sad *but* are not necessarily not happy, and young people are happy *and* not sad. The finding that participants did not disconfirm the 'Old' – 'Fun' attitude could be explained by media portrayals of older people as active and exciting, particularly movie stars. For example, popular action movie stars such as Harrison Ford (age 73), Arnold Schwarzenegger (age 68), and Sylvester Stallone (age 69) continue to appear in Hollywood films. One further reason that mean D-IRAP scores on Trial Type 2 ('Old' and words like 'Fun') were not significantly different from zero could be the difference in response patterns between New Zealanders and non-New Zealanders.

Trial Type 2 ('Old' and words like 'Fun') of the Age IRAP was the only trial type in which a significant difference in D-IRAP scores was found between participants who grew up in New Zealand and those who did not. New Zealander's D-IRAP scores were much higher ($M = 0.31$) than non-New Zealanders ($M = -0.22$). In other words, New Zealanders were faster to press 'False' when presented with 'Old' and 'Fun', while non-New Zealanders were

faster to press 'True'. This finding is interesting as it suggests New Zealanders are more likely to demonstrate negative attitudes toward older persons than non-New Zealanders, who are more likely to demonstrate positive attitudes toward older persons. Caution must be taken when generalising this finding for two reasons. Firstly, the non-New Zealander group was made up of four participants from England, three from Malaysia, one from Singapore, one from Israel, and one from Zimbabwe. These countries represent a wide variety of cultures making any generalisations rather meaningless. Secondly, while the D-IRAP scores of the New Zealanders were significantly different from zero, this was not true for the non-New Zealanders – possibly reflecting the range of cultures in that group.

Gender Chore IRAP

The results of the Gender Chore IRAP showed participants were significantly faster to respond in the consistent blocks, than in the inconsistent blocks. On trial that presented 'Male' with chores like 'Waterblasting' (Trial Type 1) participants were significantly faster to respond when instructed to press 'Right' than when instructed to press 'Wrong'. They were also faster to respond when instructed to press 'Right' when on trials that presented 'Female' with chores like 'Cooking' (Trial Type 4). Participants were faster when instructed to press 'Wrong' in trials that presented 'Male' with chores like 'Cooking' (Trial Type 2), and in trials that presented 'Female' with chores like 'Waterblasting' (Trial Type 3). Generally speaking, participant's BIRRs were in line with the attitudes: Males should do male chores *and* not do female chores, and females should do female chores *and* not do male chores. These results were different from the results reported by Drake et al. (2010), which only found a significant IRAP effect for Trial Type 4 ('Female' and chores like 'Cooking').

One explanation for this difference is the small changes I made to the stimuli. I adapted the stimuli used in Drake et al.'s (2010) study to better suit a New Zealand sample. The changes were as follows: automobile maintenance was changed to car maintenance, taking out the trash was changed to taking out rubbish, weed eating was changed to cleaning gutters, and raking was changed to water blasting. All of these chores were in the 'male chore' category, and it was in both trial types featuring these stimuli (Trial Types 1 & 3) that Drake et al. (2010) failed to find the IRAP effect. Another potential explanation for the difference between my and Drake et al.'s (2010) results could be the gender make-up of the sample. In Drake et al.'s (2010) sample, 78% of participants identified as 'female' compared to 68% of my participants. I found women had significantly higher D-IRAP scores for Trial Type 4 ('Female' and chores like 'Cooking'), with a significant IRAP effect for women, but not for men. Drake et al. (2010) did not test for differences between genders, but in line with my results found, for Trial Type 4, a significant IRAP effect for women, but not for men. This tentatively suggests a difference in response patterns between men and women but is not supported by results from the other trial types, in which no significant differences in D-IRAP scores were found.

The most likely explanation for the differences between my and Drake et al.'s (2010) results is the different practise criteria used in the IRAPs. I used the more strict 80% accuracy and 2s response-speed criteria, whereas Drake et al. (2010) used an unusual 65% accuracy and no response-speed criteria. As discussed in my introduction, the only study to test for the effect of changing the response-speed requirement on D-IRAP scores (Barnes-Holmes, Murphy, et al., 2010) found that shifting the requirement from 3s to 2s significantly increased D-IRAP scores. It is thus possible that Drake et al. (2010) would have obtained

significant IRAP effects for all trial types had they implemented a response speed requirement.

Internal Consistency

The internal consistency of the IRAPs used in my study were consistent with, if not better than, those reported in previous research. Internal consistency of the Dog Breed IRAP ($r = .858$) was higher than the highest seen in previous research ($r = .840$; Carpenter, Martinez, Vadhan, Barnes-Holmes, & Nunes, 2012). Internal consistency of the Age IRAP was also very high ($r = .821$) relative to previous research, and much higher than the average ($r = .613$). Internal consistency of the Gender Chore IRAP ($r = .640$) was closer to the mean of previous research. Drake et al. (2010) did not report internal consistency for the Gender Chore IRAP individually, but calculated across several IRAPs, so it is difficult to compare my internal consistency with theirs. Across all of the IRAPs Drake et al. (2010) used, the internal consistency was slightly lower ($r = .601$) than both the mean of previous research and my Gender Chore IRAP. Overall, these internal consistency data are comparable to those found in IAT research (Greenwald & Nosek, 2001), which tend to be much higher than is found in research using other latency-based measures (Nosek et al., 2007), supporting the validity of the IRAP.

Order Effects

Order effects were not found for any of the three IRAPs, in any trial type or for the overall mean. This was true both for block order (whether the consistent or inconsistent block was presented first) or IRAP task order (which of the three IRAPs were presented first). This was in line with previous research but was the first study to find this using the 80% accuracy and 2s response-latency practise criteria.

Pass Rates

Pass rates for the dog breed and Age IRAPs were noticeably lower (66.7% and 62.9% respectively) than both the mean of previous research (86.5%) and the pass rate of the Gender Chore IRAP (87.9%). As the effect of differences in practice criteria on pass rates have not been systematically studied, it is possible that the more strict criteria employed in my study could explain the low pass rates of the dog and Age IRAPs – though it is important to note that these pass rates are lower than the lowest reported in previous research (71%; Chan, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009), including research employing the stricter criteria used in my study (e.g. 78% in Remue, De Houwer, Barnes-Holmes, Vanderhasselt, & De Raedt, 2013). One useful finding was that once participants passed one IRAP, they did not fail to pass any of the subsequent IRAPs. It may, therefore, be beneficial to present an ‘easy’ (i.e. high pass rate) IRAP to participants first, as a preparation IRAP of sorts, to improve the likelihood of passing more ‘difficult’ IRAPs presented subsequently. Indeed, two studies (Kishita, Muto, Ohtsuki, & Barnes-Holmes, 2014; Vahey et al., 2010) have used such a methodology.

Effect of Age on D-IRAP Scores

The age of participants was significantly positively correlated with Trial Type 1 of the Dog Breed IRAP, $r(21) = .435, p = .049$, and Trial Type 3 of the Gender Chore IRAP, $r(27) = .439, p = .022$. For the Dog Breed IRAP, Trial Type 1 presented ‘Pitbull’ and words like ‘Dangerous’. The correlation here meant that the older the person, the larger the difference in response speeds between blocks in which they were instructed to press ‘Similar’ and blocks in which they were instructed to press ‘Opposite’. Loosely speaking, the older the person the more dangerous they considered Pitbulls to be. The correlation between this trial type

and age was only just significant, was less than 0.5, and all of the other trial types of the Dog Breed IRAP were also positive. Taken together, we could hypothesise the IRAP is simply reflecting that the longer a person lives, the more often they are exposed to the four relations measured in the Dog Breed IRAP. This hypothesis could be extended to the Gender Chore IRAP, which also resulted in positive correlations across all trial types. The one trial type in the Gender Chore IRAP that was significant (Trial Type 3; 'Female' and chores like 'Waterblasting') was of similar magnitude to the significant correlation found for the Dog Breed IRAP. Interestingly, the results of the Age IRAP showed the opposite of the results for the other two IRAPs. Non-significant, but negative correlations were found for all trial types of the Age IRAP; the strongest of which was on Trial Type 1 ('Old' and words like 'Sad'; $r = -.282, p = .204$). While caution must be taken when generalising these results due to the very low proportion of older people in the sample (only 9% were over age 30), the negative correlation tentatively suggests that the older a person gets, the less likely they are to demonstrate negative attitudes toward older persons and the less likely they are to demonstrate positive attitudes toward younger people. Again, it is difficult to generalise but the aforementioned attitudes do make intuitive sense so further research around the effect of age on attitudes toward age categories may be fruitful.

Limitations, Applications, Future Research, and Conclusions

Three limitations of my study have already been noted in this discussion section already and I will briefly summarise them here. Firstly, generalisations around the effect of participant's country on D-IRAP scores were limited due to the small number of participants identifying with specific countries. Future researchers could compare D-IRAP scores of participants from specific countries

(e.g. New Zealand vs. China), rather than grouping countries together. Secondly, generalisations around the effect of age on D-IRAP scores were limited as most of the participants (91%) were under 30 years old. Thirdly, the relatively low pass rates found for the dog breed and Age IRAPs could be improved by presenting an 'easier' IRAP, such as the Gender Chore IRAP, to participants beforehand.

One application of my research is in the comparison of attitudes between known groups. My research has demonstrated the IRAP effect can be found in a New Zealand sample and that differences in responding – both in magnitude and direction of D-IRAP scores - are found when comparing participants who grew up in New Zealand with those that did not. Additionally, my results showed that participant's age also affects responding on the IRAP which suggests a high level of sensitivity in the measurement of BIRRs.

One of the most important potential uses of the IRAP is in the prediction of future behaviour. To date, only two IRAP studies (Carpenter et al., 2012; Nicholson & Barnes-Holmes, 2012) have investigated this use. The IRAP, like other implicit measures, appears to be able to measure attitudes that participants do not demonstrate when responding without time pressure. This could be useful in therapies such as Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999) in which the therapist attempts to change a client's language processes. The client may not accurately report such changes so an objective measure like the IRAP could assess these changes, providing the therapist with a more accurate measure of therapeutic change.

In conclusion, my study has demonstrated the IRAP effect in a New Zealand sample across three IRAP tasks. My results have shown the three IRAPs used demonstrated acceptable internal consistency and suggested that age, gender, and country of origin affect IRAP results while block and IRAP task order do not

affect IRAP results. My results have suggested the use of a preparation IRAP may be beneficial in increasing pass rates for more 'difficult' IRAP tasks. The IRAP can thus be considered a valid measure of BIRRs in a New Zealand sample. Future research could continue to investigate the usefulness of the IRAP in the prediction of future behaviour.

Experiment 2

As briefly stated in my general introduction, in Experiment 2 I will attempt to elucidate the relationship between responding on the IRAP, impulsiveness as measured on an aversive delay discounting task (ADDT), and responses on a commonly used measure of experiential avoidance and psychological flexibility; the Action and Acceptance Questionnaire (AAQ-II; Bond et al., 2011).

