An Action Dynamics Approach to Assessing

Potential Implicit Biases Toward Transgender People

by

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ABSTRACT

To reveal opinions people may not explicitly portray, researchers have implemented a methodology called the Implicit Associations Test (IAT). While this test saw widespread use after its inception, recent problems have undermined the reliability of the measure. Researchers have begun to address these limitations by evaluating different approaches, such as the Action Dynamics paradigm. Like the IAT, the aim of action dynamics is to assess underlying activation and competition amongst beliefs as they unfold in real-time, while adding a number of more sensitive measures, in addition to those used in an IAT. The trajectories of participants' computer mouse cursors are tracked as they move from a stimulus statement to a response, providing data of the real-time decisions people are making across a number of variables. For this thesis study, the aim was to use an action dynamics paradigm to explore whether implicit biases exist toward transgender people from a larger cisgender population, even if they explicitly support or oppose others with transgender identities. These potential biases were assessed by evaluating the statements people were asked to confirm or disconfirm. There were also a number of analyses conducted in order to investigate whether such predictors such as participants' gender or political ideology predicted differences in responses. Although differences were seen in the reaction time to statements of a certain category, the other trajectory measures showed that participants' implicit and explicit attitudes toward transgender people were aligned. Implications, limitations, and future directions of this work are then discussed.

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In the development of personal identity and self-concept, many challenges are faced by the individual. However, there is an additional set of stressors that affect those who stand outside the traditional norms and actions of society. These people, who make up these minorities, experience chronic stress resulting from prejudicial encounters which can, in turn, contribute to a higher prevalence of psychiatric distress and other negative outcomes (Meyer, 1995). These unique instances of marginalization are grouped under the term *minority stress* and are perpetuated by conflict between one's internal self and expectations from the environment and others (Meyer, 1995). External influences and pressures come in the forms of overt discrimination, victimization, and rejections from others due to one's minority status, as well as covert ideas such as societal norms, microaggressions, and implicit bias (Meyer, 1995; 2003).

The LGBTQ+ community is one such minority and the people who compose this group experience many of the challenges seen in the *minority stress model* (Meyer, 1995; 2003), as well as other stressors and forms of discrimination unique to their non-traditional gender identities and orientations. These specific stressors come in the form of generalized heterosexism which is the combination of ideas, beliefs, and actions that reinforce heterosexualism and a gender binary as the norms (Meyer, 2003). Those who fit in these gender and sexual minority groups have been found to be disproportionally at risk for self-esteem issues as result of this minority stress (Bauermeister et al., 2010; Teasdale & Bradley-Engen, 2010). Thus, the members of the LGBTQ+ population not only struggle with general identity formation like their peers, but must also solidify an identity that may not fit with the prescribed roles of their perceived gender according to the larger scope of society. Many are then forced to confront this dysphoria between their

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inner identity and their outward gender expression (Stieglitz, 2010) and experience both

perceived or enacted experiences and actions of stigma, bias, microaggressions, rejection,

and victimization (Bockting, Miner, Swinburne Romine, Hamilton, & Coleman, 2013).

This victimization and discrimination take numerous forms and can come from

many places. LGTBQ+ populations experience verbal abuse like name calling, teasing,

and threats of violence, as well as actual physical abuse such as being hit in some way

(being punched, kicked, beaten, etc.) or being attacked with a weapon (knife, gun, bat,

etc.; Grossman & D'Augelli, 2006). These attacks are not isolated cases, but are often

instigated by those close to these individuals: classmates, peers, colleagues, parents,

siblings, and extended family members. Additionally, those in positions of authority have

also contributed to this victimization, with LGTBQ+ members being discriminated

against by law enforcement, religious leaders, and medical professionals (Grossman &

D'Augelli, 2006; Stieglitz, 2010). Additionally, victimization is regularly experienced in

places that should provide safe and nurturing atmospheres. Many of these individuals

report receiving abuse in places such as their own homes, their schools, employment

places, religious institutions, and medical facilities (Stieglitz, 2010). By being victimized

and tormented, these individuals report being seen as nothing more than their gender

identity or sexual orientation and not by other facets of themselves like the merit of their

character or personal qualities (Stieglitz, 2010).

Although many LGTBQ+ members experience overt acts of discrimination and

victimization, some stigmatization is covert, and caused by the bias society has about

gender identity and the traditional gender binary. With the pervasiveness of societal

norms, the acceptance of stigmatized ideas and biases of an identity as part of an

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individual's self-concept and values can manifest (Herek, Gillis, & Cogan, 2015).

Mizock & Mueser (2014) evaluated the stigmas and implicit biases faced by a working group of transgender individuals and found that those who experienced higher levels of internalized stigma and implicit bias showed poorer coping skills with a fewer number and less effective strategies. Additionally, in a study conducted by Breslow and colleagues (2015), greater psychological stress was correlated with higher levels of internalized stigma, bias, and heterosexualism within their transgender sample (Breslow et al., 2015).

The work examining stigmatization and discrimination toward LGBTQ+ community members has been largely focused on the external overt acts of others toward them and the work examining internal stigma and bias has been focused on the community's view of themselves. The tie between the general population's implicit biases against the LGBTQ+ community and its impact on this community is less known. Could implicit bias exist against this community, even when others report explicit support for LGBTQ+ individuals or do not actively discriminate against them? This thesis study aims to address this gap in the current research by: a) discussing how implicit bias has been quantified and measured, b) discussing work using this measurement to address implicit bias against transgender individuals, c) discussing how the measure of implicit bias can be expanded upon and potentially made more sensitive, and d) using said expansion to evaluate this potential implicit bias against transgender individuals. It aims to add to the implicit bias literature while connecting it with examination of this potential bias against a community that faces numerous and unique challenges related to other's views of them.

The IAT as a Measure of Implicit Bias

To uncover beliefs that people may not explicitly express, whether out of impression management concerns or because the beliefs contradict with a larger belief system of how they see themselves or the world around them, researchers have developed a methodology called the Implicit Associations Test (IAT) (Greenwald, McGhee, & Schwartz, 1998). The IAT measures the strength of automatic associations created by individuals when evaluating different topics. The strength of these associations is measured using classification tasks and recording the reaction time of participant responses (Greenwald, McGhee, & Schwartz, 1998; Greenwald, Nosek, & Banaji, 2003). For example, one task has participants sort adjectives that relate to positive and negative attributes of two target groups. "Implicit bias" is then expressed when people are faster to associate positive attributes with one group over the other or negative attributes with one group over the other (Greenwald, Nosek, & Banaji, 2003).

Implicit bias is formed in an individual when their concepts of self and the world around them either do not match or conflict with those viewed by the wider general populace. As described by Greenwald and colleagues (2002), associative strengths between constructs are broken down into three principles which connect the ideas of self-esteem, self-concept, stereotypes, and attitudes. The first principle, which they term *balance-congruity*, states that associations between two concepts are strengthened when they share a linked commonality (Greenwald et al., 2002). For example, when one starts playing a sport, putting in practice to increase their aptitude, their association between themselves and being an athlete should strengthen. The second principle, termed *imbalance-dissonance*, describes that associations between two concepts that are opposite

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in nature, will be impeded from being created (Greenwald et al., 2002). Using the earlier

example again, if a person is becoming more athletic due to playing a sport, the link

between the concept of "me" and the concept of "obese" will not form. The last principle,

differentiation, occurs when a concept is repeatably pressured to connect to opposite

valences. The result is these concepts being split into sub-concepts which are attached to

each valence separately (Greenwald et al., 2002). A working example of this would be an

under prepared student being faced with an examination. They have the ability to cheat

on the exam in order to receive a passing grade, but are wracked with the stigma of being

a cheater and breaking academic integrity. Here the concept of self is being pressured to

be linked with academic success and being a cheater, and, through *differentiation*, the

concept of self could be split between these two links so that a concept of self is linked

with the academic success of passing the exam and another concept of self is linked to

cheating. When these links are created, attitudes are formed within the individual. Some

of these attitudes align with more universal thinking, such as Adolf Hitler's actions being

evil, but others may form through more stereotypical views, such as women being

inferior to men. Thus, when someone has created this second association, for example,

when participating in an IAT task, this association can reduce how long it takes for said

individual to equate more positive words (e.g., strong) to men than women, even if they

were to explicitly say they believe men and women are equal. The first association,

Hitler's actions being evil, would most likely be revealed as implicit bias within an IAT

task as well, as most would be quick to equate negative words with Hitler. However, as

most would also explicitly denounce his actions, this implicit bias has a more easily

explained origin.

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Many studies concerned with evaluating implicit biases have focused their hypotheses around the IAT since its inception. One such example comes from Wang-Jones and colleagues (2017), who created two related Gender Identity-IATs, a Transmen-IAT and a Transwomen-IAT, to assess the amount of implicit bias people might have against transgender individuals versus biological males and females despite their reported explicit attitudes toward transgender people (Wang-Jones, Alhassoon, Hattrup, Ferdman, & Lowman, 2017). Upon completion of the study, results showed that, when evaluating transgender men, cisgender homosexual participants (those whose gender identity matched their biological gender at birth and were attracted to the same biological sex) had similar levels of negative implicit bias against them as cisgender heterosexual participants even though they reported more positive explicit attitudes that were similar to those seen in non-monosexual participants (those whose gender identity do not fit within the traditional gender binary; e.g., asexual, bisexual, and pansexual individuals). The bias against transgender men was seen in faster reaction times sorting positive adjectives (e.g., beautiful) and terms related to cisgender people (biological male) when they were paired together and when sorting negative adjectives (ugly) and transgender descriptors (transsexual male) when they were paired together as compared to when sorting the inverse pairings, while on self-reports on feelings toward transgender men, saying they supported and thought positively about transgender men. Within the transwomen-IAT, cisgender heterosexual participants showed significantly more negative implicit bias as compared to the explicit attitudes they reported. Additionally, political ideology was correlated with implicit bias, with more negative implicit bias seen in more conservative participants than more liberal participants (Wang-Jones et al., 2017).

Problems with the IAT

   Although the IAT has surged in popularity as a way to evaluate implicit biases, it has also come under scrutiny for its actual power as an assessment tool. One such problem is in ambiguity of the scoring of the assessment. Similar scores on an IAT can be accounted for by several metrics inherent to the participant. A high score, for example, could be attributed to the participant's strong implicit biases, but could equally be explained by a strong sense of empathy or compassion toward the group to which they are being assessed (Andreychik & Gill, 2012). A strong sense of empathy may have played a role in some participants' responses in the study conducted by Wang-Jones and colleagues (2017). For example, the negative associations the cisgender homosexual participants made toward transgender men may not be so much an implicit bias against the group, but, rather, might reflect a recognition of the negative plight experienced by many transgender individuals. Similarly, on a racial-IAT, it has been found that people more familiar with certain stereotypes show greater bias even if they do not endorse these stereotypes (Arkes & Tetlock, 2004). Although they may not feel actual bias toward a specific group, being aware of a stereotype led the automatic association task to skew their results toward a biased result. Looking back to the study conducted by Wang-Jones and colleagues (2017), the association of transgender terms with negative adjectives could be attributed to participants' awareness of discriminatory ideas toward transgender people, influencing them to make this association. Additionally, biased IAT results have been replicated using fictitious stimuli groups. Researchers associated negative connotations with a made-up group demographic and were able to show an implicit "bias" against the fictional group (Uhlmann, Prescoll, & Paluck, 2006).

