

An Independent Analysis of Schemas Using the Go/No Go Association Task

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Abstract

Previous research, using the Implicit Associations Test, demonstrated that a slowdown effect in regards to homosexual characters, especially homosexual male characters, exists. However, this task was not developed to observe individual gender attributes. The aim of the current research was to use the GNAT to explore these differences. The results of the current study revealed that a slowdown effect was not equal across the gender categories as it occurred more in homosexual males rather than in heterosexual males and females within schema incongruent trials. This outcome supports previous research using the IAT.

Keywords: Schemas, Gender, Sexuality, Response Time, Go/No Go Association Task

Introduction

Research has shown that when our schemas are violated a mismatch effect is created causing our cognitive processes are interrupted when schema incongruent information is encountered. In earlier studies, the Implicit Association Test, or IAT, was used alongside response time (RT) to investigate implicit attitudes towards specific concepts such as flora and, later, race (Greenwald, McGhee & Schwartz, 1998). By examining the associative strength, evaluated by using difference scores between a target concept and a positive or negative evaluator category to which it has been placed, the implicit attitude of the participant can be assumed. One of the major difficulties stemmed from the IAT being unable to separate the pairing of target concept and evaluator category as they must be measured against each other as acknowledged in the original IAT study by Greenwald and colleagues (1998). This study sought to remedy the IAT limitation by using the Go/No-Go Association Task as a method of discerning implicit attitudes while ensuring the target concept and category can be separated. The purpose of this study is to examine the effects of gender and sexuality schema violation on cognitive processing and better explaining the gender difference suggesting schemas apply more to males in regards to homosexual male target characters.

What are Schemas?

A schema is a mental shortcut where our representations of past experiences, people, places, and objects are stored (Garnham, 1981; Schubert, 2013). According to previous research, schemas are generally helpful as this method of categorization allows us to retrieve information regarding certain situations more efficiently (Bransford & Johnson, 1972). Alternatively stereotypes, which are a form of schema, can be detrimental to the comprehension of information

by interfering with our previous knowledge (Carreiras, Garnham, Oakhill, & Cain, 1996; Duffy & Keir, 2004; Dickinson, 2011). The lack of congruence between our schemas, whether they are in the form of stereotypes or not, and the information we are required to interpret causes a mismatch effect. This resulting mismatch effect slows our cognitive processes when reading a phrase that opposes our schemas (Schubert, 2013; Banaji & Hardin, 1996). A mismatch effect occurs when our schematic knowledge for a particular concept is not cohesive with what is being presented in that moment. Essentially, this is when our previously established experiential information, which is stored in our memory, does not match the encountered stimuli. Duffy and Keir (2004) explained this effect in their findings by using an example in which a sentence with the career of *electrician* was later paired with the gender context of *her*. When a select passage from a story created for the task was read, specifically “*the electrician taught herself*” (Duffy & Keir, 2004), fixation on that particular phrase was longer than that of a sentence recognized as schema congruent and thus, was subject to a mismatch effect.

Congruence is the degree to which two or more objects or concepts are complementary or cohesive. In the original IAT study (Greenwald, McGhee & Schwartz, 1998), when the target concept, *flower*, was paired with a positive evaluator category, such as *pretty*, the *flower-pretty* pairing was considered schema congruent trial as these concepts are highly compatible and match our prior experiences. As explained previously, reading a passage where a gender role is associated with the opposite sex of which it is commonly observed, for example a female electrician, this sentence is considered to be schema incongruent as the grouping is not what we identify as stereotypical. When a schema incongruent sentence is read, the automatic gender stereotype of which the role is associated becomes activated thus producing a slowdown in the participant’s processing speed (Duffy & Keir, 2004; Dickinson, 2011). This automatic activation

not only occurs with gender (Duffy & Keir, 2004) but with sexuality as well (Dickinson, 2011; Schubert, 2013).

Neilsen, Walden, and Kunkel (2002) propose that we are affected by a “heterosexual norm” in which heterosexuality is assumed and expected. Dickinson (2011) explored this premise and observed that this expectation is activated in much the same way as gender biases (Banaji & Hardin, 1996; Duffy & Keir, 2004) and a similar slowdown effect occurs after a character is classified as homosexual further on in the passage (Dickinson, 2011). A study conducted by Steffens (2008) noted that heterosexual men have more negative attitudes towards male homosexuals than female homosexuals. During a reading task involving gender and sexuality as target concepts, it was established that this mismatch, or slowdown effect, only exists in reference to male homosexual characters (Dickinson, 2011).