In the following sections, I will first describe the concepts of experiential avoidance and psychological flexibility and present a commonly used measure of these concepts; the AAQ-II. I will follow this with a description of impulsiveness and self-control, and describe a process used to assess behaviour related to these concepts. Following this, I will present a review of the literature in two areas relevant to the present experiment. Firstly, I will examine research into the relationship between experiential avoidance, psychological flexibility, and impulsiveness. Finally, I will examine research into the relationship between experiential avoidance, psychological flexibility, and performance on the IRAP.

Experiential Avoidance and Psychological Flexibility

Experiential avoidance (EA) is a functional diagnostic dimension of human language behaviour (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). It is defined as “the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioural predispositions) and takes steps to alter the form or frequency of these events and the contexts that occasion them” (Hayes et al., 1996, p. 1154). Clinical research from a wide variety of fields has identified that people who do less EA, i.e. those who are willing to notice and be in contact with their private experiences, tend to exhibit lower levels of distress and

psychopathology (Hayes et al., 1996). From psychoanalysis (S. Freud, 1920) to rational emotive behaviour therapy (A. Ellis & Robb, 1994), person-centred therapy (Rogers, 1961) to Gestalt therapy (Perls, Hefferline, & Goodman, 1951), EA of painful experiences is often seen as a core problem in most psychiatric disorders (Hayes et al., 1999, 1996). EA, like normal avoidance, is usually maintained through negative reinforcement.

While attempting to avoiding many external stimuli is not problematic (e.g. tigers), attempts to apply the same avoidance strategies to internal experience (e.g. thought suppression) tend to be ineffective and often counterproductive (Hayes et al., 1996; Rassin, 2005; Wenzlaff & Wegner, 2000) which can lead to a feedback loop of distress. For example, consider a situation in which the thought “I am ugly” is elicited by looking into a mirror, followed by an emotional reaction labelled ‘distress’ by the person. The person might say to themselves “I must not think ‘I am ugly’”, thus repeating the thought and its associated distress. Furthermore, attempts to alter the form or frequency of the “I am ugly” thought will fail, as mirrors will continue to elicit said thought and failure to control the occurrence of the thought will likely entail even more distress, creating a vicious cycle. Additionally, in each step of the process, the avoidance strategies are likely to be effective, at least for a short time, thus negatively reinforcing the emotional response and increasing the intensity of future emotional responses to the “I am ugly” thought. The idea that EA can be described as avoidance of immediate aversive emotional responses, which leads to an increase in the averseness of those same emotional responses in the future, will be explored below in the section on aversive delay-discounting.

A closely related concept to EA is that of psychological flexibility (PF), which is defined as “contacting the present moment fully and without defence,

and persisting or changing in behaviour in the service of chosen values” (Blackledge, Ciarrochi, & Deane, 2009, p. 14). The first part of the definition ‘contacting the present moment’ is, when applied to private experiences, the opposite of EA. In acceptance and commitment therapy (ACT; Hayes et al., 1999), increasing PF is the primary therapeutic goal, and decreasing EA is one of the specific ways in which this is achieved (Blackledge et al., 2009; Hayes et al., 1999). In the most recent meta-analysis of the efficacy of ACT (A-Tjak et al., 2015), ACT was found to be effective in treating a wide range of clinically relevant disorders such as depression, anxiety, substance abuse, and somatic health problems such as pain. This finding suggests that EA and PF play an important role in psychological disorders.

One of the most often used and well-validated measures of EA and PF is the seven-item Action and Acceptance Questionnaire II (AAQ-II; Bond et al., 2011). The original version, the AAQ (Hayes et al., 2004), had been shown to be a good predictor of a range of quality of life outcomes (Hayes, Luoma, Bond, Masuda, & Lillis, 2006) and correlates highly ($r = .97$) with the AAQ-II (Bond et al., 2011). The main issue with the AAQ was relatively poor internal reliability (Cronbach’s $\alpha = .70$; Hayes et al., 2004) which was considerably improved in the AAQ-II (Cronbach’s $\alpha = .84$; Bond et al., 2011).

Self-Control and Impulsiveness

Self-control and impulsiveness describe the likelihood an organism chooses a smaller, sooner consequence, over a larger delayed consequence. It has been suggested (Ainslie, 1975) that when a reward is offered to an organism, the delay to receiving that reward decreases its subjective value (Ainslie, 1975). For example, when given the choice between receiving \$100 today, or \$101 one-week from today, many people will choose the \$100 today, despite the greater

magnitude of the delayed amount. In a sense, the value of the delayed reward is 'discounted' so the subjective value of the \$101 reward is less than the subjective value of the immediate \$100 reward, and this process is termed delay-discounting. The degree to which people discount future rewards has been commonly used as a measure of impulsiveness, with larger degrees of discounting representing more impulsiveness (Morrison, Madden, Odum, Friedel, & Twohig, 2014). A typical delay-discounting task (DDT) presents participants with a series of choices between smaller sooner rewards, often money, and larger delayed rewards – as in the above example. Throughout the procedure, the value of the rewards and/or the length of the delays will be manipulated, sometimes dependent on the choices made by participants and sometimes in a fixed progression. Analysis of the choices people make across the different conditions allows for an empirical measure of impulsiveness which has been used to investigate a wide range of behaviour.

Higher rates of delay-discounting (more impulsiveness) have been found to correlate with many problem behaviours and psychological disorders, including (but not limited to) eating disorders (Davis, Patte, Curtis, & Reid, 2010; Hendrickson & Rasmussen, 2013; Rasmussen, Lawyer, & Reilly, 2010), excessive gambling (Andrade & Petry, 2011; Dixon, Marley, & Jacobs, 2003; Petry, 2001; Petry & Casarella, 1999), substance abuse (Odum, Madden, Badger, & Bickel, 2000; Petry, 2002), internet and pornography addiction (Lawyer, 2008; Saville, Gisbert, Kopp, & Telesco, 2010), suicide attempts (Dombrovski et al., 2011), schizophrenia (Heerey, Robinson, McMahon, & Gold, 2007), and social anxiety (Rounds, Beck, & Grant, 2007, though see Jenks & Lawyer, 2015). Interestingly, many of the disorders on this list have been effectively treated using ACT (see above) and, indeed, a recent author (Blackledge et al., 2009) suggests

that all of the aforementioned disorders may be conceptualised as different topographies of EA. Thus it seems there is potentially a link between EA, RF, and delay-discounting and investigation into these links could further our understanding of many psychological disorders.

Preliminary Evidence of the Link between EA, PF, and Delay Discounting

One researcher (Rounds et al., 2007) investigated the relationship between rates of monetary delay discounting and self-reported social anxiety. Measures of EA and PF correlate with measures of social anxiety (Berrocal, Bernini, & Cosci, 2010; Kashdan et al., 2014; Panayiotou, Karekla, & Panayiotou, 2014), with more EA (and less PF) generally predictive of higher levels of social anxiety.

Undergraduate psychology students ($n = 110$) were administered the social interaction anxiety scale (SIAS; Mattick & Clarke, 1998) and placed into either a 'high social anxiety' group or 'low social anxiety' based on their SIAS scores.

The results showed a significant difference in scores on the DDT between the high social anxiety group and the low social anxiety group, $\chi^2(1) = 6.23, p < .01$, with participants in the high anxiety group discounting at a higher rate than those in the low anxiety group. In other words, participants reporting higher levels of social anxiety were more impulsive than those reporting low levels. The authors suggested that a relationship may exist between rates of delay-discounting and social anxiety, though a follow-up study (Jenks & Lawyer, 2015) failed to replicate the relationship (discussed below).

The first study (Berghoff, Pomerantz, Pettibone, Segrist, & Bedwell, 2012) to specifically investigate the relationship between scores on a measure of EA and PF and rates of delay discounting utilised the original AAQ and a monetary discounting task. Participants ($n = 146$) completed the Monetary-Choice Questionnaire (Kirby, Petry, & Bickel, 1999), which involves choosing between,

for example, receiving \$54 today or \$55 in 117 days. There was no significant correlation found between scores on the AAQ and discounting rates, $r = .04$, $p > .05$.

Another study (Morrison et al., 2014) that included both a DDT and the AAQ-II investigated the effects of brief acceptance-based training on rates of delay discounting and AAQ-II scores. Participants ($n = 17$) completed a monetary DDT and the AAQ-II both immediately before and one week after attending a 60-90-minute acceptance-based training session designed to specifically target impulsiveness. A control group ($n = 17$) did not attend the training but also completed both measures twice and a week apart. While the authors did not report the relationship between scores on the DDT and AAQ-II, they did find that the training significantly decreased impulsiveness on the DDT compared to the control group, $t(25) = -2.911$, $p = .007$, Cohen's $d = .57$. There was a moderate yet non-significant effect of the training on AAQ-II scores, $t(29) = 1.972$, $p = .058$, Cohen's $d = .36$, with the group that received the training showing a larger decrease in AAQ-II scores (less avoidance, more flexibility) than the control group.

As shown above, most of the research looking at EA, PF, and delay discounting has used money in the DDT but it has been suggested that research into delay-discounting of aversive consequences could contribute to our understanding of avoidance behaviour (Lerman, Addison, & Kodak, 2006; Perrin & Neef, 2012; Salters-Pedneault & Diller, 2013). In a DDT that uses rewards, selection of the smaller sooner option indicates impulsiveness and selection of the larger delayed option indicates self-control. In an aversive delay-discounting task (ADDT), the reverse is true. In other words, choosing the smaller sooner aversive consequence indicates self-control, while choosing the larger delayed aversive

consequence indicates impulsiveness. Problematic avoidance behaviour can be understood to involve a similar process. For example, an opiate addict will often choose to avoid a smaller sooner aversive event (withdrawal) despite this choice leading to worse withdrawal effects later on, as well as poor health or even death. Similarly, a person reporting high levels of social anxiety may not attend a social engagement to avoid the aversive emotional response elicited in social situations, despite this choice increasing the severity of the emotional response through negative reinforcement in future social situations.

A possible explanation for the failed replication of Rounds et al. (2007), and the failure of Berghoff et al. (2014) to find a relationship between AAQ-II scores and rates of delay discounting could be the domain (e.g. money, drugs, health outcomes, etc.) being assessed in the DDT. While some research (Charlton & Fantino, 2008; Johnson et al., 2010; Jones & Rachlin, 2009) has shown that people discount rewards similarly across domains, other research (Jimura et al., 2011; Odum, 2011; Rasmussen et al., 2010; Weatherly, Terrell, & Derenne, 2010) has failed to find a significant relationship. For example, Rasmussen et al. (2010) found that percentage of body fat predicted delay-discounting for food rewards, but not for monetary rewards. Thus, it stands to reason that an ADDT may be better suited to investigate avoidance behaviour given the important role of aversive consequences in avoidance behaviour. Salters-Pedneault and Diller (2013) did exactly that.

