The Impact of Perceptual Fluency Manipulations on Processing Speed and Ratings of Relatedness for Gender Role Schemas Using the IAT

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Abstract

The purpose of the current study was to combine research on schema violations and perceptual fluency to determine the impact of perceptual fluency manipulations on ratings of relatedness for gender role schemas through the use of an Implicit Association Test (IAT). The goal of this study was to gain a better understanding of the cognitive impact of processing manipulations. It was hypothesized that congruent blocks would have faster response times than incongruent blocks in the IAT. It was also hypothesized that perceptual fluency could be strategically manipulated to counteract the slowdown effect associated with schema-incongruent information. In addition, it was predicted that ratings of relatedness would be correlated with response times in that perceptually fluent blocks would be rated as more related than perceptually disfluent blocks. The results showed a main effect of congruency on response times and ratings of relatedness. It was found that the slowdown effect could successfully be eliminated through the use of perceptual fluency manipulations. However, perceptual fluency manipulations did not have a significant impact on ratings of relatedness. Future studies should utilize other methods to manipulate perceptual fluency, as well as investigate how changes in response times can influence different types of attribute ratings.

Keywords: schema violation, gender roles, perceptual fluency, Implicit Association Test

The Impact of Perceptual Fluency Manipulations on Processing Speed and Ratings of Relatedness for Gender Role Schemas Using the IAT

Introduction

Schemas are learned generalizations that help an individual to categorize information (Elio & Anderson, 1981). For example, in terms of gender roles, when a person thinks of a "nurse", they automatically assume that the individual is a female. Studies have found that a slowdown occurs when a person encounters information that violates an existing schema (Banaji & Hardin, 1996). This demonstrates that a person's mental frameworks are activated when encountering roles that are specific for a certain gender (Duffy & Keir, 2004; Brochu, 2013). Therefore, the slowdown occurs when the gender role schema is violated because the individual must integrate new information that is consistent with the discourse.

Perceptual fluency refers to the amount of effort that is required to process information and it has been shown to impact how concepts are interpreted, as well as recalled (Reber & Schwarz, 1999). In this context, perceptual fluency refers to the physical manipulation of text through the use of background colour contrast. These types of manipulations impact the level of cognitive demand required to interpret information. Perceptually fluent information requires less cognitive demand than perceptually disfluent information because it is easier to perceive and interpret (Coppin, 2015). Furthermore, research has shown that information that is easy to process is often considered more positive than information that is difficult to process (Oppenheimer, 2008).

In connecting these two concepts, the current study sought to determine whether perceptual fluency manipulations could impact ratings of relatedness for information that is congruent with existing mental schemas for gender roles, as well as incongruent. This study can help to determine the role of perceptual fluency in ratings of relatedness within gender schemas. This can be done by

evaluating perceptual fluency based on both physical attributes of the stimuli, as well as how this reflects in ratings of relatedness for information that is congruent or incongruent with existing mental schemas for gender roles. Specifically, by presenting incongruent pairs fluently and congruent pairs disfluently it can be determined whether this can impact the ratings of relatedness by making incongruent pairs rated as more related and congruent pairs rated as less related.

1 Gender Role Schemas

Information that a person encounters during everyday life comes to be incorporated into that individual's mental concepts. These concepts are often referred to as schemas, which are mental representations of people, objects, and events (Garnham, 1981). These frameworks can serve as shortcuts to help a person process and categorize information more efficiently. For example, it allows a person to make generalizations and assumptions about everyday situations, which saves them from allocating attention to integrate constantly changing information from the environment (Bransford & Johnson, 1972; Horowitz & Stinson, 1995). However, certain schemas may negatively impact processing in that it can lead a person to interpret ambiguous information differently than intended (Gernsbacher, Varner, & Faust, 1990). For example, if a person encounters a statement that reads "the manager of a business…" it would be common for them to assume that the individual is a male even if the text describing the situation did not explicitly state this information (Johns, 2013). This misinterpretation is caused by an existing stereotype that men hold higher positions within the working world because of their masculine characteristics (Stoker, Van der Velde, & Lammers, 2012; Schein & Mueller, 2004). This demonstrates that gender role schemas develop from societal norms and that this can influence a person's automatic assumptions when encountering new scenarios.

Stereotypes exist because people have preconceived notions about information due to the fact that they generalize what they know about a select few to the entire population (Kunda & Oleson, 1995). This influences how individuals judge groups of people and expectations are often set based on physical characteristics or labels even though this information may not be true. For example, a study conducted by Lick, Johnson, and Rule (2015) asked participants to categorize targets by sexuality based solely on their facial features. They found that individuals that the participant categorized as bisexual were rated significantly more negative on feelings of warmth, likeability, and their desire to be friends with the target. Results also showed that sexuality was often based on gender typicality with targets that had gender atypical features being associated more often with the categorization of bisexual. Therefore, the stereotype for a bisexual person is someone with features that go against their biological gender (feminine characteristics in a male or masculine characteristics in a female) and this assumption impacts the ratings of personality traits. This demonstrates that physical differences that violate existing schemas of masculinity or femininity can negatively influence attribute ratings for the individual.

Research in the area of gender roles has focused on ambiguous role names and their automatic association with a stereotypical gender. Banaji and Hardin (1996) conducted a study to explore whether gender stereotyping was an automatic process that could negatively influence a person's judgement. The participants in this study were shown primes related to gender naturally in language (E.g. mother/father), by existing social gender role stereotype (E.g. nurse/mechanic), or that were gender neutral (E.g. person/student). After the prime, participants were shown a pronoun specific for one gender (E.g. he/she) and asked to categorize the pronoun as male or female. The findings of this study were that participants had faster response times for pronouns that were schema congruent (E.g. "nurse" followed by "she"/ "father" followed by "he") as

opposed to pronouns that were schema incongruent (E.g. “nurse” followed by “he”/ “father” followed by “she”). The results of this study demonstrated that gender stereotypes are automatic and assumed for ambiguous roles that are typical for a specific gender.

The findings of these studies demonstrate that individuals often assume a typical gender based on their mental schemas for specific roles (Banaji & Hardin, 1996; Lick, Johnson, & Rule, 2015). Therefore, when a person encounters a role that is considered characteristic for one gender they automatically make this association and assume the information is congruent with the schema. This link causes a person to assume the typical gender even if the text does not explicitly state this information. A person’s mental schemas can also impact how they perceive people belonging to a certain role based on existing ideas that deviating from the existing schema is inherently bad, which has been shown to be reflected in attribute ratings (Lick, Johnson, & Rule, 2015). In addition, a violation to existing mental schemas has been found to cause processing to slow and the current study sought to explore the impact of this slowdown.

1.1 Gender Role Schema Violations

Studies examining gender role stereotypes have found that people automatically assume a specific gender that is typical for certain roles in text that does not explicitly state the character’s gender. Duffy and Keir (2004) found that a slowdown occurs in response to a violation in a person’s existing gender role schemas. More specifically, in a sentence where a previously introduced “nurse” was later referred to by the male pronoun “himself”, a slowdown in response rates occurred because it was assumed that most nurses are female. The same slowdown was found in sentences using gender roles that are typically considered female and later introducing a male pronoun. Therefore, the pronoun in reference to the stereotypical role forces the reader to integrate

the appropriate gender relative to the discourse that violates their existing knowledge, which causes the information to be processed slower.

Beyond the findings reported in studies that utilize full sentences, a slowdown has also been shown to occur when a single gender role is followed by a single pronoun that is inconsistent with the existing mental schema for that concept. Banaji and Hardin (1996) examined whether automatic gender stereotypes were activated in relation to specific occupations. In this study, participants were first shown a single word prime, which was an occupation that was considered typical for a specific gender (E.g. “nurse” for female and “mechanic” for male). The participants were then presented with a single target pronoun and they were asked to sort the pronoun into the proper category (male or female). The results of this study showed that faster response times occurred when the gender of the prime was congruent with the target word pronoun (E.g. nurse-she, mechanic-he). In comparison, if the gender role prime was incongruent with the pronoun then a discrepancy occurred and this resulted in slower response times. This indicates that presenting a stereotypical gender role primes a person to expect the following pronoun to fit into the existing schema. A violation causes a slowdown because the information is inconsistent and therefore must be integrated into the schema. The findings of these studies demonstrate that violating gender role schemas interrupts processing causing response times to be slower. In the current study, it was expected that congruent blocks would be responded to faster than incongruent blocks because these pairings are consistent with existing gender role schemas. In contrast, incongruent blocks should be responded to more slowly because the participant should automatically assume the typical gender role schema and therefore reincorporating inconsistent information should make processing slower.

