

The Helmholtz illusion: Women's perceptions of horizontal and vertical stripes in dress

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The aim of this study is twofold: first to test the application of the Helmholtz Illusion's to dress by examining the viewer and wearer's perceptions of wearing both vertical and horizontal stripes, and second to examine how optical illusion textile print aids the wearer in moving from their actual self toward their ideal self. Theoretically grounded in the self-discrepancy theory (Higgins, 1987), the current study examined the Helmholtz Illusion. This optical illusion was created by Hermann von Helmholtz (1867) and appears as two squares consisting of 7 evenly sized and spaced lines. In the first square, the lines are positioned horizontally and in the second square the lines are positioned vertically. Helmholtz, a German physicist, argued that when comparing the two squares, the one in which the lines are positioned horizontally appears to be more narrow and taller than the square with the vertical lines. Therefore, this study proposed the following research questions: How does dressing in horizontal or vertical stripes effect the perception of body shape and size? Does the application of this optical illusion, the Helmholtz Illusion, camouflage body shape or size? Can the application of an optical illusion textile print aid the wearer in moving from their actual self toward their ideal self?

A mixed methodology approach was conducted in order to gain an understanding of both the viewer and wearer's perception of the Helmholtz Illusion and its application to dress. The participants were 98 women whom either participated in an online survey (N=73) or an in-depth interview (N=15). The online survey was created using Qualtrics.com. The online survey depicted two avatars, created in Optitex, wearing a sheath dress depicting either horizontal or vertical stripes. The researcher created the textile prints for this study in order to accurately represent the Helmholtz illusion. In viewing each avatar, participants responded to three questions: "Which women appears tallest" "Which women appears widest" and "Which women appears thinnest." Each question was answered by having participants indicate 0 = *vertical* or 1 = *horizontal*. Participants also completed the Body Image Ideal Questionnaire (Cash & Szymanski, 1995; $\alpha = .76$). For this study, the Cronbach's Alpha was $\alpha = .84$.

The 15 women who participated in the in-depth interview portion of this study came into the apparel technology lab and were body scanned in order for custom avatars to be created. The avatars contained the participant's facial features and skin tone in order for participants to feel as if they were truly viewing themselves. The participants sat with the researcher at a computer terminal where they could view their personal avatar wearing the Helmholtz Illusion garments (a sheath dress in either vertical or horizontal stripes). A 30-minute semi-structure interview consisted of questions regarding the participant's perception of their body shape and size while wearing the Helmholtz Illusion garments. Participants were also asked about their body shape ideals and asked to define their perception of society's current ideal.

Descriptive statistics revealed that when participants viewed the Helmholtz Illusion applied to avatars, 79% of participants felt that vertical stripes made the avatar look taller, 77%

felt she also looked thinner, and 77% of respondents selected the avatar pictured in horizontal stripes when asked which woman looked widest. When viewing the illusion as Helmholtz created it (not applied to the body) 53% of the respondents felt that the vertical set of stripes appeared taller, this could indicate that the illusion is less effective when applied to the body. The mean scores for the BIQ scale were computed following the guidelines set out by Cash and Szymanski (1995). The mean score for the BIQ scale was (Mean = 4.72, SD = 2.25). The researchers performed a linear regression analysis to examine if participants' body shape predicted BIQ scores. Self-reported perceived body shape was regressed on self-reported feelings BIQ ($F(1,72) = 11.20, p < .001, R^2 = 0.13, r = .36$). Thus, those who reported having less ideal body shapes (i.e. spoon & rectangle) significantly predicted higher self-discrepancy as indicated by the BIQ scale. The survey findings add supplemental support to the qualitative emergent themes.

The main themes that emerged from the data collected during the interview process were (1) perception of width and length, (2) personal history, and (3) shape effect. The first theme of perception of width and length addressed the idea that the optical illusion print could add width or length to the body shape. When viewing their own avatar one participant suggested "vertical lines add length to my body making me look taller". Another participant commented "horizontal stripes across my hips make my body look wider". The second emergent theme was personal history, which referred to participant's beliefs that stemmed from their personal experiences. A majority of the participants commented that they were told when they were younger that stripes were not flattering. One participant stated, "I have always been told that vertical stripes are slimming and horizontal stripes are not". The final theme of shape effect referred to how the Helmholtz illusion effected the perception of body shape. Although participants thought that vertical lines were in general more flattering, they also believed that the use of line (horizontal or vertical) changed the way they perceived their body shapes. A majority of the participants with rectangle body shapes felt that the horizontal lines segmented their body giving them a more defined bust, waist, and hips. Participants identified as having a spoon body shape noted that the horizontal stripes could actually balance their proportions. These data indicate that this optical illusion could aid some body shapes (i.e. rectangle and spoon) in obtaining a more ideal perception of their body shape. However, those with an hourglass shape felt that the optical illusion could ruin the perception of their already ideal shape.

The survey data and in-depth interviews revealed that the popular belief that horizontal stripes make a person look wider or fatter holds true which is contrary to Helmholtz's notion that when horizontal stripes are evenly sized and spaced they will actually make the wearer look taller. Qualitative data revealed that preconceived ideas regarding wearing stripes might play a role in the perceptions of the Helmholtz Illusion. This study has implications for apparel manufactures as it identified consumer's preferences and purchase intentions for striped clothing while simultaneously adding to the seemingly scarce amount of scholarship in this area.

References

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