Another problem faced by the IAT is in the validity of the assessment. Several meta-analyses examining the predictive validity of the race-IAT, for example, revealed IAT scores failed to predict explicit measures of bias later seen in the participant samples. In 2013, Oswald and colleagues assessed relationships between IAT scores of racial discrimination with explicit measures of discriminatory bias across several moderators. The assessment was both to determine the validity of IAT scores to predict explicit discriminatory attitudes and how this relationship may have been influenced based on different operationalizations of discrimination (Oswald, Mitchell, Blanton, Jaccard, & Tetlock, 2013). Within this analysis, IAT scores explained only small amounts of variance over and above the explicit measures used to determine discriminatory attitudes, ranging from 0.1% to 5.4% depending on the moderator (Oswald et al., 2013). A second meta-analysis on the race-IAT, conducted more recently, found the ability of the results of the IAT to predict explicit discriminatory attitudes to be similarly low, ranging around 2% over and above explicit measures (Carlsson & Agerström, 2016). These low scores in respect to validity, suggest the interaction of implicit bias with explicit attitudes may be more complex and complicated to predict with the IAT alone (Carlsson & Agerström, 2016; Oswald et al., 2013).

Lastly, most relevant for the current study, the IAT's main metric may be insufficient for evaluating the complete decision-making process involved in expressing potential implicit bias. It is thought that reaction time reveals the amount of bias one might have when comparing groups, as it should take less time to make responses aligned with one's implicit bias. However, reaction time can be skewed by the amount of attention given by the participant to the task (Blanton, Jaccard, & Burrows, 2015) or their

familiarity of the IAT task (Nosek, Banaji, & Greenwald, 2002). If a person is

multitasking when participating on an IAT task, their reaction times may be inflated; and

those familiar with the task may have significantly different reaction times than other

participants who are new to the task.

Action Dynamics: An Alternative Measure of Response Competition

The IAT may have limitations involved with it as a study measure, but there are

alternative approaches which add a number of sensitive measures beyond reaction time to

gain a more nuanced evaluation of the decision-making process. One such approach, the

"Action Dynamics" paradigm, evaluates cognitive competition with a number of other

metrics which complement reaction time (Freeman, 2018; Yu, Wang, Dengfeng, &

Bastin, 2012). Like the IAT, the aim of Action Dynamics (AD) is to assess underlying

activation and competition amongst beliefs as they unfold in real-time. To do so, a

common setup is to present participants with a centrally situated stimulus statement (at

the bottom of a computer screen) that requires them to move their computer mouse to an

affirmative or negative response (usually an evaluative decision of "yes" or "no"; "true"

or "false" that is located at the top and opposite corners of the computer screen). The

trajectory of their computer mouse is then tracked as they move from this stimulus

statement to one of the two responses. These trajectories track real-time decisions by

exposing the millisecond-resolution time course of the mouse movement (Freeman, 2018;

Kieslich, Henninger, Wulff, Haslbeck, & Schulte-Mecklenbeck, 2018; Wulff, Haslbeck,

Kieslich, Henninger, & Schulte-Mecklenbeck, 2018; Yu et al., 2012). Based on the

trajectories, a number of variables can be extracted for further analysis. These movement

variables, for example, capture attraction toward one response before settling on another,

as well as the amount of "entropy" (i.e., fluctuation between the two responses) that can act as an index of indecision. This extra information also reveals how much earlier or later different factors occur that ultimately influence the making of a decision (Duran, Nicholson, & Dale, 2017; Freeman, 2018; Kieslich et al., 2018; Wulff et al., 2018; Yu et al., 2012).

An example of AD at work, comes from a study conducted by McKinstry, Dale, and Spivey (2008). Participants were given eleven yes or no questions with varying degrees of truth to them. For example, "Should you brush your teeth every day?" being a question with a high degree of truth (as most would say this is an activity that should be done every day) and "Is a thousand more than a billion?" being a question with a low degree of truth (as this is a false statement as a thousand is less than a billion). With these statements varying in degrees of truth, some had the potential to cause participants to sway between a final answer of yes or no (these would be questions with more truth-ambiguous values; both response choices could be valid). Each trial started with a "start" button at the bottom of the participant's computer screen. When the participant clicked start, "yes" and "no" boxes then appeared at the top left and right of their screen and one of the questions was read to them by a pre-recorded voice. Participants then moved their computer mouse to their chosen answer as quickly and accurately as possible. The coordinates of their cursor were then tracked, along with overall time of their response, as they moved from the start button to their response choice (McKinstry, Dale, & Spivey, 2008). How the task is displayed visually can be seen in Figure 1 below.
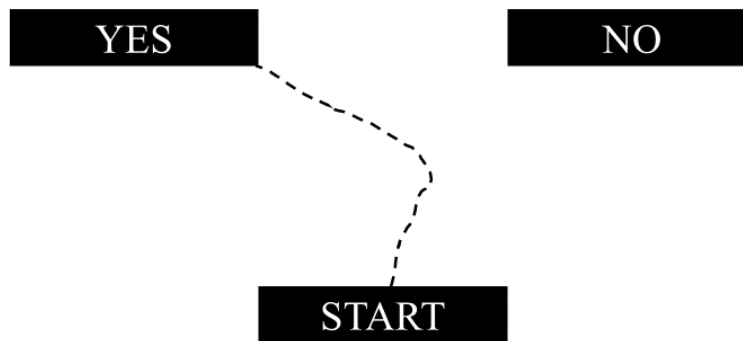
Figure 1. Visual Representation of the Action Dynamics Task. Participants clicked the start button seen at the bottom of their screen. Then, one of eleven yes or no questions were spoken to them via a pre-recorded voice. They then moved their mouse to either response choice as quickly and accurately as possible. The dashed line represents a hypothetical mouse trajectory.

Through this assessment, additional measures are evaluated in addition to reaction time. One such measure is the *max deviation* of the mouse trajectory. This measure calculates the amount of curvature in a participant's mouse cursor path as compared to a straight line between the starting position to their final response (Freeman, 2018; Kieslich et al., 2018; McKinstry et al., 2008; Wulff et al., 2018; Yu et al., 2012). Within McKinstry and colleagues' study (2008), larger and more varied max deviations were seen for the questions with lower truth values ("Is a thousand more than a billion?"). The larger deviations mean participants were attracted more to the "yes" response when they ultimately selected the "no" response as compared to questions with high truth values. This signature of movement was interpreted as participants showing greater competition in their decision making as they were attracted to one response choice before settling on another.

Another metric assessed by the AD paradigm is mouse cursor *velocity* (Freeman, 2018; Kieslich et al., 2018; McKinstry et al., 2008; Wulff et al., 2018; Yu et al., 2012). This is generally tracked by the distance covered by a participant over a period of time (millisecond, second, etc.) through their whole mouse trajectory. In the study by McKinstry and colleagues (2008), the velocities of the participants' responses were fastest when answering questions with high truth values and "yes" responses and reduced velocities were seen in questions with low truth values and "no" responses. The lower velocities showed more deliberation for the low truth answers as compared to the high truth ones.

One last additional metric assessed by an AD paradigm, and used in the study conducted by McKinstry and colleagues (2008), is the amount of *entropy* of the participant's response (how often the mouse cursor reverses direction, or flips, along the horizontal, x-axis, of the screen; also known as *x-flips*). Within this study, the most entropy was seen for participant responses toward middle-truth-value questions. In other words, participants showed more flips over the x-axis, or more disordered trajectories, for the most truth-ambiguous questions as compared to the high and low truth value questions (McKinstry, Dale, & Spivey, 2008). This increased entropy in response can illuminate the amount of "indecision" between the two response choices participants experienced.

Changes in mouse cursor paths, as seen in the example study above (McKinstry, Dale, & Spivey, 2008), are thought to reflect stronger activation of conflict-monitoring regions in the brain, even without a change in overall response time (Freeman 2018; Wojnowicz et al., 2009; Yu et al., 2012). The sensitivity added by the additional variables

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within an AD paradigm; max deviation, velocity, and entropy; may create a more complete picture of the decision-making process and the impact of implicit bias that is only partially revealed through reaction time alone. Although AD has never been directly compared to IAT (nor is it being done so here), insofar that implicit bias reflects a response conflict between what is being explicitly communicated and hidden feelings, the AD approach might prove to be superior in detecting the full extent of this conflict.

Action Dynamics, Implicit Bias, and Transgender Identities

For this thesis study, the aim is to use an AD paradigm to explore whether potential biases, positive or negative, exist toward transgender people from a larger cisgender population, and the extent to which this possible bias exists regardless of whether they explicitly support or oppose others with transgender identities. Bias was assessed by evaluating the amount of competition experienced by participants, as indexed by the variables described above. The participants were shown stimulus statements relating to transgender people paired with two response choices: True and False. Based on the statement seen, one of these response choices would be considered an explicitly biased answer (e.g., selecting "True" to the statement: "Transgender people are sexual deviants"). Thus, the amount of competition seen in their mouse paths as attraction to the explicit biased response ("True") while ultimately choosing the opposite ("False") would determine the amount of potential bias of the individual. It has been found that those who experience the most competition show the most extreme mouse paths when moving from the stimulus statement to one of the response choices, including the most deviation and entropy (Kieslich et al., 2018, Wojnowicz, Ferguson, Dale, & Spivey, 2009; Wulff et al., 2018).

Along with the patterns of competition found in AD paradigms, certain patterns in discrimination toward transgender individuals has also been found. It has been found that physical appearance is one of the first traits assessed when meeting someone and is one of the main areas of dissonance for transgender individuals (Grossman, D'Augelli, & Salter, 2006; Stieglitz, 2010; Van de Grift et al., 2016). Additionally, as was found in the Wang-Jones et al. (2017) study previously discussed, participant gender identity predicted preference toward or against transgender people. Moreover, political ideology was correlated with preference for cisgender people such that the more politically conservative the participant, the more an anti-transgender bias was seen. These individual differences were taken into account for this thesis study, not only because of their statistically significant effects in the Wang-Jones et al. (2017) study, but also by their effects seen elsewhere. Men consistently victimize and abuse transgender and other LGBTQ+ group individuals more often (Grossman & D'Augelli, 2006; Grossman, D'Augelli, & Salter, 2006; Stieglitz, 2010; Russell, Ryan, Toomey, Diaz, & Sanchez, 2011) and politically conservative individuals tend to have more rigid implicit beliefs and opinions (Malka & Soto, 2015). Thus, the following hypotheses were tested:

> **H1**: More anti-transgender bias will be seen for statements related to physical appearance (e.g., "Transgender people are the sex they say they are") and presentation of transgender individuals as compared to more social (e.g., "The Transgender community is real") and moral characteristics (e.g., "Transgender and their rights are valid").

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H2: The greatest response time, competition, and indecision effects will be seen in male participants when responding as compared to female participants, showing more anti-transgender bias.

H3: There will be a main effect of political ideology such that politically conservative participants will show the greatest response time, competition, and indecision as compared to politically liberal participants.

Methods

Participants

Although prior research involving AD paradigms tend to have samples with approximately 150 participants, due to recruitment limitations, 59 participants were recruited for the present study. These recruitment limitations included: a requirement of the program used to track mouse movements was it had to be installed on the system administering the experiment, thus, an in-lab setting was required versus using a mass internet-based subject pool; study sign up in the subject pool system used to recruit participants was volunteer-based; and the COVID-19 outbreak closed down the lab, halting further recruitment. The participants that were recruited were undergraduate students enrolled in psychology courses in a southwestern United States university. Students were awarded course credit for their participation. All participants were at least 18 years old (M = 20.16, SD = 3.67). There were 40 females (68%), 16 males (27%), and 3 participants identified as non-binary (5%).

