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ATTITUDES TOWARDS MUSLIMS ARE MORE FAVORABLE ON A SURVEY THAN ON AN IMPLICIT RELATIONAL ASSESSMENT PROCEDURE (IRAP)

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ABSTRACT

Sugar ingestion bolsters cognitive resources, which should improve ability to inhibit expressing socially undesirable responses on explicit measures, including surveys. In this study, undergraduates drank regular or diet root-beer, then completed an Implicit Relational Assessment Procedure (IRAP) followed by an Anti-Muslim Prejudice Scale (AMPS). The IRAP indicated neutral attitudes about Muslims and positive attitudes about Westerners. However, the AMPS indicated significant pro-Muslim attitudes. There was no significant effect of drink on the AMPS. However, participants who drank regular root-beer showed stronger anti-Muslim bias on the IRAP. Increased bias following sugar ingestion may reflect a discrepancy between implicit and explicit measures.

INTRODUCTION

Devine (1989) proposed that people display low levels of prejudice by inhibiting automatic reactions to stimuli associated with groups. Conscious inhibition of automatic reactions is an example of controlled processing, and controlled processing depletes cognitive resources (Richeson & Trawalter, 2005). To replenish resources, the brain metabolizes glucose from the blood (Donohoe & Benton, 1999). Hence, low blood-glucose levels should promote automatic processing because participants have fewer resources available to serve as fuel for controlled processing (McMahon & Scheel, 2010).

In a test of resource availability's effect on stereotype inhibition, Gailliott, Peruche, Plant, and Baumeister (2009) had an experimental group drink lemonade sweetened with sugar and a control group drink lemonade sweetened with sucralose. After a 12-minute delay (to give time for sugar to metabolize), both groups wrote essays about a day in the life of a gay man. Gailliott et al. confirmed that the experimental (glucose) group's essays contained fewer stereotypes.

Explicit Versus Implicit

An essay about the day in the life of a gay man is an explicit measure because it requires a verbal response. Explicit measures are often difficult to interpret because participants may be unaware of their own prejudices, or might edit themselves to give socially appropriate responses (DeHouwer, 2002). As a result, many researchers use implicit measures based on response times. Implicit measures are often successful at revealing associations that fail to appear on explicit measures. For example, Park, Felix, and Lee (2007) detected more anti-Muslim prejudice with an Implicit Association Test (IAT) than with a survey. In Park et al.'s IAT, a computer presented a Muslim name or White name in the middle of a computer screen. During congruent trials, "White" and "pleasant" shared a key; and "Arab-Muslim" and "unpleasant" shared another key. During incongruent trials, "White" and "unpleasant" shared a key; and "Arab-Muslim" and "pleasant" shared another key. Participants responded to stimulus words by pressing a key. For example, a correct response on a congruent trial would require pressing the "Arab-Muslim" key in response to "Saad", or the "unpleasant" key in response to "Evil". Park et al. found participants responded more quickly when "White" and "pleasant" shared a key than when "Arab-Muslim" and "pleasant" shared a key. Park et al. attributed their results to "anti-Arabic prejudice" (p. 42). However, the IAT prevents independent assessment of association strengths for each stimulus pairing because each stimulus type appears on each trial (De Houwer, 2002; Power, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009; Drake, et al. 2010). Therefore, it is unclear whether Park et al.'s results were due to pro-White bias, anti-Muslim bias, or a combination of the two.

In response to the IAT's lack of specificity, Barnes-Holmes et al. (2006) developed the Implicit Relational Assessment Procedure (IRAP). The IRAP requires rapid responding according to pre-determined rules. The rule during congruent blocks agrees with cultural norms; whereas the rule during incongruent blocks differs from cultural norms. Faster responding during congruent blocks produces a positive IRAP effect and faster responding during incongruent blocks produces a negative IRAP effect. For example, Drake et al. (2010) used an IRAP to study attitudes towards Muslims. Correct responses during congruent blocks required participants to answer "yes" when "Christian" appeared with words such as "good", "truthful", or "compassionate" and when "Muslim" appeared with words such as "bad", "dishonest", or "cruel". Likewise, correct responses during incongruent blocks required participants to answer "yes" when "Christian" appeared with words such as "bad", "dishonest", or "cruel" and when "Muslim" appeared with words such as "good", "truthful", or "compassionate". Drake et al. found positive IRAP effects on Christian/positive trials, Christian/negative trials, and Muslim/negative trials; but failed to find an IRAP effect on Muslim/positive trials.

