HEAD, SHOULDERS…WAIST-TO-HIPS? A STUDY ON BODY SHAPE PREFERENCE IN INFANCY

A Thesis

by

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ABSTRACT

Past adolescent and adult literature has pinpointed clear preferences for male and female body shapes within the context of reproductive fitness and mate selection. However, the question still remains whether individuals are born with preferences for adult-defined attractive body shapes. Alternatively, perhaps particular preferences emerge due to the physical expression of sexually dimorphic body shapes as a result of the pubertal surge in reproductive hormones. The purpose of the present study was to explore the existence of an early preference for adult body shapes. Infants aged 4 to 6 months and 10 to 13 months viewed 8 different computer displays, each containing 2 human figures. In one set (Set A), infants viewed 4 types of displays: 2 male displays, with a small and large waist-to-hip ratio (WHR) figure shown side-by-side; and 2 female displays, with a small and large WHR figure shown side-by-side. In another set (Set B), infants viewed 4 different types of displays: 2 small WHR displays, with a male and female figure shown side-by-side; and 2 large WHR displays, with a male and female figure shown side-by-side. Thus, the paired figures in Set A varied in body shape within stimulus sex. The paired figures in Set B, however, varied in stimulus sex within similar body shapes. Eye-tracking data was collected in the form of durations of looking. Two main findings emerged. First, results from Set A revealed that male infants looked significantly longer to the large female WHR compared to the small female WHR, but looked about equally between the small and large male WHRs. Female infants, however, did not show significant differences in looking to either the female or male pairs.

Second, results from Set B revealed that infants looked significantly longer to the female figures compared to the male figures, regardless of body shape. These results suggest that infants, in fact, do not possess preferences for adult-defined attractive body shapes. But, these findings may still signal an early foundation of mate selection strategy related to sex categorization. These explanations and others will be considered.

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1. INTRODUCTION

The human body transforms into a variety of shapes and sizes across the lifespan. Biologically speaking, differences in body shape are thought to be largely mediated by the sex-dependent anatomical distribution of fat deposits. In other words, sexually dimorphic body shapes become most noticeable after the onset of puberty when sex hormones begin to peak (Swami, 2006). Specifically, estrogen has been shown to stimulate fat deposit in the gluteofemoral region (thighs and buttocks) but inhibit fat deposit in the abdominal region, creating an hourglass body shape (Björntorp, 1987; Leibel, Edens, & Fried, 1989). Testosterone, however, has been shown to stimulate fat deposit in the abdominal region while minimizing fat deposit in the gluteofemoral region, creating an inverted triangle body shape (Björntorp, 1987; Leibel, Edens, & Fried, 1989). Differences in the distribution of fat deposits are commonly quantified by the waist-to-hip ratio (WHR), a measure that more accurately illustrates an individual's body shape rather than one's percentage of total body fat, or body mass index (BMI; Swami, 2006). WHR is calculated by measuring the ratio of the circumference of the waist (the narrowest region below the ribs) to the circumference of the hips (the largest protruded region around the buttocks).

Some research has suggested that male preferences for female WHRs may have cultural origins. For example, past research has shown that men living in first-world populations prefer small female WHRs compared to men living in other developing societies (Cashdan, 2008; Furnham & Alibhai, 1983; Furnham & Baguma, 1994;