Measures

To assess the extent to which implicit biases affect the amount of cognitive

competition participants experienced, we used a computer software called MouseTracker

(Freeman, 2016). The software allows participants' mouse velocities and trajectories to

be captured. The key variables extracted from the mouse trajectories include: a) reaction

time (a traditional measure used in IAT, AD, and other tasks), b) max deviation (furthest

a cursor path strayed from an ideal path between the stimulus and chosen response and an

AD measure of competition), and c) x-flips (the entropy of a participant's trajectory,

operationalized as the number of times a participant's cursor path crossed the x-axis

origin in the middle of the screen, and an AD measure of indecision) and were assessed

to determine the amount of competition a participant faced in each trial (see Figure 2

below). Longer reaction times, higher deviations from the ideal path, and more x-flips

were indicative of more competition when making a decision during a trial. Upon

completion of the mouse tracking portion of the experiment, the participants also

answered a demographic questionnaire to gather information on gender identities, sexual

orientations, religiosity, political ideology, socioeconomic status, marital status, age, race,

and education level. As political ideology was tied to one of the hypotheses, it was

derived from an 8-point Likert-scale question (extremely liberal to extremely

conservative for points 1-7 and point 8 being no political affiliation). All participants who

responded "1", "2", or "3" on the question were coded as "liberal"; participants who

responded "4" or "8" were coded as "moderate/no affiliation", and participants who

responded "5", "6", or "7" were coded as "conservative" for analysis. The complete

demographic survey can be found in Appendix A. Lastly, all participants were debriefed

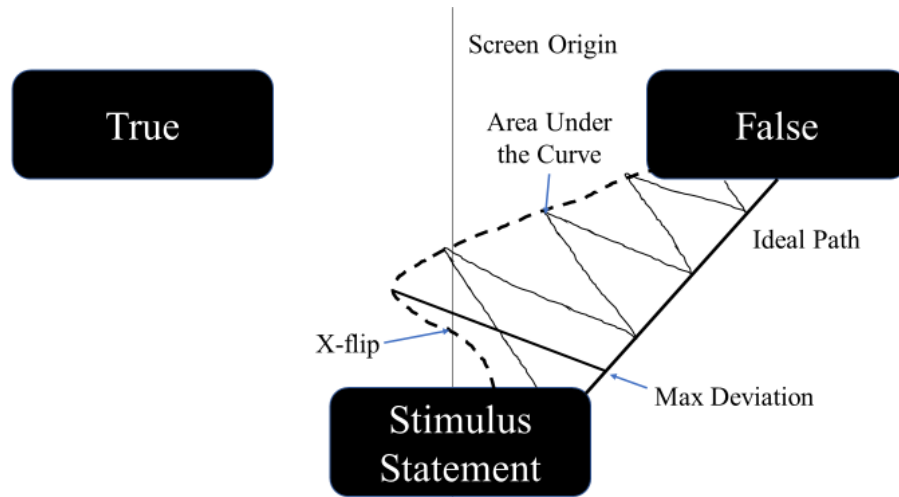on the study's purpose upon completion of the experiment and survey.

Figure 2. Visual Representation of Key Study Variables. The figure shows the key study variables for the experiment. The dashed line represents a hypothetical participant trajectory. The max deviation of their trajectory is calculated as the furthest point of their path in relation to a straight ideal path between the stimulus statement and the chosen response. The area under the curve is the area created between the participant's path and the ideal path. An x-flip occurs when the participant's trajectory crosses over the screen origin.

Materials

A total of sixty novel stimuli statements were created for this experiment. These

statements were spread between three broad categories: moral, social, and physical. The

moral category included statements that pertained to the moral character or actions of a

transgender individual. The social category included statements that pertained to

interactions with transgender people or popular topics regarding transgender individuals.

The physical category included statements that pertained to the physical appearance,

anatomy, or biological sex of a transgender individual. All the categories contained

statements positive and negative in phrasing; with ten statements of each valence within

each category. The total pool of stimuli statements within each category that were presented to participants are outlined in Tables 1, 2, and 3.

The design of this experiment involved action dynamics tied with true and false targets and a central stimulus statement. The participants were given two response options, one to the left side of their screen and the other to the right, labeled "True" and "False". They were then asked to position their mouse over an area in the bottom center of the screen labeled "Start". A series of statements pertaining to transgender people appeared in this bottom-center area once the participant clicked on the "Start" button. The participant then moved their mouse to either "True" or "False", indicating the legitimacy of the statement as quickly as they could. After each decision was made, the screen would reset and the participant had to click "Start" again to show the next stimulus statement. During this time, their mouse trajectories and velocities were tracked and recorded. Figure 3 shows the set-up of the AD task with one of the possible trials seen by participants.

The response conditions were varied by restructuring the presentation and content of stimuli. Each participant was shown thirty random statements, with ten from each of the three categories of stimuli: moral, social, and physical. Of these ten statements from each category, five were positive statements and five were negative statements. Thus, each participant was shown fifteen positive and fifteen negative statements. If the participant took longer than six seconds to begin moving their mouse (from the time they clicked the "Start" button), a warning message appeared alerting them to begin moving more quickly on subsequent trials. This was to help ensure participants would begin making a decision as quickly as possible.

This thesis study was preregistered through the Open Science Framework

Preregistration Application. Within this application, a series of aspects of the study

design were registered before data collection had begun. The hypotheses were described,

the variables of interest were explained, the exploratory variables captured in the

demographic survey were outlined, descriptions of sample size and planned analyses

were recorded, among other metrics. The complete Open Science Framework

Preregistration Application can be found in Appendix B.

Table 1.

Moral Category of Stimuli Statements

Moral Stimuli

Positive Valence	Negative Valence
Transgender people and their rights are valid	Transgender people and their rights are not valid
Transgender people are genuine	Transgender people are conniving
Transgender people use their categorization to help find harmony in their lives	Transgender people use their categorization for personal gain
Transgender people are truthful	Transgender people are deceitful
Transgender people are morally right	Transgender people are morally wrong
Transgender people know what is best for them	Transgender people don't know what is best for them
Transgender people are level-headed	Transgender people don't have control over themselves
Transgender people are forthcoming	Transgender people are sneaky
Transgender people are looking for inner peace	Transgender people want to cause chaos
Transgender people seek peace in themselves	Transgender people crave attention

Table 2.

Social Category of Stimuli Statements

Social Stimuli

Positive Valence	Negative Valence
Transgender people are like everyone else	Transgender people are different
Transgender people are creative	Transgender people are lethargic
Transgender people would greet me at a business	Transgender people would ignore me at a business
Transgender people are respectful	Transgender people are disrespectful
Transgender people are sensible	Transgender people are impulsive
The Trans community is real	The Trans community is fabricated for attention
Transgender people are intelligent	Transgender people are dumb
Transgender people are ambitious	Transgender people are lazy
Transgender people aren't just going through a phase	Transgender people are just going through a phase
The struggles of Transgender people are real	The struggles of Transgender people are fabricated

Table 3.

Physical Category of Stimuli Statements

Physical Stimuli

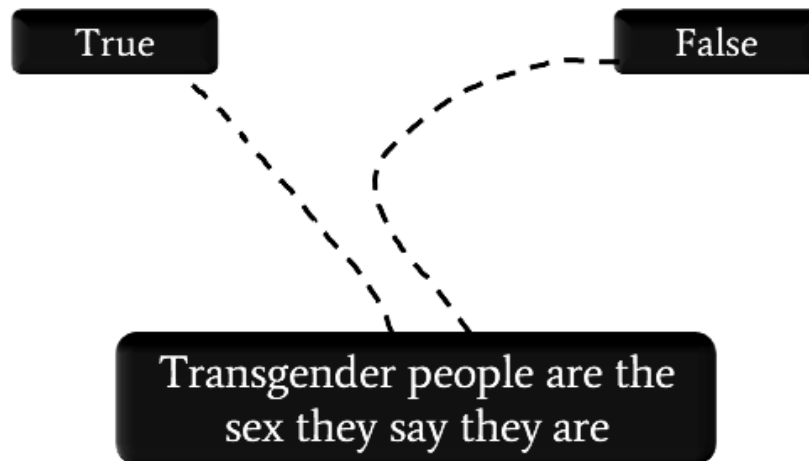| Positive Valence	Negative Valence
Transgender people are beautiful	Transgender people are ugly
Transgender people should be able to transition at their choosing	Transgender people should not be allowed to seek out transition
Transgender people are the sex they say they are	Transgender people are still their birth sex
Transgender people are not sexual deviants	Transgender people are sexual deviants
Transgender people want to align mind and body	Transgender people want to confuse others
Transgender people are exactly the people they think they are	Transgender people are still whoever they were born as
Transgender people come in all shapes and sizes	Transgender people are a specific kind of person
Transgender people should be seen	Transgender people should be invisible
Assistance to transition should be given to Transgender people	Assistance to transition should not be given to Transgender people
Transgender people can be of all ages	Transgender people are just confused youths

Figure 3. Set-up of the Action Dynamics Task. The participants were given a stimulus statement from one of the three categories (Moral, Social, or Physical) that were either positively or negatively valenced. They then used their computer mouse to select if they believed the statement to be true or false as quickly as they could. The dashed lines represent hypothetical mouse paths for a trial.

Exclusion Criteria

For each stimulus statement shown, one response choice was considered explicitly biased as it referenced a discriminatory view of transgender people (e.g., responding "true" to the statement: "Transgender people are deceitful"). Before running analyses, the full student sample was combed for participants who showed large explicit bias in their responses. Participants who decided on the explicitly biased answer half of the time (15 statements of the 30 shown) or more were considered overly explicitly biased, and their trials were removed. Seven participants were removed in this way. Additionally, participant's trials where total reaction time was above 2.5 standard deviations (M = 3519.41 milliseconds, SD = 2310.32 milliseconds) were removed. As previously stated, after each trial in which a participant took more than 6 seconds after clicking "Start" to make a final decision, a warning was displayed to remind them to

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respond as quickly as possible. The filtering of 2.5 standard deviations was decided

through the Open Science Framework Preregistration application and because this

deviation was well above the 6 second warning threshold. 126 trials were removed in this

way. Lastly, the demographic survey provided options to self-identify as male, female,

non-binary, or transgender; however, the hypotheses for this thesis only considered

gender differences between male and female participants. Only two participants

responded as non-binary and zero participants responded as transgender; thus, these two

responses were filtered out from the analysis. After these exclusions, the final sample in

the analysis included 50 participants and 1344 trial observations.

Analysis Plan

For all hypotheses, ANCOVA models were used. I did so to evaluate any

potential main effects (for all hypotheses) while controlling for the word count of the

stimuli statements. Word count of the stimuli statements was added as a covariate due to

there being a significant difference between the average length of stimuli statements in

each category, $F(2,1341) = 77.25$, $p < .001$. To determine this, an ANOVA was run with

stimuli category as the predictor and word count as the outcome. Social stimuli

statements (M = 5.41, SD = 1.82) were significantly shorter than both moral stimuli (M =

6.02, SD = 2.40) and physical stimuli (M = 7.12, SD = 2.01) and moral stimuli were

significantly shorter than physical stimuli; all $p < .001$. Significant differences in reaction

times, therefore, may have been impacted by the amount of time it took to read

statements that were significantly different in length than others. Along with word count

being added as a covariate, max deviation was separately standardized into one score

across responses as the response choices occupied either the upper left or upper right of

the screen and translated to negative or positive x-axis coordinates respectively. All analyses were run through the IBM SPSS Statistical software, version 25 (IBM corp., 2017).

For Hypothesis 1, one-way ANCOVAs were conducted to evaluate the main effect of category type (three levels: physical, moral, and social) on each variable of response competition (reaction time, max deviation, and x-flips). Thus, three models were run in total. Planned comparisons were set to evaluate each response variable across category types as it was hypothesized that the more anti-transgender bias would be seen in responses to physical stimuli statements as compared to social or moral stimuli statements.

For Hypothesis 2, one-way ANCOVAs were conducted to evaluate the main effect of participant gender (male and female) on each variable of response competition. Due to the power of the analyses being fairly low because of recruitment limitations, and none of the hypotheses predicting these particular associations, the interaction between gender and category type was not explored.

For Hypothesis 3, one-way ANCOVAs were conducted to assess the main effect of political ideology (two levels: conservative leaning or liberal leaning) on each of the response competition variables. Those who indicated moderate political ideology or none at all were excluded to directly compare conservative leaning and liberal leaning participants. The main effect proposed in Hypothesis 3 is fragile in nature, however, due to this thesis study being underpowered because of the recruitment limitations mentioned above. As can be seen in Table 4, there were very few male conservative participants.