Thirty-three undergraduate students completed an ADDT and the AAQ-II to determine the relationship between EA and delay discounting of aversive events (Salters-Pedneault & Diller, 2013). The authors hypothesised that participants demonstrating higher EA (higher scores on the AAQ-II) would be more likely to avoid the immediate aversive consequence (electric shock) in

favour of the delayed but more severe shock (i.e. show impulsiveness). In the ADDT, participants made a series of choices between an immediate half-second electric shock, and three delayed half-second shocks. The delay to the triple-shock increased over blocks from 1s to 120s. There were six blocks, each with eight trials², and the first two trials in each block were ‘forced-choice’ trials in which the participant could only select the immediate option (first trial), and then the delayed option (second trial). In the remaining six trials, participants were free to select either option. The results showed a significant difference in AAQ-II scores between participants who never selected the three-shock alternative, and participants who selected it at least once (Mann-Whitney’s $U = 64.50$, $z = 2.16$, $p = .03$). Participants who scored higher on the AAQ-II (more EA) were more likely to select the delayed, three-shock alternative, supporting the author’s hypothesis (Salters-Pedneault & Diller, 2013). One important limitation of this study was that many participants (33%) never selected the three-shock alternative, suggesting a floor effect of the measure that may obscure relevant participant differences. One of my primary foci for Experiment 2 will be to attempt to replicate this finding while modifying the procedure to try to limit the floor effect found in Salters-Pedneault and Dillers’ (2013) ADDT.

Preliminary Evidence of the Link between EA, PF, and IRAP Performance

The IRAP, as explained in my General Introduction, is generally considered a measure of the strength of pre-existing brief immediate relational responding (BIRRs). The IRAP, however, can also be considered a measure of what is termed relational flexibility (O’Toole & Barnes-Holmes, 2009). The D-

² Salters-Pedneault and Diller (2013) mistakenly stated that each block had only seven trials when, in fact, it was eight (J. W. Diller, personal communication, September 8, 2014).

IRAP score is a measure of the difference in response latencies between two contradicting relations (e.g. Fast food – unhealthy – true and fast food – unhealthy – false). Relational flexibility describes how quickly a person responds to relations that contradict previously established relations (O'Toole & Barnes-Holmes, 2009). To use the above example, if a person is asked to explain how fast food *is not* unhealthy, they will likely take longer to respond than if they were asked to explain how fast food *is* unhealthy. This is because the relation 'fast food – unhealthy – true' is associated with a stronger learning history than the relation 'fast food – unhealthy – false'. Some people will be quicker than others to respond to these inconsistent relations, demonstrating higher levels of relational flexibility. Thus, D-IRAP scores can be considered a measure of relational flexibility, with smaller D-IRAP scores indicating higher levels of relational flexibility. As a person's relational flexibility is dependent on their learning history around specific relational responses, it may be possible to gain a measure of a person's EA and PF by measuring relational responses around emotions. Hussey and Barnes-Holmes (2012) suggested that an IRAP task in which stimuli around avoidance or acceptance of emotions are presented, for example presenting 'happiness' and 'sadness' with 'I avoid' and 'I embrace', may function as a measure of EA and PF.

To date, two studies (Hooper, Villatte, Neofotistou, & McHugh, 2010; Hussey & Barnes-Holmes, 2012) have investigated the relationship between scores on measures of EA and PF and performance on IRAP measuring BIRRs around emotions. In the first (Hooper et al., 2010), an IRAP using stimuli around avoiding and accepting negative emotions was administered to participants ($n = 24$) both prior to, and following 10 minutes of either mindfulness or thought suppression training. For this IRAP, more negative D-IRAP scores indicated more

EA (less PF). Data for individual trial types were not reported, only the overall mean D-IRAP scores for each group. Participants also completed a slightly older, 10-item version of the AAQ-II (Bond et al., 2010) both at pre and post training. Figure 2.1 shows the results of the IRAP at pre and post training for both groups. Figure 2.1 shows that both groups produced similar D-IRAP scores pre-training. At post training, the D-IRAP scores changed for both groups, but in opposite directions with the thought suppression group producing lower D-IRAP scores (more EA and less PF) and the mindfulness group producing higher D-IRAP scores (less EA and more PF). For the group that received the thought suppression training, D-IRAP scores indicated a slight, and not significant ($p > .05$), increase in EA (and decrease in PF) while the group that received the mindfulness training showed a significant decrease in D-IRAP scores, indicating lower EA (and more PF), $t(14) = -3.14, p < .05$. Similarly on the ten-item AAQ-II, the mindfulness group showed a significantly increase in EA and PF, $t(14) = -2.52, p < .05$, though the authors note the mean difference in terms of score was only 2-3 points which represents a relatively small change for this measure (Hooper et al., 2010). These

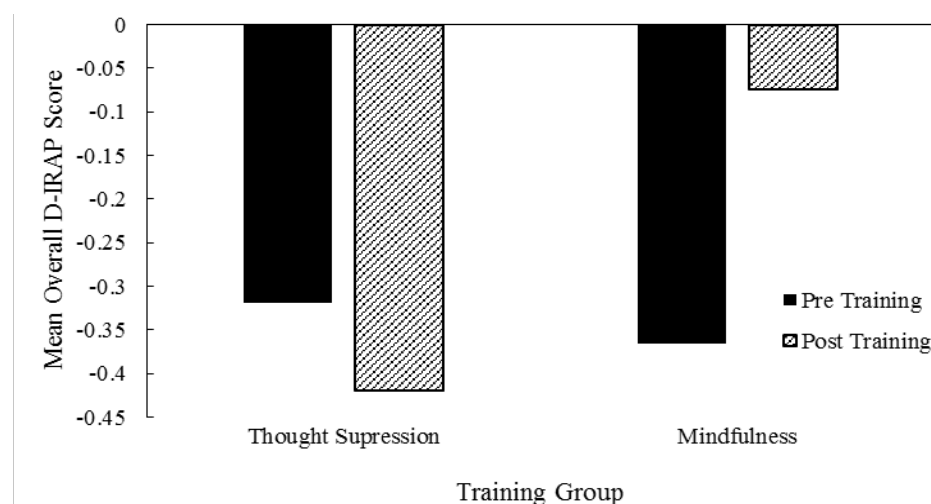


Figure 2.1. Mean overall D-IRAP scores for two groups both pre and post receiving either thought suppression or mindfulness training from Hooper et al. (2010).

results suggest an IRAP presenting stimuli around avoiding and accepting emotions could function as a measure of EA and PF.

The second study (Hussey & Barnes-Holmes, 2012) to date to attempt to use the IRAP as a measure of EA and PF involved an IRAP with stimuli modelled on items from the Depression Anxiety Stress Scales (DASS-42: Lovibond & Lovibond, 1993). Participants ($n = 29$) were split into two groups based on their scores on the 10-item AAQ-II, either 'Low Flexibility' or 'High Flexibility'. Participants completed the 10-item AAQ-II, along with the IRAP, both prior to, and following, listening to a piece of classical music (Albinoni's "Adagio in G Minor") which was expected to induce a sad mood. For the IRAP used in this study, as with the previous study (Hooper et al., 2010), only the overall mean D-IRAP scores were reported. On this IRAP, positive D-IRAP scores indicated that participants were faster to respond with 'true' than 'false' on trials in which positive emotion stimuli were presented (e.g. 'When things go well' with 'I feel happy' or 'When things go badly' with 'I feel positive') *and* that they were faster to respond with 'false' than 'true' on trials in which negative emotion stimuli were presented (e.g. 'When things go well' with 'I feel sad' or 'When things go badly' with 'I feel hopeless'). In other words, a positive D-IRAP score indicated a positive emotional bias and negative D-IRAP scores indicated a negative emotional bias. Figure 2.2 shows the results from the IRAP for the two groups both pre and post listening to the piece of music. Figure 2.2 shows that pre-music, the D-IRAP scores of the Low Flexibility group actually indicated a stronger positive emotional bias than the High Flexibility group, however at post-music this relationship was flipped. The D-IRAP scores of the Low Flexibility group inverted and showed a negative emotional bias while the D-IRAP scores of the High Flexibility group indicated a slightly more positive emotional bias than at

pre-music. Statistical analyses showed that the D-IRAP scores of the groups did not significantly differ at pre-music ($p = .43$) but did at post-music, $t(28) = 2.50$, $p = .02$. The difference in D-IRAP scores between pre- and post-music was significant for the Low Flexibility group, $t(14) = 2.81$, $p = .02$, but not for the High Flexibility group, $p = .77$. The relationship between D-IRAP scores and scores on the AAQ-II was not reported, though the higher D-IRAP scores shown for the Low Flexibility group at pre-music, as seen on Figure 2.2 (black bars), tentatively suggest that higher D-IRAP scores may indicate lower PF (and more EA). The finding that D-IRAP scores for people in the Low Flexibility group were strongly affected by the music supports the idea of the IRAP as a measure psychological flexibility. The authors explained, “Flexibility here refers [...] to an ability to react to external stressors with attenuated psychopathological responses. More informally, flexibility refers to an individual's ability to take an external stressor “on the chin,” whereas inflexibility refers to the tendency to “throw in the towel” when facing psychological challenge. From this perspective, the lack of change seen on the IRAP following sad mood induction indicates high flexibility,

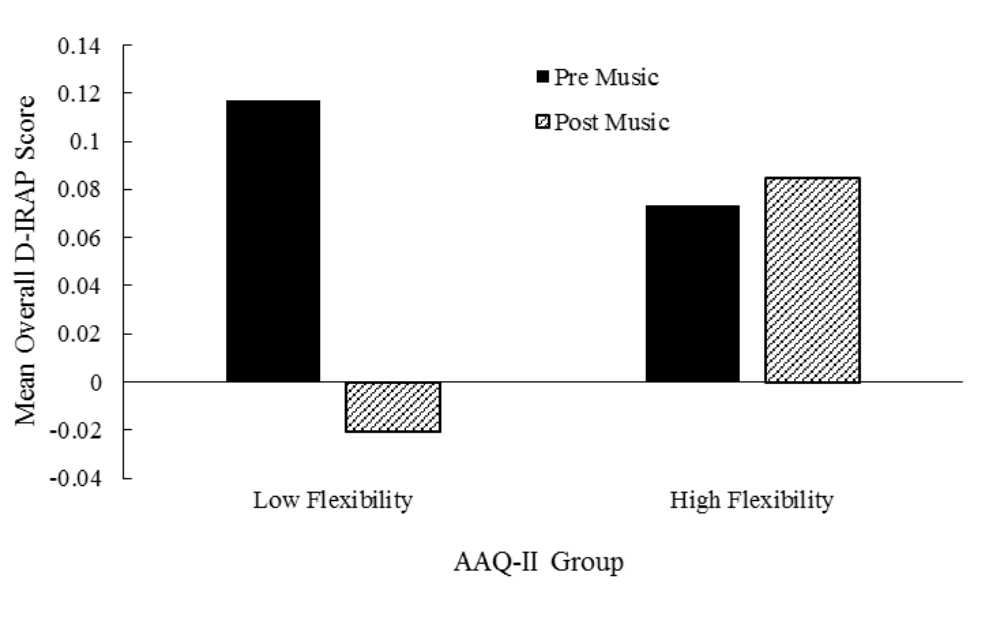


Figure 2.2. Mean overall D-IRAP scores for two groups both pre and post listening to a piece of music designed to induce a sad mood.

whereas change indicates low flexibility” (Hussey & Barnes-Holmes, 2012, p. 580).