Furnham, Dias, & McClelland, 1998; Furnham, Lavancy, & McClelland, 2001; Furnhamn, McClelland, & Omer, 2003; Furnham, Moutafi, & Baguma, 2002; Furnham, Tan, & McManus, 1997; Henss, 1995; Marlowe, Apicella, & Reed, 2005; Singh, 1993, 2000, 2004; Singh & Luis, 1995). These cross-cultural theorists have posed that differences in body shape preferences are contingent on environmental factors, such as access to food resources (Brewis & McGarvey, 2000; Craig, Swinburn, Matenga-Smith, Matangi, & Vaughan, 1996; Marlowe & Wesman, 2001; Sugiyama, 2004; Wilkinson, Ben-Tovin, & Walker, 1994), and visual experience or media exposure (Harrison, 2003; Orgel, Urla, & Swedlund, 2005; Yu, Proulx, & Shepard, 2008; Yu & Shepard, 1998). However, many researchers agree that preferences for particular WHRs are more evolutionarily adaptive rather than cultural. For instance, in much of the adolescent and adult literature WHR has been shown to act as cue for reproductive fitness related to sexual selection. Generally speaking, WHR can signal health risks like cardiovascular disorders, adult-onset diabetes, hypertension, and gall bladder disease (Folsom, et al., 1993; Huang, Willet, & Colditz, 1999; Misra & Vikram, 2003). Female WHRs can be used as a reliable cue in determining a female's reproductive age or mate value (Singh, Dixson, Jessop, Morgan, & Dixson, 2010). Evolutionary theory would suggest that certain male WHRs signal muscular strength or the ability to afford protection to one's offspring (Dixson, Halliwell, East, Wignarajah, & Anderson, 2003). Early findings have pinpointed that for premenopausal, Caucasian women, males consistently prefer WHRs between 0.67 and 0.80, a body shape that resembles an hourglass figure (smaller waist, while expanding near the hip and buttocks region; Lanska, Lanska, Hartz, & Rimm, 1985; Marti et al., 1991). For male WHRs however, research has shown that females consistently prefer male bodies resembling an inverted triangle (larger shoulders and chest, while tapering down near the hip region), specifically with a WHR between 0.90 and 0.95 (Franzoi & Herzog, 1987; Furnham, Tan, & McManus, 1997; Henss, 1995; Horvath, 1979; Lynch & Zellner, 1999; Olivardia, et al., 2004; Singh, 1995).

While the past body shape literature has shown a clear range of preferred male and female WHRs, it has also highlighted a gender imbalance in the use of physical appearance in mate selection strategy. One theory suggests that the biological nature of sexual selection causes a sex difference in mate selection criteria. More specifically, it is thought that men respond to physical appearance more than women—the rationale being that women bear a limited number of offspring over a shorter portion of the lifespan. Thus, men use physical appearance (a cue to overall health and reproductive fitness) for mate selection criteria to enhance and maximize reproductive success (Feingold, 1990; Buss, 1989; Cunningham, 1986; Kenrick, Sadalla, Groth, & Trost, 1990; Symons, 1979; Thiessen & Gregg, 1980; Trivers, 1985). Women, on the other hand, are thought to be more judicious in mate selection than men by choosing partners based on social dominance or financial stability, as the primary motivation is to enhance survival of their offspring (Feingold, 1990). In a meta-analysis of five different research paradigms, Feingold (1990) demonstrated that men placed more value on physical appearance in the opposite sex compared to women in all five study paradigms, though self-report showed the strongest gender effect. Women, however, placed more weight on intrinsic characteristics like romantic attraction and social behavior than men's physical attractiveness. Stroebe, Insko, Thompson, and Layton (1971) confirmed a similar pattern in which females showed a greater preference for intrinsically similar opposite-sex figures, while males showed greater preferences related to physical attractiveness. Though survey studies support a more sociocultural motivation in women's choice of an opposite-sex mate, there is still some evidence that women possess mate selection criteria for men's physical appearance, yet it is not as emphasized as men's criteria for female appearance.

Much of the literature to date has demonstrated a clear picture of adult preferences for the opposite sex in the context of reproductive fitness for mate selection, but far less research has been done on exploring the developmental emergence of such preferences. Connolly, Slaughter, and Mealey (2004) were among the first to investigate adult-like body shape preferences in late childhood and early adolescence. Individuals were shown 12 male and 12 female line drawings (Singh, 1993a) that varied in WHRs and participants were asked to identify which silhouette from each gender looked the nicest (terminology used for children) or the most attractive (terminology used for adolescents). Results revealed a significant difference between male and female WHR preferences beginning around age 10, when male WHRs of about 0.9 were most preferred from both genders. But, female WHRs of about 0.7 were not preferred until around age 12. While this study provided some evidence of adult-like body shape preferences in late childhood/early adolescence, the authors primarily attributed these patterns to a hormone-dependent maturation of the body and brain (i.e. puberty). Thus, it is difficult to determine from these results whether adult-like body shape preferences exist prior to the surge in reproductive hormones that occurs during pubertal onset.

