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The Role of Cognitive and Evolutionary Processes in Guiding Gaze Patterns While Viewing Transgender Women

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Abstract

Eye gaze patterns of cisgender men and women were observed while they viewed photographs of transgender and cisgender women. Past scene perception research suggested that body regions that are consistent or inconsistent with one's expectations for transgender women's bodies could attract eye gaze while viewing a transgender woman. We did observe a tendency for participants to view body regions that were consistent with their expectations for transgender women's bodies more than inconsistent body regions. Evolutionary psychological research suggested eye gaze should be drawn to chests. If a woman's chest area is important to assess for mate selection related reasons, participants should have viewed the chest more than other regions and male participants should view the chest more than female participants. We found mixed support for evolutionary theory. In some analyses it appeared the chest did attract eye gaze more than other less evolutionarily important body regions while in others it did not. Contradicting evolutionary psychological theory, we did not observe a tendency for male viewers to look more than female viewers at a transgender or cisgender woman's chest.

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The Role of Cognitive and Evolutionary Processes in Guiding Gaze Patterns While Viewing Transgender Women

With the recent mass shooting in Orlando and many bathroom bills being proposed which would force transgender people to use the bathroom corresponding to the gender they were assigned at birth, lesbian, gay, bisexual and transgender (LGBT) people have received increased attention from the public. Given that this is a community with much diversity, researchers should be careful to give scholarly attention to each of these groups individually since attitudes towards each group many not be homogenous. Norton and Herek (2013) exemplified this well by recruiting a national sample of U.S. adults via random digit dialing and using a feeling thermometer to rate their attitudes toward transgender people and lesbian, gay and bisexual people. Their results suggested that on average sexual minorities were viewed somewhat unfavorably but that transgender people were viewed less favorably than any other subgroup of the LGBT acronym. If attitudes towards transgender people are different than attitudes toward lesbian gay and bisexual men and women, it seems reasonable to ask how behavior and cognition may also be different when people think of or encounter a transgender person.

One of the most basic questions researchers can attempt to answer as they begin to investigate such a scenario is, “where do people look when they see a transgender person?” It is the purpose of this thesis to explore potential answers for questions related to how eye-gaze patterns may be altered when viewing transgender people, in this case specifically transgender women. First, are there differences in eye-gaze patterns when viewing cisgender vs. transgender women? Second, if differences do exist, what psychological processes may be responsible for those differences? Is eye-gaze while viewing a transgender woman a result of cognitive processes that have been shown to guide visual attention? Could evolutionary psychological preferences for looking at body regions explain why people look at transgender people the way they do?

Whatever the cause of differences in eye-gaze patterns could be, it seems reasonable to expect there may be differences in how people look at cisgender and transgender people given the results of past eye tracking literature. No past eye tracking literature has investigated eye gaze patterns for viewing transgender people, however, past eye-tracking literature suggests that both the gender of the observer and gender of the target person being viewed can play a role in one's eye gaze pattern (Hewig et al., 2008; Nummenmaa, Hietanen, Santtila, & Hyönä, 2012). Differences for how men and women are viewed suggest that a gendered appearance in the form of looking male or female can influence how observers scan a person. However, research on scene viewing suggests that knowledge held in the form of schemas for an environment can influence memory for scenes and potentially eye gaze (Heutig & Altman, 2005). Therefore, if someone has a schema for how a transgender woman looks it makes sense to expect that it could influence their eye-gaze pattern while viewing a transgender woman.

Semantic Consistency and Inconsistency

One's schemas for an environment (i.e. kitchen, farm, alley etc…) can influence various processes related to attention and memory, including eye-gaze. More specifically, recall for scene contents and eye-gaze can be altered when everything in the environment "belongs" together versus when some object clashes with its surroundings. When everything in a scene or environment belongs together, the objects in that environment can be said to be semantically consistent. For example, in a picture of a cashier at Wal-Mart counting back change to a customer, the cashier standing by the cash register would be semantically consistent with their surroundings since one usually expects employees to be near the registers. If an object or thing does not belong with an environment, it can be described as being semantically inconsistent with its environment. If in the same picture at Wal-Mart the cashier counting back change was replaced with an otter counting back change, the otter could be described as being semantically inconsistent with its environment since most would not expect otters to be at Wal-Mart or count change.

The semantic category information one relies on to recognize an object as being semantically consistent or inconsistent can be activated rapidly. Merely seeing a picture, even subliminally, is capable of activating semantic information. Dell'Acqua and Grainger (1999) showed participants a subliminal picture of something natural (e.g. a grape) or something artificial, (e.g. table) for 17 ms before displaying a target word. Participants were tasked with deciding whether the target word was a word for something natural or artificial. The image primes depicted either an exact representation of the target word (e.g. a picture of a grape and the word grape), a picture of something in this same category as the word but not an exact representation of the target word (e.g. a raisin) or something completely unrelated to the target word (something artificial, e.g. a table). Correct responses were faster when the image was either an exact image of the target word or belonged to the same category as the target word compared to when the image and target word belonged to separate categories. Semantic inconsistency appears to have made a participant’s decision about what category the word belonged to more difficult.

Research on semantic consistency in the context of scene viewing has found similar results. Davenport and Potter (2004) asked participants to briefly view scenes (500 ms, not subliminal) where a single foreground object was either consistent or inconsistent with its background (e.g. consistent being a Catholic priest in a church or football player on a football field and inconsistent being a Catholic priest on a football field or a football player in a church). Davenport and Potter found that when both foreground objects and background objects were semantically consistent with each other, the foreground object was identified accurately more often than when it was inconsistent with the background. When participants were asked to recall the background of an image they also tended to report the background more accurately if a foreground object had been semantically consistent with the background relative to when it was inconsistent. When asked to recall both the foreground and background objects, semantic consistency of the background and foreground objects again appeared to facilitate more accurate recall as compared to scenes with inconsistent background and foreground objects. Davenport (2007) conducted similar research investigating whether or not adding another foreground object that was consistent or inconsistent with the background would influence accurate recall of foreground objects or backgrounds. Again, scenes were briefly shown to participants for 80 ms (not subliminal), this time with two foreground objects and participants were asked to list the objects or background they had seen. Consistent with Davenport and Potter, foreground objects and background objects were identified more accurately when the pairing was consistent than inconsistent. When foreground objects were not both consistent with the background they were not recalled accurately as often as when they were consistent. This scene research is important in that it demonstrates the role that prior held knowledge about the world can play even when rapidly processing visual stimuli. Though this research focused on how memory may be influenced by prior held knowledge, other research on semantic consistency and eye gaze suggest that eye gaze could have been attracted to the semantically consistent objects.

When an individual hears a word and sees a picture containing an object matching the word (i.e. semantically consistent), there is a tendency for eye gaze to be directed toward that target object (Cooper, 1974; Heutig & Altman, 2005; Yee & Sedivy 2006). This tendency is known as the semantic mapping hypothesis (Heutig, Mishra, & Olivers, 2012). In an investigation of this tendency, Heutig and Altman (2005) asked participants to view squares that contained four drawn objects while a sentence was read to them that contained a target word that matched one of the four objects. Distractor objects were either entirely unrelated to the target or belonged to the same category as the target but were not the same object as the target word. For example, if piano was the target word a flute could have been included as a similar but not identical distractor and a vase could have been included as an entirely unrelated distractor. Heutig and Altman found that when auditory and visual information were semantically consistent in the form of seeing a picture that contained a piano and hearing a sentence that included the word piano, eye gaze tended to focus on the piano as opposed to other objects in the scene once participants heard the word piano. Even when other related objects in the form of instruments were displayed, the piano still received increased eye-gaze following having heard the word piano.

Yee and Sedivy (2006) obtained similar results when showing images of four objects on a screen with two objects being related to each other and two objects unrelated to the other objects. For example when participants heard the word lock while viewing a picture that had both a lock and a key, they were more likely to look at the lock and the key than they were to look at the two unrelated objects. These results lend support to the hypothesis that semantically consistent information can guide one's eye gaze.