In summary, the results from the two IRAP studies presented here have suggested that the IRAP may be sensitive to changes in an individual’s EA and PF, as measured on the AAQ-II. However, no research has reported the direct relationship between these measures and one of the primary foci of my Experiment 2 will be to elucidate this relationship.

The Present Study

My Experiment 2 will investigate the relationship between IRAP performance, the AAQ-II, and performance on an ADDT. I will present two IRAPs to participants. The first will be the Gender Chore IRAP used in Experiment 1, as this IRAP was shown to increase pass rates on subsequent IRAPs. The second IRAP will present stimuli around avoiding and accepting emotions (hereafter Emotion IRAP). The target words will be ‘happiness’ and ‘sadness’ and the evaluative words will be words like ‘to experience’, ‘good’, ‘avoid’, and ‘bad’. The ADDT will be a modification of Salters-Pedneault and Diller’s (2013) ADDT.

My hypotheses are as follows. Firstly, D-IRAP scores on the Emotion IRAP will positively correlate with levels of EA and lower PF as measured on the AAQ-II (i.e. higher AAQ-II scores) for the overall mean and possibly for the four trial types. Secondly, higher D-IRAP scores on the Emotion IRAP will predict higher impulsiveness as measured on the ADDT for the overall mean and possibly the four trial types. Thirdly, higher EA and lower RF as measured on the AAQ-II (i.e. higher AAQ-II scores) will positively correlate with impulsiveness as measured on the ADDT.

Method

Participants

I recruited 29 psychology students through the University of Waikato's research participant database and word-of-mouth. I offered participants the choice of either credit toward their chosen undergraduate psychology course, or to enter a draw to win a department store gift voucher.

Apparatus

Action and Acceptance Questionnaire II. The AAQ-II (Appendix E; Bond et al., 2011) is a seven-item measure of psychological flexibility as conceptualised in acceptance and commitment therapy (ACT). Participants respond using a seven-point Likert-type scale; 1 – Never True; 2 – Very Seldom True; 3 – Seldom True; 4 – Sometimes True; 5 – Frequently True; 6 – Almost Always True; 7 – Always True. To score, the numbers are summed resulting in a possible range of scores from 7 (Most psychological flexibility) to 49 (Least psychological flexibility). Internal consistency for the current sample was very high (Cronbach's $\alpha = .939$).

Implicit Relational Assessment Procedure. I administered the IRAP on a Dell Optiplex 9020 (Intel 2.8Ghz processor, 3 GB of RAM) IBM-compatible computer running a 32-bit Windows XP Professional operating system (Service Pack 2). A Dell 19" LCD monitor positioned at eye level presented the stimuli. I used the 2012 Update II IRAP (same as Experiment 1), written by Dr. Dermot Barnes-Holmes, which was downloaded from the IRAP research website (<http://irapresearch.org>). Participants used a standard US keyboard to respond to the IRAP trials. Sessions were run in one small, quiet, lit, temperature-controlled room at the University of Waikato, and only myself and the participant were

present. I sat behind and to the side of the participant and observed their responses on a second, identical monitor.

Aversive Delay-Discounting Task. The ADDT was administered on the same computer, and in the same room, as the IRAP. The software was designed and developed by myself and Rob Bakker, a computer technician in the School of Psychology at the University of Waikato, New Zealand. The white noise, with a near instant rise time, was administered through stereo headphones (Sony MDR-NC8) in 300ms bursts. The headphones had an ‘Active Noise Cancelling’ feature that was not activated.

At the start of each session, the noise level was measured using an Extech Instruments 407769 noise meter. The volume was adjusted so the noise level was close to, but never exceeded, 105dBA. Noise levels around 105dBA have been found to be aversive to humans in several studies (Grillon, Baas, Lissek, Smith, & Milstein, 2004; Lissek et al., 2005; Miller, Curtin, & Patrick, 1999; Peri, Ben-Shakhar, Orr, & Shalev, 2000; Sullivan, Warren, & Dabice, 1970; Wang, Baker, Gao, Raine, & Lozano, 2012). Participants could have received a maximum of 90 300ms white noise bursts, resulting in a total of 27.0s (and minimum of 16.2s) of exposure. This maximum amount of exposure to 105dBA noise is less than 10% of the maximum recommended exposure across a single day (U.S. Department of Health and Human Services, 1998) and as such was extremely unlikely to cause damage to participant’s ears. Participants were required to declare that they had “no known history of hearing-related issues, which could affect the safety of this procedure” on the consent form (Appendix F). The consent form also contained the advice “If you use a hearing aid or cochlear implant, this procedure is not recommended” to further reduce the risk to participants.

The ADDT consisted of 48 trials across six blocks of differing long delays based on Salters-Pedneault and Diller’s (2013) task. The short delay was always 1s and the long delay lengths were 1s, 10s, 30s, 45s, 90s, 120s, presented in that order (ascending; see Table 2.1). Each block began with two forced choice trials, in only the immediate delay option was available (Trial 1), and then the long delay option (Trial 2). The remaining six trials in each block were free choice, i.e. the participant could select either option. Table 1 shows a summary of the delays used across the blocks. The length of each trial was fixed as Long Delay Length + 5s Inter-trial Interval (ITI).

The ADDT presented participants with explicit instructions on each trial. For example, in Block 2 the instructions were “Press A to receive one blast right away, or

Table 2.1 <i>Summary of the Delays Used in the Aversive Delay Discounting Task Across Blocks</i>		
<u>Block Number</u>	<u>Short Delay</u>	<u>Long Delay</u>
1	1s	1s
2	1s	10s
3	1s	30s
4	1s	45s
5	1s	90s
6	1s	120s

press B to receive a double-blast after a 10-second delay”. These instructions were presented in the centre of the screen, in black text on a white background. The two response options were displayed as grey buttons with either “A” or “B” black text. The short delay (Button A) was always in the bottom left corner of the screen, and the long delay (Button B) was in the bottom right. During the delay and ITI, the ADDT presented a black ‘+’ sign in the centre of the screen. Participants used a standard PC mouse to respond on the trials.

IRAP Conditions

Two IRAP conditions were used in this experiment though not all were completed by all participants due to failure to meet the practise criteria (see Results).

Gender chores. Twenty-six participants completed an IRAP contrasting household chores as either male or female tasks. The stimuli were identical to those used in the first experiment. Table 2.2 shows the stimuli used for this IRAP.

Emotions. Twenty-four participants completed an IRAP contrasting emotions ‘Happiness’ and ‘Sadness’. The evaluative stimuli were positive/acceptance words and negative/avoidance words such as ‘To experience’ or ‘Healthy’ and ‘Avoid’ or ‘Sick’. Table 2.2 shows the stimuli used for this IRAP.

Procedure

As I failed in the first experiment failed to find any order effects, the IRAP, and all other tasks were presented in the same order. For the IRAP, the gender chores IRAP was presented first, followed by the emotions IRAP. The consistent block was presented first for both IRAPs.

Table 2.2
Stimuli Used Across Two IRAP Tasks. Evaluative Stimuli are Consistent/Inconsistent with Sample 1

	Gender Chores	Emotions
Sample 1	Male	Sadness
Sample 2	Female	Happiness
Consistent Evaluative Stimuli	Waterblasting	Avoid
	Cleaning Gutters	Bad
	Lawn Mowing	Harmful
	Taking Out Rubbish	Ignore
	Car Maintenance	Wrong
	Chopping Wood	Sick
Inconsistent Evaluative Stimuli	Cooking	To experience
	Mopping	Good
	Ironing	Beneficial
	Sewing	Embrace
	Laundry	Right
	Dusting	Healthy
Response Option 1	Right	Similar
Response Option 2	Wrong	Opposite

I welcomed participants to the session, assigned a participant number to preserve confidentiality and asked them to read through the brief (Appendix G).

The brief outlined the three tasks in the order they would be presented to the participant. The AAQ-II section briefly described the measure and provided a definition of psychological flexibility. The IRAP section was very similar to the brief used in Experiment 1 (Appendix A) and explained they were required to sort words. This section also mentioned they were not being asked for their opinions or beliefs, just to sort the words as directed. The ADDT section outlined the procedure and offered the participants the choice to not complete this task while still completing the first two tasks for partial course credit. No participants withdrew from the ADDT. I then answered any questions and, once satisfied, the participant signed the consent form (Appendix F).

I used the IRAP experimenter's script (Version 1.51; Appendix D) as a guide when instructing participants. I directed participants to read the rule on the screen and then gave two examples of a correct response, using stimuli from the Gender Chores IRAP. During the first two blocks of trials, the participants were not made aware of the 80% accuracy and 2,000ms response-speed practise criteria. Upon completion of the first two blocks (first block-pair), the IRAP presented feedback on screen that stated the accuracy and median response latencies for the two blocks. I explained the practise criteria by saying "Go as slowly as you need to get them all correct according to the rule". I explained that from the second block-pair onward, when their response latency exceeded the 2,000ms target on a trial, an exclamation mark would appear on the screen. Participants completed up to four practise block-pairs and if they still did not achieve the practise criteria, that IRAP was concluded and the next IRAP began. When the participant achieved the practise criteria across one block-pair, I explained they were completing the experiment proper, and would have three more block-pairs of trials. At any point in the experiment, if participants

responded incorrectly on three consecutive trials, I reminded them to slow down and to focus on responding accurately.

Once the gender chores IRAP was completed, the participant completed the emotions IRAP. If the participant did not achieve the practise criteria on either IRAP, they were thanked and debriefed, and no more data were collected. Once participants completed the emotions IRAP, they started the ADDT. I gave the following instructions:

In this task, you will be making choices around aversive consequences, in this case loud 'white noise'. You will be asked to make a series of choices between an immediate, single noise blast, and a delayed, double-blast. The delay of the second choice is added after the immediate blast option so choosing the immediate option every time will not make the experiment shorter. For example when the delay is two minutes; if you press the delayed option you will wait two minutes and then hear the blast but if you select the immediate option you will hear the blast straight away, and will then wait two minutes before the next trial. There will be delays of up to two minutes and I ask you do not do anything during that time. Finally, the noise levels used in this experiment are safe, however if you experience any ringing, or pain in your ears at any time then let me know immediately and we will stop the experiment.

I then answered any questions, and instructed the participant to place the headphones on their head, and made sure they had done so correctly. Participants then completed the ADDT and I remained in the room the entire time to ensure they didn't do anything else (e.g. use their mobile phones).

Once participants had completed the ADDT they were thanked and debriefed. The experimental session typically lasted approximately 90 minutes.

Results

Data Preparation

I used the same process to transform the raw IRAP data into D-IRAP scores as was used in Experiment 1. As in Experiment 1, participant's data were excluded if accuracy failed to stay above 70% or if response latencies across a block exceeded 3,000ms for two or more blocks. If this were the case for only one block, this block was excluded and mean D-IRAP scores were recalculated from the remaining two blocks. Unlike Experiment 1, when a participant's data were excluded for one IRAP, their entire dataset was discarded (see Pass Rates section below for details). The dependent variable for the ADDT was the overall percentage of trials in which the long delay was chosen, calculated by dividing the number of trials in which the participant selected the long delay option by the total number of free choice trials (36), as this was the same process used by Salters-Pedneault and Diller (2013).