To our knowledge, there has only been one study to investigate infants' preference for adult body shapes. Heron-Delaney, Quinn, Lee, Slater, and Pascalis (2013) investigated 9-month-olds' preference for adult-defined attractive male body shapes when paired with unattractive male body shapes. In this study, body shape was used as an operationalization of attractiveness. In other words, attractiveness in the adult literature is defined as the sexual desirability of an individual within the context of reproductive fitness (Buss, 1989); body shape can be used as a cue for reproductive fitness and thus affects one's level of perceived attractiveness or desirability. Results from Heron-Delaney et al.'s study revealed that all infants, regardless of sex, preferred the unattractive, large-bodied male figure over the attractive, smaller male figure, a pattern that the authors attributed to infants' familiarity with overweight body shapes in their everyday environment. However, it is difficult to interpret these results within the context of evolutionary theory without testing infants' responses to female figures and without assessing how preferences may change during the first year of life.

The current study explored infants' preference for male and female body shapes in two different contexts: preference for small or large WHRs and preferences for male or female figures. Here, the terms small and large are used to operationalize WHRs less than 1.0 (smaller waist than hips and buttocks) and WHRs greater than 1.0 (larger waist than hips and buttocks), relatively speaking. The purpose of these manipulations was to explore the existence of an early preference for adult body shapes when paired within stimulus sex and when paired between stimulus sex. We hypothesized that if preferences for reproductively fit body shapes become adaptively relevant as a result of the hormonally dependent maturation of the body and brain around the onset of puberty, then infants should not show preferences for the small WHR figures as one would expect in reproductively mature individuals. Another possibility, albeit unlikely, is that interest in attractive body shapes is not solely activated by the physical emergence of sexually dimorphic body shapes at puberty, but rather individuals are born into the world with these preferences. We investigated both younger and older infants' responses to these stimuli in an attempt to explore any changes in the sensitivity to body shape information within the first year of life; however, we predict that the preferential patterns found in infancy will be consistent across both age groups.

2. METHOD

2.1 Participants

Two age groups were tested: 20 infants aged 4 to 6 months, 10 M and 10 F (M = 5 months, 16 days; range = 4 months, 1 day to 6 months, 25 days) and 24 infants aged 10 to 13 months, 10 M and 14 F (M = 12 months, 14 days; range = 10 months, 23 days to 13 months, 23 days). Parents reported their infants' race/ethnicity as Caucasian (n=35), Hispanic (n=6), Black (n=1), or of mixed race/other (n=2). Seventeen additional infants were tested but excluded from the sample due to fussiness (n=12), procedural problems (n=2), or excluded as outliers (n=3).

All participants were healthy and full-term. Participants were recruited primarily from commercially produced lists and parents were offered $5 or a lab T-shirt for participation.

2.2 Apparatus and Data Recording

Infants sat on their parent's lap approximately 65 cm away from a remote eye tracker (Tobii T60 XL). The infrared corneal reflection eye tracker was embedded in the lower portion of a 24 in flat screen monitor (17.7W TFT l flat screen monitor) (resolution: 1024 x 768 pixels) and detected the position of the pupil and the corneal reflection of the infrared light from both eyes. The Tobii T60 XL records data at 60 Hz with an average accuracy of 0.5 degree visual angle and a head movement compensation drift of G0.1. The monitor was mounted on an adjustable arm so that it could be positioned optimally for each infant.

Fixation data were defined using the Tobii fixation filter (version 2.2.8) with a velocity threshold of 35 pixels and a distance threshold of 35 pixels. Total duration of looking was calculated by the sum of fixation data for each trial. Prior to test, each infant was calibrated by registering 5 gaze positions covering over 80% of the viewing area. After calibration, infants immediately viewed the test displays. The test displays were presented using professional visualization software (Tobii Studio) on a Dell Precision T5500 desktop computer with a Windows 7 operating system.

