

**"CARPENTERED WORLD" HYPOTHESIS VS. PIAGET: REVISITING THE ILLUSIONS OF
SEGALL, CAMPBELL AND HERSKOVITS**

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Individual and group differences in susceptibility to various visual illusions have interested psychologists at least since Binet (1895). At present, there appear to be at least two more-or-less competing explanations of the ontogeny of illusion susceptibility: Piaget's (1969) "Law of Relative Centration" and Segall, Campbell and Herskovits' (1966) "Carpentered World" hypothesis. While these theories sometimes produce similar predictions, they may also lead to contradictory ones.

A brief review of each theory and relevant research provides a necessary context for the data to be presented in this chapter. According to Piaget, perceptual activities (e.g. ability to decentrate, use of exploration strategies) increase in strength and variety with age. Piaget, following Binet (1895), suggested that such perceptual-cognitive developments could cause either an ontogenetic decrease or increase in susceptibility depending on the type of illusion ("primary" or "secondary", respectively). For example, Piaget found that susceptibility to the Müller-Lyer illusion decreased with age as a function of increasing perceptual activities. Segall, et al. (1966) have proposed, in contrast to Piaget, that culture and physical environment condition our visual experiences and habits, and thereby influence illusion susceptibility. Specifically, Segall and his colleagues proposed that exposure to a "carpentered world" of straight lines, square corners and rectangular artifacts could produce increased susceptibility to certain illusions such as the Müller-Lyer and Ponzo (1966, p. 88-89)* Data gathered from a large variety of cultures seemed to support the contention that persons living in carpentered environments exhibited greater susceptibility to these illusions. However, Segall, et al. cannot easily account for the general finding that Müller-Lyer susceptibility decreased with age, even though older children, in principle, have

* Piaget apparently did not study the Ponzo perspective illusion. For a good review of the illusions he worked with, see Vurpillot (1963).

more years of contact with the "carpentered world". Of possible significance is the fact that persons living in "carpentered" societies are generally much better educated; education and pictorial experience were usually confounded with carpenteredness. Segall, et al. attempt to reconcile this apparent contradiction by suggesting that the age effect may be more important than, and overshadow, the environmental effect of carpenteredness. One possible way to test this hypothesis would be to compare developmental curves of susceptibility between groups of individuals that differ only on carpenteredness or similar variables. With such a design strategy it is possible to judge the independent contribution of age and environment.

A strong Piagetian cognitive developmental approach would predict that susceptibility to primary illusions (which were used exclusively in the present study) should decrease with age within any population group; and, perceptual experience should promote perceptual development, such that schooling would produce decreased illusion susceptibility (for a general statement, see Piaget, 1967). A strong "carpentered world" hypothesis would predict that between-population differences should increase as a function of contact with urban environment, even though susceptibility within a given group might decrease with age. Thus, both hypotheses predict an ontogenetic decrease, while they predict opposite functions of perceptual (urban and/or pictorial) experience. For Piaget, increased experience should decrease susceptibility; for Segall, et al. such experience should increase susceptibility.

METHOD

The present study was undertaken in Morocco in conjunction with a larger research project that dealt with various aspects of cognitive and perceptual development. Subjects were Moroccan males selected to complete a three-way factorial design: age (4) x school (2) x environment (2). Age ranged from 7 to 22 years in groups of 24 subjects; half the subjects were in school, and half had never been to school; half the subjects lived in urban areas, while the other half lived in the Atlas mountains. Urban subjects lived in Marrakech, which includes a "casbah" and a modern quarter -- both of which would be considered to be highly carpentered, and providing few vistas. Rural subjects lived in small villages where most of the houses are made of packed earth. While the houses are often rectangular, there is little else in this region that could be characterized as carpentered.

Subjects were tested on two illusion configurations -- Müller-Lyer and Ponzo -- from the illusion booklet of Segall and Campbell (1969). Each subject was also interviewed for socio-demographic background which assessed contact with urban life, mass-media, and socio-economic status. Finally, each subject was administered a modified version of the Children's Embedded

Figures Test (after Witkin, Dyk, Raskin and Karp, 1971) as a measure of perceptual development. Detailed results of the CEFT are discussed in Wagner (1978b). Further ethnographic information and the results of other perceptual and cognitive tests are available in Wagner (1977, 1978a).