It may be that a bias for visually attending to stimuli that fit with our schemas exists. However, the biases in memory and recall may just reflect an ease in processing stimuli that fit with one's prior held schema for some given category, not a desire to visually attend to semantically consistent objects more than inconsistent ones. If a scene is displayed long enough for individuals to scan the entire scene, they could prefer to look at semantically inconsistent objects until some other stimuli activates a semantic category (Heutig & Altman, 2005). Henderson, Weeks & Hollingworth (1999) also note that tasks in eye tracking studies can influence what objects in a scene attract eye gaze. They suggest that visual search tasks may decrease the amount of eye gaze inconsistent objects receive while recall tasks do tend to allow inconsistent objects to be gazed at longer.

This would help explain findings suggesting that eye gaze is drawn to semantically inconsistent objects. Loftus and Mackworth (1978) investigated the influence of semantic inconsistency by showing participants scenes with objects that did or did not fit with their surroundings. For example, one picture of a farm had a tractor sitting just outside of a barn (consistent) or an octopus sitting just outside of a barn (inconsistent). Participants tended look for a longer period of time at inconsistent objects than consistent ones. Similar to Loftus and Mackworth, Henderson et al. (1999) asked participants to view pictures of environments that contained objects consistent or inconsistent with the rest of the scene (i.e. a picture of a kitchen with a glass on a counter or kitchen with a microscope on a counter). The first time participants looked at an inconsistent object, participants spent a longer amount of time viewing the inconsistent object before looking away than when they viewed consistent objects. They also returned their gaze to inconsistent objects more often than they did consistent objects.

Both Loftus and Mackworth (1978) and Henderson et al. (1999) made use of black and white line drawn pictures for stimuli and it could be argued that these pictures are different enough from what one actually sees in real life that their results are not generalizable to the real world. However, even when photographs of real world scenes are used, semantic inconsistencies can capture visual attention. Semantically inconsistent or bizarre and unexpected events photoshoped into real world scenes such as dogs staring intently at a checker board or men with three legs are capable of attracting eye gaze (Rayner, Castelhano, & Yang, 2009). The unifying theme to Loftus and Mackworth, Henderson, et al. and Rayner et al. is that when an object violates an individual's schema for something, that inconsistent object will attract eye-gaze.

Transgender women and semantic consistency/inconsistency

For Rayner, et al. (2009), men with third legs and dogs intensely pondering a move in a game of checkers violated expectations. Various areas of transgender women's bodies may also violate expectations if people expect their bodies to have specific characteristics. If transgender women are expected to look more masculine relative to cisgender women, then a picture of a feminine transgender woman should have increased attention to more feminine body parts such as breasts or waist/hip area. On the contrary, someone's expectations about women generally looking feminine could be violated if a transgender woman looked masculine, in turn drawing eye gaze to areas more typically associated with masculinity. For example, a five o' clock shadow or broad shoulders could receive increased eye gaze due to the inconsistency between what one expects a woman to look like (e.g. slender build, clear skin instead of stubble) and what is seen.

Still though, there is literature that indicates both words and pictures can prime semantic category information and that eye gaze can be drawn to objects consistent with that semantic information. If semantic consistency guides eye gaze when social identity information is primed and someone's schema for transgender woman includes specific body parts, then eye gaze should be drawn to those body areas when viewing a transgender woman. Prior literature has not yet documented how learning social identity information about a person can influence a viewer's eye gaze of a target individual. As a result it is not clear how or if semantic consistency and inconsistency processes would influence eye gaze when viewing a transgender woman.

Evolutionary Psychology

Evolution, or the change in genetics across generations, is thought to have played a formative role in the physiological development and changes of all lifeforms on Earth. Anytime genes gave rise to physiologically advantageous traits that increased one's chances of survival or reproduction, it is thought that those genes would have been more likely to be passed on to future generations of a species. Buss (1995) argues that this "natural selection" of genes led to the development of many different psychological processes/modules that are now universal or near universal traits of our species. Buss posited that these processes helped humans better adapt to the more nomadic lifestyle of our ancestors.

Whether men living in this more nomadic lifestyle were aware of it or not, an effective psychological process for promoting reproduction would have been being attracted to physical traits associated with fertility. For example, these men would not have been aware that levels of oestrodial in women are associated with a higher chance of being impregnated but it still would have been adaptive for them to be attracted to anything associated with higher levels of oestrodial (Lipson & Ellison, 1996). This should have encouraged men to be attracted to breasts since a positive relationship between breast size and levels of oestrodial has been documented in women (Jasienska, Ziomkiewicz, Ellison, Lipson, & Thune, 2004). Though there is research to suggest men prefer women with large breasts, participant and target characteristics can influence attractiveness ratings.

When male participants in Africa and Britain were asked to evaluate the attractiveness of women, they did not universally tend to prefer larger breasts (Swami, Jones, Einon, & Furnham, 2011). When the target women being viewed did not share their same ethnicity, men tended to prefer smaller breasts. It could be argued that if men's preferences for breasts are still occurring in a systematic and universal way that this tendency could still be consistent with what Buss (1995) defines as an evolved psychological mechanism. However, even a preference for large breasts for women of a man's own ethnicity does not appear to be universal. Swami and Tovee (2013) asked male participants to choose which of five photo realistic computer generated women were most attractive. The only difference between the five computer generated women was breast size. They found that only 19.1% of their male participants preferred the largest breasts, only 24.4% preferred the model with second largest breasts while the largest portion of their participants (only 32.7%) preferred medium sized breasts. The remaining 23.8% of participants preferred the models with the smallest or second to smallest breasts. Upon conducting multiple linear regression Swami and Tovee also found that benevolent sexism (b =

.59, SE = .06, $\beta = .55$, $t = 10.33$, $p < .001$) and objectifying women ($b = .33$, SE = .18, $\beta = .13$, $t = 2.68$, $p < .001$) predicted breast size preference. While not in accordance with Buss's theory, these results suggest that men's preference for large breasts may not be universal and preference for breast size could be predicted by attitudinal constructs.

Moving further down the body to the waist hip area, research has documented the importance of waist/hip ratio in influencing judgements of a targets woman's attractiveness (Jasienska et al., 2004; Singh 1993; Singh & Young 1995); this research has not always been consistent with eye tracking literature. In eye tracking literature, it is widely thought that the greater the amount of time viewing something, the more interest there is in the object/thing being gazed upon. In eye tracking studies, men have not always exhibited a tendency to gaze at the waists of women relative to other areas of the body or relative to when they view the waists of men. Melnyk, McCord and Vaske's (2014) findings give reason to believe individual differences may be important for predicting how men view women's waist area and bodies more generally. Approximately 70% of their male participants were described as almost exclusively looking at a woman's face, only "rarely" viewing any other region of women's bodies. The other 30% viewed the face for longer than any other area of the body (consistent with other eye tracking studies) but gazed at other regions of the body for relatively equal amounts of time. Hewig et al. (2008) found that men tended to spend longer amounts of time looking at the waist area of male targets than they did the waist area of female targets. It would have been more supportive of evolutionary theory had men in Hewig et al.'s study viewed women's waists for longer periods of time than men's waists and if all/most of Melnyk et al.'s participants looked at the waists or breasts of women at all.

However, Hewig et al. (2008) did use evolutionary psychological literature as their theoretical basis for their predictions. They predicted that if men were asked to view pictures of women, evolutionary psychological motivations would cause them to show more attention to the breasts compared to women who viewed pictures of women. Hewig and colleagues also wanted to explore potential gender differences for how male and female observers view male and female targets. To test their hypotheses Hewig et al. (2008) showed pictures of both men and women to male and female participants while their eye-gaze was being monitored by an eye-tracker. Men and women tended to look at the face before other regions of the body were looked at, similar to other eye tracking studies involving targets such as Nummenmaa and colleagues (2012). In addition men tended to look for a longer duration of time at women's breasts than women did. Hewig et al. interpreted this as supporting their hypotheses that men would look for a longer duration at women's chests. While exploring their data in search for other gender differences that they had not predicted, Hewig et al. found differences in how male and female observers viewed the bodies of male and female targets. Women tended to look at the legs of male and female targets earlier than men and looked at the legs of female targets earlier than male targets. Men tended to look at the arms of male and female targets earlier than women did and they looked at men's waist area longer than women did. Men looked earlier at women's breasts than women did and spent more time gazing at women's breasts the first time they looked at women's breasts than female observers did.