2.3 Stimuli and Design

The stimuli were adapted from previous research (Maner, DeWall, & Gailliot, 2008), containing computer-generated human figures that varied in body shape and sex. The human figures, modified using Adobe Photoshop CS5, were 2.3 inches in width by 5.3 inches in height and depicted three-dimensional men and women dressed in identical t-shirts and pants shown on a light blue background, the entire display measuring 6 inches wide by 10 inches tall.

All infants viewed 8 different displays, each containing two human figures. In one set of displays (Set A), 2 male displays and 2 female displays were shown (Fig 1a). In the male displays, 1 small WHR male figure and 1 large WHR male figure were shown side-by-side. In the female displays, 1 small WHR female figure and 1 large WHR female figure were shown side-by-side. The side (right or left) on which the small WHR figure was shown for the first display was counterbalanced across infants and reversed for the second display, for both male and female displays. Thus, the displays in Set A consisted of varying body shapes within stimulus sex.

In another set of displays (Set B), 2 small WHR displays and 2 large WHR displays were shown (Fig. 1b). In the small WHR displays, 1 small WHR female figure and 1 small WHR male figure were shown side-by-side. In the large WHR displays, 1 large WHR female figure and 1 large WHR male figure were shown side-by-side. The side (right or left) on which the female figure was shown for the first display was counterbalanced across infants and reversed for the second display, for both small WHR and large WHR displays. Thus, the displays in Set B consisted of varying stimulus sex within body shape.

Each of the 8 displays was shown in random order for 4 s, for a total of 32s.

2.4 Data Coding

Two areas of interest (AOIs) were identified in each test display: one for each figure (Fig. 1). All AOIs were 3.5 inches in width x 5.4 inches in height and were centered over each figure. Number of fixations and duration of looking to the AOIs were both coded. However, because both metrics yielded similar results, only duration of looking will be reported.

3. RESULTS

Preliminary analyses revealed no significant main effects or interactions involving age group on infants' responses to the test stimuli. Hence, the data were collapsed across age group for all analyses.

3.1 Set A

Infants' duration of looking to the AOIs (DV) was averaged across 2 female trials and 2 male trials and analyzed using a Repeated Measures ANOVA with Body Shape and Stimulus Sex as the within subjects factors and Sex of the Participant as the between subjects factor. Overall, results revealed a 2 (Body Shape) x 2 (Stimulus Sex) x 2 (Sex of the Participant) interaction, $F_{1,42}= 9.97$, $p = .003$, $\eta^2 p = .19$. More specifically, male infants showed a significant Body Shape x Stimulus Sex interaction ($F_{1,19}= 6.90$, $p = .02$, $\eta^2 p = .27$) as did female infants ($F_{1,23}= 4.72$, $p = .04$, $\eta^2 p = .17$). Post-hoc t-tests revealed that male infants looked significantly longer to the large WHR female figures (M=1.33, SD=.60) compared to the small WHR female figures (M=.87, SD=.57), $t_{19} = -4.34$, $p < .001$, $d = 1.99$; but, male infants did not show significant looking differences to the large (M=.87, SD=.52) and small WHR (M=.85, SD=.61) male figures. Post-hoc t-tests for female infants, however, revealed no significant differences in looking to any of the male (large WHR M=1.21, SD=.80; small WHR M=.96, SD=.70) or female (large WHR M=.93, SD=.54; small WHR M=1.21, SD=.78) pairs.

3.2 Set B

Infant's duration of looking to the AOIs was averaged across 2 small WHR trials and 2 large WHR trials and analyzed using a Repeated Measures ANOVA with Stimulus Sex and Body Shape as the within subjects factors and Sex of the Participant as the between subjects factor. Overall, results revealed a main effect of Stimulus Sex ($F_{1, 42}$ =1.87, p = .04, $\eta^2 p$ = .09); however, there was no significant difference in looking to Body Shape ($F_{1,42}$ = 1.01), nor were there any significant interactions between Body Shape, Stimulus Sex, or Sex of the Participant (all F's < 1.00). Post-hoc t-tests revealed that infants looked significantly longer to the female figures (M=1.17, SD=.55) compared to the male figures (M=.97, SD=.52; t_{43} = 2.08, *p* = .04, *d* = 0.63).

