

THE EFFECTS OF STRIPED CLOTHING ON PERCEPTIONS OF BODY SIZE

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Findings in recent studies indicate that, contrary to popular fashion advice, horizontal lines do not give the impression of larger body size (Thompson, 2008; Thompson & Mikellidou, 2009, 2011). However, in these studies stimuli were presented concurrently with vertical and horizontal lines, and it is unclear whether the same effect is found in the absence of such perceptual anchors. In this study, 120 naive participants interacted with a female confederate wearing a dress with vertical stripes, horizontal stripes, or no stripes. Following this, they were asked to rate the confederate's body size. Results showed that the confederate was rated as having a significantly larger body size when she was dressed in horizontal stripes than when she was wearing either vertical stripes or no stripes. There was no significant difference in body size perceptions when she was wearing vertical stripes or no stripes. The practical implications of these results are discussed.

Keywords: striped clothing, horizontal stripes, vertical stripes, body size, perceptions.

Visual illusions have long been studied (Boring, 1942), but why these illusions occur and what practical implications they have continue to be a matter of debate. One such illusion is the Helmholtz (1867) square effect, which refers to the fact that a square on horizontal lines is perceived as being taller than one on vertical lines. It is not clearly understood why a horizontal square should look too tall, although it has been proposed that filled extent increases perceived size (Coren &

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Girgus, 1978). These evaluations of the Helmholtz square illusion are important because of its relevance to the fashion industry and body size perceptions (Thompson, 2008).

Specifically, the widespread belief that wearing horizontal stripes makes individuals look heavier than they really are appears to contradict the Helmholtz (1867) square illusion, which suggests that wearing horizontal stripes should make an individual appear taller and thinner. In testing this, Thompson (2008) showed that the Helmholtz square illusion persists when applied to two-dimensional female figures (that is, horizontal stripes made stimuli appear slimmer than the same stimuli with vertical stripes). However, it is possible that vertical stripes give the impression of slimness by providing three-dimensional cues to bodily morphology, thereby attenuating or overturning the widening Helmholtz square effect of vertical stripes (Taya & Miura, 2007).

In a recent series of studies, however, Thompson and Mikellidou (2009, 2011) reported that the Helmholtz square effect holds when stimuli consisting of three-dimensional cylinders are used. Additionally, Thompson and Mikellidou (2011) reported that the Helmholtz square effect held when their stimuli consisted of three-dimensional images of half-body mannequins dressed in strapless t-shirts with either horizontal or vertical stripes. Specifically, participants viewed two mannequins side by side (in mirror-calibrated three-dimensions), one in vertical stripes and the other in horizontal stripes, and were asked to indicate which was wider. Results showed that “the mannequin in horizontal stripes needed to be 10.7% broader to be perceived as identical to the one in vertical stripes” (Thompson & Mikellidou, 2011, p. 74). The authors took this as evidence that the horizontal lines did not have a widening effect when applied to women’s clothing.

Even so, there are reasons to believe that this conclusion might be premature, particularly as Thompson and Mikellidou’s (2011) experiments lack ecological validity. Most importantly, stimuli comprising vertical and horizontal lines were presented concurrently in their experiments, but it is unclear to what extent such perceptual anchoring will occur in real-world settings. In other words, it has not yet been determined whether clothes with horizontal stripes give the impression of greater width when viewed in the absence of a vertically striped anchor. This is important because, in the absence of such an anchor, it may be the case that the Helmholtz square illusion does not apply and horizontal stripes give the impression of larger body size (as popular culture and fashion experts seem to predict; see e.g., Feldon, 2000).

This study was conceived as a more careful attempt to investigate the effects of striped clothing on the perception of women’s body size. To do so, we had naive participants take part in brief interactions with a female model wearing clothing with either vertical stripes, horizontal stripes, or no stripes. Following this

interaction, participants were asked to estimate the body size of the model using an objective index of female body size. Based on the reasoning of Thompson and Mikellidou (2009, 2011), we hypothesized that our naive participants would perceive the model as having a smaller body size when she was wearing horizontal stripes as compared to when she was wearing vertical stripes or no stripes.