1.2 Mediating Factors - The Slowdown Effect

Research has found that there are mediating factors that can reduce or eliminate the slowdown associated with schema incongruent information. Duffy and Keir (2004) found that the slowdown that occurs as a result of gender role schema violations can be eliminated through the use of priming. For example, if the sentence explicitly states before the pronoun “she” that the “mechanic” is a “woman” then the slowdown does not occur. They conducted a study comparing fixation times for ambiguous sentences (those that did not state the character’s gender) and sentences that were primed (those that explicitly stated at the beginning of the sentence the character’s gender). The results showed that ambiguous sentences had significantly higher fixation times (M= 366ms) than those that were primed (M=305ms). The findings of this study demonstrated that it is useful to overtly state at the beginning of the sentence the gender of the individual because it prevents the slowdown from occurring.

A study found that another mediator for the gender role schema violation slowdown is the culture of the participant. Brochu (2013) studied the difference in slowdown for individuals partially or completely entrenched in Canadian Francophone culture to determine whether the slowdown effect specifically occurred for individuals exposed to Canadian Anglophone culture or if the same results would be found across different cultures. The results of this study showed that the slowdown was not significant for those completely entrenched in Canadian Francophone culture (M=583ms in the congruent condition and M=663ms for the incongruent condition), suggesting that gender role schemas are weaker for these individuals. In comparison, individuals partially or completely entrenched in Canadian Anglophone culture demonstrated a significant slowdown effect regardless of whether their primary language was English or French. The findings

of this study were taken into consideration in the current study and therefore culture of the participant was controlled for by only using Canadian Anglophone participants.

1.3 Theory - The Slowdown Effect

A proposed theory to explain the slowdown associated with schema incongruent information is referred to as the “mismatch effect”, which states that the lack of congruency slows a person’s cognitive processes when interpreting pairs that violate their existing mental schemas in text. The cognitive cost associated with reconsidering the new information and integrating it into the discourse results in the mismatch effect. As previously discussed, Duffy and Keir (2004) used a reading task where they instructed participants to read paragraphs with gender-ambiguous role names and found that this automatically activated a stereotypical gender. In addition, they found that reading a gender-incongruent pronoun later in the text slowed processing. For example, if the reader encountered the word “herself” in reference to the previously mentioned “mechanic” this caused the sentence fixation times to increase. The slowdown effect occurs when the schema incongruent sentence is read because the automatic gender stereotype associated with that schema has already been activated (Dickinson, 2011; Banaji & Hardin, 1996). Therefore, the slowdown occurs because the individual must reconsider the information due to the inconsistency and correct the cognitive error. In the current study, this means that incongruent blocks would cause a slowdown because the pairings (male/family and female/career) violate the existing gender role schema, which forces the individual to reconsider the information and modify their mental representation to suit the discourse.

Another theory to explain the slowdown effect is the theory of accessibility. This theory is focused on memory research pertaining to the concept of interference, which shows that speed of

learning is influenced by previously learned concepts (Millon & Lerner, 2003). More specifically, information is processed more slowly if the new material does not match an individual's past memories. The theory of accessibility states that schemas are heuristics constructed by personal experience and that the most common explanation for new information should be consistent with what the person has experienced in the past. In terms of gender roles, research has shown that throughout history and into present time, males are more likely to be in career-related positions and females are more likely to be in family-related positions (Carreiras, Garnham, Oakhill, & Cain, 1996). Therefore, the schema for men is consistent with concepts related to the working world and the schema for women is consistent with concepts related to home life. In the current study, the congruent condition was male/career and female/family and the incongruent condition was male/family and female/career because these pairings are consistent with existing gender role schemas. According to the theory of accessibility, congruent information should be responded to more quickly than incongruent information because these schemas should be more easily accessed in memory due to more exposure to these gender roles in everyday life.

An alternative theory to the mismatch effect and theory of accessibility is the self-schema model. This model states that schema congruent information is consistent with the person's self-concept. The assumptions of this model are that information that is consistent with oneself is processed more quickly and efficiently than information that contradicts a person's self-image (Bem, 1982). For example, a female mechanic would consider this gender/career role pairing as congruent due to her personal experiences. However, this model has been refuted by previous research because findings have shown response times slow for incongruent information regardless of the participant's personal characteristics. For example, Dickinson (2011) found that even when participants identified themselves as "non-heterosexual" a slowdown in reading speeds occurred

when answering questions pertaining to a video containing homosexual content in comparison to a video containing heterosexual content. This study demonstrates that participants in the current study would be expected to display slower response times for the incongruent blocks regardless of their personal identity and life experiences with gender roles.

2 Perceptual Fluency

Perceptual fluency refers to the subjective ease of processing a person experiences when they encounter information. Various studies have found that easy processing has led to more positive ratings of truth, simplicity, preference, affective judgements, liking, and morality (Forster, Leder, & Ansorge, 2013;West & Bruckmüller, 2013; Laham, Alter, & Goodwin, 2009; Hansen, Dechene, & Wanke, 2008; Song & Schwartz, 2008). Therefore, the subjective effort required to process text can negatively influence attribute ratings for that information.

There are a variety of ways that perceptual fluency can be manipulated, such as modifying the style, colour, or size of the font (Oppenheimer & Frank, 2008). These operations have been shown to impact attribute ratings with easy processing being associated with more positive evaluations. Hansen, Dechene, and Wanke (2008) conducted a study to explore whether easy processing would be associated with higher judgements of truth. They asked participants to rate relatively ambiguous consumer-related statements on a scale ranging from 1 to 7 (1 meaning “definitely false” and 7 meaning “definitely true”). The study found that the truthfulness of statements was impacted by whether the statement deviated in perceptual fluency from the previous statements. This was done by presenting six statements in high fluency followed by six statements in low fluency, or vice versa. The results showed that statements were judged as significantly more true when they were presented in higher contrast after lower contrast (M=4.23)

as opposed to lower contrast after higher contrast (M=3.69), in comparison to the previously presented statements. Therefore, subtle changes in encoding difficulty can influence how individuals process and interpret information.

It has been found that text written on easy to read background colour contrasts are evaluated more positively in ratings of simplicity and preference than those presented in difficult to read background colour contrasts. Song and Schwartz (2008) found that when instructions were printed in easy to read font, subjects reported that they believed the behaviour would take less time to complete and that they would be more likely to engage in the behaviour than if it were presented in difficult to read font. Participants were asked to rate the perceived difficulty of the task on a scale of 1 to 7 (1 meaning “very hard” and 7 meaning “very easy”). Results showed that the task written in perceptually fluent font was rated as significantly less difficult (M=4.8) than the task written in perceptually disfluent font (M=3.5). In addition, participants were asked to rate their willingness to complete the task on a scale of 1 to 7 (1 meaning “very unlikely” and 7 meaning “very likely”). Results showed that participants were significantly more likely to engage in the task when it was written in perceptually fluent font (M=4.5) than if the task was written in perceptually disfluent font (M=2.9). This demonstrates that perceptual fluency manipulations can impact effort prediction, as well as motivation, which is important in the current study because it demonstrates that subtle changes in encoding can impact a person’s evaluation of that information.

Perceptual fluency manipulations have been shown to impact judgements of positive affective state. Winkielman and Cacioppo (2001) conducted a study to determine whether perceptually fluent stimuli would be evaluated more positively than perceptually disfluent stimuli. This was done by presenting participants with 20 black and white line drawings of neutral objects (E.g. horse, airplane, bird, house), half of which were presented fluently and the other half

disfluently. Perceptual fluency was manipulated through the use of random noise in the form of small dots added to the picture. After the presentation of each stimulus the participant was asked to rate their response to the stimulus either on level of positivity from 1-4 (1 meaning no positive reaction and 4 meaning very positive reaction) or level of negativity from 1-4 (1 meaning no negative reaction and 4 meaning very negative reaction). The results showed that participants who were asked to provide judgements on positivity gave significantly higher ratings to perceptually fluent stimuli (M=2.46), as opposed to perceptually disfluent stimuli (M=2.19). Participants who were asked to provide judgements on negativity did not give significantly different ratings between perceptually fluent stimuli (M=2.07) and perceptually disfluent stimuli (M=1.95). This result is in support of the hedonic marking hypothesis, which states that reading perceptually fluent information creates a positive affective state (Laham, Alter, & Goodwin, 2009; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). In the current study, it was predicted that perceptually fluent blocks would be rated higher on ratings of relatedness based on the hedonic marking hypothesis, which will be further discussed in the theory section.