3.3 Secondary Analyses and Results

The results obtained for Set A, reported above, suggest that male but not female infants possess large WHR preferences. However, the AOIs covered the entire figure, making it possible (albeit unlikely) that this difference was carried by a preference for body areas other than the waist and hips. To assess this possibility we identified smaller AOIs, including just the torso area. A new, trunk AOI was placed on each of the human figures used in Set A. The trunk AOIs were approximately 3.5 inches in width by 3 inches in height and were centered over the torso—below the head and above the legs respectively— which included the shoulders, arms, waist, and hips. Given the size of the stimuli, it would be difficult to create smaller AOIs (e.g., including only waist and hips) and feel confident about reliability of scanning behavior.

Durations of looking to the trunk AOIs were analyzed in the same manner as the whole body AOIs for Set A. As expected, overall results revealed a 2 (Body Shape) x 2 (Stimulus Sex) x 2 (Sex of the Participant) interaction, $F_{1,42} = 4.50$, $p = .04$, $\eta^2 p = .10$. Similar to the whole body AOIs, male infants showed a significant Body Shape x Stimulus Sex interaction to the trunk region, $F_{1,19} = 4.88$, $p = .04$, $\eta^2 p = .20$. Post-hoc t-tests for male infants revealed significantly longer looking to the large WHR female trunks (M=.70, SD=.64) compared to the small WHR female trunks (M=.46, SD=.48; $t_{19} = -2.60$, $p = .02$, $d = 1.19$); but, male infants did not show significant looking differences to the large (M=.50, SD=.39) and small WHR (M=.52, SD=.41) male trunks. Interestingly, when localized to only the torso area, female infants showed no significant differences in looking to Body Shape or Stimulus Sex, nor was there a significant interaction between these factors (all F’s < 1.00).

4. DISCUSSION

The current study demonstrates that infants aged 4 to 6 months and 10 to 13 months do not show preferential looking to adult-defined attractive body shapes. Rather, male infants but not female infants showed longer looking to large WHRs compared to small WHRs for female figures only. In line with our hypothesis, this indicates that perhaps interest in reproductively fit, or attractive, body shapes is activated later in life. More specifically, it is possible that the surge in pubertal hormones, which also initiate secondary sexual development, are also responsible for the development of body shape preferences for the reproductively fit. It seems a more adaptive conclusion that physical attractiveness, in the form of WHR, be used as a cue for mate selection among reproductively mature individuals rather than as an inborn strategy, as prepubescent individuals are not motivated by sexual selection in the same way as are adolescents and adults.

On the other hand, the current study revealed an interesting opposite sex pattern of results in Set A, of which male infants showed a stronger interest in large WHR stimuli of the opposite sex compared to female infants. It is possible that this finding speaks to an early foundation of mate selection strategy. For instance, here we find that body shape preference, though not the adult-defined preference for attractive bodies, is linked to the opposite sex stimuli among male infants. Based on previous findings, this could be interpreted as an inborn attention to biological sex within the context of body shape. Evolutionarily speaking, it is a more adaptive strategy for a male to evaluate female bodies compared to male bodies. The observation of this strategy in male infants but not female infants is not surprising given that much of the adult literature suggests that males are more extrinsically motivated in their preferences for opposite sex individuals compared to females (Feingold, 1990; Stroebe, et al., 1971).

Lastly, it should be addressed that male infants did not show the same interest in body shape when stimulus pairs varied in sex. In Set B, when pairs of stimuli were shown varying in sex within similar WHRs, all infants showed a preference for female stimuli compared to male stimuli, but no body shape differences associated with this stimulus sex preference were found. It is possible that the nature of the stimulus pairing in Set B (similar WHRs shown together) affected the patterns of looking and somehow heightened interest in stimulus sex. In other words, rather than a forced choice of body shape like in Set A, the pairing of stimuli in Set B forced infants to choose between male or female rather than between small or large WHRs.