Comparing Park et al.'s (2007) IAT results directly with Drake et al.'s (2010) IRAP results is difficult because each study used different stimuli. Nevertheless, the specificity of conclusions from each study illustrates the IRAP's advantage over the IAT. Park et al. identified a more favorable attitude towards White names over Muslim names. However, Drake et al. were able to specify that participants were generally more pro-White than anti-Muslim because the IRAP allowed for independent measurement of attitudes about each group.

Resource Availability

Scheel, Fischer, McMahon, Mena and Wolf (2012) tested for effects of resource availability on women's implicit and explicit endorsement of stereotypes about straight and homosexual men. Scheel et al. found resource availability had a greater effect on explicit measures (surveys) than on an implicit measure (an IRAP). Although the effect of drink type on surveys only approached significance, consistent trends on all three surveys suggested failure to reach significance was due to insufficient statistical power.

Current Study

The primary aim of the current study is to replicate an effect of sugar ingestion on an explicit measure. In this case, the measure was Park et al.'s (2007) Anti-Muslim Prejudice Scale (AMPS). Participants drank regular or diet root beer at the start of the study, then took the AMPS after a 12-minute delay so the sugar had time to metabolize into glucose. Our primary hypothesis was that participants who drank regular root beer would subsequently show less anti-Muslim bias on the survey, because glucose availability would facilitate self-editing.

The secondary aim of the current study was to use an IRAP to replicate and extend results from Park et al.'s (2007) IAT results about attitudes towards Muslims. To facilitate comparisons, the IRAP used the same stimuli as Park et al.'s IAT. We predicted the IRAP would replicate the IAT's general result favoring white names, and also replicate Drake et al.'s more specific finding that overall attitudes are more pro-white than anti-Muslim.

Finally, we predicted the null-hypothesis with respect to an effect of drink type on the IRAP. As an implicit measure, the IRAP should be relatively invulerable to self-editing. Sugar should also require at least 10-12 minutes to take effect, and the current procedure had participants take the IRAP immediately after drinking rootbeer. However, Molden et al. (2012) recently had participants rinse their mouths with sugar-sweetened water or aspartame-sweetened water, then immediately begin work on a Stroop task. Despite ingesting no sugar, and having insufficient time for metabolization, participants who rinsed with sugar-water had faster response times on the Stroop task. Molden et al. proposed that the mouth's contact with carbohydrates motivates performance by signaling possibility for reward (for a replication, see Sanders, Shirk, Burgin, & Martin, 2012). According to a motivational hypothesis, participants in the current study might show an effect of drink on the IRAP if tasting sugar increases motivation. We therefore included drink as a variable in our analysis of IRAP results, despite predicting a null result.

METHOD

Participants

Fifty-two students at a Midwestern university volunteered in exchange for partial course credit. Participant ages ranged from 19 to 31 (M = 21.59). Eleven participants failed to reach the minimum criteria of 80 percent accuracy on IRAP practice blocks, or answered in less than 300 ms on more than 10% of trials (final N = 41; 28 female).

Materials and Procedure

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). Prior to participant arrival, an experimenter randomly drew a bottle from the refrigerator and recorded the participant's bottle number, unaware of which type of root beer was in each bottle. This assigned participants to either a Regular (n = 17) or Diet (n = 24) condition. The experimenter poured half the 12-ounce bottle of root beer into a disposable red cup, and the other half into a disposable blue cup. After indicating informed consent, participants drank from each cup and then completed a brief taste test indicating whether one drink was sweeter, tasted better, or tasted bland. We did not analyze taste test results.