2.1 Impacts of Disfluency

Studies have found that perceptual fluency manipulations can influence discrimination against individuals with mental disorders. West and Bruckmüller (2013) explored how perceptual fluency manipulations impact prejudice towards individuals diagnosed with schizophrenia. In this study, all participants were given a description of a successful male musician; however, half of the participants were told that this man had been diagnosed with schizophrenia. They were then asked to imagine a social interaction with the man. The perceptual fluency of the instruction font was also manipulated to determine how this would impact the imagined contact. In addition, participants were instructed to complete a nine item measure of prejudice against people with

schizophrenia from 1 to 7 (1 meaning “not at all” and 7 meaning “very”), which consisted of questions such as, “I would feel unsafe around people with schizophrenia”. The results of this study found that participants reported the most positive interaction with the man who did not have schizophrenia. In comparison, participants reported perceptions of dangerousness and avoidance in the condition with the man who had schizophrenia. In analyzing the impact of perceptual fluency, it was found that participants in the perceptually fluent font conditions reported less prejudice overall (M=2.52) than the participants in the perceptually disfluent font conditions (M=3.11). Therefore, ease of processing is associated with attribute ratings in that perceptually fluent descriptions lead a person to report more positive evaluations. In the current study, this would mean that perceptually fluent conditions should be rated as more related than perceptually disfluent conditions.

Perceptual fluency has also been found to impact moral judgements. Laham, Alter, and Goodwin (2009) explored whether perceptual fluency manipulation would impact a participant’s rating of moral wrongness for negative statements. They presented statements either fluently (black font on a white background) or disfluently (black font on a 60% greyscale background) and asked participants to rate how morally wrong they considered the protagonist’s actions described in the statement to be on a scale of 1 to 10 (1 meaning “not at all wrong” and 10 meaning “very wrong”). An example of a vignette used in this study was “man defaces a memorial”. The results of this study showed that the statements presented fluently were rated as significantly less morally wrong (M=8.2) than the statements presented disfluently (M=9.2). This study demonstrates that judgements of moral wrongness were influenced by the background contrast manipulation. Therefore, perceptual fluency influenced the individual’s evaluation of the information with easy to read statements being rated less negatively.

The findings of these studies demonstrate that the perceptual fluency of text can influence a person's interpretation of that information. A scenario presented in perceptually fluent text is rated more positively in many aspects, as opposed to the same scenario presented in perceptually disfluent text. This demonstrates that the physical manipulation of perceptual fluency can impact judgements and this finding has held true in the area of prejudice, as well as morality. The current study sought to determine whether perceptual fluency manipulations would also impact ratings of relatedness.

2.2 Theory - Positive Attribute Ratings for Fluent Information

There are two possible theories to explain why perceptually fluent information is rated more positively than perceptually disfluent information. The first is the hedonic marking hypothesis, which states that easy processing leads to a positive affective state (Laham, Alter, & Goodwin, 2009; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Therefore, sentences or words that are easy to read take less time to perceive and this makes the individual associate positive emotion with the information. According to this theory, perceptual fluency can be considered directly linked to affective preferences due to a positive emotional reaction triggered by easy processing (Laham, Alter, & Goodwin, 2009). Furthermore, the hedonic marking hypothesis is linked to the finding that perceptually fluent processing elicits an automatic activation of the zygomaticus muscles, which are engaged while smiling (Winkielman & Cacioppo, 2001). Studies have found that even when forced, smiling and laughter have been associated with positive mood ratings (Neuhoff & Schaefer, 2002). Therefore, the activation of this muscle could contribute to the positive affect associated with perceptually fluent information. In the current study, perceptually fluent blocks should be rated as more related than perceptually disfluent blocks due to the fact that perceptually fluent text is easier to read than perceptually

disfluent text. This would support the hedonic marking hypothesis and familiarity hypothesis, which states that perceptual fluency would be associated with a positive affective state, as well as feelings of familiarity (Lick & Johnson, 2015; Laham, Alter, & Goodwin, 2009; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Therefore, fluent text should be rated more positively than disfluent text in both congruent and incongruent conditions.

The second theory is the familiarity hypothesis, which states that information that is processed more easily and quickly is associated with feelings of familiarity (Lick & Johnson, 2015). According to this theory, text that is easier to process is perceived to be more familiar, which results in a more positive attribute rating (Lick & Johnson, 2015). This means that people use a heuristic in recognition-memory decisions, which leads them to believe the subjective ease of processing can be attributed to a prior encounter with the stimulus (Westerman, Lanka, & Olds, 2015). This theory also proposes that novel stimuli are perceived as more risky and therefore undesirable (Song & Schwarz, 2009). In the current study, the pairings in both the congruent and incongruent block should be rated as more related if they are presented fluently because according to the familiarity hypothesis this means that the information should be perceived as more familiar. The familiarity hypothesis can also be linked to the hedonic marking hypothesis in that perceptual fluency creates a positive emotional reaction and this positivity leads to a sense of familiarity.

3 Implicit Association Test (IAT)

The Implicit Association Test (IAT) measures a participant's automatic attitudes toward target and attribute categories (Greenwald, McGhee, & Schwartz, 1998). These implicit attitudes may either be unconscious or not socially acceptable to express. Surveys and questionnaires are explicit measures that may be impacted by social desirability, which occurs when the participant

answers questions in a manner that would be viewed favourably by others (Krumpal, 2013). The IAT has been used to eliminate this bias when examining sensitive areas, such as cultural attitudes towards gender roles, sexuality, race, and ethnicity (Steffens, 2004). The IAT is utilized in the current study to eliminate possible sources of error discussed above while evaluating the impact of perceptual fluency on attribute ratings for gender role schemas.

During the IAT, participants are asked to sort stimuli into the correct categories as quickly as possible and response times are recorded. Each stimulus that appears on the screen belongs to one of four possible categories, two of which are target categories (E.g. male/female), and two of which are attribute categories (E.g. career/family). Stimuli are words related to these categories (E.g. male and female names or career and family related words). The target and attribute categories are paired so that they are either congruent or incongruent with existing schemas. The congruent condition would be made up of one target and one attribute label (E.g. male/career or female/family) and this would be paired to a single response key. The incongruent condition would be made up of the opposite pairing of target and attribute labels, which would violate existing mental schemas (E.g. male/family or female/career). Previous studies have found that the congruent pairings are more highly associated with one another because they fit into a person's existing schema (Greenwald, McGhee, & Schwartz, 1998). This results in faster response times than incongruent pairings, which violate the existing schemas. Moreover, these results have held consistent regardless of participant gender (Banaji & Hardin, 1996).

There are three basic assumptions to the IAT. The first assumption is that response times are faster for information that is consistent with our mental schemas (congruent condition). For the gender-career IAT this means that it is assumed that the stimuli would be sorted faster in the condition with congruent labels (male/career and female/family). The second assumption is that

response times should be slower for information that violates our mental schemas (incongruent condition). For the gender-career IAT this means that it is assumed that stimuli would be sorted slower in the condition with incongruent labels (male/family and female/career). The third assumption is that the IAT requires a person to use cognitive processes that are automatic and therefore unconscious (Greenwald et al., 1998; Schubert 2013). This means that the person automatically responds without considering how other people will interpret their answers.

4 Overview of the Current Study

The congruency of schemas is interpreted based on response times using the gender-career IAT. As previously mentioned, two concepts that are processed faster are considered to be more strongly associated (Greenwald, McGhee, Schwartz, 1998; Schubert, 2013). Research has shown that response times for the gender-career IAT are faster for conditions using male/career and female/family, as opposed to male/family and female/career (Greenwald et al., 1998; Schubert, 2013). This helps in the determination of which concepts are considered to be schema congruent and incongruent. The pairings of male/career and female/family are more highly associated with one another because they fit into the existing gender schema, which results in faster response times than pairings of male/family and female/career.

Additionally, research in the area of meta-cognitive monitoring has found that information that is processed faster is attributed as more positive than information that takes longer to process (Unkelbach et al., 2010). This means that schema congruent information should be rated more positively than schema incongruent information due to the slowdown effect. Based on these findings, the assumption was made in the current study that ratings of relatedness should be higher

for pairs that are congruent with existing gender role schemas (male/career and female/family) because they are processed faster than pairs that are incongruent (male/family and female/career).

Studies have also shown that perceptually fluent information is processed faster and rated more positively than disfluent information (Oppenheimer, 2008). The current study takes these findings a step further to explore whether manipulating perceptual fluency to make the congruent block disfluent and the incongruent block fluent will reflect in the response times and ratings of relatedness. The response times for perceptually fluent trials should be faster and this should result in higher ratings of relatedness. In comparison, the response times for perceptually disfluent trials should be slower and this should result in lower ratings of relatedness. In examining gender role schemas, the focus is on whether the slowdown effect can be eliminated in regards to incongruent blocks (male/family and female/career) when the font is perceptually fluent and whether a slowdown will occur when the font is made perceptually disfluent in the congruent blocks (male/career and female/family).