In conclusion, the current study suggests that infants do not possess the same body shape preferences as adolescents or adults; rather male infants show early preferences for adult-defined unattractive female figures. Furthermore, these results illustrate a stronger body shape preference for the opposite sex in male infants compared to female infants. Together, these results offer insight into the development and adaptive function of body shape preference within the context of reproductive fitness and mate selection.

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APPENDIX

FIGURES

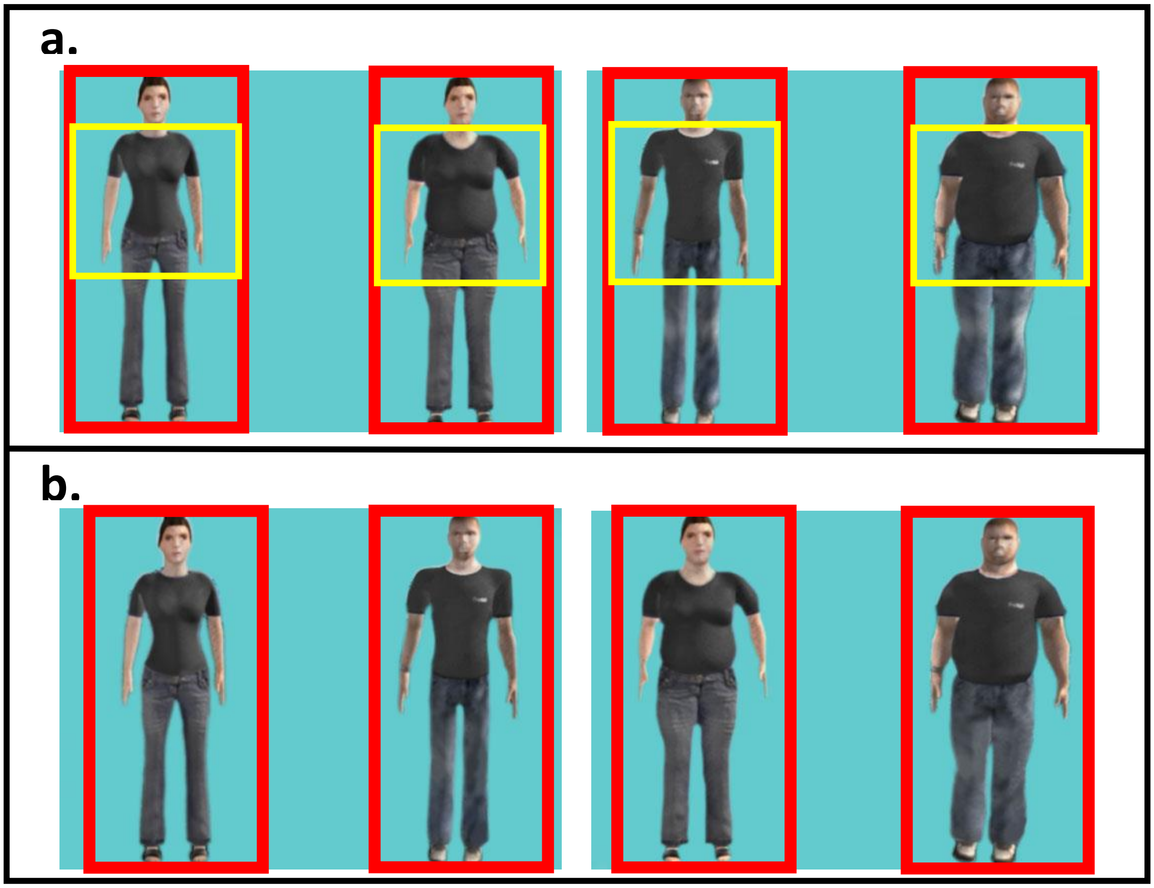

Figure 1. Test Stimuli. Areas of Interest AOIs (in red) were placed over the entire human figures within each display. Trunk AOIs (in yellow) were used for secondary analyses (a.) Set A displays; *left side:* two female figures, small WHR and large WHR respectively; *right side:* Two male figures, small WHR and large WHR respectively. (b.) Set B displays; *left side:* two small WHR figures, female and male respectively; *right side:* two large WHR figures, female and male respectively.