Nummenmaa and collegues (2012) conducted a similar study, asking male and female observers to view full body clothed pictures of men and women. Again, men exhibited a tendency to look at the breasts of women for a longer period of time than female observers did.

No gender differences for how early participants looked at regions of the body emerged. Keeping in mind that Buss (1995) argues any evolutionarily developed psychological mechanism should be widespread within a population and specialized, it does appear that men's attentional bias for looking at the breast region at least has the potential to be an evolved mechanism meant to assist men in making mate choices. It is possible that this process is in effect while men view any woman, whether cisgender or transgender in any context similar to these studies (evaluating pictures). It may be that men's tendency to view cisgender women's breasts is a result of their having a tendency, evolved or not, to view breasts when they see them on any human's body.

Present Study

The proposed study will assess whether differences exist for how transgender and cisgender women are gazed at by men and women and whether eye gaze is influenced by the labels given to the target women. Participants will be shown photos of self-identified transgender and cisgender women and who will be identified with a gender identity label. The study design will be a mixed model 2 (within subject: picture: a transgender or cisgender woman) X 3 (within subject: label: baseline - no label, "cisgender woman" and "transgender woman") X 2 (participant gender: male or female). If differences are observed, we will test whether or not people's eye gaze while viewing transgender and cisgender women may reflect cognitive or evolutionary psychological processes. If cognitive processes influence eye gaze while viewing transgender women, we should expect areas of the body most consistent or inconsistent with a participant's self reported schema for a transgender woman's body to receive the most attention. If evolutionary theory guides eye-gaze, the breasts may receive increased attention. These predictions create a total of three hypotheses for the current study which are listed below:

- H1: If semantic consistency influences eye-gaze, participants will give increased eye gaze to whatever areas of the body/bodily characteristics they report thinking of when they think of a transgender or cisgender woman's body. This should be evidenced by longer fixation duration in those areas and more total fixations in that area.

- H2: If semantic inconsistency influences eye gaze participants will give increased eye gaze to areas of the body they report not associating with a transgender or cisgender woman's body. This should be evidenced by longer fixation duration in those areas, more total fixations in that area and more entries into that area.

- H3A: If an evolutionary process guides eye-gaze, then participants should tend to spend relatively more time viewing the chest area of cisgender and transgender women than other areas of the body excluding the face. In addition, they should spend the same amount of time viewing the chest area of cisgender and transgender women's bodies if they are in fact using the same evolutionary process to view cisgender and transgender women.

  H3B: If an evolutionary psychological process guides eye gaze then male viewers should gaze longer and fixate more at all females chests than female viewers will.

It is important to note that the cognitive hypotheses are not competing hypotheses. It is possible that semantic consistency of guides eye gaze early while viewing pictures while semantically inconsistent objects begin to attract eye gaze latter. Each of the two cognitive hypotheses are not mutually exclusive with the evolutionary psychological hypotheses. For example, if an individual's concept for a transgender woman's body is a woman who has breasts and a penis and semantic consistency guides eye gaze, they may show more attention to the chest and groin areas of a transgender woman. If it is also the case that participants looked more at the chest than any other body region below the face, this finding would still be supportive of H3A. In addition, if a gender difference was observed where men gazed longer at chests and had more fixations in chest regions this would still be supportive of H3B.

If the individual does not view areas of the body they associate with transgender women or does not view areas that violate their expectations but still views the breasts, an evolutionary psychologist would suggest this supports the hypothesis that evolutionary processes guide eye gaze when viewing transgender women. The evidence for the relative influence of semantic consistency, semantic inconsistency and evolutionary processes will lie in the comparison between where the individual looks and what that individual reports thinking of when they think of a transgender woman's body. What combination of the three hypotheses will be able to be supported will also depend upon which area of the body is viewed the most. For semantic consistency to be supported, participants need to fixate on the areas of the body they think of when they think of a transgender woman. The opposite would need to be true for semantic inconsistency to be supported, that is, people should look most at characteristics they do not associate with transgender women. For evolutionary psychological theory to be supported the chest should be gazed at in a number of ways. Similar to Nummenmma and colleagues, (2012) we predict that reproductively important regions should attract attention from men and women. More specifically in our case, we predict that chests should receive more eye gaze than body regions that are not the face due to the fact that breasts in the chest region should trigger an evolutionary mechanism that makes people assess chests as a way to assess fertility (Hewig et al., 2008). It is unlikely that human's ancestors, living in an evolutionary environment would have needed to differentiate between transgender and cisgender women's chests given the lack of medical interventions such as hormone replacement therapy and breast augmentation. Therefore, when breasts appear, there should be a motivation to view them as a result of evolved psychological mechanism related to assessing fertility. Men should also look at the breasts of women more than female viewers do if there are evolved gender differences in mate preferences causing men to be especially interested in assessing the fertility of women.

Method

Participants

In total, 73 participants were recruited to participate in this study via two recruitment strategies. The first strategy involved students completing an online pre-screening survey advertised on the SONA research system website. In total, 700 participants completed the pre screening survey from the first recruitment strategy. One individual recruited into the eye tracking study via email address recognized two of the transgender women's photos. Prior research indicates that when viewing faces one has previously viewed, one's eye gaze tends to differ in that where one gazes becomes less widely distributed than when viewing novel faces (Heisz & Shore, 2008). As such we chose to exclude this participant's data from the analysis. We were left with seventeen cisgender women and one cisgender man recruited via this method. These participants were mostly white (83.30%) and heterosexual (77.80%). In the second recruitment strategy meant to recruit specifically male participants, we recruited 36 men through an advertisement for the eye-tracking study on the SONA system website. Again, the majority of participants recruited were white (74.30%) and heterosexual (94.40%). We were unable to analyze data from eighteen people recruited through either recruiting strategy due to inability to calibrate the eye tracker to their eyes.

We used data from 50 of the participants to test the cognitive hypotheses and we used data from 48 of the participants to test the evolutionary psychological hypotheses. The sample sizes for each set of analyses differed as a result of separate exclusion criteria for testing each hypothesis. Participants were excluded from the analyses testing the cognitive hypothesis if they did not understand the term transgender. If they did not understand the term, we could not be sure their eye gaze was being influenced by their transgender woman schema as opposed to their transgender man schema or any other schema. However, participants were not excluded if they were lesbian, gay or bisexual as this should not have influenced their tendency to look at or not look at body regions that were semantically consistent/inconsistent with their expectations for transgender women's bodies. Participants were excluded from the analyses testing the evolutionary psychological hypothesis if they were not heterosexual. This is due to the fact that the previously sight literature and theory about evolutionary mechanisms influencing eye gaze during person perception is focused on specifically heterosexual people's mate preferences. However, they were not excluded from analysis if they did not understand the term transgender.

Materials & Apparatus

In the pre-screening study participants filled out a short questionnaire (Appendix A) asking them to share demographic information as well as what areas of the body they think of when they think of a transgender woman. Men recruited directly into the eye tracking answered the same questions after they completed the eye tracking portion of the study. Four pictures of cisgender women and four pictures of transgender women were gathered from people the researchers knew (Appendix B displays an example photo). Four pictures of cisgender men and three pictures of transgender men were collected in the same manner. One photo of a transgender man came from a website without copyright restrictions. All pictures depicted a person standing, with their hands to their sides and looking at the camera with the exception of one picture of a trans man whose gaze was directed off camera to the viewers left. The pictures of men were only intended to be distractor images and are not included in any of the analyses reported in this paper. An EyeLink II eye tracker was used in conjunction with a nineteen inch monitor that displayed the picture stimuli to record individual fixations and fixation duration. Individual fixations are defined by the eye's slowing down beyond a given threshold. In the current study we used the EyeLink II's default setting for recording fixations. Whenever possible, both video camera and infrared light reflection were used to track eye movements since it captures eye movements most accurately. However, it is also more difficult to properly calibrate the infrared camera and in some cases infrared tracking needed to be disabled in order to calibrate the eye tracker. A short survey assessing how participants felt about the pictures they viewed was administered upon finishing the eye tracking portion of the experiment (Appendix C).