IRAP

The IRAP program is available at: http://irapresearch.org/downloads-and-training/. At the start of the IRAP, an experimenter said the following (adapted from the IRAP administration instructions):

In this study we're interested in the pleasantness of names. At the top of the screen, you will see either a Western name or a Muslim name; and in the middle of the screen you will see a pleasant or unpleasant word, such as "peace" or "evil". We call this a trial. You've got two response options at the bottom of the screen, one on the left and one on the right. Those response options are going to be "Similar" and "Different". Press the D key for "Similar" and the K key for "Different". You'll complete a series of trials, one after another, in what we call a block. After each block you'll get a break and some feedback on how you're doing. Put a finger on the D key and a finger on the K key. You can see the rule on screen.

The task is essentially a pairing task. Although this might sometimes feel odd or may be something you disagree with, following the rule is how this task is conducted properly. Let's do a few trials together, press the space bar to begin.

The experimenter aided the participant for a few trials. Names appeared at the top of the screen and terms appeared in the middle of the screen. Response options appeared at the bottom corners of the screen. After correct responses, the screen went blank for 400 ms before the next trial began. After incorrect responses, a large red "X" appeared between the sample and target stimuli, and remained on the screen until the participant responded correctly. A random sample of 27 participants started with a block of congruent trials, while the remaining 14 participants started with a block of incongruent trials. Congruent blocks required answers of SIMILAR when Western names appeared with pleasant words and Muslim names appeared with unpleasant words; and answers of DIFFERENT when Western names appeared with unpleasant words and Muslim names appeared with pleasant words. Incongruent blocks required answers of SIMILAR when Western names appeared with unpleasant words and Muslim names appeared with pleasant words; and answers of DIFFERENT when Western names appeared with pleasant words and Muslims names appeared with unpleasant words. See Appendix A for a list of IRAP stimuli.

Blocks included 40 pairs. Each name appeared with one pleasant word. Each name also appeared with one unpleasant word. Pleasant and unpleasant words appeared randomly with replacement. Participants who started with a congruent block subsequently completed an incongruent block, and *vice versa*. After two practice blocks, participants completed six blocks of alternating type, depending on the initial block. After the eighth block, the program prompted participants to "please notify the researcher."

Anti-Muslim Prejudice Scale

After the IRAP, participants filled-out an Anti-Muslim Prejudice Scale (AMPS; Park et al. 2007). The AMPS features 20 statements. Participants indicated agreement with each statement on a 9-point scale ranging from -4 (very strongly disagree) to 4 (very strongly agree). For example, "Muslims show great respect for human rights and freedom". Half of the statements required reverse scoring (e.g., "The basic teachings of Islam must be condemned as evil"). Hence, higher scores reflected pro-Muslim attitudes.

RESULTS

IRAP

We analyzed data using a version of Greenwald, Nosek and Banaji's (2003) D algorithm called the D-IRAP algorithm (see Drake et al., 2010). To facilitate comparison between D-IRAP scores, we multiplied Muslim-related scores by negative one. This meant higher scores on Western-Pleasant and Muslim-Pleasant indicated positive relationships between Name-type and Term. Likewise, higher scores on Western-Unpleasant and Muslim-Unpleasant indicated negative relationships between Name-type and Term. Figure 1 summarizes mean D-IRAP scores by condition after transforming Muslim-related scores.