IRAP Internal Consistency

I measured internal consistency using the split-half method, calculating D-IRAP scores for odd and even numbered trials for each of the three IRAPs. I produced Pearson correlations which were corrected using the Spearman-Brown formula. Internal consistency for the two IRAPs were acceptable and significant ($r_{\text{GENDER}} = .662, p = .027, r_{\text{EMOTIONS}} = .662, p = .021$).

IRAP Pass Rates

Twenty-nine participants attempted the Gender Chore IRAP and 26 (89.7%) achieved the practise criteria to complete the test blocks. Two participants failed to stay within the 70/3000 criteria on the test blocks and their data sets were discarded. Of the remaining 26 participants who attempted the Emotion IRAP, 24 (92.3%) passed. None of the test block data were beyond the

70/3000 criteria for this IRAP. Three participants did not complete the ADDT as they requested to complete it in a later session, but never returned, resulting in 20 complete data sets.

Trial Type Analysis

One-sample t-tests were completed for overall mean D-IRAP and the four trial types to determine whether they were significantly different from zero, and Cohen's *d* effect sizes were calculated. Table 2.3 shows the mean D-IRAP score, *SEM*, *N*, *t*, *p*, and Cohen's *d* values for each of the trial types and overall mean for each of the three IRAPs. Across all two IRAPs, the mean overall D-IRAP scores were all positive and significantly different from zero, showing the participants were significantly faster to respond in the consistent blocks than they were to respond in the inconsistent blocks. For the Gender Chore IRAP (Table 2.3, top section), the means ranged from 0.16 to 0.40, and only Trial Type 1's D-IRAP score was not significantly different from zero ($p = .063$). I found the strongest effect sizes on Trial Types 3 ($d = 1.05$) and 4 ($d = 0.99$). Figure 2.3 shows the mean D-IRAP scores across trial types, and for the mean, for the Gender Chore IRAP. The D-IRAP scores vary considerably across trial type. For the Emotion IRAP (Table 2.3, lower section) Trial Type 1 ($d = 1.00$) had the strongest effect

Table 2.3
Mean D-IRAP Score, SEM, N, t, p, and Cohen's d Scores for all Trial Types and Overall Mean across Two IRAP Tasks.

<u>Trial Type</u>	<u>Mean D-IRAP</u>	<u>SEM</u>	<u>N</u>	<u>t</u>	<u>p</u>	<u>Cohen's d</u>
Gender 1: Men – Male Chore	.16	.08	20	2.0	.063	0.44
Gender 2: Men – Female Chore	.26	.11	20	2.5	.023	0.55
Gender 3: Women – Male Chore	.34	.07	20	4.7	<.001	1.05
Gender 4: Women – Female Chore	.40	.09	20	4.4	<.001	0.99
Gender Overall	.29	.07	20	4.4	<.001	0.99
Emotions 1: Sadness – Avoid	.30	.07	20	4.6	<.001	1.00
Emotions 2: Sadness – Experience	.18	.07	20	2.5	.021	0.56
Emotions 3: Happiness – Avoid	.26	.08	20	3.1	.005	0.70
Emotions 4: Happiness – Experience	.28	.08	20	3.4	.003	0.76
Emotions Overall	.26	.05	20	5.3	<.001	1.18

size. The means ranged from 0.18 to 0.30, and all trial types were significantly different from zero. Figure 2.4 shows the mean D-IRAP scores across trial type, and for the mean, for the Emotion IRAP. D-IRAP scores are very similar for Trial Types 1, 3, and 4, while the D-IRAP score of Trial Type 2 is noticeably lower than the other three.

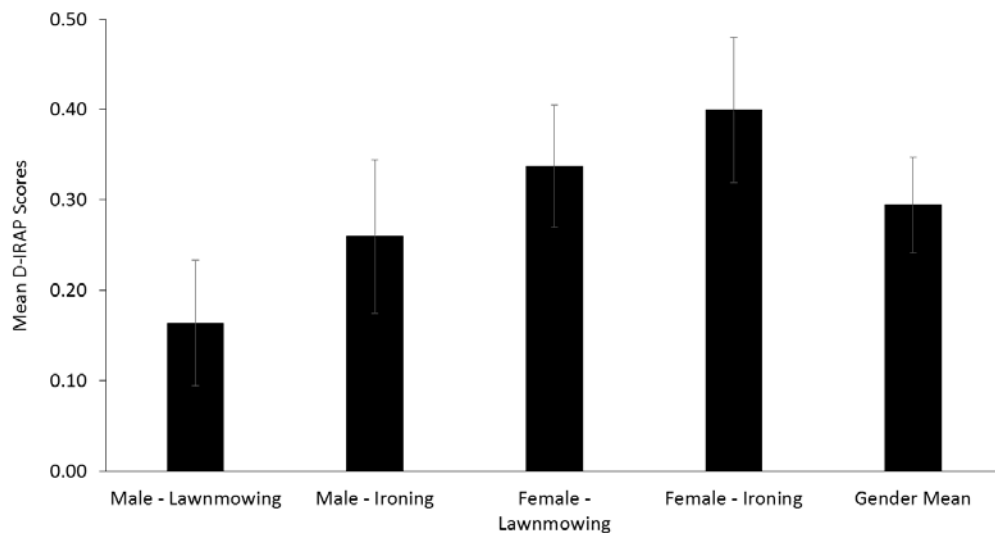


Figure 2.3. Mean D-IRAP scores across trial type, and for the mean, for a Gender Chore IRAP. Error bars represent standard error of the mean. Positive values represent faster responding on consistent blocks.

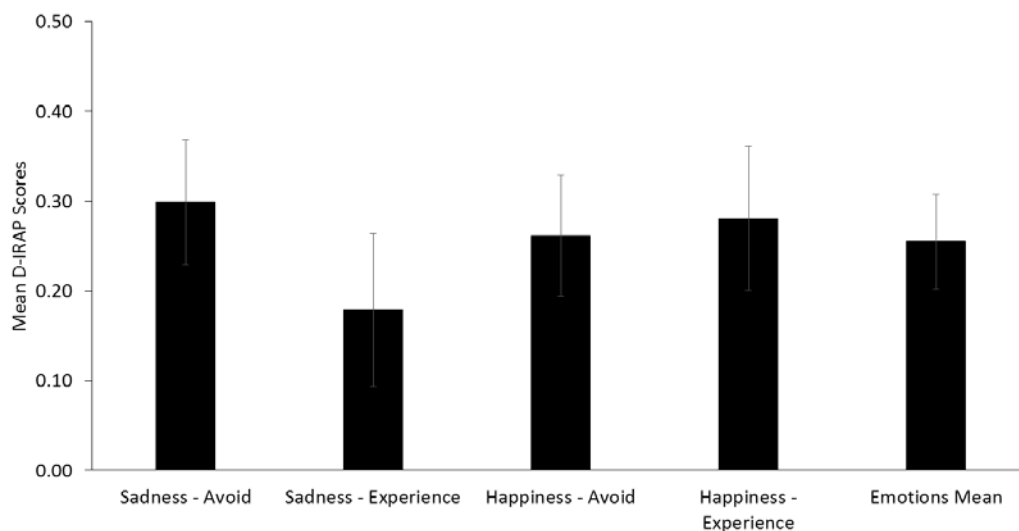


Figure 2.4. Mean D-IRAP scores across trial type, and for the mean, for an Emotion IRAP. Error bars represent standard error of the mean. Positive values represent faster responding on consistent blocks.

AAQ-II and ADDT Descriptive Statistics

The mean AAQ-II score was 24.8 ($SD = 9.21$) with scores ranging from 9 to 39, and the overall distribution was very close to normal (Skewness = 0.03). For the ADDT, the mean percentage of trials in which participants chose the long delay option was 19.6% ($SD = 21.24$). Scores on the ADDT ranged from 0% to 77.8% and were highly positively skewed (Skewness = 1.36). Figure 2.5 shows the frequency distribution of percent of trials in which the long delay was chosen on the ADDT. Figure 2.5 clearly shows the positive skew of the ADDT data, with the majority ($N = 13$; 65%) below the mean. There is a noticeable gap in the data around the mean, with no cases between 15 and 25% and this warranted further analysis.

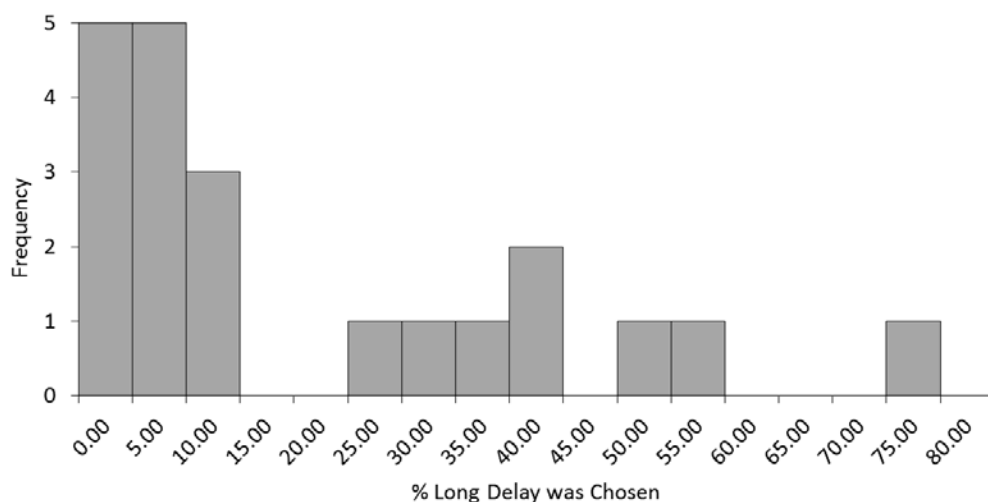


Figure 2.5. Frequency distribution of ADDT scores.

I split the participants into two groups; Low Scorers were those for whom the overall ADDT score was below the mean, and the remaining were High Scorers. Figure 2.6 shows the mean percent of trials in which the long delay was chosen by block number for Low and High scorers. In Block 1, there is a smaller difference between the Low (24%) and High Scorers (38%). However across the remaining blocks the groups begin to clearly differ; Low Scorers selected the long

delay in less than 10% of the trials in each of the remaining blocks, with values decreasing across blocks. High Scorers, however, selected the long delay in more than 33% of the trials across the remaining blocks with values generally increasing across blocks, peaking in Block 5 at 57% before dipping slightly to 48% in Block 6. Due to the differences in trends between the Low and High Scorers, this distinction will be further investigated following the correlation analyses.