Procedure

Participants recruited through emails or SONA came to the lab and were seated at a computer and informed consent was obtained by a research assistant. All participants engaged in a calibration procedure to ensure the eye tracker would accurately record the movements of their eyes. Research assistants informed them that they would be viewing pictures and that at times a label would appear just before the pictures were about to appear. Participants were told to look at the stimulus photos the way they would normally look at any other photos. They were also informed that they should look at every picture for the full duration of the time they were on the screen due to the fact that latter they would be asked to judge the pictures they saw on a number of dimensions.

Prior to viewing every picture, participants viewed a fixation cross in the center of the screen for about five seconds. To prevent anticipatory saccades the software, required them to look at a fixation cross in the center of the screen, after which an experimenter would allow the next stimulus picture to randomly appear either to the left or right of the fixation cross. The first two pictures participants saw were of cisgender or transgender women and no label appeared before those two pictures were displayed. After these first two pictures appeared, a label for the image they were about to see always appeared after the fixation cross and in the center of the screen for two seconds. Four lists of picture and label combinations were made in order to counterbalance the pictures such that each individual picture appeared at least once in all three of our label conditions. Pictures appeared in a random order and participants saw every picture exactly one time.

In the first online recruitment strategy participants completed a pre-screening study where they were asked to share what areas of the body they thought of or did not think of when they thought of transgender women as well as demographic information about themselves. Participants provided this rating by sorting body regions into an “Associated” or “Not Associated” box. The sorting task is displayed in Figure 1. They were also asked a multiple choice question designed to determine whether or not they understood the term transgender woman. Participants who could not answer this question correctly were not invited to participate in the eye tracking portion of the study. This was necessary as participants not knowing what transgender means could make testing the theories difficult. To test the cognitive hypotheses, participants needed to know what the word meant for there to be a schema with which the images could be consistent or inconsistent. In addition, if their schemas for transgender man and transgender women accidentally had the wrong labels, their eye gaze could be a reflection of their transgender man schema being primed just before presentation of the stimuli. If participants mixed up transgender men and women but then realized they had mixed the terms up while completing the study, eye gaze patterns could be a reflection of information contained in those schemas being reorganized.

Figure 1. Body Region Sorting Task

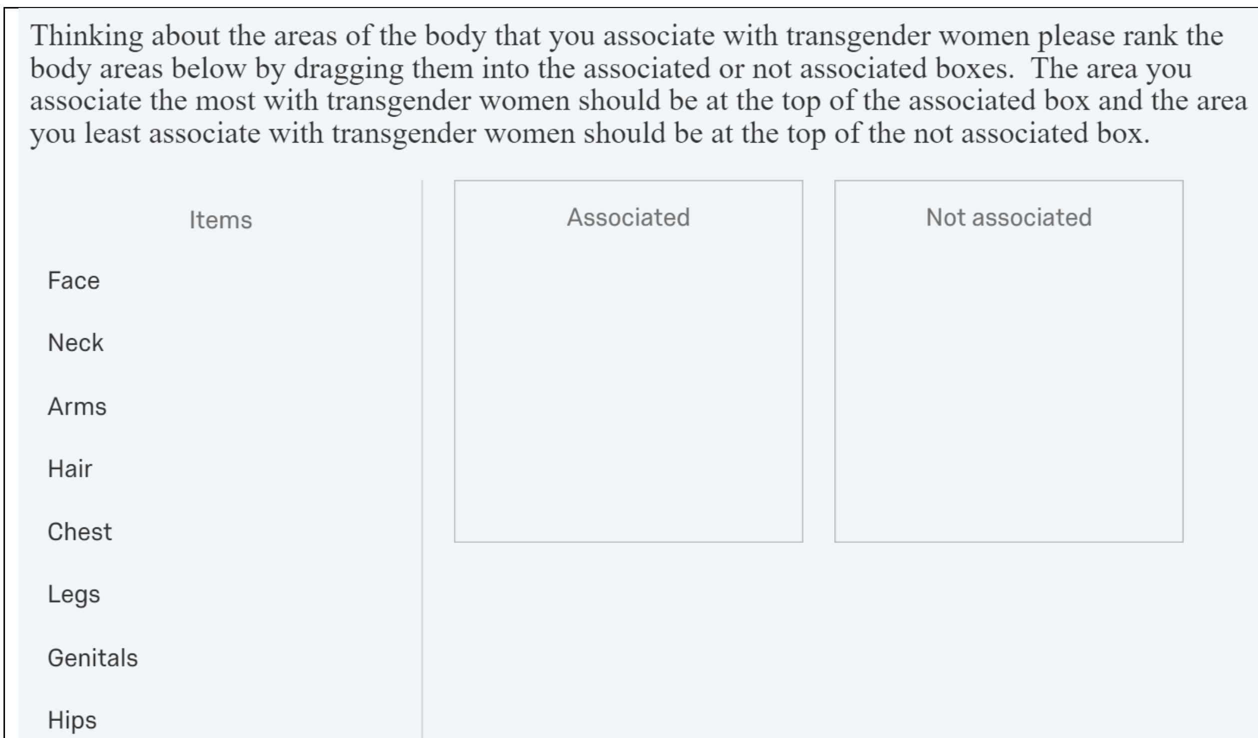

Figure 1. Participants were able to drag and drop each body region into one of the two boxes or not place the body region into either of them.

In the second SONA recruitment strategy, men were able to see an advertisement for the study on the SONA system website. The advertisement informed them that they would be asked to come to a lab on campus to participate in a study where they would be asked to view an assortment of images and subsequently complete a post study questionnaire. This post study questionnaire contained the same questions that were asked in the first recruitment strategy's pre-screening questionnaire. Participants were also asked to rate how arousing and attractive they found the pictures. Participants were asked questions about the pictures in order to help prevent participants of future eye tracking studies from automatically assuming that being told they will answer questions about the pictures they see is only a ruse meant to motivate them to look at the screen during the presentation of stimuli.

Upon completion of the eye tracking study or questionnaire, participants were verbally asked a series of questions by the research assistant as a part of a funnel debriefing meant to reveal suspicions or accurate guesses as to the true purpose of the study. The first question was, "Do you have any comments you would like to make about the study?" Next, the RA asked "What did you think the study was about?" After their response the research assistant asked, "At any point did you believe the true purpose of the study was to track the movement of your eyes while you looked at the pictures of the women?" If the participants responded yes, they were asked to share when they came to guess the study's true purpose (22% of participants guessed the true purpose). At the end of the funnel debriefing, the research assistant informed participants of the true purpose of the experiment and thanked them for their time.

Results

Preparation of Data for Analysis

Table 1

Proportion of Classifications of a Body Region as Associated or Not associated with Transgender Women

Body Region	Associated	Not Associated
Hair	51.00%	47.10%
Face	90.20%	9.80%
Neck	25.50%	72.50%
Chest	86.30%	13.70%
Arms	47.1%	51.00%
Waist/Hip	66.70%	31.4%
Genital	84.30%	13.70%
Leg	45.10%	52.90%

Note. Percentages do not always add to 100% due to the fact that participants had the option to abstain from classifying a region as Associated or Not Associated.

The eye tracking device recorded each fixation made by the participants, the order in which the fixations happened, where on the screen each fixation happened and how long in milliseconds each fixation lasted. In order for us to extract the average time spent gazing in each region of interest and the number of fixations for each region of interest, we needed to define where each region was in each picture. To do this we recorded a set of X and Y coordinates that defined each target stimuli's face, neck, chest, arms, waist, genital area and legs. For the purposes of analyzing the semantic hypotheses, we used each individual's prescreening data to collapse the body regions into either semantically consistent or semantically inconsistent regions. Which regions were defined as consistent or inconsistent was unique to each individual participant. Body regions were considered consistent or inconsistent for an individual based on whether they had listed a body area as being "associated" with transgender women (consistent) or "not associated" with transgender women (inconsistent) in the pre-screening study. Table 1 displays the proportion that each region was categorized as "associated" and "not associated." Table 2 displays gaze duration and number of fixations for each individual body region.