Implicit Association Test (IAT)

The Implicit Association Test, or IAT, is a task designed to evaluate the associative strength between specific target concepts which have been interpreted as a measure of implicit attitudes (Greenwald, McGhee, & Schwartz, 1998). Previously, the IAT has been utilized to ascertain implicit attitudes towards objects (Greenwald, McGhee, & Schwartz, 1998), gender roles (Duffy & Keir, 2004), and sexuality (Steffens, 2008; Schubert, 2013). The design of the IAT provides the opportunity in which we can measure the differences that occur in response to encountering schema congruent versus schema incongruent information (Greenwald, McGhee, & Schwartz, 1998). The IAT ascertains what has been referred to as implicit attitudes by assessing the strength between the target concept and a positive or negative attribution or evaluator category. More specifically, each concept is then paired with each evaluator category throughout

the task. The schema congruent concept and category combination would be expected to have the fastest performance speed throughout all conditions. One of the expectations of the IAT proposes that the difference in performance speed can possibly be an indicator of an individual's implicit attitude towards the particular concept (Greenwald, McGhee, & Schwartz, 1998).

This technique to measure implicit attitudes, however, has limitations in regards to the categorization of certain concepts. Greenwald and colleagues (1998) mentioned that the IAT was not designed to differentiate between individual gender attributes. In Schubert's (2013) study, he administered a sexuality IAT using Greenwald's (1998) original stimuli that was not developed for this purpose. If efforts are to be made to explore these previous findings regarding gender and sexuality, it was suggested that an alternative task should be utilized. When dividing gender into categories, homosexual characters can be sorted efficiently, as the character couple ascribes to just one gender, either female or male. The heterosexual character is composed of two opposing genders therefore disallowing proper categorization of the group as a whole. There is no one gender category that encompasses the concept, thus, a slowdown effect cannot be directly attributed to schema violation as the inability of the heterosexual concept to be properly categorized acts as a confounding variable (Greenwald, McGhee, & Schwartz, 1998). Although this occurrence may be more easily observed when using a heterosexual versus a homosexual pairing, this phenomenon exists in all instances employing gender as a target concept.

Usefulness of the Go/No-Go Association Task (GNAT)

The Go/No Go Association Task (Banaji & Nosek, 2001) has also been used in the past to measure implicit associations by examining the strength of association between a target concept and an evaluator category depending on how efficiently the target is sorted into the

correct category upon the press of a response key by the participant. The faster the participant reacts to the stimuli presented when the target concept is paired with either a positive or negative attribute should indicate their implicit attitude towards the target concept (Banaji & Nosek, 2001). By conducting tasks like the GNAT, we can make an effort to interpret certain perceptions that mirror the underlying automatic gender and sexuality stereotypes or schematic information (Banaji & Nosek, 2001)

The GNAT operates in much the same way as the IAT, however, the category system does not require sorting; the response key is either pressed, indicating a *go* trial, or not, indicative of a *no-go* trial (Banaji & Nosek, 2001). Instead of being required to divide the target concepts into the category of which it best fits, the participant simply has to acknowledge whether the presented stimuli is included within the label of the GNAT exhibited in the instructions at the beginning of each GNAT block.

Current Research: Using the GNAT in Schema Violation

The objective of the current study is to explore and explain the differences in response time in regards to sexuality schema violation as a function of character gender. Given the previous literature, we can make speculations as to what would occur in response to male homosexual characters presented as target stimuli. The IAT used the difference of performance speed in regards to the two target concepts in order to measure the strength of association between the two. This causes a problem in that the two concepts must be examined together and cannot be separated. The GNAT allows us to investigate these target concepts and analyze their strength of association without using comparison and established solely on how efficiently they are sorted into the appropriate labels.

Based on previous research regarding schemas, we can expect a significant effect regarding congruency and male target characters as schemas are said to impact male targets more than females (e.g., Dickinson, 2011; Shilhan, 2011; Steffens, 2005; Schubert, 2013). We can also expect that the N400 component will be larger for schema incongruent trials (e.g. *gay/good*) as well as a larger LPP for schema congruent trials (e.g. *straight/good*). Overall, the current study should lead to better understanding of the cognitive processing differences that occur as a result of schema violation and providing more evidence of the differences regarding male and female target characters.