4.1 Hypotheses

The first hypothesis was that congruent blocks should have faster response times than incongruent blocks for the gender-career IAT, as found in previous studies (Greenwald et al. 1998; Schubert, 2013) This can be explained by the mismatch effect, which states that information that is congruent with existing mental schemas for gender roles should be processed faster than information that is incongruent with existing mental schemas because violating these frameworks forces the reader to reconsider the information. It could also be explained by the theory of accessibility, which states that information that is more common in everyday life is more easily accessible and this leads to faster response times (Millon & Lerner, 2003). Therefore, in the

current study, congruent blocks (male/family and female/career) should have faster response times than incongruent blocks (male/family and female/career).

The second hypothesis was that the stereotypical bias indicated by a slowdown effect in regards to gender role schemas can be reduced or eliminated by strategically manipulating perceptual fluency. More specifically, presenting schema incongruent information fluently should increase ratings of relatedness because faster response times are associated with more positive ratings of relatedness. In comparison, presenting schema congruent information disfluently should decrease ratings of relatedness because this would slow processing and cause the information to be rated less positively. The response times predicted from fastest to slowest were as follows: congruent x fluent, congruent x disfluent, incongruent x fluent, incongruent x disfluent. The ratings of relatedness were expected to correspond with the response times in that faster response times would result in higher ratings of relatedness.

The third hypothesis was that perceptually fluent blocks should have faster response times than incongruent blocks for the gender-career IAT and in turn be rated as more related. According to the hedonic marking hypothesis, information that is presented in perceptually fluent text should be rated as more related because information that is easy to process is more positively evaluated due to the association with a positive affective state (Laham, Alter, & Goodwin, 2009; Winkielman, Schwarz, Fazendeiro, & Reber, 2003). According to the familiarity hypothesis, information that is presented in perceptually fluent text should be rated as more related because information that is easy to process is considered more familiar (Lick & Johnson, 2015). Therefore, blocks with black font on a white background should have faster response times than blocks with black font on a 60% greyscale background.

Method

1 Participants

A total of 29 undergraduate students from Laurentian University volunteered to participate in this experiment (10 males/19 females) with a mean age of 20.97 years. All participants used in the study identified as Anglophones who were born and raised in Canada. This control was chosen because culture has been shown to impact gender role schemas. As previously discussed, individuals who are completely entrenched in Francophone culture have been shown to have weaker gender role schemas (Brochu, 2013). All participants in the current study were also required to have correct or corrected to normal vision to ensure that they could effectively sort stimuli. Informed consent was obtained and participants received extra course credit for their participation.

2 Materials

The current study utilized an Implicit Association Test. This program presents visual stimuli using E-Prime software version 2.0 (Schneider, Eschman, & Zuccolotto, 2002). Participants indicated their answer on a response box by pressing either 1 or 2. All target and attribute categories as well as stimuli were originally developed by Greenwald et al. (1998). The target and attribute categories in the gender-career IAT task that was used are male/female and career/family, respectively. Stimuli consist of male and female names as well as career and family related words. (See Appendix A). The relatedness Likert scale was developed specifically for this study (See Appendix B). However, other studies have used similar Likert scales to convey other types of attribute ratings (e.g. Song & Schwartz, 2008). In the current study, participants indicated

their rating from 1 to 5 (1 meaning “not at all related and 5 meaning “very related”) using numbers on a keyboard.

3 Variables

There were two independent variables in the current study. The first was congruency, which was counterbalanced with half of the participants receiving the congruent block first (male/career and female/family) and the other half of the participants receiving the incongruent trial first (male/family and female/career). Extensive studies have been conducted that have found that response times are faster for conditions that are compatible with existing schemas using the IAT. Specifically, for the gender-career IAT, it has been found that there are stronger associations for the pairings male/career and female/family because they are responded to significantly faster. In addition, Carreiras, Garnham, Oakhill, and Cain (1996) conducted a study asking participants to rate the gender typicality of 100 names on a scale of 1 to 7 (1 meaning “very female” and 7 meaning “very male”), as well as the association strength of 100 words from 1 to 7 (1 meaning “very career related” and 7 meaning “very family related”). The names/words chosen for the current study were rated on the extreme ends of the Likert scale indicating they are strongly associated with one gender (male or female) and one gender role (career or family). It was also found that males are more associated with career roles and females are more associated with family roles, which supports the findings in previous research.

The second independent variable was perceptual fluency, which was counterbalanced with half of the participants receiving the congruent block greyed and the other half receiving the incongruent block greyed. The process of greying was achieved by using a 60% greyscale background, which served as noise to make processing more difficult (See Appendix C). This

operation was chosen because previous studies have found that a slowdown does occur using this type of perceptual fluency manipulation. Furthermore, using a 60% greyscale background makes it more difficult to read without forcing the participant to strain their eyes while viewing the stimuli.

There are two dependent variables in the current study. The first is response time, which was measured in milliseconds according to when the buttons on the response box were pressed by the participant while sorting stimuli during the experimental trial. The second was the ratings of relatedness, which was measured at the end of the experiment. Participants were asked to rate on a scale from 1 to 5 (1 meaning “not at all related” and 5 meaning “very related”) the relatedness of target and attribute categories for the four pairings. This was used to determine whether manipulating the perceptual fluency would impact the ratings of relatedness for fluent and disfluent information.

4 Procedure

Once the participants entered the Cognitive Health Research Lab in room E-228 of the Alphonse Raymond building, they were asked to fill out an informed consent form (See Appendix D), a demographics questionnaire (See Appendix E), and handedness questionnaire (See Appendix F). The participant was then escorted to the sound-attenuating booth equipped with a computer monitor and response box to perform the experiment. The actual experiment lasted approximately 30 minutes and a break was offered between each testing block.

Participants were tested individually and instructed to sort stimuli into categories appearing on either the right or left side of the computer screen using a response box. The stimuli were shown for an unlimited amount of time. Therefore, the length of the study ultimately depended on the speed of the participant; however, the entire session lasted approximately an hour.

A red “X” appeared in the middle of the screen for 500 milliseconds if an incorrect response was made, though participants were not required to correct mistakes. The inter-trial time period was 400 milliseconds for all trials.

The gender-career IAT that was used followed a five-step procedure. A word or name associated with one of the four categories (male/female or career/family) was presented in the center of the screen and participants were instructed to press buttons on the response box (1 or 2) to indicate that the word belonged to the category on either the right or left side of the screen based on the category pairings. Congruency of target and attribute category pairings was counterbalanced across participants with half receiving the congruent condition first (male/career, female/family) and the other receiving the incongruent condition first (male/family, female/career). Perceptual fluency was counterbalanced across the participants as well with half receiving the fluent condition first (black font on a white background) and the other half receiving the disfluent condition first (black font on a 60% greyscale background). The order of stimuli was also randomized.

Participants first completed a practice block of trials where they became familiarized with classifying each target category to one response key. Category labels were presented on the left and right sides of the screen. The first practice block had the male and female labels and participants were instructed to sort the names into the proper category. For example, the name “Ben” would be sorted to the male category on one side of the screen and the name “Julia” would be sorted to the female category on the other side of the screen. A second practice block was used to familiarize participants with classifying career and family related words into attribute categories. For example, the word “business” would be sorted to the career category on one side of the screen and the word “children” would be sorted to the family category on the other side of the

screen. Target and attribute categories were then combined into paired categories for the third practice block (E.g. male/career on one side and female/family on the other). The fourth practice block had the same target and attribute categories in the same position with the same pairings; however, the labels were removed from the screen. (E.g. no labels displayed on either side, but words were sorted into the same categories as the previous trial as if they were still in the same position) The experimental block was identical to the fourth practice block with a greater number of trials (E.g. no labels displayed, but words were sorted into the same categories as the previous two trials as if they were in the same position) and this was when response times were recorded (See Appendix G).

After the participant completed the five-step procedure for either the congruent or incongruent condition they had to repeat the steps with the opposite condition. The order of this was determined through counterbalancing. For example, if the participant first received the congruent condition, as used in the previous example, then the second condition would be incongruent. The difference in this condition was that the label pairings were switched (male paired with family and female paired with career). It is also important to note that the position of the labels (right or left side of the screen) was randomized, as well as the order of the presentation of the stimuli throughout the experiment (See Appendix H).