Semantic Consistency & Inconsistency: Fixation Duration

In order to test H1, which proposed that areas that are associated (semantically consistent) with expectations about transgender women will receive more eye gaze than areas not associated (semantically inconsistent) and H2, which was the converse of H1, we conducted repeated measures ANOVAs. The first ANOVA used average fixation duration in milliseconds for time spent gazing at transgender women as the dependent variable. The first ANOVA contained two within subjects factors which were Label, (No label, Transgender Woman or Cisgender Woman) and Semantic Consistency (Semantically Consistent Body Region or Semantically Inconsistent Target Region). We included everyone who participated in the study regardless of whether they completed the study questionnaire as a part of the prescreening study or following completion of the eye tracking portion of the experiment. We observed a main effect of Semantic Consistency, $F(1,49) = 96.23$, $p < .001$, $\eta_p^2 = .66$ such that semantically consistent regions were gazed at statistically significantly longer than inconsistent regions (Table 3 displays the means and standard deviations for gaze duration in these regions). This result supported H1. No other main effects or interactions were statistically significant and all *F* values were less than one.

Table 2

Gaze Duration/Count for Women's Body Regions

	Gaze Duration		Fixations	
Body Region	*M*	*SD*	*M*	*SD*
Hair	342.55	280.24	1.13	1.00
Face	2034.10	672.05	4.86	3.01
Neck	141.93	191.97	0.52	0.33
Chest	404.10	203.47	1.86	0.95
Arms	136.78	148.20	0.56	0.56
Waist/Hip	186.58	132.56	0.83	0.53
Genital	80.51	76.38	0.34	0.32
Legs	489.73	271.90	2.11	1.15

Note. Means and standard deviations for gaze duration/fixations in all women's body regions. "Duration" refers to the average number of milliseconds viewing body regions. "Fixations" refers to average number of fixations in body regions.

Next we ran the same ANOVA previously described but without the men recruited via the second strategy, who had completed the questionnaire after the eye tracking portion of the study, rather than as a prescreening measure. We did this out of concern that the men's reports of what they did and did not associate with transgender women's bodies could have been influenced by the pictures they had viewed in the eye tracking portion of the study. The men may have also been more likely to answer the question about what a transgender woman is correctly more often after having seen the stimuli pictures for this study. Again, we found a main effect of Semantic Consistency $F(1,17) = 24.06$, $p < .001$, $\eta_p^2 = .59$, such that consistent regions ($M = 2806.56$, $SD = 882.50$) were gazed at statistically significantly longer than inconsistent areas ($M = 954.07$, $SD = 809.18$). There was not a statistically significant main effect of Label or a statistically significant Semantic Consistency by Label interaction.

Semantic Consistency & Inconsistency: Fixation Count

The next ANOVA we ran was identical to the first except that the average number of fixations in the consistent and inconsistent regions was used as the dependent variable. We began by including all participants who correctly answered the question about what a transgender woman is regardless of whether they answered the question about what a transgender woman is before or after the eye tracking portion of the experiment. Again, a main effect of Semantic Consistency supported the Semantic Consistency hypothesis, $F(1,49) = 62.42$, $p < .001$, $\eta_p^2 = .56$. Participants gazed more frequently at regions consistent with their expectations compared to regions that were inconsistent with their expectations (Table 3 displays the means and standard deviations for fixations in these regions). There was not a statistically significant main effect of Label or a statistically significant Semantic Consistency by Label interaction.

We excluded the men recruited directly into the eye tracking study again out of concern for how the experiment and stimuli photographs may have influenced their questionnaire responses. We observed a main effect of Semantic Consistency supporting the Consistency hypothesis again, $F(1,17) = 23.40$, $p < .001$, $\eta_p^2 = .58$. Participants tended to gaze longer at the body regions that were consistent with their expectations (*M* = 9.06, *SD* = 3.40) than at regions that were inconsistent with their expectations (*M* = 3.30, *SD* = 2.25). There was not a statistically significant main effect of Label or a statistically significant Semantic Consistency by Label interaction.

Table 3

Fixation Duration Time/Fixations for Gazing at Semantically Consistent and Inconsistent Body Regions of Transgender Women

	Gaze Duration		Fixations	
Semantic Consistency	*M*	*SD*	*M*	*SD*
Consistent	2,902.00	799.25	8.83	3.70
Inconsistent	851.29	682.83	3.32	2.22

Note. Means and standard deviations for all participants recruited into the eye tracking experiment who understood the term "transgender woman". "Duration" refers to the average number of milliseconds viewing consistent and inconsistent regions. "Fixations" refers to average number of fixations in consistent and inconsistent regions.

Data Preparation & Primacy of Faces

In order to test the evolutionary hypothesis, we extracted the average fixation duration length and fixation count for each of the eight individual body regions of the transgender and cisgender women. Using gaze duration in milliseconds we conducted a repeated measures ANOVA with Actual Target Gender (Transgender Woman and Cisgender Woman) and Body Region (Hair, Face, Neck, Chest, Arms, Waist/Hip, Genital and Legs) as within subjects factors and participant gender (male or female) as a between subjects factor. There was a main effect of body region, $F(7,40) = 174.23$, $p < .001$, $\eta_p^2 = .79$, suggesting that participants did not look at the body regions for equal amounts of time. Simple contrasts comparing the face to each of the other areas of the body revealed that participants viewed the face for statistically significantly more milliseconds than any other region of the body (All F's > 100, all p's < .001). We chose to exclude the face from the main analyses. We chose to do this because of how consistently the face tends to attract more eye gaze in past literature and the fact that evolutionary psychologists do not predict that any region, even the chest, will attract more eye gaze than the face (Hewig et al., 2008; Melnyk et al., 2014).

Evolutionary Psychology: Fixation Duration

Next, we tested H3A, which proposed that the chest area should be gazed at more than other body regions (with the exception of the face) and that transgender and cisgender women's chest's should receive equal amounts of eye gaze. We also tested H3B which claimed that male viewers should look longer at female targets chests than female viewers do respectively. We conducted repeated measures ANOVAs with Actual Target Gender (Transgender Woman and Cisgender Woman) and Body Region (Hair, Neck, Chest, Arms, Waist/Hip, Genital and Legs) as within subjects factors and participant gender (male or female) as a between subjects factor. We did not include the Label factor in these analyses because if there is a psychological mechanism that leads men to view breasts more than other regions when they see them, labels should not influence where they look. However, we did initially run an ANOVA with the Label factor included to be sure that it did not influence eye gaze. As predicted, we did not find a statistically significant main effect of Label or a statistically significant interaction involving Label and so removed it from further analyses.

We ran a repeated measures ANOVA with Actual Target Gender (Transgender Woman and Cisgender Woman) and Body Region (Hair, Neck, Chest, Arms, Waist/Hip, Genital and Legs) as within subjects factors and participant gender (male or female) as a between subjects factor. We found a main effect of body region, $F(6,41) = 20.74$, $p < .001$, $\eta_p^2 = .31$. Table 2 displays the means and standard deviations for gaze duration in body regions. Planned simple contrasts revealed gaze patterns that suggested chests were viewed statistically significantly longer than the neck, arms, genitals and waist/hip which is supportive H3A. Participants did not gaze at chests statistically significantly more or less than legs or hair which was not supportive of H3A. In past eye tracking studies, the basis for believing the chest region would receive increased eye gaze relative to any other body region (except for the face) was founded on the notion that, especially for men, the chest region displays important information for assessing reproductive fitness. The chest region should be relevant for helping make determinations about sexual maturity and ability to produce reproductively successful offspring. Therefore, it should be the case that legs or hair do not receive as much eye gaze as a function of having less informative information about potential for producing reproductively successful offspring. In sum, this finding can only provide partial support H3A given that areas with no or at least less biological relevance were capable of attracting a relatively equal amount of eye gaze.

There was a statistically significant body region by Actual Target Gender interaction, $F(6,41) = 2.98$, $p = .008$, $\eta_p^2 = .06$. Paired samples *t*-tests were used to test the interaction. These tests and means/standard deviations are displayed in Table 4. There was almost a statistically significant difference in how long participants gazed at transgender women's chests and cisgender women's chests. A lack of difference in how participants gaze at transgender and cisgender chests supports H3A whereas a statistically significant difference would contradict H3A. Participants looked statistically significantly longer at transgender women's hair than cisgender women's hair. Participants looked statistically significantly less milliseconds at transgender women's genitals region than cisgender women's genitals regions. Participants gazed statistically significantly longer transgender women's arms than cisgender women's arms. Participants looked statistically significantly more at transgender women's waists/hips than they did at cisgender women's waists/hips. There were not any other statistically significant differences between how long participants gazed at body regions as a function of Actual Target Gender.