Our hypothesis implies that there should be indicative of processing difficulty in regards to homosexual male characters. If we obtained results signifying that a cognitive slowdown effect has occurred, it will provide added support for prior research examining the impacts of gender and sexuality schemas (e.g., Dickinson, 2011; Schubert, 2013) and demonstrates that the IAT can, in fact, be used to separate concepts without being able to properly tease apart certain concepts, such as homosexual characters. However, if our hypothesis is deemed false and we do not achieve significant results, previous IAT literature concerning gender and sexuality concepts should be re-examined. The results attained could be due to the inability of the IAT to separate specific concepts or other variables including the gender of the target.

Methods

Participants

18 students, 4 male and 14 female, of Laurentian University voluntarily participated in this study. Each participant spoke English as a primary language. All participants were primarily right-handed; handedness was assessed using a handedness questionnaire given to participants

before initiating the experiment. Informed consent was also gathered and the students were then compensated for their time participating in the study by awarding them bonus marks for their respective courses upon permission from their course supervisor.

Materials

The current study used the Go/No Go Association Task to evaluate implicit attitudes towards sexuality. In all, there were eight GNATs administered: GAY-GOOD, GAY-BAD, STRAIGHT-GOOD, STRAIGHT-BAD, MALE-GOOD, MALE-BAD, FEMALE-GOOD, and FEMALE-BAD. The order in which these GNATs took place was counterbalanced to avoid order effects. The GNAT and generated stimuli were presented to the participants via the computer program E-prime (V.20) (Schneider, Eschmann, & Zuccoloto, 2002). The labels for the target categories were either the words *GAY* or *STRAIGHT* to signify attitudes towards homosexuals or heterosexuals. The words *GOOD* or *BAD* were used to indicate positive and negative labels respectively. The stimuli to be classified consisted of images depicting homosexual and heterosexual couples as well as words indicative of positivity or negativity, such as *beautiful* and *agony*. All stimuli and categories were extracted from Greenwald and colleague's (1998) Gay-Straight IAT (Appendix A). The GNATs used were based on the design of the original task created by Nosek and Banaji (2001).

Procedure

Stimuli generated by the E-Prime (V.20) program (Schneider, Eschmann, & Zuccoloto, 2002) was presented to the participants over one practice trial and one experimental block, with numerous trials in both, for each of the eight GNATs. There was one practice block presented before each experimental block in which stimuli was to be either responded to or not depending

on the specific conditions of that immediate GNAT block. The practice block displayed the category and attribution labels (e.g., GAY and GOOD) to which the participant was to respond in the subsequent experimental block. This practice session was implemented in order for the participant to become accustomed to either responding (“GO”) or not responding (“NO GO”) to target concept that coincided with the category labels presented above the stimuli.

During both practice and experimental trials, a blank screen was displayed for 500-1000ms followed by an appearance of the target concept for a maximum of 1000ms allowing the participant to respond by pressing the spacebar on a keyboard in front of the computer to indicate their response. The feedback, or accuracy screen, was then presented for 500ms to let the participant know whether they have responded to the stimuli correctly or not. Another blank screen was presented for 1000ms to signify the end of one trial and the beginning of another. In order to determine the length of time it took for the participant to respond to the stimuli, response time was recorded using the E-prime (V.20) software (Schneider, Eschmann, & Zuccoloto, 2002). Each set, or block, of trials lasted approximately 10 minutes after which the participant was offered a break. The entire experiment took an estimated 40-45 minutes to complete.

Results

Statistical Analysis

A behavioural method of analysis was used to assess the implicit associations regarding the gender and sexuality schemas of the current study. Response times were recorded and foreseen significant slowdown effects were observed exclusively within the male gender. All mean differences were found using Pairwise comparison and a 2 (character gender: male, female) X 2 (character sexuality: gay, straight) X 2 (attribute category: good, bad) repeated

measures ANOVA was performed. An alpha level of .05 was used as the cut-off value for any and all analyses. In order to conduct post-hoc tests, Least Significant Differences (LSD) were utilized. As $n < 30$, the assumption of Homogeneity of Variance was not satisfied, however, Wilks' Lambda was alternatively calculated where results remained static throughout. A significant effect in regards to character gender and attribute $F(1,17)=20.87, p < .05 \eta^2 = .55$. A significant three-way interaction was discovered with our attention being drawn towards the interaction in reference to the male character gender $F(1,17)=9.40, p < .05 \eta^2 = .36$.