RESULTS

Percent illusion susceptibility to the Müller-Lyer and Ponzo illusions are presented in Figure 1. Three-way analyses of variance were conducted for each illusion. For the Müller-Lyer illusion, both urbanization and schooling produced significantly increased susceptibility ($F(1,368) = 32.06$, $p < .01$, and $F(1,368) = 36.75$, $p < .01$), while an age-related decrease in susceptibility did not reach significance ($F(3,368) = 2.16$, $p \leq .10$).

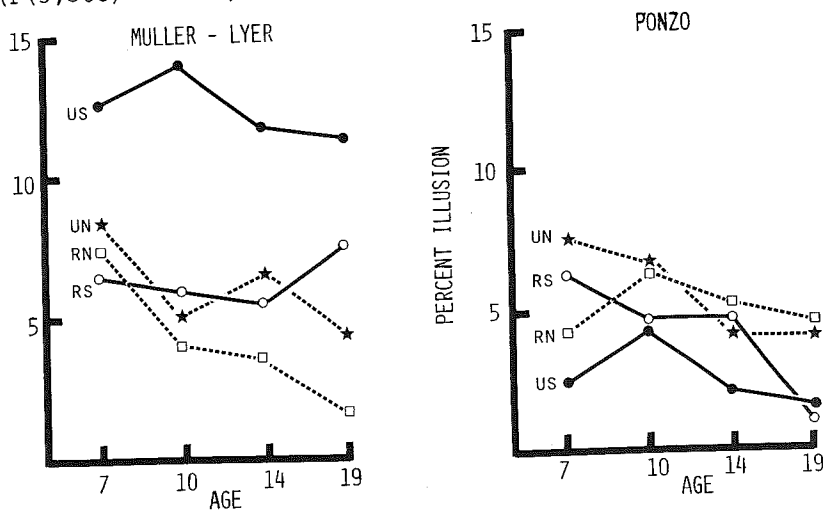


Figure 1: Mean percent illusion magnitude for Müller-Lyer stimulus (Fig. 1a) and for Ponzo illusion stimulus (Fig. 1b). (Groups: US - Urban/Schooled; RN - Rural/Schooled; UN - Urban/Non-Schooled; RS - Rural/Non-Schooled).

However, a separate analysis of variance of the non-schooled subjects showed an age-related decrease in susceptibility, which is supported by an almost significant age x schooling interaction ($F(3,368) = 2.30$, $p \leq .08$). The schooling x environment interaction ($F(3,368) = 8.38$, $p < .01$) showed that schooling had a more important effect in the urban setting. For the Ponzo illusion, susceptibility appeared to decrease significantly with both age ($F(3,368) = 5.81$, $p < .01$) and schooling ($F(1,368) = 14.66$, $p < .01$). Rural

subjects were somewhat more susceptible than urban subjects, but the difference was not statistically significant. There were no significant interactions.

DISCUSSION

The present results point to a complex picture of the ontogeny of the Müller-Lyer and Ponzo illusions used by Segall, et al.. In general, the results tend to give some support to Piaget's theoretical position that primary illusions (e.g. Müller-Lyer and Ponzo) decrease with age. The only exception seems to be with the schooled subjects (primarily rural-schooled) on the Müller-Lyer illusion. The effects of schooling and environment play differing roles in each illusion configuration. Schooling and urban environment act together to increase susceptibility in the Müller-Lyer illusion, while schooling decreases susceptibility for the Ponzo illusion. Such results not only seem to contradict a simple "carpentered world" hypothesis, but also seem to contradict any unilinear prediction about experiential effects in illusion susceptibility.*

It appears that an adequate interpretation of the present results would need to account for the common element of an ontogenetic decrease in susceptibility, and the contrasting effects of certain perceptual experiences such as acquired in schools. Some evidence for such differentiation between ontogenetic trends as a function of illusion configuration has been reported by Wagner (1977) for the Ponzo illusion. While the present results argue against support for a simple "carpentered world" hypothesis, it is interesting to note that the lack of effect of carpenteredness for the Ponzo illusion was precisely what Segall, et al. (1966) found in their original study. In sum, Piaget appears to provide a reasonable explanation for the ontogeny of primary illusion susceptibility, but cannot account for the effects of specific environmental experiences. The complexity of these results suggest at least a partial explanation of the diversity in the findings of previous cross-cultural illusion research.

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* Multiple regression analyses were also conducted within each major group (UN, RN, US, RS). While there were a number of significant predictors of susceptibility within each group, there was little systematic variation across groups. Therefore, these analyses were of little help in the interpretation of the present data. John Berry (personal communication) has pointed out that the limited range of variability of socio-demographic variables within some of the groups would act against the likelihood of meaningful regression equations.

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