H3B predicted that there would be a gender difference for gazing at the chest region. This gender difference should have been defined by male participants gazing longer at a female target's chest than female viewers would. There was not a statistically significant participant gender by body region interaction that needed to be present for H3B to be supported, $F(6,41) = 1.53$, $p = .167$, $\eta_p^2 = .03$. In case the large number of body regions being tested was hiding a statistically significant difference between how male and female participants viewed chests, which would support H3B, we conducted a paired samples *t*-test on heterosexual men and women's gaze durations for chests. We did not find a statistically significant difference in how male ($M = 373.50$, $SD = 234.81$) and female ($M = 350.46$, $SD = 178.18$) participants viewed transgender women's chests, $t(46) = 0.32$, $p = .750$. We did not find a statistically significant difference in how male ($M = 450.40$, $SD = 266.67$) and female ($M = 415.44$, $SD = 247.19$) participants viewed cisgender women's chests, $t(46) = 0.41$, $p = .683$. In sum, this lack of gender differences for gaze duration in the chest area does not provide support for H3B.

Table 4

Gaze Duration for Transgender and Cisgender Women's Body Regions

	Gaze Duration				
	Actual Target Gender				
Body Region	Transgender	Cisgender	*t*	*p*	*d*
Chest	367.26 (219.31)	440.93 (259.40)	-2.00	.051	0.29
Hair	425.58 (424.03)	259.51 (295.33)	2.45	.018	0.35
Genital	55.96 (69.14)	105.07 (107.15)	-3.55	.001	0.51
Arms	162.28 (189.74)	111.29 (146.81)	2.14	.038	0.31
Waist/Hip	208.72 (178.63)	164.44 (118.61)	2.06	.045	0.30
Legs	487.69 (277.51)	491.76 (313.84)	-0.12	.905	0.02
Neck	131.67 (155.24)	152.19 (264.27)	-0.70	.490	0.10

Note. Mean gaze duration in milliseconds for each region of transgender and cisgender women's body regions accompanied by the standard deviation in parentheses.

Again, the effect of body region may be diluted by the large number of different body regions being tested. In an attempt to adjust for this we also chose to compute a new variable that consisted of the averages of milliseconds in all body regions except for the face and chest. Running the same ANOVA as before except with Body Region being comprised of chest area and the newly computed non-chest area. Consistent with H3A, we found a main effect of Body region, such that the chest area (M = 404.10, SD = 203.47) was looked at statistically significantly more than the average of the hair, neck, waist/hip, arms and legs regions (M = 229.68, SD = 73.74) $F(1,46) = 29.75$, $p < .000$, $\eta_p^2 = .39$. We also found a statistically significant body region by Actual Target Gender interaction, $F(1,46) = 4.55$, $p = .038$, $\eta_p^2 = .09$.

such that participants looked statistically significantly longer at the non-chest areas of a transgender woman (M = 245.32, SD = 97.05) than at the not chest area of a cisgender woman (M = 214.05, SD = 76.56), $t(47) = 2.31$, $p = .025$, $d = 0.33$. Participants did not spend statistically significantly more or less time viewing the chest region of transgender and cisgender women which supported H3A.

Evolutionary Psychology: Fixation Count

Using number of fixations as a dependent variable we conducted a repeated measures ANOVA with Actual Target Gender (Transgender Woman and Cisgender Woman) and Body Region (Hair, Neck, Chest, Arms, Waist/Hip, Genital and Legs) as within subjects factors and participant gender (male or female) as a between subjects factor. We found a statistically significant main effect of body region, $F(6,41) = 30.55$, $p < .000$, $\eta_p^2 = .40$. Table 2 displays the means and standard deviations for fixations in body regions. Planned simple comparisons partially supported evolutionary psychological theory. Participants did look statistically significantly more at the chest than the hair, neck, arms, genitals, and waist/hip but not statistically significantly more than the legs (Table 5 displays the means and standard deviations for fixation count within body regions).

There was a statistically significant body region by Actual Target Gender interaction that did not support H3A, $F(6,41) = 4.52$, $p < .000$, $\eta_p^2 = .09$. Paired samples t-tests were used to test the interactions. These tests and the corresponding means and standard deviations are displayed in Table 5. The tests revealed that participants fixated statistically significantly less in the chest regions of transgender women than the chest regions of cisgender women. To support H3A, the chest region should not have been gazed at statistically significantly differently as a function of Actual Target Gender. Participants fixated statistically significantly more in the hair region of transgender women than the hair region of cisgender women. Participants fixated statistically significantly less in the genital region of transgender women's bodies than they did the genital region of cisgender women's bodies. There were no other statistically significant differences in how participants viewed body regions as function of Actual Target Gender.

Table 5

Fixations in Transgender and Cisgender Women's Body Regions

	Fixations				
	Actual Target Gender				
Body Region	Transgender	Cisgender	*t*	*p*	*d*
Chest	1.65 (0.94)	2.08 (1.20)	-2.88	.006	0.42
Hair	1.42 (1.38)	0.84 (1.01)	2.95	.005	0.43
Genital	0.25 (0.34)	0.42 (0.37)	-3.75	< .000	0.54
Arms	0.61 (0.63)	0.50 (0.62)	1.32	.192	0.19
Waist/Hip	0.89 (0.68)	0.76 (0.52)	1.58	.121	0.23
Legs	2.10 (1.24)	2.12 (1.26)	-0.173	.864	0.02
Neck	0.56 (0.32)	0.48 (0.55)	0.914	.365	0.13

Note. Mean number of fixations in each region of transgender and cisgender women's body regions accompanied by the standard deviation in parentheses.

There was not a statistically significant Body Region by Participant Gender interaction that should have been present if H3B was correct, $F(6,41) = 1.4$, $p = .216$, $\eta_p^2 = .03$. Out of concern that the number of body regions was hiding a statistically significant difference between how men and women gazed at chests we decided to conduct between subjects *t*-tests on men and women's eye gaze for chests. To support H3B there would have needed to be a statistically significant difference between how men and women fixated in the chest regions of women such that men gazed more at chests than women gazed at chests. Inconsistent with H3B, this effect was not observed when analyzing men (M = 1.68, SD = 1.00) and women's (M = 1.59, SD = 0.78) fixation count for transgender women's chest, $t(46) = .28$, $p = .779$. Inconsistent with H3B, this effect was not observed when analyzing men (M = 2.13, SD = 1.28) and women's (M = 1.92, SD = 1.00) fixation count for cisgender women's chest either, $t(46) = .53$, $p = .596$. There were no other statistically significant differences in how male and female participants gazed at each body region.

Similar to the gaze duration variable, we computed a variable that was the average number of fixations for all body regions except the chest and the face and ran a new ANOVA to help test H3A. This ANOVA had two within subjects factors (Body Region: Chest, Not Chest and Face) and Actual Target Gender (Transgender women and Cisgender Women) and one between subjects factor (Participant Gender: Male or Female). We observed a main effect of body region that indicated that the chest region (M = 1.86, SD = 0.95) was fixated in more than the average fixation count of all the other regions combined, (M = 0.91, SD = 0.32) $F(1,46) = 42.02$, $p < .001$, $\eta_p^2 = .48$. This finding was consistent with H3A. A statistically significant Body Region by Actual Target Gender interaction was an observed, $F(1,46) = 7.55$, $p = .009$, $\eta_p^2 = .14$. Paired samples t-tests revealed that participants fixated statistically significantly less in the chest regions of transgender women (M = 1.65, SD = 0.94) than the chest regions of cisgender women, (M = 2.08, SD = 1.20) $t(47) = -2.88$, $p = .006$, $d = 0.42$. This previously observed difference in how people fixated in the chests was inconsistent with H3A. These t-tests also suggested that participants fixated statistically significantly more in the regions that were not the chest or the face of a transgender woman (*M* = 0.99, *SD* = 0.36) than in the areas that were not the chest or the face of a cisgender woman, (*M* = 0.85, *SD* = 0.32), $t(47) = 3.06$, $p = .004$, $d = 0.44$.