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Table 4.
Number of Participants and Trials in Each Political Ideology Group by Gender

	Male		Female	
	Liberal	Conservative	Liberal	Conservative
Number of Participants	6	3	19	14
Number of Trials	170	79	516	365

Note: The number of participants and trials used in the analysis examining the interaction of gender and political ideology.

Also, before running the ANCOVA models to test the main hypotheses, bivariate correlations between the three DVs were conducted. As the three DVs (reaction time, max deviation, and x-flips) are all meant to measure response time, cognitive competition, and indecision, but are in of themselves, supposed to be independent, no strong correlations were expected and the correlation tests were to ensure that any correlations observed made theoretical sense.

Results

Bivariate Correlations

The bivariate correlations between the major study variables are summarized in Table 5. Reaction time and max deviation were positively correlated with one another ($r = 0.21$), as was the correlation between max deviation and x-flips ($r = 0.06$), showing that an increase in one of these variables (e.g., reaction time) resulted in a positive increase in the other (e.g., max deviation). While these correlations were statistically significant, the variables were weak or moderately correlated which supports the notion that these metrics evaluate different aspects of cognitive processing, as is a typical assumption in AD studies (Hehman, Stoiler, & Freeman, 2015). It should also be noted that the correlations were all below the range of 0.3 to 0.7 that is suggested by Maxwell (2001) for consideration of MANOVA vs ANOVA modeling. In addition, there was a significant

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negative correlation between x-flips and reaction time ($r = -0.23$). Thus, as participants took more time to decide on a response, the number of times they flipped across the axis actually decreased. This negative correlation may have been caused by the larger max deviations being positively correlated with longer reaction times in that, as a participant's path became more extreme off the ideal path, they did not flip across the axis as much, but showed more singular attraction to the other response.

Table 5.
Bivariate Correlations between Major Study Variables

	1	2	3
1. Reaction Time	—		
2. Max Deviation	0.28**	—	
3. x-flips	-0.23**	0.063*	—

Note: $*p < .05; **p < .01$.

Hypothesis 1

As a reminder, Hypothesis 1 is that the greatest anti-transgender bias would be seen for statements related to physical appearance as compared to more social and moral characteristics. Three one-way ANCOVAs were conducted to compare the response time, competition, and indecision variables across the categories of stimuli whilst controlling for word count. Levene's test and normality checks were carried out and assumptions were met. The histograms for normality and Levene's test values can be found in Appendix C. No significant differences were seen in reaction time [$F(2,1340) = 2.27, p = 0.10$], max deviation [$F(2,1340) = 1.51, p = 0.19$], or x-flips [$F(2,1340) = 1.31, p = 0.27$], across stimuli categories. These relationships can be seen in Figure 4 below.
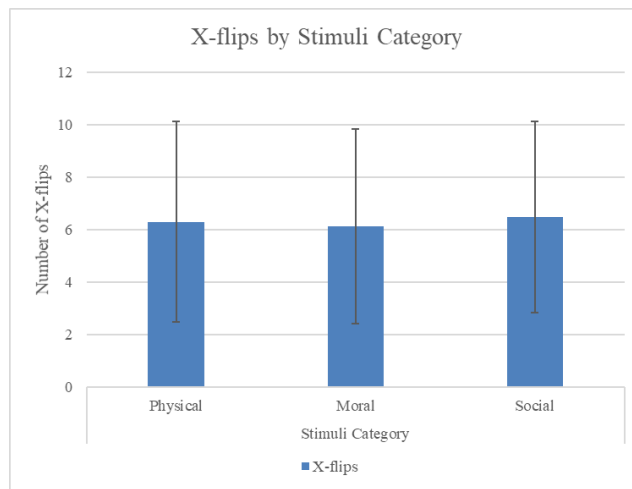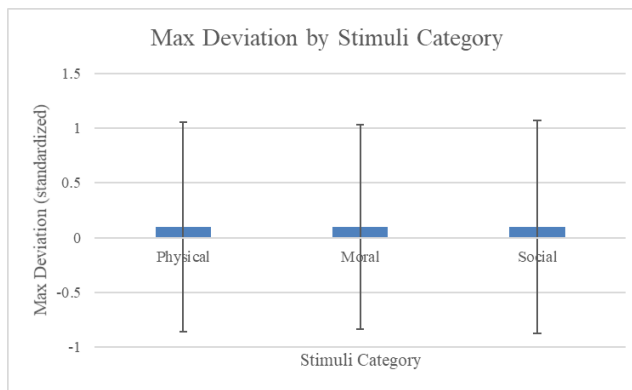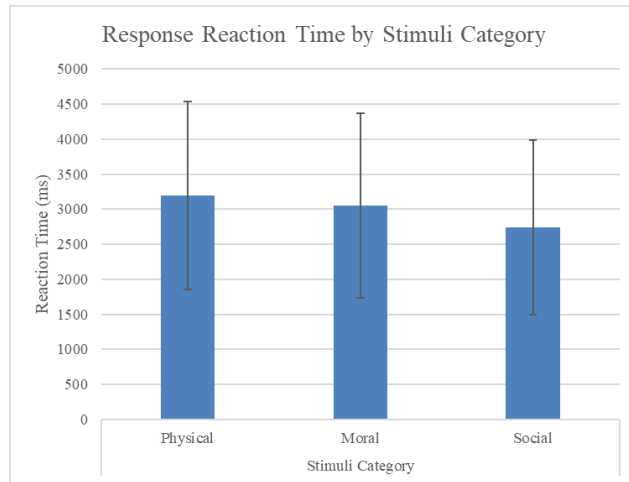
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Figure 4. Hypothesis 1 Relationships. Bar graphs illustrating the relationship between the stimuli categories and the reaction time, competition, and indecision variables. The y-axes are in milliseconds for reaction time, number of flips for x-flips, and standardized score values for max deviation. The x-axes break up the competition effects by each stimuli category: physical, moral, and social. Standard deviations for each variable are included.

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Hypothesis 2

Hypothesis 2 is that the greatest response time, competition, and indecision effects would be seen in male participants when responding as compared to female participants, showing more anti-transgender bias. Three one-way ANCOVAs were conducted to compare the response time, competition, and indecision variables between the gender of the participant whilst controlling for word count. A significant difference in reaction time was found [$F(1,1341) = 3.91$, $p = 0.05$], with male participants responding faster (M = 2926.83 ms, SD = 1332.83 ms) than female participants (M = 3018.91 ms, SD = 1311.47 ms). There was also a significant difference in x-flips found [$F(1,1341) = 8.43$, $p = 0.004$], with male participants flipping more over the x-axis (M = 6.76 flips, SD = 3.85 flips) than female participants (M = 6.13 flips, SD = 3.67 flips). No significant difference in max deviation was found between genders [$F(1,1341) = 0.56$, $p = 0.45$]. These relationships can be seen in Figure 5 below.

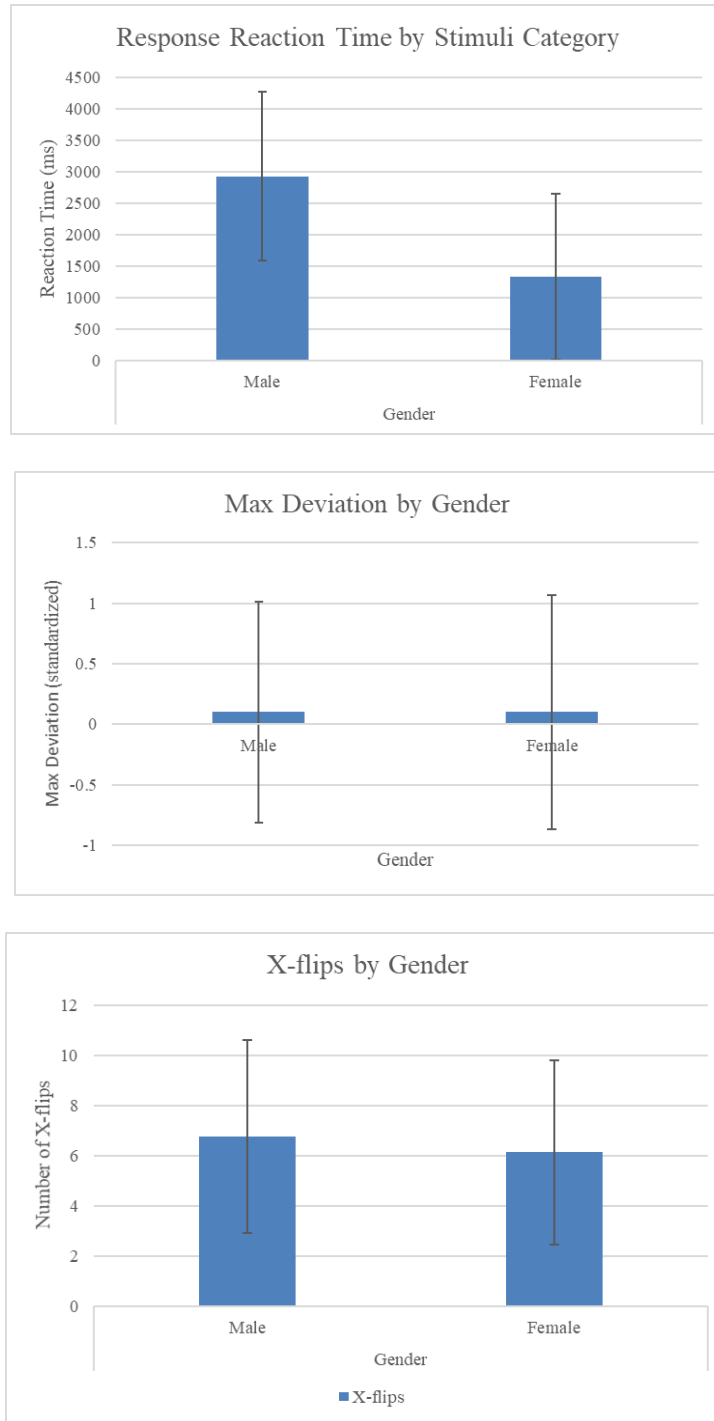**Figure 5.** Hypothesis 2 Relationships. Bar graphs illustrating the relationship between gender and the response time, competition, and indecision variables. The y-axes are in milliseconds for reaction time, number of flips for x-flips, and standardized score values for max deviation. The x-axes break up the two genders assessed: male and female. Standard deviations for each variable are included.

Hypothesis 3

Hypothesis 3 is that there would be a main effect of participant political ideology such that more politically conservative participants would show the greatest response time, competition, and indecision as compared to more liberal participants. The main effect of political ideology was non-significant for reaction time [$F(1,1127) = 1.03$, $p = 0.31$] and max deviation [$F(1,1127) = 0.72$, $p = 0.40$], but a significant difference was seen in x-flips [$F(1,1127) = 33.02$, $p < .001$] with politically conservative participants (M = 7.04, SD = 3.70) engaging in more flips across the x-axis than politically liberal participants (M = 5.78, SD = 3.54) . The relationship of this main effect and the reaction time, competition, and indecision variables can be seen in Figure 6.