At the end of the experiment, participants were presented with four relatedness questions in randomized order. These questions asked participants to rate the relatedness of the target and attribute ratings on a scale from 1 to 5 (1 meaning “not at all related” and 5 meaning “very related”). The questions stated, “how related are ___ and ___?” and the four pairings were: male/career, male/family, female/career, female/family. The purpose of this attribute rating was to determine whether the perceptual fluency impacted the relatedness rating for congruent and

incongruent pairings. It was assumed that the condition that was perceptually fluent would elicit a more positive rating of relatedness. This assumption was based on previous studies that show presenting information fluently makes attribute ratings more positive (Oppenheimer, 2008). This would also mean that ratings of relatedness would correspond with response times in that faster response times would lead to higher ratings of relatedness.

Results

1 Response Times

Response times were analyzed using a 2 X 2 repeated-measures analysis of variance (ANOVA) with congruency (congruent x incongruent) and fluency (fluent x disfluent). A main effect of congruency on response times was found. Response times were significantly faster in the congruent condition (M=648.79ms, SD=19.52ms) compared to the incongruent condition (M=710.13ms, SD=22.76ms), $F(1, 27) = 22.83$, $p < .05$, $\eta^2 = .46$ (Refer to Figure 1). This result supported the hypothesis that congruent blocks would have faster response times than incongruent blocks.

An interaction was also found between congruency and fluency on response times. The results showed fluent/congruent blocks (M=751.92ms, SD=34.85ms) were responded to significantly faster than incongruent/disfluent blocks (M=645.96ms, SD=29.89). In comparison, there was no significant difference in response times found for the congruent/disfluent blocks (M=651.64ms, SD=25.11ms) and the incongruent/fluent blocks (M=668.34ms, SD=29.33ms), $F(1, 27) = 12.09$, $p < .05$, $\eta^2 = .31$ (Refer to Figure 2). This result supported the hypothesis that perceptual fluency manipulations could eliminate the slowdown effect that occurs with incongruent information in the IAT.

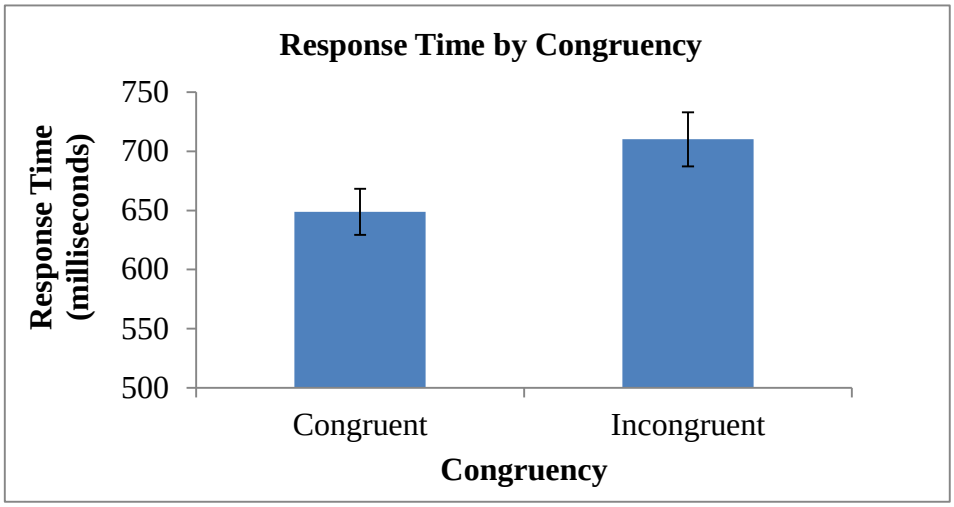

Figure 1. The error bars represent the standard error of the mean. The figure shows that the error bars for congruent blocks and incongruent blocks do not overlap, which means the differences in the sample means for response time could not have been due to chance alone. This demonstrates a main effect of congruency.

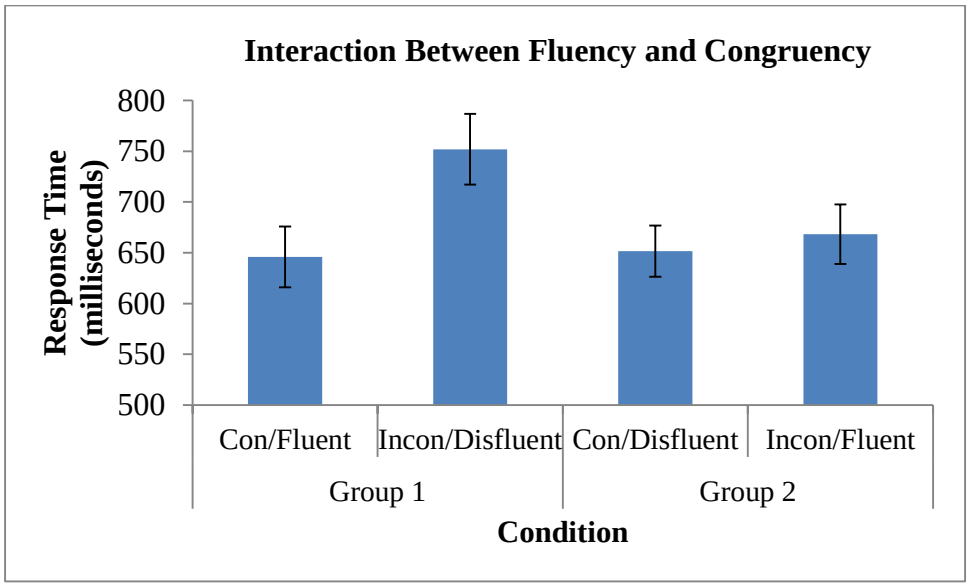

Figure 2. The error bars represent the standard error of the mean. This figure represents the effect of fluency and congruency on response times. A significant slowdown in response times is shown for the incongruent/disfluent block in comparison to the other 3 blocks (congruent/fluent, congruent/disfluent, incongruent/fluent).

2 Ratings of Relatedness

Ratings of relatedness were analyzed using a 2 X 2 repeated-measures analysis of variance (ANOVA) with congruency (congruent x incongruent) and fluency (fluent x disfluent). A main effect of congruency on ratings of relatedness was found. The congruent blocks (M=3.54, SD=.27) were rated as significantly more related than the incongruent blocks (M=3.05, SD=.18), $F(1, 27) = 9.04$, $p < .05$, $\eta^2 = .25$ (Refer to Figure 3). No significant effect was found for perceptual fluency manipulations on ratings of relatedness. The fluent blocks (M=3.48, SD=.33) were not rated as significantly more or less related than the disfluent blocks (M=3.01, SD=.28), $F(1, 27) = .77$, $p > .05$ (Refer to Figure 4). This result did not support the hypothesis that perceptually fluent blocks would be rated as more related than perceptually disfluent blocks on the IAT.

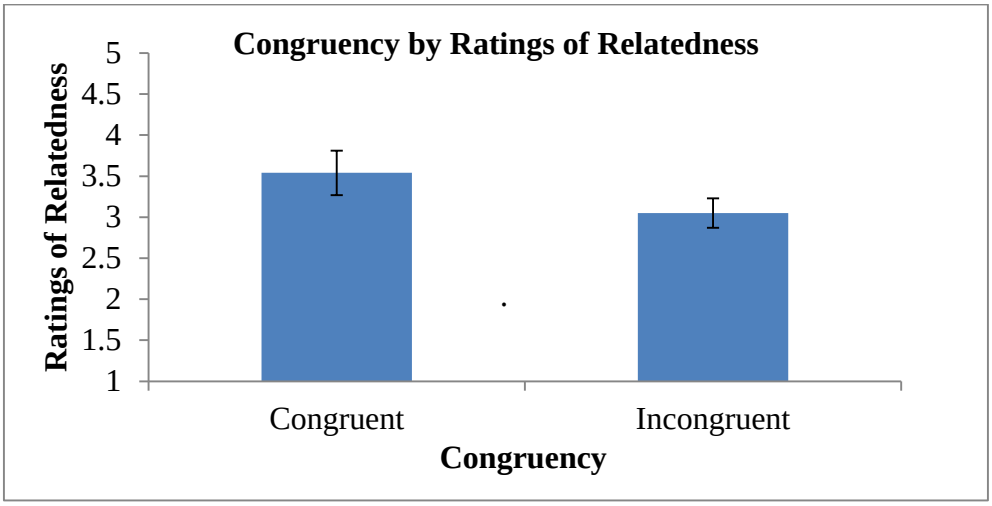

Figure 3. The error bars represent the standard error of the mean. The figure shows that the error bars for congruent blocks and incongruent blocks do not overlap, which means the differences in the sample means for ratings of relatedness could not have been due to chance alone. This demonstrates a main effect of congruency.