Discussion

Participants tended to gaze more frequently and for a longer duration of time at body regions that were consistent with their expectations for transgender women's bodies than body regions that were inconsistent with their expectations. With respect to comparisons of the chest to individual areas of the body, the chest region was gazed at for longer than the neck, arms, genitals and waist/hip but the chest was not gazed at more or less than the hair and leg regions. When every region that was not the face or chest was averaged and compared to gaze duration for the chest region, the chest region was gazed at longer than the other regions. Participants did not gaze at transgender and cisgender women's chests for different lengths of time but did gaze more at transgender women's non face and chest regions. Heterosexual men and women did not gaze for a statistically significantly different length of time at the chest area of women, regardless of stimuli photo's Actual Target Gender or manipulated label. With respect to comparisons of the chest to individual areas of the body, the chest region was fixated on more than the hair neck, arms, genitals and waist/hip but the chest was not gazed at more or less than the leg regions.

The finding that people gaze longer at semantically consistent body regions than inconsistent body regions supports H1. The finding that participants fixate more in consistent regions supports H1. Out of concern that participants who completed the questionnaire after the eye tracking study may have biased responses for what body regions they do and do not associate with transgender women we removed them from analysis. Even after removing these participants from the analysis of gaze duration and number of fixations in semantically consistent and inconsistent regions, we still consistently found support for the Semantic Consistency hypothesis.

Evolutionary hypotheses both received and did not receive support. H3A did manage to receive some support due to the fact that the chest was looked at more than some areas that have relatively less or little relevance for choosing a mate. It also received support in that when gaze duration and count in all other body areas were averaged and compared to gaze duration and fixation count of the chest, the chest area received more milliseconds of eye gaze and more fixations. The finding that participants gazed at the chest for a similar length of time also supported H3A. However, in many cases, areas with relatively less importance or little importance for mating were capable of receiving a similar amount of eye gaze which was not consistent with H3A. Another quality of the data that was inconsistent with H3A was the fact that people did not fixate equally in the chest region of transgender and cisgender women. H3B, which predicted that a participant gender difference would be observed that was characterized by male viewers gazing longer and fixating more at a female target’s chest than female viewers would, received no support from the data. There was no difference in the gaze duration or fixation count for men and women whether they were looking at a transgender woman’s chest or a cisgender woman’s chest.

These data support prior literature that suggest that semantically consistent areas/objects tend to attract eye gaze while failing to support literature that suggests semantically inconsistent information attracts eye gaze. Previously, it was theorized that if people have time to evaluate an entire image of a scene, inconsistent objects/regions will tend to draw attention. It may be that in past scene perception research participants looked more at inconsistent areas not only due to having enough time to scan the entire image but also the high degree to which the inconsistent regions/objects were inconsistent with their environments. It is unlikely that many of these studies participants had ever seen an octopus on a farm or a microscope inside a bar. Pictures of cisgender and transgender women may depict bodily features that are inconsistent with people's schemas for transgender women but those features may be not be inconsistent enough to interrupt a tendency to gaze at semantically consistent regions. For example, a transgender woman may have broad shoulders that make her appearance inconsistent with a general woman's body schema. However, some women have broad shoulders so this feature would likely not be categorically unexpected in the way an octopus on a farm would be. It may also be the case that semantic consistency and inconsistency are important factors in attracting eye gaze during person perception, but in a manner separate from how they attract eye gaze during scene perception.

Depending on how we analyzed the data, we both did and did not observe a tendency for participants to gaze at the chest more than all other body regions that were not the face. Due to the fact that the chest was gazed at relatively equally to multiple other body regions, the present study's findings related to H3A most closely resemble but are not identical to the findings of Melnyk et al. (2014). Melnyk et al. also found that in 30% of cases, participants gazed at the chest in a manner similar to how they gazed at other individual areas of the body that were not the face. We also failed to deserve an outright bias for the chest to be gazed at more than any other region that was not the face. Where the present study's findings and the findings of

Melnyk et al. diverge is that the chest was gazed at longer than some other individual regions of the body.

Evolutionary theory suggests that during a historical evolutionary period, important gender differences emerged for what heterosexual men and women should want from a potential mate. Researchers such as Hewig and colleagues (2008) have asserted that these differences should lead men to exhibit a bias for gazing at the chest of a female target relative to female viewers. No such gender difference was observed in this study for the chests of transgender or cisgender women. Inconsistent with Nummenmaa et al. (2012) we did not observe a bias on the part of male viewers to gaze at a target female's chest longer than female viewers did. Similar to how individual or environmental differences have been able to provide alternative explanations for heterosexual male and female's attraction (Swami et al., 2009; Swami & Tovée, 2013) it may be that the contents of an individual's schema are more/as important in guiding eye gaze as gender is.

When interpreting these results, limitations related to the recruitment of participants, stimuli pictures and the screen that displayed them should be considered. In the effort to avoid stimuli pictures of transgender women biasing responses to what a transgender woman is and biasing reports of what was consistent/inconsistent with schemas for transgender women's bodies we asked participants to report this information during a pre-screening study. Participants were recruited if they provided their email at the end of that pre-screening study. The participants who provided their email address were almost entirely all women. Due to the fact that these participants gave their email address after answering questions about transgender people's bodies and what the definition of a transgender woman is and still provided the email, they may have been different from people who did not provide their email or the men recruited directly into the eye tracking study. Participants who provided their email may have been more open to thinking about transgender issues. Additionally, all but one man that was included in the analyses was recruited via a relatively vague SONA advertisement that did not reveal what the study was about. Our original goal was to recruit both men and women via the email invitations but had to use SONA as a result of how few men we were able to recruit through emails. The women that took the pre-screening study would have been more aware about that a potential follow up study might be in some way related to transgender people both when they provided their email and when they came to participate in the study. The men were not likely to be aware the study would involve looking at images of transgender women. The women could have been relatively more accepting of transgender people than the men were and more open to new experiences than the men were. Although this is a potentially serious research confound, it should be noted that when we analyzed only people recruited through the pre-screening study/email invitation we found the same pattern of results, so this limitation may not be of great concern.

The sorting task in the questionnaire may have also been limited in its ability to help us understand what was and was not semantically consistent/inconsistent with a participant's transgender woman's body schema. In the task participants were asked to sort body regions into "associated" or "not associated" boxes. Areas of the body that they do associate with transgender women's bodies are likely in that individual's schema for transgender women's bodies. However, participants may have categorized a body region as "not associated" for more than one reason. It may be that a region was categorized as not associated because the body region was somehow inconsistent with their schema for a transgender woman's body. Although they did have the option of not sorting a body region, they could also have listed regions as not associated when they felt the body region was merely not relevant to their transgender woman's body schema instead of being inconsistent with it.

One limitation that was experienced by any participant completing the study was related to the research assistants. Eye tracking research assistants needed to be in the room with the participant to run the experiment. Research assistants were seated at another computer to the participant's left while they viewed the pictures and pressed a key that prompted each photo to appear on screen once the participant had viewed a fixation dot. It is possible that participants wanted to alter or did alter their eye gaze as a function of being so close to the experimenter during the study. Langer, Fiske, Taylor and Chanowitz (1975) documented a tendency for participants to avoid looking at a picture of a disabled person if they were in the presence of an observer instead of being alone. Past literature in eye tracking research may alleviate some of the concern about this limitation related to observers as there is evidence to suggest that in the context of eye gaze it can be difficult for participants to manipulate their eye gaze (Cerf, Paxon, & Koch, 2009). Cerf, et al. asked participants to search for a fixation cross in a picture and in one condition did not give them information about where the fixation cross would not be (free search condition) and in the other condition informed them that it would not be in some area of interest such as a face (avoid condition). Cerf, et al. reports that even though participants should not have gazed at faces in the avoid condition since they were aware it held no value in helping to successfully complete the search task, participants still tended to gaze at the face.

