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THE IMPLICIT RELATIONAL ASSESSMENT PROCEDURE (IRAP) AS A MEASURE OF WOMEN'S STEREOTYPES ABOUT GAY MEN

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ABSTRACT

The Implicit Relational Assessment Procedure (IRAP) is a relatively new method for studying attitudes and beliefs. The current IRAP assessed women's stereotypes about gay and straight men. Results confirmed significant stereotypes about traits of both groups, and revealed that participants denied that either group displayed traits associated with the other group. Stereotypes confirming traits were stronger than stereotypes denying traits. The current study also manipulated cognitive resources by administering surveys before or after the IRAP; and by having participants drink either a regular or sugar-free beverage. Surveys were more sensitive to resource availability than the IRAP.

INTRODUCTION

Surveys about attitudes and stereotypes are often difficult to interpret because participants may be unaware of their own prejudices, or may deliberately give socially desirable responses (De Houwer, 2002). As a result, many researchers have chosen alternative methods, including the popular Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998). In the IAT, a computer presents a stimulus in the middle of a computer screen. A pair of category labels are assigned to each of two keys, and participants respond to the stimulus by pressing the key assigned to the category to which the stimulus belongs. During a congruent task, pairs of strongly associated categories share keys. During an incongruent task, pairs of strongly associated categories are assigned to different keys. The IAT identifies relative differences in association strengths between pairs of stimuli by comparing response times between congruent and incongruent trials. However, the forced-choice nature of the IAT, with each stimulus type on each trial, prevents *independently* assessing association strengths for each stimulus pairing (De Houwer, 2002).

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The Implicit Relational Assessment Procedure (IRAP)

Barnes-Holmes et al. (2006) recently developed an alternative to the IAT called the Implicit Relational Assessment Procedure (IRAP). The IRAP presents stimuli with response options, then requires participants to give preassigned responses as quickly as possible. Preassigned responses agree with cultural norms during congruent blocks, and disagree during incongruent blocks. Faster responding during congruent blocks produces a positive IRAP effect. Faster responding during incongruent blocks produces a negative IRAP effect. For example, Cullen, Barnes-Holmes, Barnes-Holmes, and Stewart (as cited in Cullen & Barnes-Holmes, 2008) presented sexual orientation ("gay" or "straight") as a sample stimulus at the top of a computer screen. A positive (e.g., "normal" or "safe") or negative (e.g., "abnormal" or "dangerous") target word appeared in the center of the screen. Relational response options appeared in each bottom corner of the screen (e.g., "press 'd' for similar" and “press 'k' for opposite").

Cullen et al. found heterosexual and homosexual participants produced positive IRAP effects by affirming relationships between positive terms and straight; and also negative IRAP effects by affirming relationships between positive terms and gay. Heterosexual and homosexual participants also produced positive IRAP effects by denying relationships between straight and negative terms. However, heterosexual participants produced a positive IRAP effect by affirming a relationship between gay and negative traits; while homosexual participants produced a negative IRAP effect by denying a relationship between gay and negative traits. Hence, the IRAP specified that heterosexual attitude bias in favor of straight relationships results from negative responses evoked by gay couples, rather than exclusively positive responses evoked by straight couples. The ability to independently measure response bias for each stimulus type is an advantage of the IRAP over the IAT (Drake et al., 2010). The IRAP's greater complexity, as compared to the IAT, may also make deceptive responding more difficult because a method for influencing scores in a certain direction is less transparent (McKenna, Barnes-Holmes, Barnes-Holmes, & Stewart, 2007).

Resource Availability

Devine (1989) proposed that stimuli associated with other groups automatically evoke stereotypes and attitudes, and that people who display low levels of prejudice inhibit these responses through effortful controlled processing. This controlled processing depletes cognitive resources (Richeson & Trawalter, 2005). To replenish resources, the brain must metabolize

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glucose from the blood (Donohoe & Benton, 1999). Therefore, people with lower glucose levels should be less able to maintain prolonged controlled processing, and correspondingly be more likely to respond automatically (McMahon & Scheel, 2010).

Gailliott, Peruche, Plant, and Baumeister (2009) directly tested the resource depletion account of stereotype inhibition. An experimental group drank lemonade sweetened with sugar and a control group drank lemonade sweetened with sucralose. Next, all participants spent 12-minutes filling out unrelated questionnaires to give time for the experimental group to metabolize sugar into glucose. After the delay, participants wrote essays about a day in the life of a gay man. Gailliott et al. confirmed a relationship between resource availability and stereotype inhibition on an explicit measure by showing that essays by the experimental (glucose) group contained fewer stereotypes about gay men.