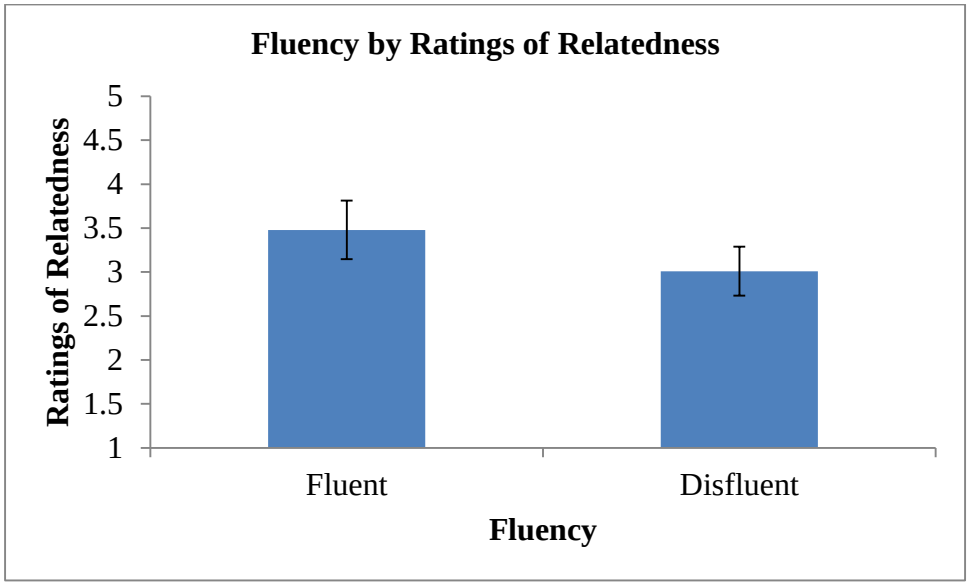

Figure 4. The error bars represent the standard error of the mean. The figure shows that the error bars for fluent blocks and disfluent blocks overlap, which means the differences in the sample means for ratings of relatedness could have been due to chance alone. This demonstrates that there was no significant difference found for ratings of relatedness between fluent and disfluent blocks.

3 IAT Accuracy Data

Accuracy rates were analyzed to ensure participants were reading for content rather than randomly sorting names/words between categories. It was found that across all blocks the accuracy rates were above 97%. It was also noted that there was a significant difference in accuracy ratings with the congruent/fluent block having a significantly higher accuracy rate (99.05%) than the incongruent/disfluent block (97.15%), congruent/disfluent block (97.65%), and incongruent/fluent block (97.45%). $F(1, 27) = 4.12$, $p > .05$, $\eta^2 = .13$.

Discussion

The main purpose of this study was to determine whether perceptual fluency manipulations would impact response times and ratings of relatedness for gender role schemas. Previous research has observed a difference in response times between congruent blocks (male/career and female/family) and incongruent blocks (male/family and female/career) in the gender IAT. However, studies that examined the impact of perceptual fluency manipulations in tests that look at congruence/incongruence of schemas have not been found. The current study found results that were consistent with other studies (e.g. Schubert, 2013) in that there was a significant difference in response times between congruent and incongruent blocks with response times being significantly faster for the congruent blocks than the incongruent blocks. The prediction for response times was based on research showing that congruent information is processed faster than incongruent information and that fluent information is processed faster than disfluent information due to the level of cognitive demand (Dieman-Yauman, Oppenheimer, & Vaughan, 2011). Therefore, it was originally predicted that the response times from fastest to slowest would be: congruent x fluent, congruent x disfluent, incongruent x fluent, incongruent x disfluent. The results supported this hypothesis with mean scores of 645.96, 651.64, 668.34, and 751.92 milliseconds, respectively. These results demonstrate that gender role schemas can impact processing speeds on the IAT because congruent blocks were responded to faster than incongruent blocks. In addition, perceptual fluency manipulations also impacted processing speeds because the perceptually fluent blocks were responded to faster than the perceptually disfluent blocks for the congruent condition, as well as the incongruent condition.

The results support the mismatch theory, which states that violating a gender role schema causes the participant’s cognitive processing to slow because the automatic gender stereotype

associated with the schema was automatically activated (Banaji & Hardin, 1996). Therefore, the participant would be forced to reincorporate the new information into the schema in the incongruent blocks, which would result in longer response times. The results also support the theory of accessibility in that the congruent blocks were responded to faster because the new information was consistent with the participant's past experiences with gender roles. The pairings of male/family and female/career are inconsistent with existing gender role schemas and the results showed that these blocks had slower response times than the congruent pairings of male/career and female/family. The incongruent pairings caused participant's response times to be slower because it took longer to sort between categories that were inconsistent with the existing schemas. In the incongruent blocks, participants needed to recognize that the pairings were inconsistent with existing gender role schemas and put extra effort into sorting the names/words accordingly. These results indicate that in the IAT the incongruent blocks create a discrepancy between what is assumed and what the task actually requires. The participant is forced to disregard their previous knowledge and sort based specifically on the labels. This causes processing to be slower because there is a mental disconnect between the terms that are incongruent (male/family and female/career) and the participant is required to modify these concepts by reincorporating new information that is consistent with the sorting task.

The results supported the hypothesis that the slowdown effect could be eliminated through the use of perceptual fluency manipulations in the gender IAT. Group 1 had a significant difference in response times in that the congruent/fluent blocks were responded to significantly faster than the incongruent/disfluent blocks. This was hypothesized because other studies have shown that congruent information is processed faster than incongruent information, as previously mentioned (Banaji & Hardin, 1996). Moreover, the introduction of perceptual fluency

manipulations should have only further impacted the difference in scores in Group 1 because fluent information is easier to read than disfluent information (Oppenheimer, 2008). In comparison, Group 2 did not have a significant difference in response times in that the congruent/disfluent blocks were not responded to significantly faster than the incongruent/fluent blocks. In other words, by presenting schema congruent information disfluently and schema incongruent information fluently, the discrepancy in response times was eliminated. This interaction demonstrates that strategically manipulating the perceptual fluency of text can eliminate the slowdown effect associated with schema violations.

The ratings of relatedness in the current study were impacted by congruency with congruent pairings being rated as significantly more related than incongruent pairings. This is consistent with previous findings, which explicitly asked participants to rate the association strength of gender names with roles. For example, Carreiras, Garnham, Oakhill, and Cain (1996) found that participant's rate male names as more associated with career roles and female names as more associated with family roles. Previous studies have also found that reading speeds are faster for information that is schema congruent, as opposed to schema incongruent (Duffy & Keir, 2004). The current study found that congruent pairings were rated as more related and that congruent blocks were responded to significantly faster than incongruent blocks. This finding suggests a stronger association for the congruent pairings of male/career and female/family, as opposed to the incongruent pairings of male/family and female/career.

It was hypothesized that perceptually fluent blocks would be rated as more related than perceptually disfluent blocks based on two theories. Firstly, the hedonic marking hypothesis, which states that easy processing would lead the participants to experience a positive affective state and cause them to rate information more favourably (Laham, Alter, & Goodwin, 2009;

Winkielman, Schwarz, Fazendeiro, & Reber, 2003). Secondly, the familiarity hypothesis, which states that fluency coincides with feelings of familiarity and would lead the participants to provide more positive evaluations of information (Lick & Johnson, 2015). However, the findings showed that perceptual fluency did not have a significant impact on ratings of relatedness in the current study. There are a few possible explanations for this result. Firstly, previous studies that analyzed the impact of perceptual fluency manipulations on attribute ratings asked participants to rate stimuli based on other qualities than relatedness (e.g. positivity/negativity, emotional affect, truthfulness, moral wrongness, perceived difficulty, liking, etc.). For example, Winkielman and Cacioppo (2001) asked participants to rate fluent and disfluent drawings on a scale of 1-4 for positivity (1 meaning “no positive reaction” and 4 meaning “very positive reaction”), as well as negativity (1 meaning “no negative reaction” and 4 meaning “very negative reaction”).Therefore, previous studies (e.g. Forster, Leder, & Ansorge, 2013;West & Bruckmüller, 2013; Laham, Alter, & Goodwin, 2009; Hansen, Dechene, & Wanke, 2008; Song & Schwartz, 2008) focused on the attitudes towards the schemas, as opposed to the current study which focused on the actual association. It is also possible that the gender schemas may have been considered too culturally entrenched to have been completely eliminated after only one exposure to a change in perceptual fluency. In other words, the gender role schema has been consistent with what the participant would have encountered numerous times in the real world and therefore stereotypes would persist regardless of the perceptual fluency manipulation.