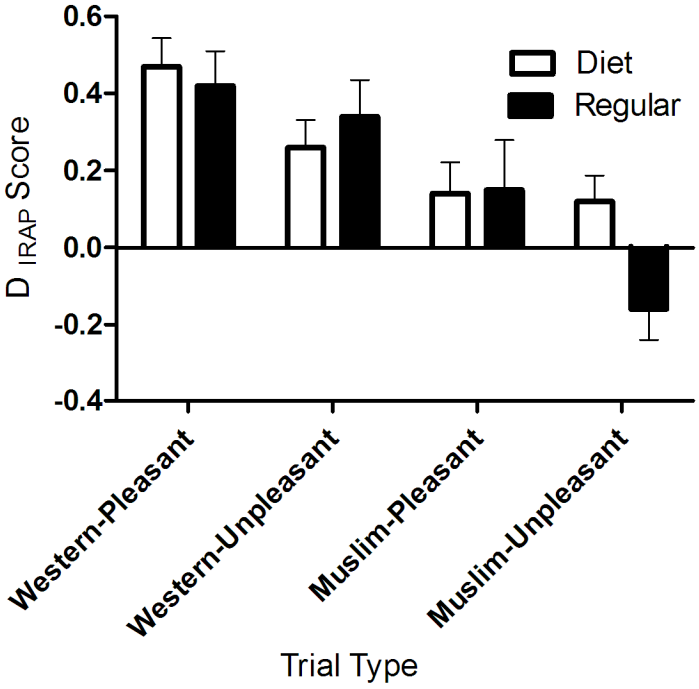

Figure 1: Mean (and SEM) of D-IRAP scores* by condition.
* - Muslim-related scores transformed by multiplying by -1.

A two-way mixed design ANOVA analyzed D-IRAP scores, with Drink as a between subjects factor, and Trial Type as a within-subjects factor. The ANOVA revealed a significant main effect for Trial Type, $F(3, 117) = 42.01$, $MSE = 2.808$, $p < .0001$. There was no significant main effect for Drink. However, there was a significant interaction between Drink and Trial Type, $F(3, 117) = 3.334$, $MSE = 0.223$, $p = .022$. Consequently, we performed separate analyses for each Drink condition.

Diet

A one-way ANOVA revealed a main effect of Trial Type on D-IRAP scores, $F(3, 69) = 4.50$, $MSE = 0.627$, $p = .006$. A series of one-sample t-tests compared D-IRAP scores in each condition with a hypothetical mean of zero. Western-Pleasant ($M = .47$; $SD = .36$; $t(23) = 6.496$, $p < .0001$) and Western-Unpleasant ($M = .26$; $SD = .35$; $t(23) = 3.611$, $p = .002$) each significantly exceeded zero. However, neither Muslim-Pleasant ($M = .14$; $SD = .40$; $t(23) = 1.694$, $p = .104$) nor Muslim-Unpleasant ($M = .12$; $SD = .33$; $t(23) = 1.806$, $p = .084$) differed significantly from zero.

Regular

A one-way ANOVA revealed a main effect of Trial Type on D-IRAP scores, $F(3, 48) = 5.45$, $MSE = 1.117$, $p = .003$. A series of one-sample t-tests compared D-IRAP scores in each condition with a hypothetical mean of zero. Western-Pleasant ($M = .42$; $SD = .37$; $t(16) = 4.661$,

p = .0003) and Western-Unpleasant (M = .29; SD = .37; $t(16) = 3.520$, p = .003) each significantly exceeded zero. However, neither Muslim-Pleasant (M = .14; SD = .45; $t(16) = 1.179$, p = .256) nor Muslim-Unpleasant (M = -.004; SD = .36; $t(16) = 1.932$, p = .071) differed significantly from zero. Nevertheless, a negative value for the transformed mean IRAP score suggests participants who drank regular root beer were *more* likely to endorse an implicit relationship between Muslim names and Unpleasant words. This appears as a significant negative relationship between Drink and Muslim-Unpleasant in the matrix of correlations between variables appearing as Appendix B.

Anti-Muslim Prejudice Scale

On the first day of testing, an experimenter failed to identify bottle numbers on six surveys. Consequently, we were unable to identify drink type on those six surveys; two from the regular condition and four from the diet condition. A one-sample t-test comparing overall mean AMPS score (M = 24.671; SD = 29.194) with a hypothetical mean of zero confirmed participants held significantly *positive* attitudes towards Muslims, $t(34) = 5.000$, $p < .0001$. However, a t-test comparing AMPS scores by Drink was not significant, $t(33) = 0.249$, $p = .805$.