Current Study

Cullen et al. measured attitudes about homosexuals, but did not address stereotype endorsement. Like most IRAP studies, Cullen et al. was a product of the Barnes-Holmes laboratory (Drake et al., 2010). An aim of the current study was to establish the IRAP's generality by demonstrating effects in a different laboratory on a novel topic: Stereotypes about gay and straight men. The current study also tested effects of resource availability on IRAP and survey results. If resource availability affects inhibition of socially undesirable stereotypes and attitudes, then surveys should reveal stronger negative attitudes, and greater stereotype endorsement, after participants deplete resources by completing an IRAP. We predicted this effect would be weaker among participants who had ingested a sugary drink at the start of the experiment, because glucose metabolized from the drink would replenish resources depleted by the IRAP. We also predicted resource availability would have little or no effect on IRAP scores because the IRAP minimizes opportunities for self-editing.

METHOD

Participants

Ninety undergraduates (75 females) at a small Midwestern university volunteered. Volunteers ranged from 17 to 53 years old (M = 20.29, SD = 4.11). The small number of male volunteers precluded using participant sex as a variable, and combining sexes would have been inappropriate because males and females differ in attitudes towards gay men (Kite & Whitley,

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1996; Steffens, 2005). Therefore, analyses excluded data from male participants. Analyses also excluded data from two participants who responded in less than 300 ms on more than 10% of trials (after Greenwald, Nosek, & Banaji, 2003). One female failed to finish the experiment in the allotted time. A fire alarm interrupted another female during testing, and three additional females were excused from the taste test for reporting that they were diabetic (final $N = 68$).

Materials and Procedure

The study took place in two rooms. Room A contained a desk, a refrigerator, and a countertop. Room B had two computers. One computer ran a survey program; the other an IRAP program. Survey and IRAP programs were each written in Python 2.6 using the PsychoPy IDE (Peirce, 2009). While participants indicated informed consent in Room B, an experimenter prepared a root beer taste test in Room A. When the experimenter finished, participants moved to Room A for a taste test, then returned to Room B. Thirty-three randomly-assigned participants took a survey, then an IRAP. The remaining 35 participants took an IRAP, then a survey. The entire procedure took about 45 minutes.

Taste test

Before testing, the senior researcher (MS) covered bottle labels with duct tape and affixed numbered stickers to bottle necks. Half were bottles of *Point Premium Root Beer* [1], with 45 grams of sugar, while the other half were bottles of sugar-free *Point Premium Diet Root Beer* [2] (Point Brewery, Stevens Point, WI, USA). Experimenters randomly drew bottles from the refrigerator and recorded each participant's bottle number, unaware of which type of root beer was in each bottle. This assigned participants to either a Regular ($n = 34$) or Diet ($n = 34$) condition.

The experimenter closed the door to Room B to prevent the participant from hearing only one bottle opening, then poured half the 12 ounce bottle of root beer into a disposable red cup, and the other half into a disposable blue cup. Participants drank from each cup, and then filled out a form indicating whether either drink was sweeter, whether one tasted better, or whether either tasted bland. We did not analyze taste test results.

Surveys

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A computer presented statements one-at-a-time on the top half of the screen with a seven-point Likert scale on the bottom half of the screen (1 = "Strongly Disagree"; 7 = "Strongly Agree"). The first 20 questions came from the Heterosexual Attitudes Towards Homosexuality (HATH) scale (Larsen, Reed, & Hoffman, 1980). Questions 21 to 30 came from the Acceptance of Stereotypes About Gays and Lesbians (ASGL) scale (Brown & Groscup, 2009). Items 31 to 50 came from the Attitudes Toward Lesbians and Gay Men (ATLGM) scale (Herek, 1988). The computer then repeated the first 50 questions, reworded to convey opposite meanings. For example, "I enjoy the company of homosexuals" (Question 1 from HATH) became "I do not enjoy the company of homosexuals". The second set of 50 questions ensured participants in the Regular group had sufficient time to metabolize sugar before starting the IRAP. We did not analyze responses to reworded questions.

IRAP

At the start of the IRAP, participants read the following:

Your objective is to choose the correct answer on each trial. If you get an incorrect answer an 'X' will appear and you must choose the alternate answer. This task will sometimes require that you respond in a way that agrees with your beliefs. At other times, it will require that you respond in a way that disagrees with your beliefs. Please answer as quickly as possible. A few errors are okay. The following are practice trials.