It is also possible that ratings of relatedness were not significantly impacted by perceptual fluency manipulations due to the design of the experiment. In the current study, each of the participants received one of two possible combinations of blocks (either congruent/fluent and incongruent/disfluent or congruent/disfluent and incongruent/fluent). It may have been necessary

to eliminate this between-subject variable by exposing each participant to all four blocks and asking them to rate the relatedness after the two congruent blocks, as well as after the two incongruent blocks. This would have been a better measure of perceptual fluency because it would have allowed participants the opportunity to compare perceptual fluency across both congruent and incongruent conditions, as opposed to having one or the other. An alternative research design that addresses this issue will be further discussed in the limitations section.

An interesting finding in the current study was that accuracy rates were significantly higher for the congruent/fluent blocks in comparison to the incongruent/disfluent, congruent/disfluent, and incongruent/fluent blocks. This means that not only were the congruent/fluent blocks responded to faster, they were also responded to with the greatest level of accuracy. There was no prediction made on accuracy rates; however, this finding is consistent with the theories regarding the slowdown effect, as well as differences in attribute ratings. Firstly, the congruent/fluent block contained pairings that were consistent with existing mental schemas and the stimuli was easy to read, which allowed participants to quickly and accurately sort between categories. In comparison, the incongruent blocks would have had lower accuracy rates because participants would have assumed the pairings were consistent with existing mental schemas and automatically sort to those categories, which would cause their answers to be more frequently incorrect. Secondly, taking into account the perceptual fluency manipulation, it is likely that the 60% greyscale background made it harder for participant’s to identify the stimuli and sort according to the category, which would result in lower accuracy rates.

1 Limitations

A main limitation in the current study was that perceptual fluency was not manipulated for in the ratings of relatedness scale and presented stimuli. In other words, participants in both groups received the relatedness question, scale, and stimuli to rate in perceptually fluent text. It would have been possible to manipulate the perceptual fluency in the question and compare across those who received the question fluently and those who received the question disfluently. It would also be possible to measure other attribute ratings to determine how slow processing influences how participants perceive information (e.g. acceptability). In order to obtain a significant difference in ratings of relatedness based on perceptual fluency manipulations it may have been necessary to completely change the existing mental schema. Schemas are developed as a person encounters new situations and they are strengthened with continued exposure (Oppenheimer, 2008). Although this experiment may have required participant's to violate existing gender role schemas, this is only one instance, in comparison to the multiple exposures that led to the development of the association.

Another limitation in the current study was that participants may have required a comparison for perceptual fluency across all conditions to impact relatedness. Participants in this study were randomly assigned to one of two groups, which means that they only received one block fluently and the other disfluently regardless of congruency. It would have been a better measure of perceptual fluency if participants were given the congruent block fluently and disfluently followed by a rating scale, as well as the incongruent block fluently and disfluently followed by a rating scale. It would have been possible to counterbalance the order of blocks as long as the two congruent and two incongruent blocks remained together. In the current study, this design was not used because it would have doubled the amount of time it would take for each

participant to complete the experiment. In addition, carry over effects may have been an issue due to the fact that participants would be shown the ratings of relatedness scale twice, which means their ratings in the middle of the experiment may have influenced their ratings at the end of the experiment.

Gender of the participant was not controlled for in the current study because previous research has found that the slowdown effect occurs for both males and females when encountering information that is incongruent with existing gender role schemas (Banaji & Hardin, 1996). An attempt was made to analyze the differences between males and females in the current study. However, it was found that through the randomization process an unequal number of males and females were distributed between groups. It was found that 3 males and 11 females were randomly assigned to Group 1. In comparison, 7 males and 8 females were randomly assigned to Group 2. After taking into consideration these findings, it would have been meaningless to run the proper analysis, as there would be a high chance of significant results due to error. These unequal sample sizes would not make for an accurate representation of the differences between males and females in each group and therefore it will not be discussed. Consequently, the results in the current study do not speak to the differences in participant gender for the gender-IAT because any results would be inconclusive.

2 Implications

Research using the IAT helps develop an understanding of the impact of schema violations and the implications this has on our cognitive processes. Previous research has shown that a violation to an existing gender role schema causes reading speeds to slow (Dickinson, 2011). A possible explanation for the slowdown in responding is the mismatch effect—the theory that the

automatic gender stereotype is assumed and a violation to that schema forces new information to be incorporated into the individual's mental framework (Banaji & Hardin, 1996). The theory of accessibility could also explain these findings because it would have been easier for the participant to access information that is consistent with their previous knowledge of men holding career-related roles and women holding family-related roles (Millon & Lerner, 2003). The results of the current study supported these theories because incongruent blocks were responded to more slowly than congruent blocks demonstrating that gender schemas do impact rates of responding in the IAT.

The current study sought to explore whether perceptual fluency manipulations could impact processing speeds, as well as influence attribute ratings for that information. The slowdown effect was not shown to impact ratings of relatedness by making them less related, as predicted. However, future studies should continue to explore the impacts of eliminating the slowdown effect with the goal of determining how processing speeds can influence how information is perceived and interpreted. The findings of this study help to develop a better understanding of meta-cognitive monitoring because it reveals the inner workings of higher order thinking (Brown, 1987). This study showed that the impact of congruency on processing can be influenced by perceptual fluency manipulations. This is the first step in recognizing that processing speeds can be influenced by manipulating perceptual fluency for gender role schemas. The next step would be to analyze whether speeds of processing can impact different types of attribute ratings for that information.

3 Future Studies

Future studies should take the findings of previous research, as well as this study to develop a better understanding of cognitive processes and other possible factors that interfere with the slowdown effect. Previous studies have found that gender role schema violations are detrimental on reading speeds (Dickinson, 2011; Duffy & Keir, 2004). Future research should examine the role of gender during reading tasks by analyzing the differences between male and female characters, as well as the role of participant gender to empirically test differences across genders for schema violations. It would be useful to explore whether the slowdown effect can influence attribute ratings for information beyond relatedness.

In addition, future studies should design to test specifically for the impact of perceptual fluency. This could be done by using a complete repeated-measures design where each participant receives all four conditions. It would be necessary to have each participant receive the congruent and incongruent blocks fluently followed by a rating scale, as well as disfluently followed by a rating scale (See Appendix I). This would allow participants to compare across conditions for perceptual fluency, which may have an impact on ratings of relatedness. It would also be possible to manipulate the perceptual fluency in the actual ratings of relatedness scale and stimuli presented for participants to rate. This would allow for a better measure of the impact of perceptual fluency manipulations.

Future studies should analyze how the current results may differ depending on culture and age of the participant. The results in the current study can only be generalized to Canadian Anglophones, as all the participants identified in their demographics questionnaire that they were born and raised in Canada with English as their first language. Previous studies have found that culture can influence gender role schemas (Brochu, 2013). Therefore, future studies should also

explore whether these results apply to individuals from other countries with different cultures. Canadian Anglophone culture is also constantly changing, as well as gender roles. However, traditional gender role stereotypes and attitudes still persist, as demonstrated in the current study. The current study only used University students, which limits the age range of participants considerably. It would be interesting to see whether the results would be more dramatic for older individuals who were raised with strict traditional gender roles. Prospective studies could also target younger people to determine whether significant changes in gender role schemas have occurred and will occur in the future.

4 Conclusion

The current study explored whether processing speeds could be influenced by strategically manipulating the perceptual fluency of gender role stimuli. The goal of this experiment was to determine whether slow processing would lead to more negative attribute ratings because this would help develop a better understanding of meta-cognitive monitoring and stereotypes. This is the first study to empirically examine the effects of perceptual fluency manipulations on gender role schemas. The results showed that a significant effect of congruency was found for both response times and ratings of relatedness. Congruent blocks were responded to significantly faster than incongruent blocks and congruent pairings were rated as significantly more related than incongruent pairings. Furthermore, this study showed that perceptual fluency manipulations can eliminate the slowdown effect associated with incongruent blocks in the IAT. Across all four blocks, the only significant difference in response times was found for the incongruent/disfluent condition, which had significantly slower response times. A significant result was not found for the ratings of relatedness measure used in the current study. Future studies should analyze how speeds of processing can impact different types of attribute ratings.