Reaction Time by Political Ideology

Max Deviation by Political Ideology

X-flips by Political Ideology

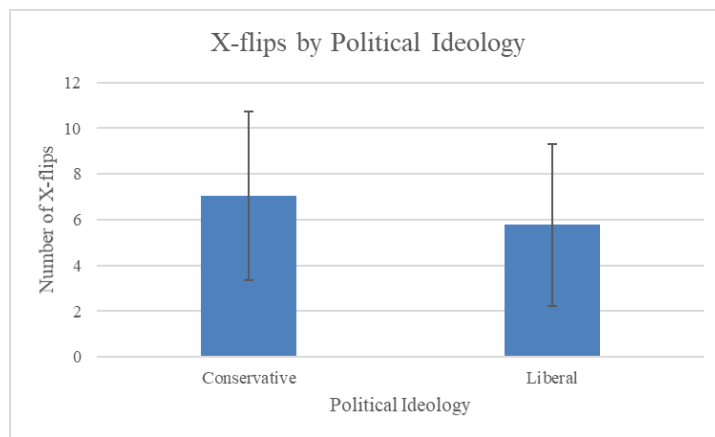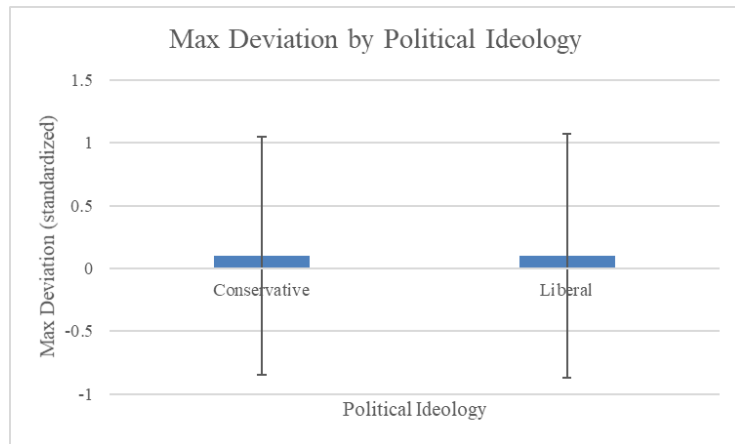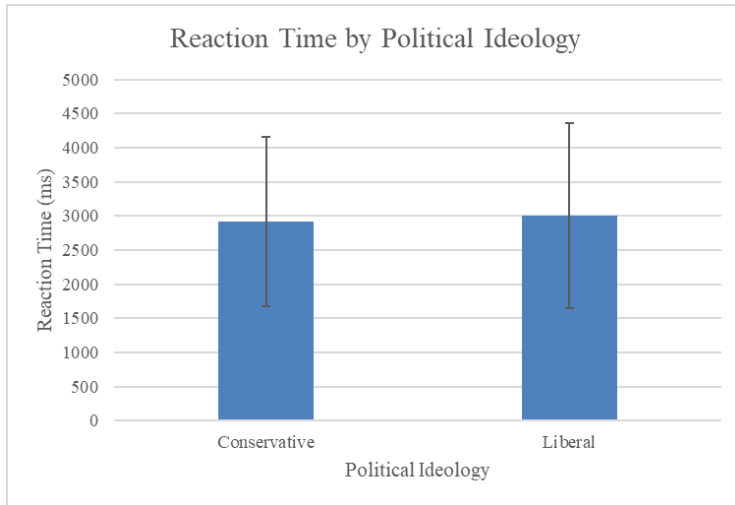*Figure 6.* Hypothesis 3 Relationships. Bar graphs illustrating the main effect of political ideology on the reaction time, competition, and indecision variables. The y-axes are in milliseconds for reaction time, number of flips for x-flips, and standardized score values for max deviation. The x-axes break up the political ideologies: liberal and conservative. Standard deviations for each variable are included.

Discussion

The broad aim for this thesis study was to begin to address the gap in the literature examining biases against the LGBTQ+ community from the general population and the possible impact this has on said community. A number of goals were devised to accomplish this, focusing on the ways in which implicit bias has been measured, some of the work that has already been done to begin addressing this gap, and new forms of assessment which may provide more sensitivity to detect implicit bias. Specifically, this thesis worked to expand on previous research, to investigate implicit bias against transgender using action dynamics (AD)—an innovative paradigm that has yet to be applied in the area of LGBTQ+ bias.

It was hypothesized that among the three categories of stimuli shown—moral, social, and physical—more anti-transgender bias would be observed for statements related to the physical appearance and presentation of transgender individuals compared to social and moral characteristics. However, this hypothesis was not supported as none of the variables of response time, competition, and indecision effects significantly differed between the three types of statements. That is, there was no significant differences in how long it took participants to answer; in the trajectory to participants' final response, which was seen in the lack of significant difference in path deviations; or in flips across the x-axis between response options.

The second hypothesis, that compared to female participants, male participants would show more anti-transgender bias as evidenced by greater response time, competition, and indecision effects, was partially supported. It was found that male and female participants significantly differed in reaction time, with males responding faster,

on average, than females. This could suggest more thinking at the onset of the decision-making process or impression management early on in male participants more so than female participants. There was also a significant difference in the number of x-flips between genders, with male participants flipping across the x-axis more often than female participants. This could suggest that, when responding to the statements, the male participants may have experienced more indecision between the two response choices or more "back-and-forth" thinking as they chose a response in the trials and this could be a result of an internal argument of their beliefs, their impression concerns by evaluators or other members of society, or a number of other factors.

The lack of sensitivity of reaction time as a sole measure is another potential implication of the results of this thesis study. In an IAT task, the reaction time of a decision is the only variable used to measure cognitive competition, and only provides information of the outcome of the event; how long it takes to make a decision (Yu et. al, 2012). By adding the other variables used to assess cognitive competition as a continuum; max deviation and x-flips; with an AD paradigm, more information of the competition experienced and the evolution of the participant's decision is revealed. If this thesis study were an IAT task, the results would show that male participants had more implicit bias when responding than female participants. However, when the other competition effects and indecision measures were added to the analysis, max deviation and x-flips, the significant differences seen were expanded on. While male participants responded more quickly than female participants, the path of their mouse trajectories were not significantly different. Additionally, male participants displayed more entropy in their trajectories, by flipping over the x-axis more often than female participants. By adding

more measures to the experiment, the sensitivity to which implicit bias was assessed, increased, and more information was found in how participants were making a decision overall. This sensitivity, in turn, provides support that AD may provide a more robust view of the decision-making process which may be missed in an IAT task where reaction time is usually measured solely.

Word count was included as a covariate in all reported analyses because the length of the phrases created for the stimuli significantly differed by statement category. The physical category had significantly more words in the phrases used, on average, than both social and moral categories. Thus, the significant difference in reaction times found between genders may be partially explained by artificial cognitive competition created by participants having to read more words for the physical statements than the other statements in the other categories. Having to take more time to read the statements could potentially explain why those rection times were significantly different while the other variables related to the actual path toward a decision did not significantly vary. Moreover, the significant difference between word count in each category may have accounted for variation in cognitive competition over and above any differences between stimuli categories that occurred. This would provide a possible explanation or confound as to why no differences were seen in response time, competition, and indecision measures between the three stimuli categories. If there were differences actually present, they may have been hidden by the variation caused by word count.

Although the differences in word count between categories was a limitation in this thesis study, the main effect of political ideology did show a significance over-and above this potential confound. Within the indecision variable, x-flips, a significant difference

was seen, in that politically conservative participants' mouse paths crossed the x-axis more times, showing more entropy, than politically liberal participants. This partial support of Hypothesis 3 may provide evidence that there is more decision-making, impression management, or implicit bias in men with more rigid conservative views. They may have participated in more "back-and-forth" thinking as they chose a response in the trials and this could be a result of an internal argument of their beliefs, their impression concerns by evaluators or other members of society, or a number of other factors. However, as stated earlier, the analyses performed for Hypothesis 3 were fragile as the study was underpowered due to the limited number of participants. Thus, the results seen for the main effect of political ideology is tenuous. Future research could examine these ideas further by assessing similar measures with a larger population and to see what factors may more heavily influence making a decision when faced with other socially relevant or evocative concepts. Along with the significant differences in the length of phrases between each stimuli category, this thesis study had a number of other limitations. With recruitment of study participants, the target number decided for the study was not met. This was due to several factors. The subject pool system employed by the university where the study was posted is completely voluntary. Many of the undergraduate psychology courses at the university require research credits to be completed as either part of the grade or as extra credit in order to drive interest in research being conducted and to provide researchers with student participants. However, because of the voluntary nature of the subject pool, studies are in competition with one another for student participation. Coupled with the nature of recruitment through this system, part of the study recruitment time took place during the initial outbreak of the

COVID-19 virus pandemic. Although recruitment and trials had been running before the pandemic, universities shutting down facilities as protective measures to help contain and reduce spread of the virus, impacted further recruitment due to the study taking place in a physical lab location. Lack of participant population reduced the power of the study overall, resulting in AD measures that may have not been able to capture truly significant results of cognitive competition and indecision within this study.

The software used to assess the competition and indecision effects was another limitation. The MouseTracker software (Freeman, 2016) was used to design and present the study as well as track and record the mouse movements and trajectories of the participants. To accomplish this, the software is required to be installed on the systems being used to run the study, making it necessary to run in person in a lab setting. Due to its in-lab nature, the participant population was comprised entirely of those enrolled in undergraduate psychology courses, limiting the diversity of those involved and the study's generalization to the larger world population. Future revisions of this study, or other studies employing similar AD paradigms, would benefit from an internet-based program with the same capabilities as MouseTracker. This would eliminate the need to conduct the studies in a lab and would provide more accessibility to a wider and more diverse population of participants with the capability of being distributed through more public subject pool systems like Amazon's Mechanical Turk or Prolific.

Lastly, the categories themselves may have been a limitation. The statements created to evaluate cognitive competition in this study were the first iteration of their kind and may have suffered due to ambiguity or overlap between the content of the phrases, in addition to the varied word count. Statements that are more similar in length and more

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distinct in topic between categories, may provide better comparisons as to what evaluations of transgender individuals may impact the thought process of the larger general population. Future work in this realm would benefit from more robust disambiguation between these categories, or from assessing other categories related to transgender individuals that evoke more competition and indecision within participants.

Future studies can improve upon the limitations seen in this thesis study in the ways formerly described, as well as through other directions in which this work could develop. One such direction would be in the creation of an intervention aimed at reducing anti-transgender bias. This could potentially be implemented through a second portion of an AD study with a similar set-up. After running through a number of trials aimed at examining the potential implicit bias of participants, a study could then introduce an intervention in which a vignette is shown to participants describing the personal struggles of transgender people or biological information about the transition process. After the completion of these vignettes, the participants could then be revaluated with a similar AD-based activity, with the success of the intervention being measured by any decrease in response competition and indecision in their mouse cursor movements and trajectories.

The impact of this thesis study is two-fold. First, it provides a stepping stone for further research examining decision-making, impression management, and biases using AD as a more robust measure of these processes as compared to other evaluation methods, such as the IAT. Further research can determine what demographic and cultural aspects influence individuals' decision-making and bias management processes more. Additionally, avenues on to which this work may be built have been described within the limitations already discussed. Second, it begins to bridge the gap in literature discussed

earlier by providing further insight into impressions of the LGBTQ+ community

(transgender individuals specifically) from the larger general population. Transgender

and other LGBTQ+ members face increased risk of victimization and abuse due to non-

traditional identities and gender expressions (Grossman & D'Augelli, 2006; Grossman,

D'Augelli, & Salter 2006; Russell et al., 2011; Ryan, Russell, Huebner, Diaz, & Sanchez,

2010; Stieglitz, 2010) and evaluating potential implicit biases of other community

members toward these groups can provide information that can be used to create

beneficial assistance and intervention programs for LGBTQ+ members. Further

assessment will increase knowledge on what particular ideas the general population has

the most bias against or the most difficulty in forming an opinion on when faced with

topics of LGBTQ+ expression, lifestyle, and daily interaction. Increasing this knowledge

will, in addition to providing avenues for the creation of more interventions aimed at

increasing public awareness and understanding of these marginalized groups, give a

better understanding of the stigmatization and discrimination seen against them.

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APPENDIX A

QUALTRICS DEMOGRAPHIC SURVEY

Trans Biases Demographic and General Info Survey

Start of Block: Demographic Questions

Q1 Browser Meta Info
Browser (1)
Version (2)
Operating System (3)
Screen Resolution (4)
Flash Version (5)
Java Support (6)
User Agent (7)

Q23 What is your Subject ID? (Please ask the Research Coordinator to fill this in)

_____

Q25 GENERAL DEMOGRAPHIC QUESTIONS

There are nine questions in this section that get at basic facts about yourself.