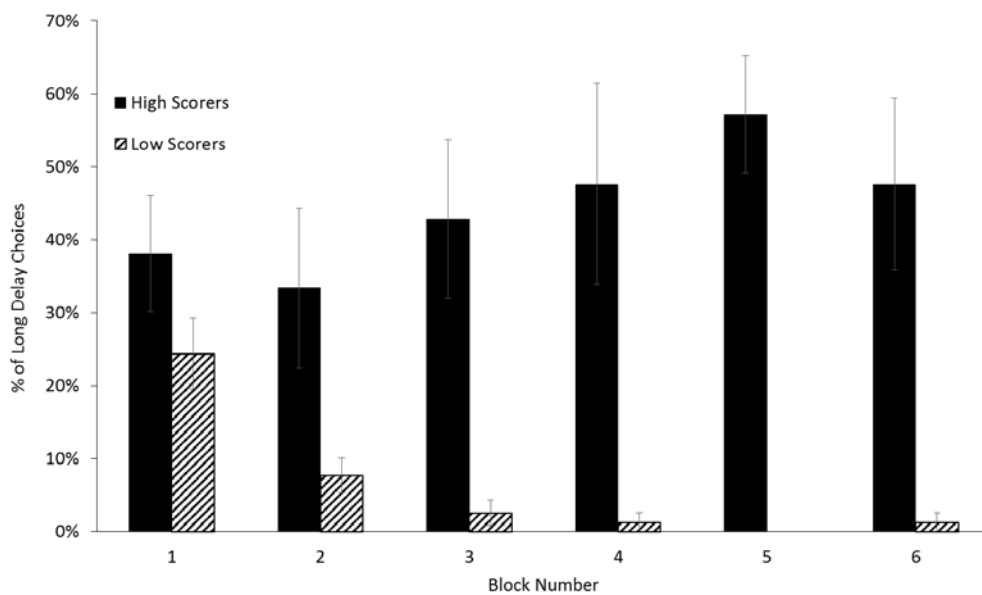


Figure 2.6. Percentage of trials in which the long delay was chosen across block number for the Low and High Scorer groups.

Correlations between IRAPs, AAQ-II, and ADDT.

I calculated Spearman's rank correlations between the IRAP tasks, and the AAQ and ADDT. I used Spearman's as visual inspections of the scatterplots indicated curvilinear trends for most data and the small sample size ($n < 30$).

Gender Chore IRAP and AAQ-II. Significant negative correlations were found between AAQ-II score and Trial Type 2 (Male – Female Chore), $r_s(20) = -.476, p = .034$, Trial Type 4 (Female – Female Chore), $r_s(20) = -.692, p = .001$, and the overall mean, $r_s(20) = -.573, p = .008$. The remaining trial type correlations were negative, but not significant ($ps \geq .331$). Figure 2.7 shows two

scatterplots; the left panel shows the correlation between Trial Type 2 and AAQ-II scores, and the right panel shows the correlation between Trial Type 4 and AAQ-II scores. Figure 2.7 shows that the negative correlation between AAQ-II scores and D-IRAP scores on Trial Type 4 (right panel) is stronger than the correlation between AAQ-II scores and D-IRAP scores on Trial Type 2 (left panel), with one possible outlier on the Trial Type 2 graph (left panel) on the right side near the AAQ-II score of 30.

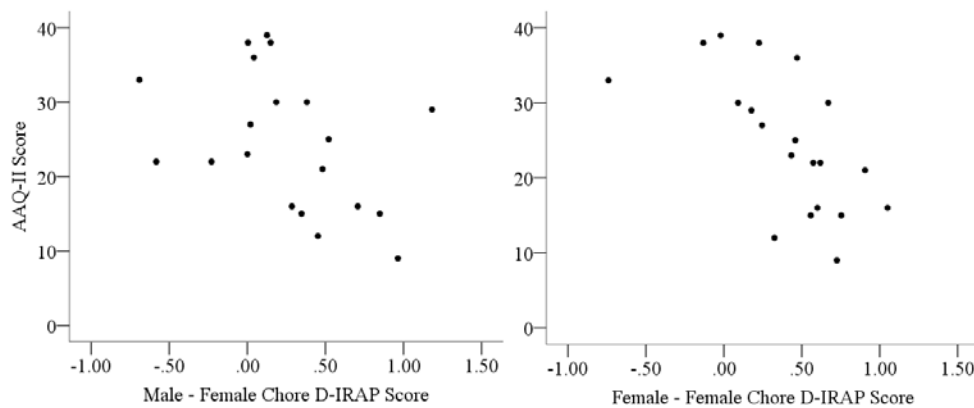


Figure 2.7. Correlations between AAQ-II scores and D-IRAP scores on the Gender Chore IRAP. Left panel shows the correlation for Trial Type 2 (Male – Female Chore). Right panel shows the correlation for Trial Type 4 (Female – Female Chore).

Emotion IRAP and AAQ-II. A moderate, non-significant positive correlation was found between AAQ-II scores and Trial Type 4 (Happiness – Experience), $r_s(20) = .425, p = .062$. No significant correlations were found between AAQ-II scores and any of the remaining trial types, or the overall mean, (all $ps \geq .233$).

Gender Chore IRAP and ADDT. Significant positive correlations were found between scores on the ADDT and Trial Type 2 (Male – Female Chore), $r_s(20) = .747, p < .001$, Trial Type 3 (Female – Male Chore), $r_s(20) = .647, p = .002$, Trial Type 4 (Female – Female Chore), $r_s(20) = .535, p = .015$, and the overall mean, $r_s(20) = .786, p < .001$. Trial Type 1 (Male – Male Chore) did not

significantly correlate with ADDT scores, $r_s(20) = .344, p = .137$. Figure 2.8 shows the correlations between ADDT scores and the four trial types. Positive correlations are visible for all four trial types. The left top panel (Trial Type 1) shows a moderate linear positive correlation, with data bunched at lower ADDT scores but more spread out at higher ADDT values and no clear outliers. The right top panel (Trial Type 2) shows a stronger, curvilinear, positive correlation with no clear outliers. The left lower panel (Trial Type 3) shows a weaker, again curvilinear, positive correlation with three potential outliers (near the top, near the right hand side, and the bottom left-most point). Finally, the right lower panel (Trial Type 4) shows a moderate, curvilinear, positive correlation with no clear outliers.

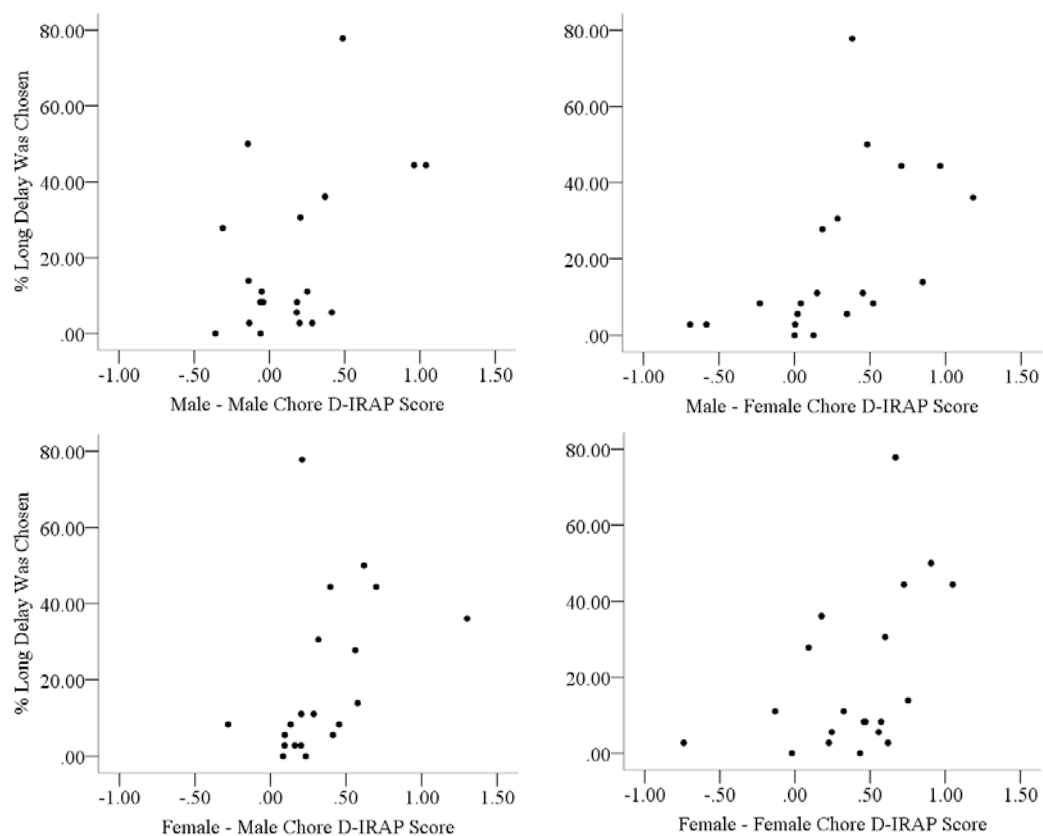


Figure 2.8. Correlations between ADDT scores and D-IRAP scores on the Gender Chore IRAP. Left top panel shows the correlation for Trial Type 1 (Male – Male Chore). Right top panel shows the correlation for Trial Type 2 (Male – Female Chore). Left lower panel shows the correlation for Trial Type 3 (Female – Male Chore). Right lower panel shows the correlation for Trial Type 4 (Female – Female Chore)

Emotion IRAP and ADDT. Significant negative correlations were found between ADDT scores and Trial Type 1 (Sadness – Avoid), $r_s(20) = -.536$, $p = .015$, and Trial Type 4 (Happiness – Experience), $r_s(20) = -.446$, $p = .049$. Correlations between ADDT scores and the remaining two trial types, and the overall mean, were not significant ($ps \geq .272$). Figure 2.9 shows the correlations between ADDT scores and Trial Type 1 (Sadness – Avoid; left panel), and Trial Type 4 (Happiness – Experience; right panel). The left panel (Trial Type 1) shows a negative, slightly curvilinear correlation with no obvious outliers. The right panel (Trial Type 4) also shows a negative, curvilinear correlation with a possible outlier at the top-centre of the graph.

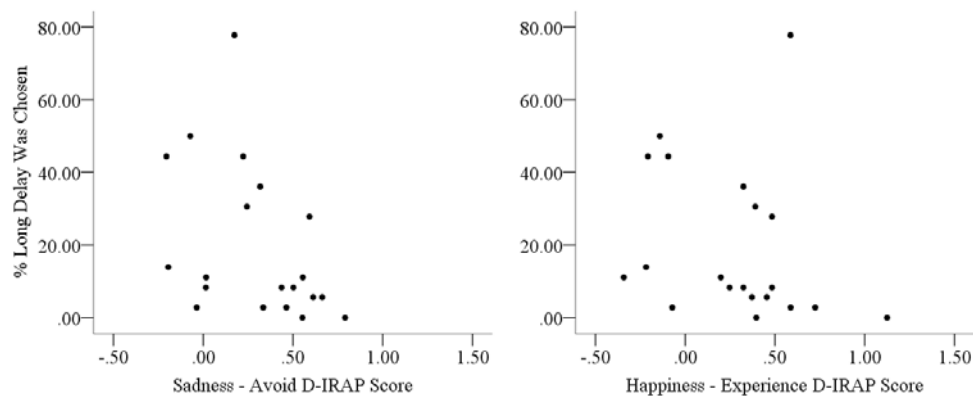


Figure 2.9. Correlations between ADDT scores and D-IRAP scores on the Emotion IRAP. Left panel shows the correlation for Trial Type 1 (Sadness – Avoid). Right panel shows the correlation for Trial Type 4 (Happiness –

AAQ-II and ADDT. A weak, negative, not significant correlation was found between scores on the AAQ-II and the ADDT, $r_s(20) = -.374$, $p = .104$.