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Appendices

Appendix A. Stimuli Used

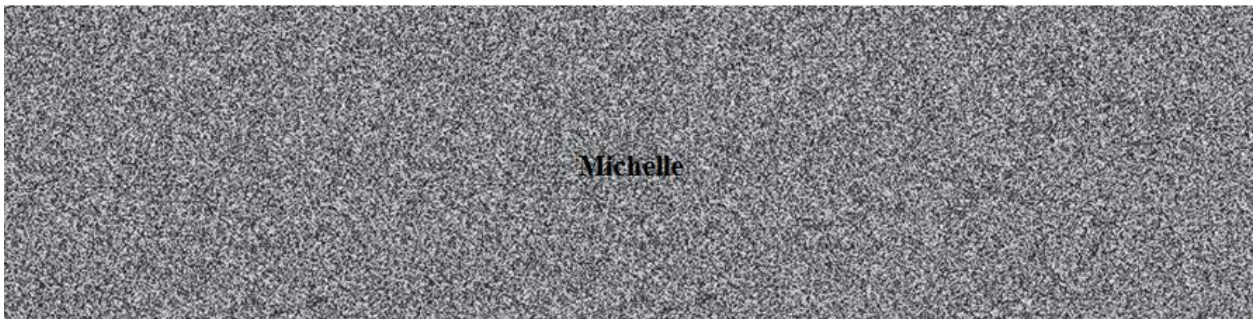
Gender-Career IAT

Category	Stimuli Used
Male:	Ben, John, Daniel, Paul, Jeffrey
Female:	Julia, Michelle, Anna, Emily, Rebecca
Career:	Management, Professional, Corporation, Salary, Office, Business, Career
Family:	Home, Parents, Children, Family, Marriage, Wedding, Relatives

Appendix B. Rating of Relatedness Scale

1	2	3	4	5
Not Related		Somewhat Related	Very Related	

Appendix C. Example of 60% Greyscale Manipulation



Appendix D. Informed Consent

Breeanna Streich
Laurentian University
bstreich@laurentian.ca

I, _____, am interested in participating in this sorting task involving schemas. This study is being conducted by Breeanna Streich, a fourth year student supervised by Dr. Dickinson.

My participation will consist of attending a session lasting approximately one hour during which I will be asked to sort words into categories according to the task instructions by pressing keys on a keyboard. These results will be kept confidential, and only the researcher and her supervisor will have access to them. No personal information will be disclosed. However, digital data will be kept indefinitely (with no ID or reference numbers connecting participants to their data) and may be used for publications in the future.

My participation is strictly voluntary and I am free to withdraw from the study at any moment or refuse to participate without any penalty. Although it would be preferable that I answer all questions, if I am uncomfortable with any particular question, I am able to refuse to answer.

If you have any ethical concerns about this study, you may contact: Dr. Rousseau (Chair of ethics committee) with the Laurentian University Psychology Department Ethics committee. You may contact Dr. Rousseau at lrousseau@laurentian.ca or (705) 675-1151 ext. 4253.

If you have any concerns about the ethical conduct of this study, you can contact the LU Research Officer, Pauline Zanetti at ext. 2436 or ethics@laurentian.ca or you can call toll free at 1-800-461-4030.

If you should have any questions regarding this study please feel free to ask or to contact the research supervisor Dr. Dickinson at jdickinson@laurentian.ca or (705) 675-1151 ext. 4297.

Participant's Signature:_____ Date: _____

Researcher's Signature:_____ Date: _____

I wish to receive a summary of the results of this study that will be available in April 2016, at the following address: _____

Appendix E. Demographics Questionnaire

Age: _____ Years

Year in University: 1 2 3 4 5 More

Gender: _____

Handedness: Right Left Ambidextrous

Do you speak English as your first language? Yes No (Please circle)

Were you born and raised in Canada? Yes No

Appendix F. Handedness Questionnaire

Have you ever had an injury or other problem that caused you to change your hand preference?
YES NO
If so, please give the date of the change and the reason for it:
Which hand do you use for each of these things?
If your preference is not strong, put +
If you would never use the other hand unless forced to, put ++
If you might use either hand, put + in both columns

Writing	_____	_____
Drawing	_____	_____
Throwing	_____	_____
Scissors	_____	_____
Toothbrush	_____	_____
Knife (without a fork)	_____	_____
Spoon	_____	_____
Broom	_____	_____
Striking a match (match)	_____	_____
Opening box (lid)	_____	_____
Which foot do you prefer to kick with	_____	_____
Which eye do you use when using only one?	_____	_____
Ex. for a telescope		

Is anyone in your family left-handed, including parents, siblings, and grandparents? _____
If yes, give relationship (s): _____

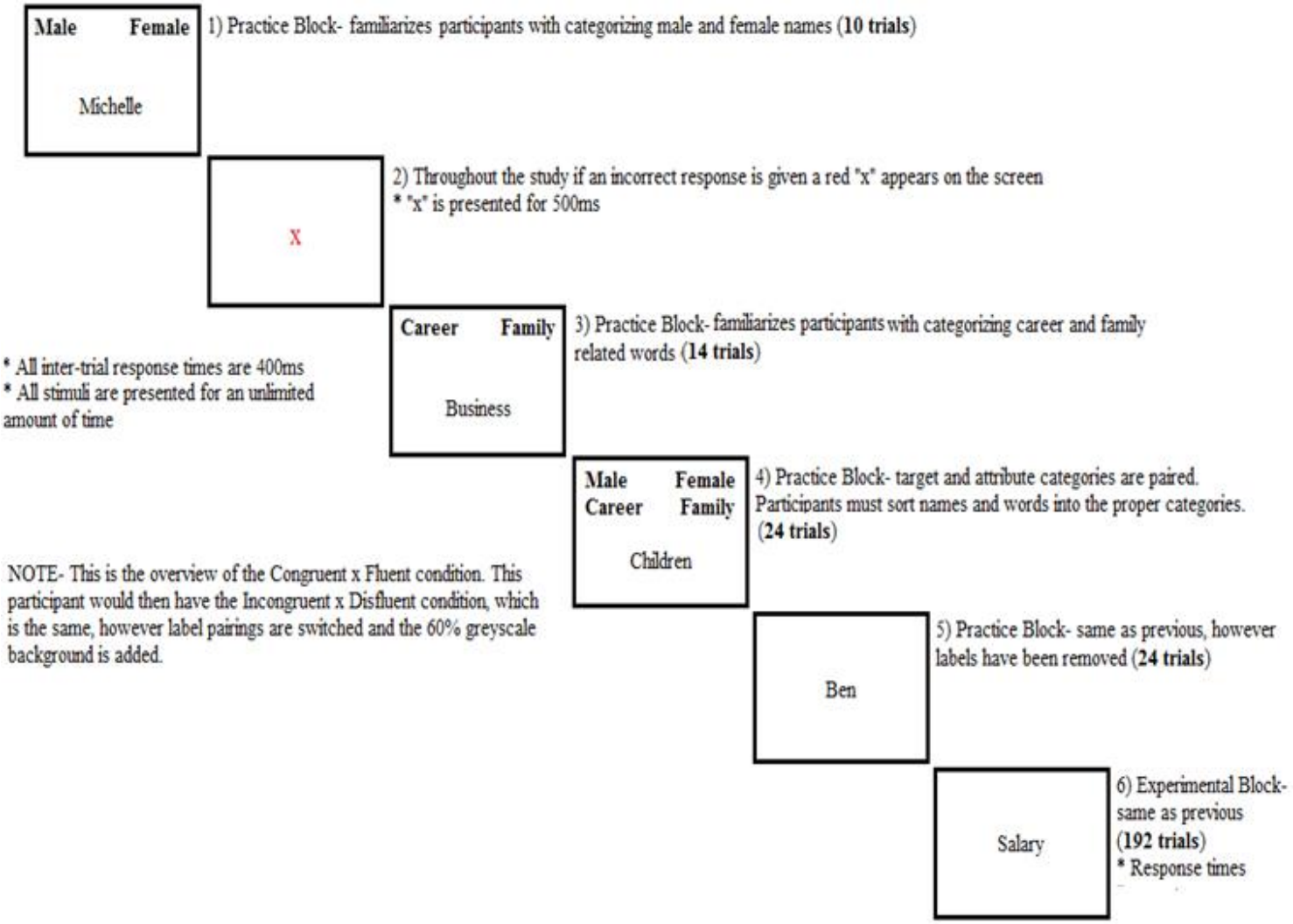
If no, do you wear contact lenses or glasses (state what you have with you today) _____
If contact lenses, do you wear: HARD SOFT

Appendix G. Summary of Trials

	Gender-Career IAT
Block	Number of Trials
Target Discrimination	10
Attribute Discrimination	14
Paired Practice Block	24
Paired Practice Block*	24
Experimental Block*	192

Note. *Target and Attribute labels were removed during these blocks.

Appendix H. Visual Representation of Condition



Appendix I. Possible Future Study