Each trial presented a sexual orientation ("Gay Males" or "Straight Males") as a sample stimulus at the top of a computer screen. In the center of the screen, a stereotypically gay- or straight-male trait appeared. We derived a list of stereotypical traits of gay (Compassionate, Artistic, Feminine, Promiscuous, Dramatic, Materialistic, High-pitched voice, Sinful) and straight (Religious, Ambitious, Assertive, Athletic, Competitive, Masculine, Dominant, Independent) men from the literature (Brown & Groscup, 2009; Haddock, Zanna, & Esses, 1993; Herek, 1988; Madon, 1997; Sandfort, 2005). Relational response options of "True" and "False" appeared in each bottom corner of the screen, switching sides randomly from trial to trial (e.g., "select 's' for True" and “select 'l' for False", with "True" and "False" switching randomly between "s" and "l"). After correct responses, the screen went blank for 400 ms before the next trial began. After incorrect responses, a large "X" appeared between the sample and target stimuli, and remained on the screen until the participant responded correctly.

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Half the participants started with a block of congruent trials; the other half started with a block of incongruent trials. During congruent blocks, responses of "True" ended trials when stereotypes applied to the target stimulus; and responses of "False" ended trials when stereotypes did not apply to the target stimulus. During incongruent blocks, responses of "True" ended trials when stereotypes did not apply to the target stimulus; and responses of "False" ended trials when stereotypes applied to the target stimulus. See Appendix A for a list of correct responses to each stimulus pairing.

Blocks included each target word paired once with "Gay Males" and once with "Straight Males". The computer sampled from the 32 possible stimulus pairings randomly without replacement. After the first practice block, the following appeared: *Correct answers on the next block will now be reversed. Press any key to continue*. Participants who started with congruent trials now faced incongruent trials, and *vice versa*. After the second practice block, the following appeared:

Please answer as quickly as possible. A few errors are okay. Correct answers on the next block will now be reversed from the previous block. These trials will count. Press any key to continue.

Except for "these trials will count", the last message appeared after every subsequent block until a thank-you message appeared after the last block.

RESULTS

IRAP

A data transformation, based on Greenwald, Nosek and Banaji's (2003) C4 algorithm, re-scored times below 300 ms as equal to 300 ms; and times over 3000 ms as 3000 ms. Higher IRAP scores reflect stronger implicit endorsement of stereotypes. A four-way mixed design ANOVA analyzed IRAP results. Drink (Regular vs Diet) and Order (Survey-first vs IRAP-first) were between-subject factors. Stimulus values for Orientation (Gay vs Straight) and Traits (Masculine vs Feminine) were within-subject factors. Table 1 lists mean IRAP effects by condition.

Table 1. Means (and standard deviations) of IRAP effects as functions of first activity and drink type in each Orientation-Trait combination

	Diet		Regular	
Stimuli	Survey (*n*=17)	IRAP (*n*=17)	Survey (*n*=16)	IRAP (*n*=18)

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Gay-Gay	159.75 (199.61)	198.57 (304.08)	246.56 (183.04)	126.00 (272.62)
Gay-Straight	131.94 (190.10)	186.45 (353.90)	45.69 (260.64)	-12.31 (278.04)
Straight-Gay	90.47 (186.40)	133.12 (247.21)	109.25 (310.06)	30.00 (256.41)
Straight-Straight	223.49 (186.66)	188.41 (252.74)	165.71 (231.02)	214.17 (284.93)

The ANOVA revealed no significant main effects for Drink or Order; and no significant interactions involving either Drink or Order. However, the interaction between Orientation and Traits was significant, $F(1, 64) = 12.61$, $MSE = 700359$, $p = .0007$. Participants endorsed stereotypes about gay men displaying gay-male traits ($M = 180.95$; $SD = 244.92$) more strongly than they endorsed stereotypes about gay men not displaying straight-male traits ($M = 87.09$; $SD = 282.06$). Likewise, participants endorsed stereotypes about straight men displaying straight-male traits ($M = 198.66$; $SD = 237.97$) more strongly than they endorsed stereotypes about straight men not displaying gay-male traits ($M = 89.54$; $SD = 250.25$). Single sample t-tests comparing obtained IRAP effects with hypothetical means of zero (indicating no effect) confirmed that each of the four Orientation-Trait combinations produced significant IRAP effects at the .05 level (see Appendix B).

Surveys

Two-way between-groups ANOVAs analyzed survey scores, with Drink (Regular vs Diet) and Order (Survey-first vs IRAP-first) as factors. Higher scores reflect stronger explicit endorsement of stereotypes (ASGL) or stronger negative attitudes (HATH and ATLGM) about homosexuals. Table 2 lists mean scores on each survey in each experimental condition.