Method

Participants

The participants were 120 undergraduates (58 women, 62 men) from a university in London, England (M age = 19.90, SD = 1.68; self-reported body mass index [BMI] M = 21.84 kg/m², SD = 3.45). Most participants were of British White descent (73.3%), while others were of Asian descent (19.2%) or African Caribbean descent (7.5%).

Stimuli and Materials

Confederate and clothing. Prior to data collection, a female confederate (height = 163 cm, weight = 49 kg, BMI = 18.44 kg/m²) was selected from a pool of women who volunteered for the study. In the experimental set-up, the confederate wore one of three stretch cotton dresses, each of which was slim fitting and featured a scoop neck and three-quarter length sleeves. Two of the dresses were white, with one centimeter, navy-blue stripes spaced two centimeters apart, running either horizontally or vertically from the neckline to the hem. A third dress was similarly white, but without stripes or any other features.

Body size perception. Following the experimental procedure, participants were presented with the Photographic Figure Rating Scale (PFRS; Swami, Salem, Furnham, & Tovée, 2008). The PFRS consists of 10 photographic images of real women in front view and who represent the full range of established BMI categories, from emaciated to obese (for details, see Swami et al., 2008). The body size of the confederate matched Figure 4 of the PFRS most closely. Previous researchers have shown that participants are able to rank the images of the PFRS in terms of BMI correctly and that ratings of current body size are strongly correlated with their BMI (Swami et al., 2008).

Procedure

Ethical approval for this study was obtained from the relevant university ethics committee. Potential participants were invited to take part in a study that was ostensibly on memory (used as a cover to mask the study's purpose). Participants who agreed to take part in the study provided informed consent and were invited to go to a laboratory at a specified time. A female experimenter met the

participants individually upon arrival. She informed them that she was awaiting the arrival of a second participant (in fact, the confederate).

Participants were then taken to a waiting room, where they were left on their own. After about two minutes, the confederate entered the room and immediately introduced herself to the naive participant. The confederate was then instructed to converse freely with the participant while both remained standing. The confederate's clothing during the experiment was randomly chosen, so that she appeared to the naive participant in one of the three dresses described above and in flat shoes (horizontal stripes $n = 41$, vertical stripes, $n = 43$, no stripes, $n = 37$). To maintain consistency across participants, the confederate did not wear any makeup and had her hair styled in the same manner each time.

After exactly five minutes, the experimenter entered the room, interrupted the conversation if it was still ongoing, and led both the participant and the confederate to separate cubicles. The participant was then presented with what was ostensibly a screening survey, consisting of a two-page, paper-and-pencil questionnaire. The first side of the questionnaire form included simple memory questions and demographic items (sex, age, ethnicity, height, and weight). On the second side of the questionnaire, the participant was presented with the PFRS and asked to rate the figure that most closely resembled the body size of the participant (confederate) who had been in the waiting room with them. Once participants completed the questionnaire, the experiment was terminated and participants were fully debriefed by the experimenter.

Results

A one-way analysis of variance (ANOVA) with the experimental groups (horizontal stripes, vertical stripes, and no stripes) as the independent variable showed that there were no between-group differences in participant age, $F(2, 117) = 2.10$, $p = .127$, $\eta^2 = .04$, or self-reported BMI, $F(2, 117) = .35$, $p = .708$, $\eta^2 < .01$. There were also no between-group differences in the distribution of participant sex, $\chi^2(2) = .11$, $p = .945$, $\phi = .031$, or ethnicity, $\chi^2(4) = 2.82$, $p = .589$, $\phi = .153$, suggesting that the randomization procedure was successful.