Low Scorers and High Scorers on ADDT

I calculated a one-way MANOVA with Low/High Scorers as the independent variable and D-IRAP scores across all trial types and means for the two IRAP tasks, and AAQ-II scores, as the dependent variables. I also conducted Levene’s homogeneity of variance tests and when the data violated the assumption of homogeneity, I conducted an independent-sample t-test and didn’t

assume equality of variances. For the Gender Chore IRAP, significant differences in D-IRAP scores were found on Trial Type 2, $F(1,18) = 7.49, p = .014$, Trial Type 3, $F(1,18) = 9.127, p = .007$, and for the overall mean, $F(1,18) = 13.54, p = .002$. No significant differences were found for Trial Types 1 and 4 ($ps \geq .099$). For the Emotion IRAP, no significant differences were found for any trial type or for the mean ($ps \geq .207$). I found no significant difference between Low and High Scorers' scores on the AAQ-II, $F(1,18) = 1.35, p = .261$.

In summary, on the Gender Chore IRAP participants were significantly faster to respond during the consistent blocks on three of the four trial types, and overall. For the Emotion IRAP, participants were significantly faster to respond during the consistent blocks on all four trial types, and overall. For the AAQ-II, significant correlations were found for D-IRAP scores of Trial Type 4 of the Gender Chore IRAP, and the overall mean of the Gender Chore IRAP. For the ADDT, significant correlations were found for D-IRAP scores on three of the four trial types, and the overall mean, on the Gender Chore IRAP.

Discussion

My hypotheses were as follows. Firstly, higher D-IRAP scores on the Emotion IRAP would positively correlate with higher levels of EA and lower PF as measured on the AAQ-II (i.e. higher AAQ-II scores) for the overall mean and possibly for the four trial types. This hypothesis was not confirmed. Secondly, higher D-IRAP scores on the Emotion IRAP would predict higher impulsiveness as measured on the ADDT for the overall mean and possibly the four trial types. My results showed negative correlations between these measures, thus not supporting this hypothesis. Thirdly, higher EA and lower RF as measured on the AAQ-II (i.e. higher AAQ-II scores) would positively correlate with impulsiveness as measured on the ADDT. This hypothesis was also not confirmed. While no hypotheses were generated for the Gender Chore IRAP, several relationships were found and are discussed below.

Gender Chore IRAP

Unexpectedly, strong positive correlations were found between most of the Gender Chore IRAP's trial types, and the overall mean, and scores on the ADDT. That is, participants who showed less relational flexibility for the Male – Female Chore, Female – Female Chore, and Female – Female Chore relations were more impulsive. The correlation coefficients for the aforementioned relationships were moderate to strong (.535 - .747) suggesting that people who demonstrate relationally flexibility around gender stereotypes are more likely to demonstrate self-control. Somewhat surprisingly, there appears to be no literature investigating or even speculating on the relationship between gender stereotyping and impulsiveness. Considering the strength of the correlations and the consistency across trial types found in my data, further investigation in this area could be very fruitful.

The observed negative correlations between two of the Gender Chore IRAP's trial types, and the overall mean D-IRAP score, and the AAQ-II were similarly unexpected. Participants who demonstrated less relational flexibility on the Male – Female Chore and Female – Female Chore relations demonstrated more psychological flexibility and less experiential avoidance on the AAQ-II. In other words, participants with less flexibility around gender roles were less experientially avoidant and more psychologically flexible. A recent criticism of the AAQ-II (Wolgast, 2014) may shed some light on this finding. Wolgast (2014) attempted to discover whether the AAQ-II was measuring EA and PF, or rather the quality of life outcomes posited to be associated with EA and PF, such as psychological distress. The results suggested that scores on the AAQ-II were more closely related to general levels of psychological distress than specific the behavioural patterns of avoidance and PF. Research (Killen & Stangor, 2001; Mulvey & Killen, 2015; Toomey, Card, & Casper, 2014) has found that people who act in ways that disconfirm gender stereotypes are more likely to experience aggression, abuse, and social exclusion – all factors that increase psychological distress. Understanding the AAQ-II as a measure of distress thus explains my finding that higher AAQ-II scores (meaning more distress) were associated with more flexibility around gender roles.

Emotion IRAP

Negative correlations were found between two of the Emotion IRAP's trial types and scores on the ADDT. Participants who were more flexible around the Sadness – Avoid and Happiness – Experience relations demonstrated more impulsiveness. Said another way, self-controlled individuals were less relationally flexible. This was the opposite of what I predicted. My hypothesis was that more relational flexibility would predict self-control and was based on two lines of

research. Firstly, more relational flexibility had been found to predict more PF (and less EA; Hooper et al., 2010; Hussey & Barnes-Holmes, 2012), and secondly more PF had been found to predict self-control (Berghoff et al., 2012; Morrison et al., 2014). While this was true for the Gender Chore IRAP, the opposite was true for the Emotion IRAP. As I could find no other research that has directly investigated the relationship between relational flexibility and impulsiveness, more research is needed before any attempt to generalise my findings can be made.

No correlations were found between any of the trial types of the Emotion IRAP and scores on the AAQ-II. A moderate positive, yet non-statistically significant, correlation was found for the Happiness – Experience relation, tentatively suggesting that less relational flexibility around happiness may predict less psychological flexibility, which is consistent with my hypothesis. As previous researchers (Hooper et al., 2010; Hussey & Barnes-Holmes, 2012) who used the IRAP and AAQ-II did not report the correlations between these measures, I cannot directly compare my results to theirs. However, when Hussey and Barnes-Holmes (2013) assigned their participants into groups based on low and high scores on the AAQ-II, no difference in D-IRAP scores was found between the groups (before listening to the music). As no difference was found, this loosely suggested the IRAP was unable to discriminate between low and high scorers on the AAQ-II which is consistent with my findings.

AAQ-II and the ADDT

I found no relationship between scores on the AAQ-II and the ADDT, contrary to my hypothesis. This finding is consistent with research (Berghoff et al., 2012) that used a monetary DDT, but did not support the findings of Salters-Pedneault and Diller (2013) who used an ADDT. One explanation for the failure

to replicate Salters-Pedneault and Diller's results could be the different way in which the data were analysed. Salters-Pedneault and Diller assigned participants into two groups based on whether or not they ever selected the delayed (impulsive) alternative, and conducted a Mann-Whitney U test. I tested whether the same analysis would yield a significant result for my data, although only 10% of my participants never selected the delayed option, compared to a third of the participants in Salters-Pedneault and Diller's study. There was no significant difference in AAQ-II scores between the groups, $U = 9.00$, $z = -1.14$, $p = .256$, though this could be attributed to the very low number of participants who never chose the delayed option. However, as discussed in my Experiment 2 introduction, the fact that so many of Salters-Pedneault and Diller participants never selected the delayed alternative represents a floor effect in their ADDT, and could have been obscuring important differences. Given that my and Salters-Pedneault and Diller's experiments are the first two experiments to administer an ADDT and a measure of EA and RF, further replication is required before any generalisations can be drawn.

There were two important differences between my and Salters-Pedneault and Diller's (2013) ADDT which could also explain the failure to replicate. The first was the type of aversive stimulus employed in the ADDT. I used white noise whereas Salters-Pedneault and Diller (2013) used electric shock. When planning my study, I had originally planned to use electric shock but was unable to access the equipment needed to safely and reliably administer electric shocks to participants. It may be that sensation of an electric shock, being a physical sensation, more closely resemble physical sensations commonly labelled anxiety compared to the auditory white noise stimuli. Thus, an ADDT using electric shock may be a better model of the processes involved in EA. The second difference

between my and Salters-Pedneault and Diller's (2013) ADDT was the magnitude of the increase of the aversive stimulus between the immediate and delayed option. In Salters-Pedneault and Diller's (2013) ADDT, a single shock was administered when the immediate option was selected, and three shocks were administered on the delayed option. In my ADDT, one white noise blast was administered on the immediate option, and two blasts on the delayed option. In other words, Salters-Pedneault and Diller's (2013) delayed consequence was triple the immediate consequence and mine was only double. I chose to reduce the magnitude of the increase to try to reduce the floor effect found in Salters-Pedneault and Diller's (2013) ADDT (discussed above, and in the introduction section). While this change successfully reduced the proportion of participants who never selected the delayed option (10% vs. 33%), it may have had other unintended effects on participant's choices.

There were two limitations around the use of the ADDT. First, many participants reported that, while the white noise was aversive at first, they became accustomed to it over time, and as such the white noise may not have been as aversive in later trials. Future research could try to find an aversive consequence less likely to decrease in effectiveness over the course of a session. The second limitation related to the ADDT was an occasional glitch that occurred in the software which caused a white noise burst to be shorter than the normal 300ms. This didn't occur for all participants, and when it did, usually only affected one noise burst throughout the session, and as such was unlikely to have greatly affected results.

One further limitation of my study involves the use of the AAQ-II as a measure of EA and PF. As discussed above, the AAQ-II may not necessarily be a measure of the verbal processes related to EA and PF, but rather a measure of

psychological distress. Future research could employ a more comprehensive measure of EA, such as the Multidimensional Experiential Avoidance Questionnaire (MEAQ; Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011).

Applications, Future Research, and Conclusions

Given the exploratory nature of this study, future research could further investigate the links between EA, RF, impulsiveness, and IRAP performance. My results suggest stereotyping around gender roles may be related to impulsiveness, EA and PF but much more research is needed to generalise these findings. Given the role impulsiveness appears to play in a range of psychological disorders, understanding the verbal processes that relate to impulsiveness could suggest new ways of influencing delay discounting behaviour.

To conclude, my Experiment 2 has demonstrated relationships between performance on the IRAP, impulsiveness, experiential avoidance and psychological flexibility. As this is a very new line of enquiry, much more research is needed in this area before the findings can be generalised. Further research in this area is important, especially given the clinical relevance of impulsiveness and EA.

General Summary

In this exploratory study, I sought to determine the relationship between IRAP performance, experiential avoidance, and impulsiveness. My first experiment was a first attempt to replicate the IRAP effect in a New Zealand sample by administering three IRAP tasks to undergraduate students. In other words, the IRAP was able to discriminate the strength of the learning history around specific relational responses. The results of the first experiment demonstrated the IRAP effect in Dog Breed, Age, and Gender Chore IRAP tasks. Results in the first experiment were consistent with past research and supported the validity of the IRAP in a New Zealand sample.

The results from my first experiment helped to inform my second experiment in two ways. Firstly, confirmation of the IRAP effect in a New Zealand sample supported the use of the IRAP with this population. Secondly, the results from the first experiment suggested it would be beneficial to present the Gender Chore IRAP before the Emotion IRAP to increase the likelihood that participants would successfully complete the task.