Table 2. Means (and standard deviations) of survey scores as functions of first activity and drink type

	Diet		Regular	
Survey	Survey (n=17)	IRAP (n=17)	Survey (n=16)	IRAP (n=18)
ASGL	2.15 (0.78)	3.16 (1.02)	2.56 (0.86)	2.73 (1.04)
HATH	1.76 (0.53)	2.61 (1.59)	1.82 (0.69)	1.89 (1.16)
ATLGM	2.07 (0.90)	2.93 (1.72)	2.13 (0.90)	2.15 (1.30)

The effect of Order on the HATH was not quite significant, $F(1, 64) = 3.0047$, $MSE = 14.6883$, $p = .09$. However, Order significantly affected scores on the ASGL, $F(1, 64) = 6.57$, $MSE = 24.04$, $p = .01$. Participants in the Diet group who took the survey after finishing the IRAP had the

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highest scores on each survey. This interaction between Order and Drink was not significant for any survey, though it approached significance on the ASGL, $F(1, 64) = 3.23$, $MSE = 11.82$, $p = .08$.

DISCUSSION

The current study supports the IRAP as a general measure of implicit cognition. The IRAP's ability to independently measure stereotypes confirmed that college females have implicit stereotypes about both gay and straight men. The specificity of the IRAP showed that (a) college females implicitly deny that gay and straight males share stereotypical traits (e.g., gay men do not possess straight-men's traits); and (b) stereotypes about traits either group possess were stronger than stereotypes about traits either group does not possess.

Taking the IRAP significantly affected ASGL scores. Other survey results revealed trends that failed to reach significance. Consistency of trends across surveys, combined with collateral findings from other laboratories (e.g., Gailliott et al., 2009; Richeson & Trawalter, 2005), suggests failures to reach significance on some survey measures were due to lack of power. A follow-up procedure with a larger sample could test this hypothesis.

Priming may have contributed to higher scores when surveys followed the IRAP. However, priming cannot account for moderating effects of drink type. Instead, these results support the hypothesis that survey scores are vulnerable to self-editing, and that self-editing is a function of resource availability. Likewise, failure to find resource availability effects on the IRAP agrees with the hypothesis that IRAP effects are relatively immune to self-editing, and are therefore less affected by resource availability. An implication of the current study is that explicit measures are more sensitive to order effects than are implicit measures.

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ENDNOTES

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[1] Regular ingredients: Carbonated water, cane sugar and/or fructose corn sweetner, maldextrine, pure honey, caramel color, natural and artificial flavors, vanilla, phosphoric acid, and sodium benzoate.

[2] Diet ingredients: Carbonated water, caramel color, natural and artificial flavors, phosphoric acid, acesulfame potassium, sodium benzoate, sucralose, and vanilla.

APPENDIX A: CORRECT RESPONSES TO IRAP STIMULI DURING CONGRUENT (AND INCONGRUENT) BLOCKS

Trait	Gay Male	Straight Male
Compassionate	True (False)	False (True)
Artistic	True (False)	False (True)
Feminine	True (False)	False (True)
Promiscuous	True (False)	False (True)
Dramatic	True (False)	False (True)
Materialistic	True (False)	False (True)
High-pitched voice	True (False)	False (True)
Sinful	True (False)	False (True)
Religious	False (True)	True (False)
Ambitious	False (True)	True (False)
Assertive	False (True)	True (False)
Athletic	False (True)	True (False)
Competitive	False (True)	True (False)
Masculine	False (True)	True (False)
Dominant	False (True)	True (False)
Independent	False (True)	True (False)

APPENDIX B: CORRELATION MATRIX FOR IRAP ANOVA AND SINGLE SAMPLE T-TEST RESULTS

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	Drink	Order	Gay-Gay	Gay-Straight	Straight-Gay	Straight-Straight
Drink	1.00					
Order	0.03	1.00				
Gay-Gay	0.01	-0.08	1.00			
Gay-Straight	-0.26*	-0.01	0.40***	1.00		
Straight-Gay	-0.09	-0.04	0.38**	0.53***	1.00	
Straight-Straight	-0.03	0.01	0.39**	0.13	0.31*	1.00
M			180.95	87.09	89.54	198.66
SD			244.92	282.00	250.25	237.97
t(67)			6.09****	2.55*	2.95**	6.88****

Note. For drink: Diet = 1, Regular = 2; for order: Survey first =1, IRAP first = 2.
One-sample t-tests compared obtained means with hypothetical means of 0.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$.

APPENDIX C: CORRELATION MATRIX FOR SURVEY ANOVAS

	Drink	Order	ASGL	HATH	ATLGM
Drink	1.00				
Order	0.03	1.00			
ASGL	0.00	0.30*	1.00		
HATH	-0.15	0.20	0.68**	1.00	
ATLGM	-0.14	0.17	0.70**	0.94**	1.00
M			2.65	2.02	2.32
SD			1.00	1.14	1.31

Note. For drink: Diet = 1, Regular = 2; for order: Survey first =1, IRAP first = 2.
*$p < .05$; **$p < .0001$

AUTHORS' NOTE

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