The stimuli photos had limitations related to consistency of what was depicted in the photos and the number of photos. Photographs of transgender people can be extremely difficult to acquire. We are currently unaware of any database of pictures that display clothed, full body images of transgender people. Their being a small portion of the population can make them difficult to locate and online groups are not often receptive to assisting behavioral scientists in research. Most of our efforts to obtain images online were unsuccessful which necessitated our needing to ask transgender people the researchers knew for pictures and not be overly restrictive about what kind of pictures could be included in the study. Though we did impose some amount of homogeneity to the posture, expression and clothing that was depicted in stimuli photographs, there were a number of appearance related characteristics we did not control for. We did not check whether or not any of the women had ever had cosmetic surgery, we did not ask transgender women about prior/current hormone replacement therapy, we did not ask anyone to put their hair up or down and we did allow them to wear whatever color of clothing they preferred. We only had four photographs of transgender women and four photographs of cisgender women for stimuli in this study. Although prior researchers have used as few as four pictures altogether (Melnyk et al., 2014) this relatively small number of photographs means that if there was some unique characteristic these photos all possessed our results could be biased in some manner.

The size of the pictures and accuracy of the eye tracker should also be considered when interpreting these results. After successful calibration, eye trackers do not perfectly track the position of eyes on a screen but they do track them with a very small amount of error, usually only a fraction of degree off. The screen we used was large enough to allow us to make reliable determinations about where a participant's eyes were directed when they viewed most body regions. However, in the case of the face and the hair, some fixations for one area may have been recorded as a fixation in the other. For example, if a participant was gazing at the top of the forehead close to but not in the hair region it is possible that this fixation could get recorded as hair. Due to the fact that the hair is a relatively thin region that borders the face, it is possible that many fixations to the hair were recorded as fixations to the face as well.

It should also be noted that successful calibration does not always happen and this can be a limitation in its ability to influence which participants the eye tracker can effectively collect data from. Equipment malfunction led to a loss of 12 participants in the beginning of the study. After these initial problems were corrected for, it was still possible for it to be so difficult to calibrate the eye tracker to a participant's eye that they could not complete the study. Reasons for this ranged from having particularly difficult eyes to calibrate the eye tracker, wearing makeup and glasses could also at times cause issues during calibration. Women who did not wear makeup were probably more likely to have successful calibrations than women who did wear makeup. In seven cases, calibration was good enough for the study to be completed but still poor enough that it was clear that the eye tracker had not accurately detected their gaze during the study. When this happened, it was common that many of the fixations recorded (more than 45%) were not on the body or located in an area where we displayed a picture. In sum, these limitations mean that participants who did not wear make-up or corrective lenses were more likely to have provided data that were included in the final analyses.

Future research could account for these limitations by using more pictures and using larger screens that allow for displaying larger pictures. However, future research should also attempt to expand the body of literature on semantic consistency and inconsistency. As previously discussed in this thesis, Heutig and Altman (2005) suggests that people need a few seconds to evaluate a picture before a bias for viewing semantically inconsistent regions emerges. Our study allowed pictures to be viewed for five seconds, meaning enough time was provided that one should expect to have observed the aforementioned bias for inconsistent regions. The current study's data suggest the degree of inconsistency could also be an important factor for attracting eye gaze. A future study could Photoshop uncommon characteristics, such as birth marks, and impossible characteristics, such as reptile scales, onto the skin of a person in a stimuli photo in an area that does not typically receive much eye gaze. If the impossible body feature attracted more eye gaze than the uncommon body feature, then it would suggest that the degree to which something is inconsistent helps determine how much eye gaze it will receive. If it did not receive more eye gaze, then it may suggest that people tend to have a relatively stable tendency to look at semantically consistent regions in the context of person perception.

The goal of the current study was to better understand whether cognitive and/or evolutionary processes may guide eye gaze during person perception and more specifically while people view images of transgender women. We collected data from psychology students who participated in an eye tracking study where participants viewed images of transgender and cisgender women to help answer this question. We observed strong support for the cognitive hypothesis that body regions that fit with a participant's expectations will attract eye gaze. The data's support for the two Evolutionary Psychological hypotheses was mixed. The predicted bias for gazing at the chest more than other body regions was both observed and not observed depending upon how the data were analyzed. The evolutionary based assumptions about gender differences in mating should have led to us observing a tendency for men to look at chests of women longer than female viewers and fixate on the chest region more but these effects were never observed. Future research should investigate whether degree of expectation violation is related to inconsistent areas attracting eye gaze during person perception and scene perception.

With respect to the current study, the data gathered do provide support for the notion that in the context of person perception while viewing transgender women, people do tend to look at areas that are consistent, rather than inconsistent with their expectations of transgender women. The data's support for the two Evolutionary Psychological hypotheses was mixed. There was partial support for the first Evolutionary Psychological prediction that the chest would receive more eye gaze than any other body region and that people would gaze similarly at transgender and cisgender women's chests. The chest was gazed at more than some body areas, but did not receive more eye gaze than a few areas that should not have been as important for determining the quality of a potential mate. Participants gazed at transgender and cisgender women's chests for relatively equal amounts of time which supported the prediction but fixated more on cisgender women's chests which contradicted the prediction. Relative to the first evolutionary psychological hypothesis, how the data did/did not support the second prediction was much more clear. This data did not support the Evolutionary Psychological prediction that important gender differences stemming from a historical evolutionary period/environment will lead to a bias for male viewers to look at female targets breasts more than female viewers.

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Appendix A

Screening Questions and Demographics

1. A transgender woman is A. Someone who was assigned female at birth but is a man. B. Someone who was assigned male at birth but is a woman, C. A lesbian woman who likes to dress as a man, D. A gay man who enjoys dressing as a woman.
2. Please list any areas of the body or physical features you think of when you think of a transgender woman:
3. Please list any areas of the body or physical features you would find most surprising on a transgender woman:
4. Age:
5. Are you transgender? (A transgender person is someone who does not identify with the sex they were assigned at birth)

   [If yes] Are you a transgender man / transgender woman / Other (please specify:____)

   [If no] Are you a man / woman
6. Sexual Orientation: Heterosexual / Homosexual / Bisexual / Other (please specify:____)
7. Major or intended major:
8. Minor (if any):
9. Classification: Freshmen / Sophomore / Junior / Senior / Other (please specify: ______)
10. Are you a U.S. citizen? Yes/ No
11. Is English your first language? Yes/No
12. What is the approximate population of your hometown? Less than 1,000 people /1000-10,000 people / 10,000-50,000 people /50000-100000 people /100,000-500,000 people /500,000 – 1,000,000 people / 1,000,000 -10,000,000 /more than 10,000,000

13. Which of the following do you identify with? European American or White / African American or Black / Asian American or of Asian descent / Hispanic or Latino American / American Indian or Alaska Native / Native Hawaiian or other Pacific Islander / Other (please specify: __________)
14. How would you describe your political orientation? Very liberal/ Liberal/ Moderate / Conservative / Very Conservative / Other (please specify: ____________)
15. Please rate how religious you are based on the following scale : **1 = not at all religious to 5 = very religious.**
16. Which of the following do you identify with? Catholic / Protestant (e.g., Lutheran, Methodist) / Mormon (The Church of Jesus Christ Latter Day Saints) / Jewish / Muslim / Agnostic / Atheist / Spiritual but not religious / Other (please specify: __________) / None of the above
17. Do you know any people who are transgender? Check each of the following that apply.

    A transgender person is a member of my family.

    A transgender person is a friend of mine.

    A transgender person is an acquaintance of mine.

    A transgender person is a romantic partner of mine.

    A transgender person is a former romantic partner of mine

Appendix B

This photo was not included in the study however it does approximate the type of pose and facial expression of the stimuli photos that participants viewed. On the left, the picture appears the way photos included in the study appeared. On the right, the hair, face, neck, chest, arms, waist/hip, Genital and Leg regions are highlighted as an example of how we defined the regions in our stimuli photos.

Appendix C

Post Eye-Tracking Questions

On average how attractive did you find the pictures in the woman categories with 1 meaning not at all attractive to 5 meaning very attractive?

On average how arousing did you find the pictures in the woman categories with 1 meaning not at all arousing to 5 meaning very arousing?