In my second experiment, participants completed two IRAPs, the Action and Acceptance Questionnaire II, and an aversive delay discounting task. The first IRAP measured relational flexibility around gender roles while the second measured relational flexibility around accepting and avoiding emotions. The results showed that more relational flexibility around gender chores predicted more self-control on the delay discounting task, and more experiential avoidance while more relational flexibility around emotions predicted more impulsiveness. My results from the second experiment represent one of the first attempts at linking the concepts of experiential avoidance, impulsiveness, and relational flexibility and as such my study is an important first step in understanding the

relationship between these concepts. In order to better understand the relationship between impulsiveness, experiential avoidance, and brief immediate relational responding, future research could use a more specific measure of experiential avoidance and psychological flexibility such as the MEAQ. Additionally, different kinds of DDTs may affect the strength of the relationships between the aforementioned concepts. Future research could use other kinds of aversive stimuli, such as exposure to unpleasant images or unpleasant words in the ADDT.

Impulsiveness, experiential avoidance, and psychological flexibility play an important role in psychological disorders and so the measurement of said processes is of vital clinical importance. One promising application of the IRAP is as a measure of therapeutic progress. In ACT for example, specific verbal processes such as psychological flexibility are targeted and the IRAP could be employed as a measure of these processes, especially given the difficulty of faking IRAP results (McKenna, et al., 2007). Additionally, the IRAP appears to be sensitive to the effects of therapeutic interventions (Hooper et al., 2010), further supporting the IRAP as a measure of therapeutic progress.

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Appendices

Appendix A: Experiment 1 Brief

Language and Cognition Experiment Brief

This experiment is designed to investigate how language and cognition work. The computer program you are about to use is known as the Implicit Relational Assessment Procedure (IRAP; Barnes-Holmes et al., 2006) and it measures your responses to the required tasks. This measure was developed out of a theory of human language and cognition called Relational Frame Theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001).

This research will help to validate the use of the IRAP program and, more broadly, RFT in general.

In this experiment you will be required to sort words from various subject areas into categories that are defined by the program. You will not be asked your opinions or beliefs regarding the subject areas, merely to sort them as directed.

The subject areas that may be used are: dog breeds, gender chores, age, emotions, and smoking.

If you agree to participate, please sign the attached consent form and the researcher will provide further instructions.

References

Barnes-Holmes, D., Barnes-Holmes, Y., Power, P., Hayden, E., Milne, R., & Stewart, I. (2006). Do you really know what you believe? Developing the implicit relational assessment procedure (IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist*, 32(7), 169–177.

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Appendix B: Experiment 1 Consent Form

Consent Form



PARTICIPANT'S COPY

Research Project: Language and Cognition Experiment

Name of Researcher: Joseph Graddy

Name of Supervisor (if applicable): Dr. T. Mary Foster & Dr. Rebecca Sargisson

I have received an information sheet about this research project or the researcher has explained the study to me. I have had the chance to ask any questions and discuss my participation with other people. Any questions have been answered to my satisfaction.

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Research and Ethics Committee (Professor Michael O'Driscoll, Tel: 07 838 4466 ext 8899 and email: m.odriscoll@waikato.ac.nz))

Participant's Name: _____ Signature: _____ Date: _____

Appendix C: Experiment 1 Demographic Form

Language and Cognition Experiment Demographic Questionnaire

Thank you for choosing to participate in this experiment. Please answer the following questions:

1) What is your age? _____

2) What is your gender? (Circle) Female Male

3) In which country did you spend most of your childhood (up to the age of 18?)

4) Do you own a dog? (Circle) Yes No

5) Do you currently smoke cigarettes? (Circle) Yes No

Thank you. Please return this form to the experimenter.

Appendix D: IRAP Experimenter's Script

IRAP Generic Experimenter's Script

The following is by no means the only way to deliver an IRAP, but we suggest a standardised script may be useful. If you have any questions, comments or feedback, please email me! (ian.hussey@nuim.ie)

Boxed text denotes instructions to the experimenter that are not spoken to the participant.

Bold Text denotes content that may differ depending on the IRAP.

Before beginning, have the IRAP prepared at the pre-block screen that states the rule (after 'prepare screen for participant').

This next task is very different from doing a questionnaire. Instead of asking you questions about what you personally or subjectively think or feel, this task asks you to following a rule and tests how easy or difficult you find it to follow that rule. As you can see on the screen, for the moment that rule is that you should **answer AS IF pleasant is positive, and unpleasant is negative**. You might not personally agree with this – that's ok; this is all part of the task.

On each trial you will see either "Pleasant" or "Unpleasant" at the top of the screen, and either a **positive or negative word**, such as "heath" or "murder", in the middle of the screen.

Your two response options are at the bottom of the screen. Press the D key for the left option and the K key for the right option. **These options can swap sides**. Go as slowly as you need to get them all right according to the rule.

When the participant gets a trial wrong for the first time the participant informed them that:

Unlike a questionnaire, where you can give whatever answer you want to, In this task if you get one "wrong" according to the rule you'll see a red X. You have to give it the "right" answer (according to the rule) to continue.

***NB responding speed has not been mentioned, only accuracy! (NB. The 2012 version of the IRAP allows the experimenter to set latency feedback to only appear after the first pair of practice blocks)*

At the end of the block:

After what is called a block of trials the program gives you some feedback. You can see that you have two goals when you're learning to do this task. One is to answer accurately according to the rule. This takes practice. When you can answer accurately you'll naturally start to go very quickly, but you can't learn to do it the other way around. **To remind you that we eventually want you to be both accurate and quick, from now on the task will put an exclamation mark on the bottom of the screen if you take more than 2 seconds to answer on any trial.**

As you can see, the rule is now to please answer as if '**pleasant is negative and unpleasant is positive.**' These are the only these two rules, and they will alternate between blocks.

If a participant is responding very quickly at the sacrifice of accuracy, the experimenter needs to undermine this quickly and effectively. The experiment may stop them mid-block and emphasise that they need to concentrate on being accurate first.

If you see a few consecutive red "X"s it means that you are going too quickly. Slow down temporarily, you need to learn to be accurate first; you'll naturally go quickly once you've learned to do this.

When the participant meets the criteria:

Well done, you've shown that you have learned how to do the task. Keep going: the program will remind you what the new rule is before each block, and you'll do 6 more blocks in total. Keep being as accurate as you can, and when you're accurate you'll naturally go quickly. You'll still be given feedback after each block so that you can see how you're doing. If you find your scores have dropped you can take a break between blocks.

Appendix E: AAQ-II

AAQ-II

name: _____ date: _____

Below you will find a list of statements. Please rate the truth of each statement (for the agreed time period) in the column on the right, using the following scale:

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

1.	my painful experiences and memories make it difficult for me to live a life that I would value	
2.	I'm afraid of my feelings	
3.	I worry about not being able to control my worries and feelings	
4.	my painful memories prevent me from having a fulfilling life	
5.	emotions cause problems in my life	
6.	it seems like most people are handling their lives better than I am	
7.	worries get in the way of my success	

total score =

Average (mean) score in a clinical population was 28.3 (SD 9.9); while in a non-clinical population it was 18.51 (SD 7.05). Scores of >24-28 suggest probable current clinical distress and make future distress & work absence more likely.

Bond, F. W., S. C. Hayes, et al. (2011). "Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: A revised measure of psychological inflexibility and experiential avoidance." *Behavior Therapy* 42(4): 676-688.

The present research describes the development and psychometric evaluation of a second version of the Acceptance and Action Questionnaire (AAQ-II), which assesses the construct referred to as, variously, acceptance, experiential avoidance, and psychological inflexibility. Results from 2,816 participants across six samples indicate the satisfactory structure, reliability, and validity of this measure. For example, the mean alpha coefficient is .84 (.78-.88), and the 3- and 12-month test-retest reliability is .81 and .79, respectively. Results indicate that AAQ-II scores concurrently, longitudinally, and incrementally predict a range of outcomes, from mental health to work absence rates, that are consistent with its underlying theory. The AAQ-II also demonstrates appropriate discriminant validity. The AAQ-II appears to measure the same concept as the AAQ-I ($r=.97$) but with better psychometric consistency.

Appendix F: Experiment 2 Consent Form



CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant.

Research Project: A study of the relationship between experiential avoidance, delaying of aversive outcomes, and implicit relational behaviour.

Please complete the following checklist. Tick (✓) the appropriate box for each point.	YES	NO
1. I have read the Participant Brief (or it has been read to me) and I understand it.		
2. I have been given sufficient time to consider whether or not to participate in this study		
3. I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet		
4. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty		
5. I have the right to decline to participate in any part of the research activity		
6. I know who to contact if I have any questions about the study in general.		
7. I am aware that this procedure involves aversive noise levels (if applicable).		
8. I declare that I have no known history of hearing-related issues*, which could affect the safety of this procedure (if applicable).		
9. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study.		
I wish to receive course credit for PSYC208 – Student ID:		
I wish to receive a summary of the findings – Email Address:		

* If you use a hearing aid or cochlear implant, this procedure is not recommended.

Declaration by participant:

I agree to participate in this research project and I understand that I may withdraw at any time. If I have any concerns about this project, I may contact the convenor of the Psychology Research and Ethics Committee (James McEwan, Tel: 07 838 4466 ext 8295, email: jmcewan@waikato.ac.nz)

Participant's name (Please print): _____

Signature: _____ Date: _____

Declaration by member of research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it. I believe that the participant understands the study and has given informed consent to participate.

Researcher's name (Please print): _____

Signature: _____ Date: _____

Appendix G: Experiment 2 Brief

Participant Brief

A study of the relationship between experiential avoidance, delaying of aversive outcomes, and implicit relational behaviour.

Experiential avoidance has been implicated in a wide range of psychological disorders (Hayes, Strosahl, & Wilson, 1999) and this study will investigate the relationship between scores on a measure of experiential avoidance, and two behavioural computer-based tasks. This experiment has three parts.

Part 1: The Acceptance and Action Questionnaire-II (Bond et al., 2011)

This questionnaire is designed to measure experiential avoidance and psychological flexibility, which is “the ability to fully contact the present moment and the thoughts and feelings it contains without needless defense, and, depending upon what the situation affords, persisting or changing in behavior in the pursuit of goals and values” (Bond et al., 2011, p. 7).

Part 2: The Implicit Relational Assessment Procedure (Barnes-Holmes et al., 2006)

For this task, you will be required to sort words into categories that are defined by the program. You will not be asked your opinions or beliefs, merely to sort the words as directed.

Part 3: Aversive Delay-Discounting Task

This computer-based task measures your responses to choices that involve either an immediate aversive consequence, or a delayed, larger, aversive consequence. The aversive consequence will be mild-electrical stimulation. You will choose a level that is highly annoying, but not painful, and then answer a series of questions while playing a computer game. If you choose not to participate in this part of the experiment, you will still be eligible for 1% course credit, for completion of the first two parts.

If you have a history of heart-related, or other medical problems, that may affect the safety of this procedure, please inform the experimenter before signing the consent form.

All data collection is anonymised so no personally identifying information will be associated with your results.

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