Q26 What is your age?

_____

Q31 What is your gender?

○ Male (1)

○ Female (2)

○ Non-binary (3)

○ Transgender (4)

Q28 How would you classify yourself?

○ Arab (1)

○ Caucasian/White (2)

○ Hispanic or Latino (3)

○ Black or African American (4)

○ Native American or American Indian (5)

○ Asian/Pacific Islander (6)

○ Multiracial (7)

○ Other (8) _____

Q29 What is your marital status?

○ Single, never married (1)

○ Married or domestic partnership (2)

○ Widowed (3)

○ Divorced (4)

○ Separated (5)

Q30
What is your religious preference?

○ Mormon (1)

○ Seventh-Day Adventist (2)

○ Protestant (3)

○ Muslim (4)

○ Jewish (5)

○ an Orthodox church such as the Greek or Russian Orthodox Church (6)

○ Roman Catholic (7)

○ Christian Scientist (8)

○ Something else (please specify) (9)

_____

○ None (10)

Q27 What is the highest degree or level of school you have completed?

○ No schooling completed (1)

○ 8th grade or less (2)

○ Some high school, no diploma (3)

○ High school graduate, diploma or equivalent (e.g., GED) (4)

○ Some college credit, no degree (5)

○ Trade/technical/vocational (2 year) (6)

○ Associate degree (7)

○ Bachelor's degree (8)

○ Master's degree (9)

○ Professional degree (MD, JD, etc.) (10)

○ Doctorate degree (11)

Q32 Which of the following best describes the area you live?

○ Urban (1)

○ Suburban (2)

○ Rural (3)

Q33 What is your current household income in U.S. dollars?

○ Under $10,000 (1)

○ $10,000-$19,000 (2)

○ $20,000-$29,999 (3)

○ $30,000-$39,000 (4)

○ $40,000-$49,000 (5)

○ $50,000-$74,999 (6)

○ $75,000-$99,999 (7)

○ $100,000-$150,000 (8)

○ Over $150,000 (9)

Q34 Which of the following categories best describes your primary area of employment?

○ Homemaker (1)

○ Retired (2)

○ Student (3)

○ Unemployed (4)

○ Part-time (20 or fewer hours a week) (5)

○ Part-time (21 to 30 hours a week) (6)

○ Full time (40 hours a week or more) (7)

Page Break

End of Block: Demographic Questions

Start of Block: Political Opinion

Q2 POLITICAL OPINION QUESTIONS

There are six to ten questions in this section (depending on your answers to certain questions). Please provide your initial reaction.

Q4 We hear a lot of talk these days about liberal and conservatives. Here is a seven-point scale on which the political views that people might hold are arranged from extremely liberal to extremely conservative.

Where would you place YOURSELF on this scale, or haven't you thought much about this?

○ Extremely liberal (1)

○ Liberal (2)

○ Slightly liberal (3)

○ Moderate or middle of the road (4)

○ Slightly conservative (5)

○ Conservative (6)

○ Extremely conservative (7)

○ Haven't thought much about this (8)

Q5 If you had to choose, would you consider yourself a liberal or a conservative?

○ Liberal (1)

○ Conservative (2)

Q6 Where would you place the Democratic Party on this scale?

○ Extremely liberal (1)

○ Liberal (2)

○ Slightly liberal (3)

○ Moderate or middle of the road (4)

○ Slightly conservative (5)

○ Conservative (8)

○ Extremely ⌈⌐⌉SEP conservative (6)

○ Haven't thought much about this (7)

Q7 Where would you place the Republican Party on this scale?

○ Extremely liberal (1)

○ Liberal (2)

○ Slightly liberal (3)

○ Moderate or middle of the road (4)

○ Slightly conservative (5)

○ Conservative (8)

○ Extremely ⸤SEP⸥conservative (6)

○ Haven't thought much about this (7)

Q8 Generally speaking, do you usually think of yourself as a ⸤SEP⸥Republican, a Democrat, an Independent, or what?

○ Republican (1)

○ Democrat (2)

○ Independent (3)

○ Other/No preference (4)

Q9 Would you call yourself a strong Republican or a not very strong Republican?

○ Strong (1)

○ Not very strong (2)

Q10 Would you call yourself a strong Democrat or a not very strong Democrat?

○ Strong (1)

○ Not very strong (2)

Q11 Do you ⸨SEP⸩think of yourself as closer to the Republican or Democratic party?

○ Closer to Republican (1)

○ Neither (2)

○ Closer to Democratic (3)

Page Break ───

Q22 Please indicate your handedness.

○ Left-handed (1)

○ Right-handed (2)

Q37 Which type of device are you using to make cursor movements?

○ A computer mouse that you drag across a desktop (1)

○ A computer mouse that is stationary and is operated via a trackball (2)

○ A trackpad on my keyboard or laptop (3)

○ Something else (please specify) (4)

_____

Q24 Please you this space to provide your thoughts on the layout and implementation of this experiment. Were there aspects of it that you liked, disliked, felt could be improved, etc?

_____

_____

_____

_____

_____

End of Block: Political Opinion

APPENDIX B

OPEN SCIENCE FRAMEWORK PREREGISTRATION APPLICATION

OSL/PT Preregistration Template

Investigator's Name and Affiliation
(leave blank if this is an anonymous preregistration)

Jacob Hamlett Arizona State University

Names and Affiliations of Collaborators
(leave blank if this is an anonymous preregistration)

Dr. Nicholas Duran   Arizona State University

Date of Preregistration   October 19, 2019

IRB Status

○ IRB Review Not Necessary
○ Not Submitted Yet
○ Submitted
⦿ Approval Received, Date: 3/18/2019

Study Title

An Action Dynamics Approach to Assessing Potential Implicit Biases Toward Transgender People

VARIABLES

What are your independent / grouping / predictor variables (including mediators and moderators) ? Explain how you operationalize each variable.

The independent variables are the groups created for the stimuli statements that will be shown to participants: Physical, Moral, Social. The physical category includes statements that pertain to the physical appearance, anatomy, or biological sex of a Transgender individual. The moral category includes statements that pertain to the moral character or actions of a Transgender individual. The social category include statements that pertain to interactions with Transgender people or state of popular topics of Transgender individuals. Additionally, several predictor variables include gender of the participant, sexual orientation of the participant, and political ideology of the participant. These will be operationalized by self-identified gender of participant (on demographics survey), self-identified sexual orientation of participant (on demographics survey), and politically liberal or conservative (based on demographics survey) respectively.

What are your dependent / outcome variables? Explain how you operationalize each variable.

The dependent variable is the amount of bias toward or against Transgender individuals. This bias will be operationalized by the amount of mouse activity seen in the trials of the experiment (max deviation, area under the curve, x-flips, and reaction time).

List any exploratory variables. These are variables that you included in your study, but are not central to your main predictions.

Several other demographic identifies will be included as exploratory variables including education, socioeconomic status, marital status, employment status, race, age, religious preference.

Did you create new, or modify existing, variables for this study? (select all that apply)

☑ Some, or all, variables have been used in prior, published research, and no modifications were made

☐ Some variables were modified from their original form

☑ Some variables were created for this study

If you indicated above that 'Some variables were modified,' describe how you modified existing variables here:

If you indicated above that 'Some variables were created for this study,' list and describe the variables that you created for this study:

The variables created for this study are the stimuli statements used for participant responses and their categories (Physical, Social, and Moral).

HYPOTHESES

What are your primary study hypotheses / research questions?

The primary hypothesis is that the most bias against Transgender people will be seen in statements related to physical appearance and presentation of Transgender individuals as compared to more social and moral characteristics.

Do you have any exploratory hypotheses / research questions? If so, describe them below:

The following secondary hypotheses related to the predictor variables described above: those who identify as male will show more competition (mouse deviation, reaction time, etc.) when responding and males who are more politically conservative will show more competition when responding to the stimuli.

At the time of this preregistration, describe the status of data collection:

○ No new data collection is required for this project (e.g., meta-analysis)

⊙ Data collection has not started for this study

○ Data collection is in progress

○ Data collection is complete

○ Other:

If you selected 'Other' to describe the status of data collection, please explain here:

If you indicated above that data collection is 'complete' or 'in progress,' have you (or anyone else) already conducted any statistical analyses?

○ No data analyses have been performed

○ Some preliminary analyses have been performed, but not those relevant to the primary or exploratory study hypotheses described above (e.g., you calculated descriptive statistics)

○ Some, or all, analyses of the primary or exploratory hypotheses have been performed

If you selected 'Some preliminary analyses have been performed' describe the analyses you have already conducted:

If you selected 'Some, or all, analyses of the primary or exploratory hypotheses have been performed,' you should stop completing this form. Pre-registration of hypotheses MUST occur before you have analyzed your data.

SAMPLING

What is your target sample size? `150`

How was your target sample size determined? (check all that apply)

☐ Power analysis

☑ Target sample size based on convention / past research

☐ Target sample size based on constraints / convenience (e.g., size of subject pool, available money to pay participants, access to participants)

☐ Other:

How will you determine when to stop collecting data (i.e., your stopping rule)?

⊙ When the target sample size is reached

○ A particular amount of time has passed (e.g., the end of the semester)

○ Other (describe below)

If you selected 'Other' for your stopping rule, please explain here:

RESEARCH DESIGN

What type of research design are you using?

- ⦿ Experiment
- ◯ Quasi-experiment
- ◯ Correlational Study
- ◯ Other:

If you selected 'Other' for your research design, please explain here:

EXPERIMENTAL DESIGNS ONLY

If you are conducting an experiment, what is the nature of the manipulation?

- ◯ between-participants
- ◯ within-participants
- ⦿ mixed (at least one between and one within factor)

What are the total number conditions in your study? (e.g., a 2 x 2 design has 4 total conditions):

> 8 conditions
> (3 Stimuli, 2 Gender, 3 Political Affiliation)

Will the experimenters be aware of the condition to which a particular participant has been assigned?

- ⦿ Yes, the experimenter will be aware of the condition to which a participant has been assigned
- ◯ No, the experimenter will be blind to condition

Will participants be randomly assigned to condition?

- ⦿ Yes
- ◯ No (describe below)

If you selected 'No' for how you will assign participants to condition, please explain here:

If you are predicting an interaction (in your hypotheses), describe the nature of that interaction below:

> That males with conservative political views with see the most competition in responses than any other gender and political ideology combination.

DATA ANALYSIS PLAN

What will be your criterion for determining statistical significance?

- ⦿ $p < .05$ ◯ $p < .01$ ◯ $p < .005$
- ◯ Other:

Will your tests of significance be:

- ◯ One-tailed
- ⦿ Two-tailed
- ◯ A combination of one- and two-tailed tests

If you indicated that some tests of significance will be one-tailed, describe the hypothesis and predicted direction of the effect or association below:

Will you exclude participants from data analysis based on any of the reasons listed below?

☐ Failed attention check   ☐ Failed manipulation check   ☐ Missing data

Describe any additional exclusion criteria here:

Participants with overly explicitly biased responses (15 of 30 statements shown being the explicit biased response)

What criterion (if any) will you use to determine whether a participant is an outlier?

◯ Greater than 3 standard deviations from the mean

◉ Other: 2.5 SD

Which statistical tests will you use to conduct your data analyses? (check all that apply)

☑ ANOVA   ☐ Correlation   ☐ t-test   ☐ Chi-square

☐ Regression   ☐ Other/Additional

If you selected 'Other/Additional' for the statistical test above, describe the analyses you will conduct here:

If relevant, describe what types of follow-up tests will you perform (e.g., Tukey post-hoc; simple main effects). If you will conduct planned comparisons, explain the nature of those comparisons below:

If interactions are observed, simple main effects testing will be performed in order to determine the relationship of the interaction.