In order to examine the effect of the confederate's clothing on participants' perceptions of her body size, we conducted a 2 (participant sex) \times 3 (experimental condition) ANOVA, with body size ratings from the PFRS as the dependent variable. Results showed that there was no significant sex by experimental condition interaction, $F(2, 114) = 1.41$, $p = .249$, $\eta^2 = .02$. The results also showed that there was no significant main effect of participant sex, $F(1, 114) = .20$, $p = .658$, $\eta^2 < .01$. There was, however, a significant main effect of experimental condition, $F(2, 114) = 4.79$, $p = .010$, $\eta^2 = .08$.

A test of simple effects revealed that there was no significant difference in perceived body size between participants in the vertical stripes ($M = 3.90$, $SD = .53$) and no stripes conditions ($M = 3.86$, $SD = .71$), $t(77) = .28$, $p = .777$, $d = .06$. However, participants in the horizontal stripes condition ($M = 4.26$, $SD = .63$) perceived the confederate as having a heavier body size than did those in the vertical stripes condition, $t(81) = 2.83$, $p = .006$, $d = .63$, and those in the no stripes condition, $t(76) = 2.65$, $p = .010$, $d = .61$.

Discussion

The results of this study showed that, when the confederate wore horizontal stripes, she was perceived as having a significantly larger body size than when she wore either vertical stripes or no stripes. The most likely reason for the discrepancy between our study and the results of previous studies (Thompson & Mikellidou, 2009, 2011) concerns the method of presenting the stimuli. In previous studies, stimuli with vertical and horizontal stripes were presented concurrently, which probably activated the Helmholtz (1867) square illusion. However, it seems unlikely that such concurrent presentation will occur in real-world settings, which means that the visual illusion may not be present or activated. In situations where the anchoring effect of vertical stripes is not present, it appears to be the case that horizontal lines give the impression of a larger body size. This is what we found in this study and what fashion experts appear to suggest (e.g., Feldon, 2000).

However, two important caveats to our results should be noted. First, the effect size of the overall difference in this study ($\eta^2 = .08$) was, by Cohen's (1988) standards, small. Second, we did not find a slimming effect for vertical stripes in relation to the no stripes condition. Overall, then, it is probably reasonable to conclude that vertical stripes do not give the impression of slimness, whereas horizontal stripes may give the appearance of a larger body size, though only a slightly larger body size. Indeed, the relationships we have uncovered in this study suggest that wearing stripes probably does not significantly alter body size perceptions (in either direction) and that its effects are probably inconsequential in real terms.

The main limitation of this study was the reliance on a single confederate. It is possible that her behavior exhibited subtle differences in the different experimental conditions, which, in turn, could have affected how she was perceived. In a similar vein, the use of a single confederate limits our ability to generalize our findings, as our results may not hold for confederates of other shapes and sizes. Additionally, because of our research design, it is not possible to conclude whether our results will also hold for immediate perceptions of body size, as opposed to memory for apparent size. Finally, future researchers could

extend these findings by varying further aspects of our stimulus, such as the width and color of the stripes.

Although these limitations are important, our results suggest it may be premature to conclude that the Helmholtz square illusion applies to perceptions of body size. We do not dispute the existence of the Helmholtz square illusion, but rather suggest that its effect may not be very strong when it comes to striped clothing in the absence of an anchor. More specifically, when estimating the size of an object, features of the stimulus (e.g., stripes, intersection of lines, image motion) must be estimated from the input data. However, these size estimations are biased as a result of noise, resulting in erroneous perception of the location of features. Such biases are pronounced when the stimulus consists of illusory patterns (Fermüller & Malm, 2004), such as the Helmholtz square, but our results suggest that they may not be large enough to be noticeable in real-life conditions. In short, it is possible that, in situations that more closely mirror ecologically valid scenarios, striped stimuli do not fulfill the criteria of perceptual illusions and thus do not have a major effect on size perceptions.

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