Response Time Performance

Upon analysing response time results from the Go/No Go Association Task, it was observed that participants performed significantly slower during schema incongruent trials than during schema congruent trials which was previously expected based on the literature. The male homosexual character, supporting prior research, had the slowest response times compared to their homosexual female, and both male and female heterosexual counterparts. A significant three-way interaction was observed meaning that all three independent variables have an impact on the participant's response time in some way (Fig. 1). The response times were slowest for the MALE-GAY-POSITIVE condition ($M=601.95\text{ms}, SD=77.67$) and were the fastest for the MALE-GAY-NEGATIVE condition ($M=526.87\text{ms}, SD= 67.21$), the former being the schema incongruent condition and the latter, the schema congruent condition. These results were expected as the MALE-GAY pairing has been previously associated with slower reaction times in both research on reading (Dickinson, 2011) as well as using the Implicit Association Test (Schubert, 2013).

The female characters, although of little concern to the current study, still showed an

effect of character gender and attribute (Fig. 2), however, no significant interaction with sexuality was observed leading to our disinterest in this particular gender variable. As depicted in figure 2, female characters were more speedily associated with positive attributes ($M= 530.82\text{ms}$, $SD=69.24\text{ms}$) than were male characters ($M= 582.32\text{ms}$, $SD=59.78\text{ms}$). When it came to negative attributes, male characters were faster associated ($M=535.84\text{ms}$, $SD=63.13\text{ms}$) than were female characters ($M=589.91\text{ms}$, $SD=75.56\text{ms}$)

Discussion

The purpose of the current study was to further examine and support the previous research on the differences in response time relating to sexuality schema violation as it is contingent on the gender of the character. As we have observed, character gender results in response time variances when a sexuality schema is violated which is a finding consistent with previous literature (e.g., Schubert, 2013). When the sexuality of a male character is established as homosexual and positive attributes are associated with this particular character, the literature highlights that participants will demonstrate slower response times as this MALE-GAY-GOOD pairing is largely considered to be schema incongruent (e.g, Duffy & Keir, 2004; Dickinson, 2011; Schubert, 2013), which is what we have found during this study.

Although there has been research examining the effects of character gender on sexuality schema violations using the Implicit Association Test (e.g., Schubert, 2013), the optimal measure of studying these effects have yet to be implemented until now. Since an acceptable technique which employs an acceptable method of separating individual gender attributes has been used and similar results to IAT research were replicated, perhaps research that was earlier discounted, should be reconsidered. Although not designed to examine gender as a target

concept, it is now understood that the Implicit Association Test can be used to separate individual gender attributes and efforts should be made to re-examine findings, especially in regards to event related potential (ERP) analysis (e.g., Schubert, 2013).

Event Related Potentials, or ERPs, are an electrophysiological measurement aiding in the investigation of cognitive processing differences and brain activity (Luck, 2005) that behavioural measures, such as response time, are not able to fully explain (Williams & Themanson, 2010). Due to the results obtained in Schubert's (2013) study, it can be expected that schema incongruent information will have a larger N400 for incongruent trials over congruent trials and a larger LPP component for congruent trials over incongruent trials. Since the response time findings of the current study closely mimic those of Schubert's (2013) IAT research, these ERP results should be re-examined to obtain information that may still be relevant and valuable.

By using the findings of the current study alongside the support of earlier research, perhaps advancements in the education of schemas can be made in using the previously discussed techniques of understanding implicit attitudes. Kaufman (2012) has already made efforts in expanding this field using the Go/No Go Association Task as a method of presenting participants with concrete data regarding our processing difficulties upon our encounters with schema incongruent information. In doing so, a continuously growing body of literature has been created which can assist in this educational venture and allow for these schematic biases to be interpreted and perhaps eventually altered as illustrative data highlights these cognitive processing difficulties regarding certain social concepts. Translating the findings of these studies into real-world application can draw interest to the study of cognitive processing as well as investigating the effects that schemas have on our interpretation of information.