Explicit Versus Implicit

We compared explicit (AMPS score) and implicit (average of Muslim-Pleasant with Muslim-Unpleasant D-IRAP score) attitudes towards Muslims for all thirty-five participants who produced scores on each measure. AMPS scores and D-IRAP scores were significantly correlated (r = .392, p = .02). However, D-IRAP scores (M = .027, SD = .352) were not significantly different from zero, $t(34) = .452$, p = .654.

DISCUSSION

The primary aim of the current study was to test whether sugar ingestion would decrease subsequent expression of socially undesirable attitudes toward Muslims. However, such a test requires that participants hold anti-Muslim attitudes that they make an effort to conceal. Overall lack of anti-Muslim bias on the IRAP may explain our failure to find an effect for resource availability on AMPS score. Participants needed no extra resources for self-editing because they had little (if any) socially unacceptable bias to edit. Follow-up studies should identify a strong socially undesirable implicit bias with an IRAP before testing for an effect of resource availability.

The secondary aim of the current study was to use an IRAP to replicate and extend results from Park et al.'s (2007) IAT. Our IRAP suggests Park et al.'s results may have reflected strong pro-White bias rather than "anti-Arabic prejudice" (p. 42). The finding that pro-White bias was stronger than anti-Muslim bias also agrees with Drake et al.'s (2010) IRAP finding. The IRAP's ability to identify and confirm relative contributions of each type of bias represents a straightforward demonstration of the IRAP's specificity advantage over the IAT.

We did not expect an effect of drink-type on IRAP performance. Superficially, our finding an effect of sugar-ingestion on the IRAP agrees with recent proposals that sugar-ingestion affects cognitive performance primarily by increasing motivation to perform, rather than by bolstering

resources. Follow-up studies could explore relationships between resource availability and implicit bias by manipulating time between sugar ingestion and IRAP performance. In our procedure, participants may have metabolized sufficient glucose to affect resource availability before the end of the IRAP. Extra resources may have enhanced recall of existing implicit associations, thereby resulting in a stronger IRAP effect. In that case, increasing the delay between sugar ingestion and the IRAP to approximately 12 minutes should increase the difference between regular and diet conditions. On the other hand, sugar may have influenced IRAP performance by increasing motivation to reduce response time by relying on existing associations. In that case, sugar should affect IRAP performance immediately, and increasing the delay between sugar ingestion and the IRAP to approximately 12 minutes should decrease the difference between regular and diet conditions (assuming that a motivational effect decreases as a function of time since ingestion). Supplemental data from blood-glucose measurement between IRAP trials could also help determine whether an effect is due to glucose availability, or an increase in motivation.

Regardless of whether sugar's effect is motivational or resource-based, our finding that participants who drank regular root beer showed stronger anti-Muslim bias than participants who drank diet root beer underscores a potential for implicit measures to contrast with explicit measures of bias. Gailliott et el. (2007) found that sugar ingestion decreases explicit bias. However, our result suggests sugar ingestion may enhance detection of implicit bias. If other laboratories confirm our result, sugar manipulation may emerge as a tool for magnifying differences between each type of measure.

REFERENCES

Barnes-Holmes, Dermot, Yvonne Barnes-Holmes, Patricia Power, Eilish Hayden, Rebecca Milne and Ian Stewart. 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* 32:169-177.

De Houwer, Jan. 2002. "The Implicit Association Test as a Tool for Studying Dysfunctional Associations in Psychopathology: Strengths and Limitations." *Journal of Behavior Therapy and Experimental Psychiatry* 33:115-133.

Devine, Patricia G. 1989. "Stereotypes and Prejudice: Their Automatic and Controlled Components." *Journal of Personality and Social Psychology* 56:5-18.

Donohoe, Rachael T. and David Benton. 1999. "Cognitive Functioning is Susceptible to the Level of Blood Glucose." *Psychopharmacology* 145:378-385.