For the analyses listed above, will you include any covariates or control variables? If so, describe them below and provide a justification:

Word count as there was a significant difference in the length of phrases between the 3 categories of statements

APPENDIX C

HOMOGENAITY AND LEVENE'S TESTS FOR ASSUMPTIONS OF MAJOR
STUDY VARIABLES

Assumption Testing for Reaction Time:
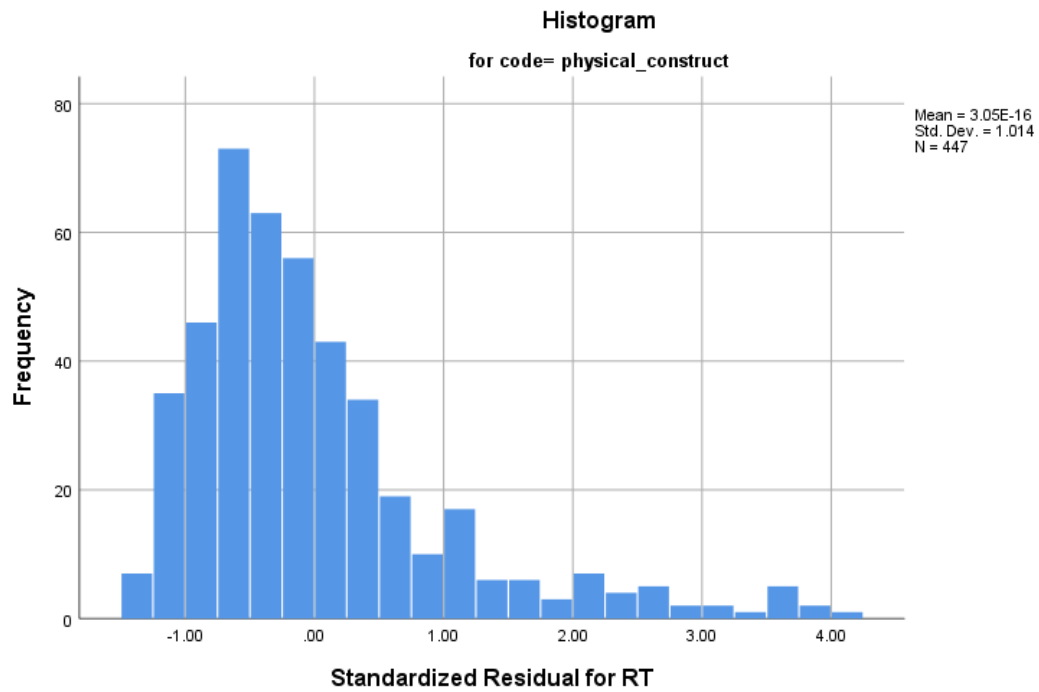
Levene's Test of Equality of Error Variances[a]

Dependent Variable: RT

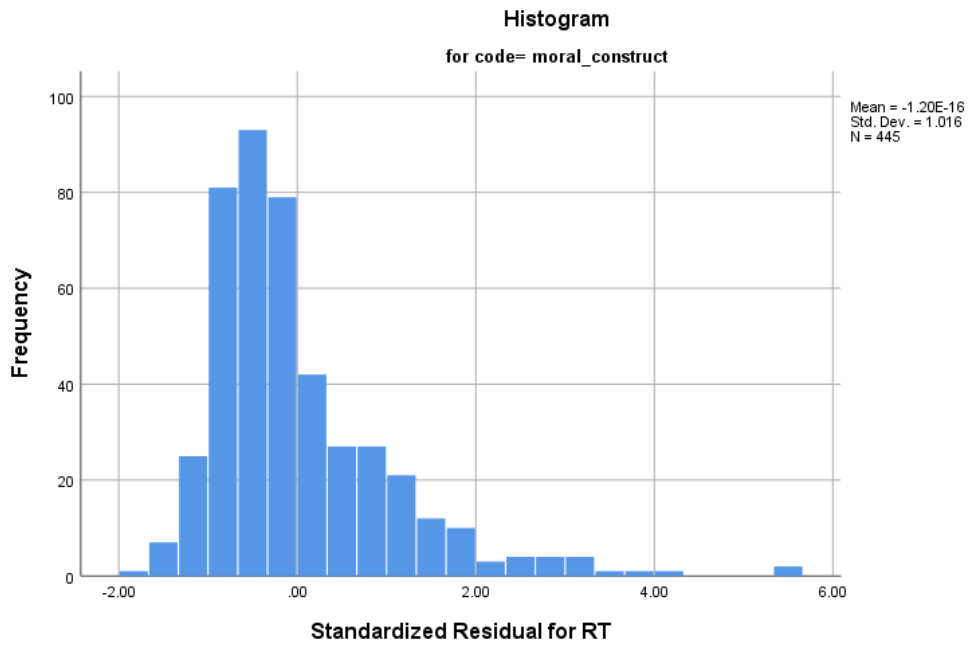| F	df1	df2	Sig.
1.024	2	1341	.359

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
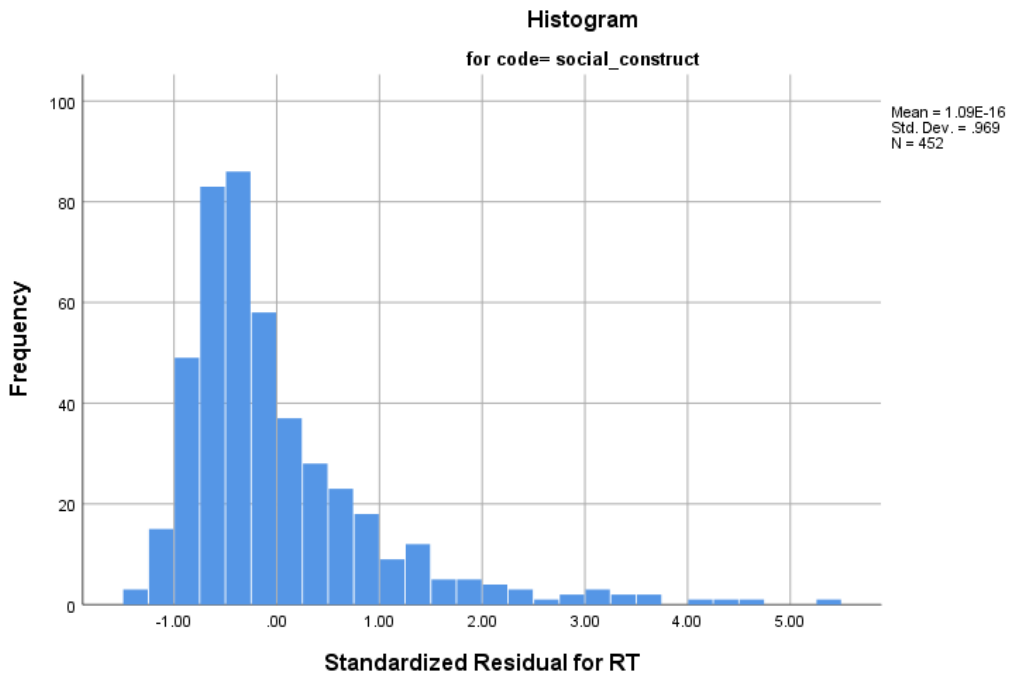
a. Design: Intercept + WordCount + code

Physical Stimuli

Histogram

for code= physical_construct

Mean = 3.05E-16
Std. Dev. = 1.014
N = 447

Moral Stimuli

Social Stimuli

Assumption Testing for Max Deviation:
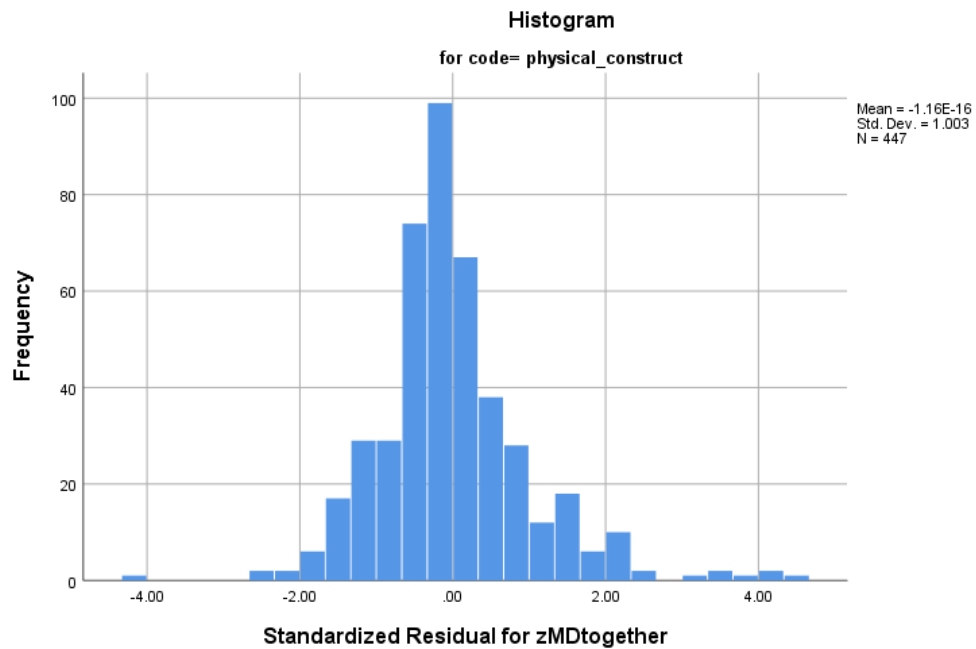
Levene's Test of Equality of Error Variances[a]