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Figures

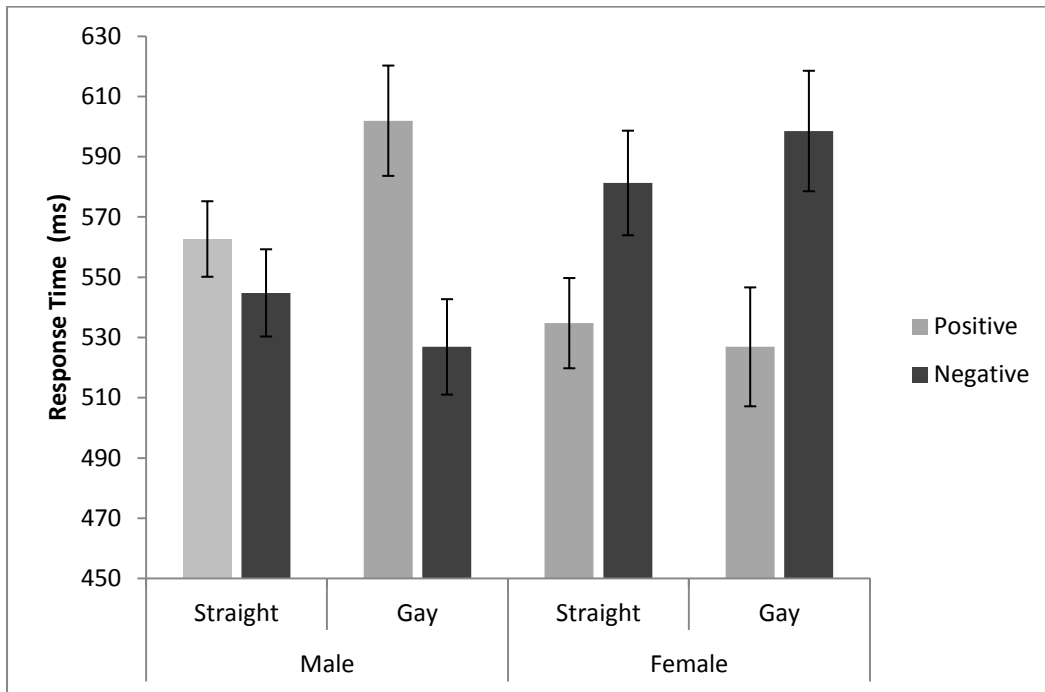


Figure 1: Character Gender X Sexuality X Attribute three-way interaction.

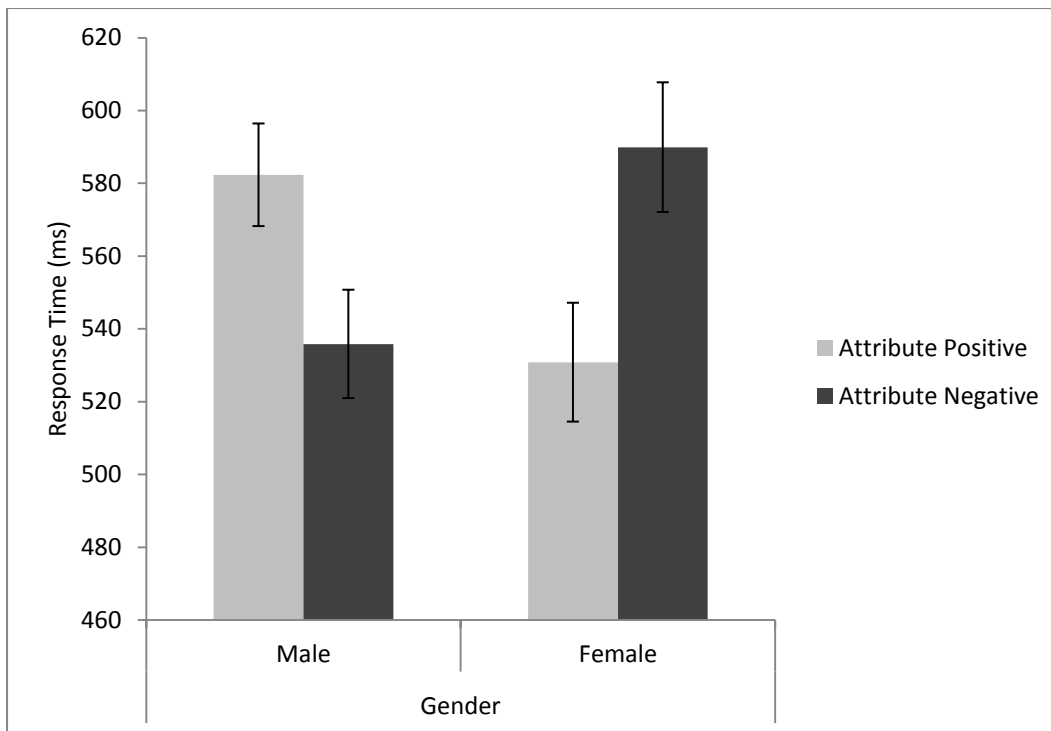




Figure 2: Character Gender X Attribute interaction.

Appendices

Gay-Straight IAT (Greenwald et al., 1998)

Category	Stimuli
Good	Joy, Beautiful, Marvelous, Wonderful, Pleasure, Glorious, Lovely, Superb
Bad	Agony, Terrible, Horrible, Humiliate, Nasty, Painful, Awful, Tragic
Gay	
Straight	

Appendix A: Gay-Straight IAT categories and stimuli (Greenwald et al., 1998).