Drake, Chad E., Karen K. Kellum, Kelly G. Wilson, Jason B. Luoma, Jonathan H. Weinstein and Catherine H. Adams. 2010. "Examining the Implicit Relational Assessment Procedure: Four Preliminary Studies." *The Psychological Record* 60:81-100.

Gailliot, Matthew T., B. Michelle Peruche, E. Ashby Plant and Roy F. Baumeister. 2009. "Stereotypes and Prejudice in the Blood: Sucrose Drinks Reduce Prejudice and Stereotyping." *Journal of Experimental Social Psychology* 45:288-290.

McMahon, Anthony J. and Matthew H. Scheel. 2010. "Glucose Promotes Controlled Processing: Matching, Maximizing, and Root Beer." *Judgment and Decision Making* 5:450-457.

Molden, Daniel C., Chin M. Hui, Abigail A. Scholer, Brian P. Meier, Eric E. Noreen, Paul R. D'Agostino and Valerie Martin. 2012. "Motivational Versus Metabolic Effects of Carbohydrates on Self-Control." *Psychological Science* 23:1137-1144.

Park, Jaihyun, Karla Felix and Grace Lee. 2007. "Implicit Attitudes Towards Arab-Muslims and the Moderating Effects of Social Information." *Basic and Applied Social Psychology* 29:35-45

Power, Patricia, Dermot Barnes-Holmes, Yvonne Barnes-Holmes and Ian Stewart. 2009. "The Implicit Relational Assessment Procedure (IRAP) as a Measure of Implicit Relative Preferences: A First Study." *The Psychological Record* 59:621-640.

Richeson, Jennifer A. and Sophie Trawalter. 2005. "Why do Interracial Interactions Impair Executive Function? A Resource Depletion Account." *Journal of Personality and Social Psychology* 88:934-947.

Sanders, Matthew A., Steve D. Shirk, Chris J. Burgin and Leonard L. Martin. 2012. "The Gargle Effect: Rinsing the Mouth with Glucose Enhances Self-Control." *Psychological Science* 23:1470-1472.

Scheel, Matthew H., Lauren A. Fischer, Anthony J. McMahon, Melissa M. Mena and Joshua E. Wolf. 2012. "The Implicit Relational Assessment Procedure (IRAP) as a Measure of Women's Stereotypes About Gay Men." *Current Research in Social Psychology* 18:11-23. http://www.uiowa.edu/~grpproc.

ENDNOTES

[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 BLOCKS

Western	Muslim	Pleasant	Unpleasant
Adam	Ammar	Diamond	Abuse
Andrew	Jaafar	Freedom	Cancer
Chip	Haashim	Heaven	Evil
Frank	Hassan	Honest	Filth
Jonathan	Muhammad	Honor	Pollute
Justin	Nadeem	Love	Poverty
Harry	Rashid	Loyal	Rotten
Matthew	Saad	Lucky	Sickness
Roger	Umar	Pleace	Stink
Stephen	Jahir	Rainbow	Vomit

APPENDIX B: CORRELATION MATRIX

	Drink	AMPS	Western - Pleasant	Western - Unpleasant	Muslim - Pleasant	Muslim - Unpleasant	Muslim - Average
Drink	1.00						
AMPS	-.04	1.00					
Western - Pleasant	-.07	-.33*	1.00				
Western - Unpleasant	.15	-.25	.64****	1.00			
Muslim - Pleasant	-.05	.30	-.51**	-.57***	1.00		
Muslim - Unpleasant	-.39*	.40*	-.50**	-.58***	.60****	1.00	
Muslim - Average	-.23	.39*	-.57***	-.64****	.91****	.88****	1.00

Note. For Drink: Diet = 1, Regular = 2; Correlations used transformed (y = -y) means for Muslim-Pleasant and Muslim-Unpleasant, and Muslim-Average. The correlation matrix reflects results from the 35 participants with data from the AMPS and IRAP.
*$p < .05$; **$p < .01$; ***$p < .001$; ****$p < .0001$; p adjusted for multiple comparisons using Holm's method

AUTHORS' NOTE

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