Dependent Variable: zMDtogether

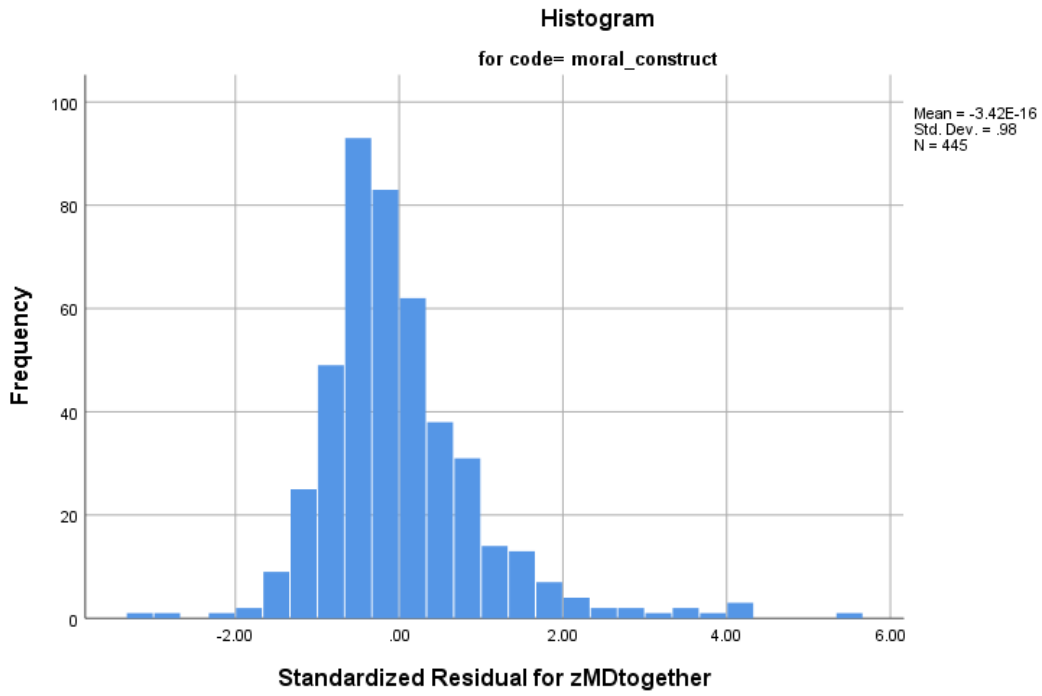| F	df1	df2	Sig.
.835	2	1341	.434

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
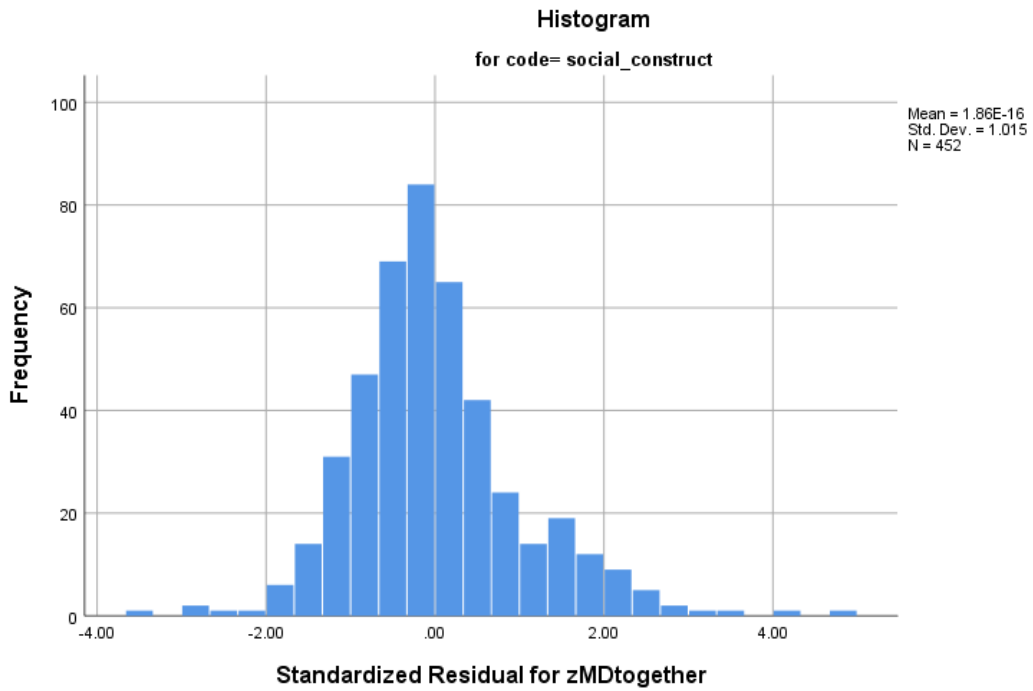
a. Design: Intercept + WordCount + code

Physical Stimuli

Histogram

for code= physical_construct

Mean = -1.16E-16
Std. Dev. = 1.003
N = 447

Moral Stimuli

Histogram

for code= moral_construct

Mean = -3.42E-16
Std. Dev. = .98
N = 445

Frequency (y-axis)

Standardized Residual for zMDtogether (x-axis)

Social Stimuli

Histogram

for code= social_construct

Mean = 1.86E-16
Std. Dev. = 1.015
N = 452

Frequency (y-axis)

Standardized Residual for zMDtogether (x-axis)

63

Assumption Testing of X-Flips:

Levene's Test of Equality of Error Variances[a]

Dependent Variable: xflip

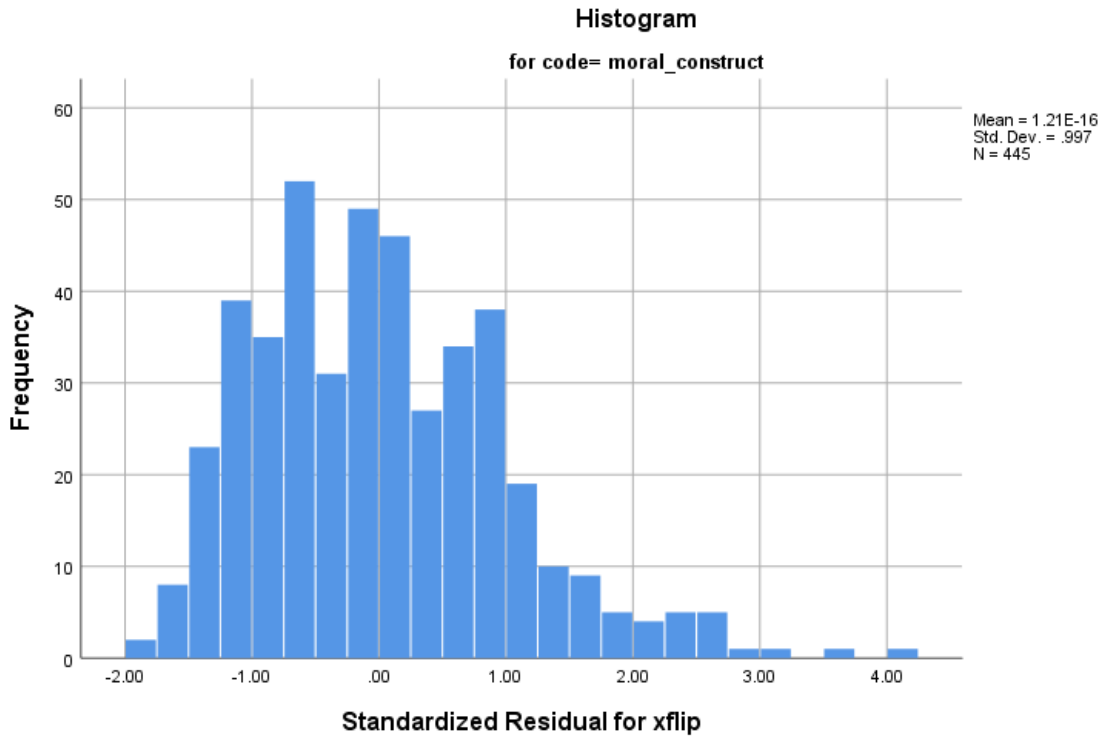| F	df1	df2	Sig.
.736	2	1341	.479

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
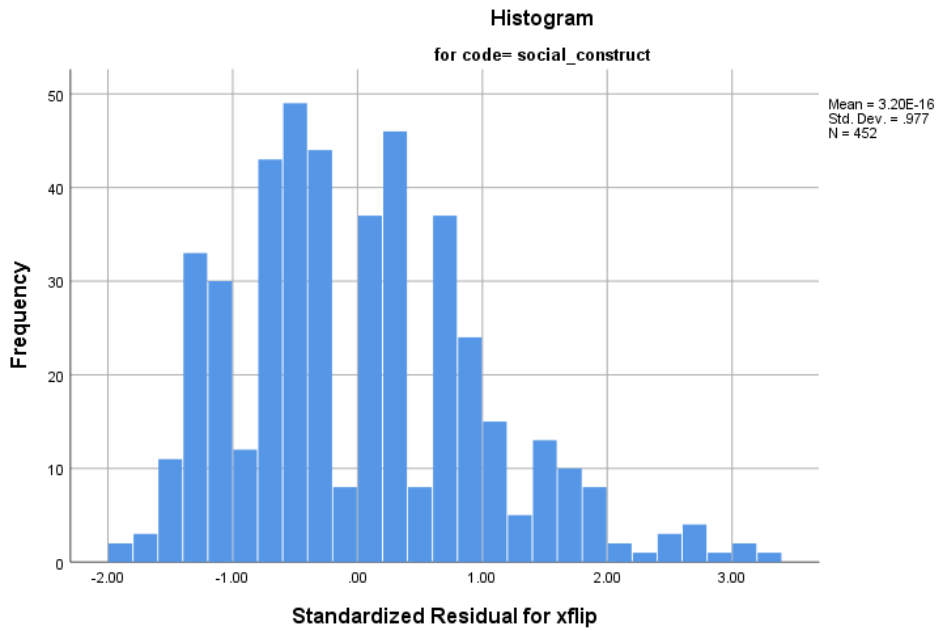
a. Design: Intercept + WordCount + code

Physical Stimuli

Histogram

for code= physical_construct

Mean = -7.29E-17
Std. Dev. = 1.025
N = 447

64
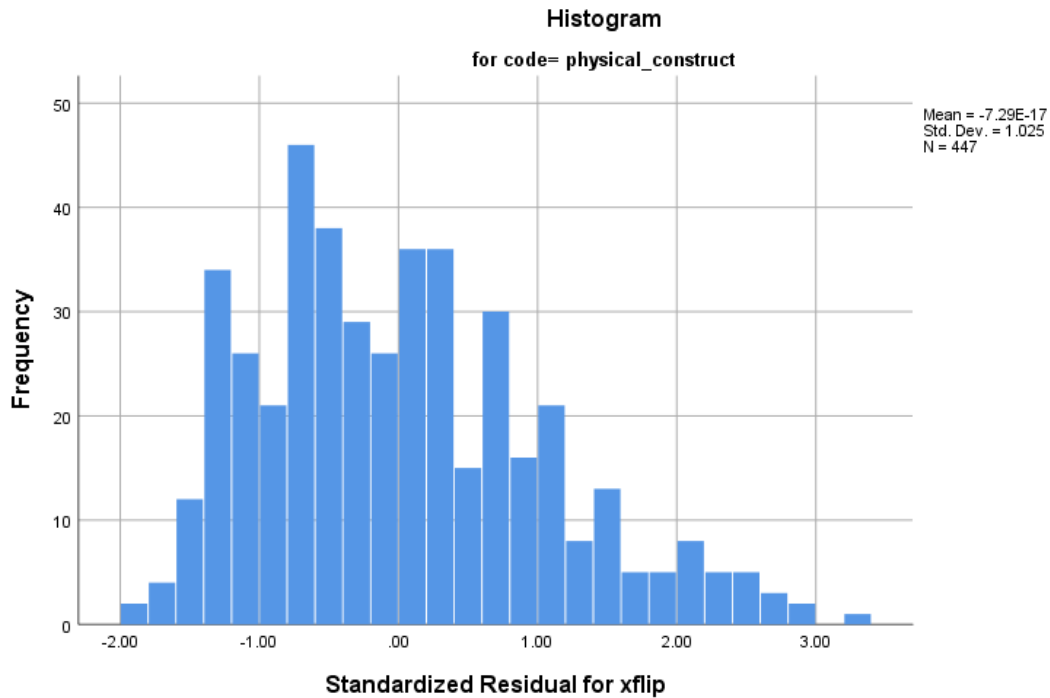
Moral Stimuli

Social Stimuli

APPENDIX D

IRB APPROVAL AND MODIFICATION APPROVAL

EXEMPTION GRANTED

Nicholas Duran
Social and Behavioral Sciences, School of (SSBS)
-
Nicholas.Duran@asu.edu

Dear Nicholas Duran:

On 3/18/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Assessing Bias with Action Dynamics
Investigator:	Nicholas Duran
IRB ID:	STUDY00009890
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Qualtrics Demographics Survey.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Transpeople Biases Consent Form v2.pdf, Category: Consent Form; • Instructions to Participants.pdf, Category: Recruitment Materials; • Hamlett Transpeople Biases IRB Application v3 (ND).docx, Category: IRB Protocol; • Revised Trans People Stimuli Prompts.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 3/18/2019.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).
Sincerely,
IRB Administrator

APPROVAL: MODIFICATION

Nicholas Duran
NCIAS: Social and Behavioral Sciences, School of (SSBS)
-
Nicholas.Duran@asu.edu

Dear Nicholas Duran:

On 9/19/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Modification/Update
Title:	Assessing Bias with Action Dynamics
Investigator:	Nicholas Duran
IRB ID:	STUDY00009890
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Hamlett Transpeople Biases IRB Application V 5.0.docx, Category: IRB Protocol; • Instructions to Participants.pdf, Category: Recruitment Materials; • Instructions to In Lab Participants.pdf, Category: Recruitment Materials; • In Lab Consent From.pdf, Category: Consent Form; Transpeople Biases Consent Form v3.pdf, Category: Consent Form;

The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,
IRB Administrator