Hypnotic Age-Regression and Magnitudes of the Ponzo and Poggendorff Illusions

Abstract. *The effect of hypnotically induced age-regression on the magnitudes of the Ponzo and Poggendorff illusions was determined for ten college students. The results, when compared with normative developmental data, are more typical of younger ages than of the chronological ages of the subjects.*

Although visual geometric-optical illusions have been noted for many years, few satisfactory theoretical analyses of their determining causes have been formulated (*1*). One approach has been by analysis of age trends in the magnitude of illusions, which has provided a quantitative base for attempts at theorizing (*2*). Recently it was determined that the Ponzo (Fig. 1A) and Poggendorff (Fig. 1B) illusions both vary systematically as a function of age (*3, 4*). The Ponzo illusion increases in magnitude between childhood and adulthood while the Poggendorff decreases. In both of these studies, age was varied by testing of subjects of different chronological ages. Our purpose was to extend the previous studies by experimental manipulation of "age" in the same subjects by the technique of hypnotic age-regression.

Undergraduate volunteers were subjected to standard hypnotic induction and tested on Barber's suggestibility scale (BSS) (*5*). The first ten students (four females and six males) to obtain a score of eight on the scale were selected for our study; they ranged in age from 18 to 21, averaging 19.1 years, and had normal vision with or without correction.

The magnitudes of the Poggendorff and Ponzo illusions were determined under four conditions: no hypnosis, hypnosis without age-regression, hypnotic age-regression to age 9 years, and hypnotic age-regression to age 5. Only one condition was presented on 1 day weekly; the order was random. In each session a standard induction procedure and BSS were administered before the stimuli were presented.

The procedures used in determining the magnitude of illusions were identical with earlier ones. For the Ponzo illusion (*3*) a series of 21 cards similar to Fig. 1A, inset, but with the line nearest the point of convergence varying in length from 6.35 to 12.70 cm in 0.32-cm steps, were presented randomly; the other vertical line was constant in length at 10.16 cm. The subject was asked to indicate which of the two lines was longer. The cards were presented in random order, one card at a time, horizontally on a table before the subject. Before presentation the subject was told: "I am going to show you some cards with lines on them. I want you to point to, or tell me, which of the two vertical lines is longer or bigger." After presentation of the first and second cards in the series the experimenter gave no further instructions and simply recorded without comment the subjects' responses. Inasmuch as the order of the cards was random and the experimenter was uninformed of the method for determining the equality value, he was naive regarding the significance of the subjects' responses for any given card at the time of presentation. The equality value was determined later by interpolation from the transition point at which the subjects' responses changed. The length of the center line was 32.07 cm.

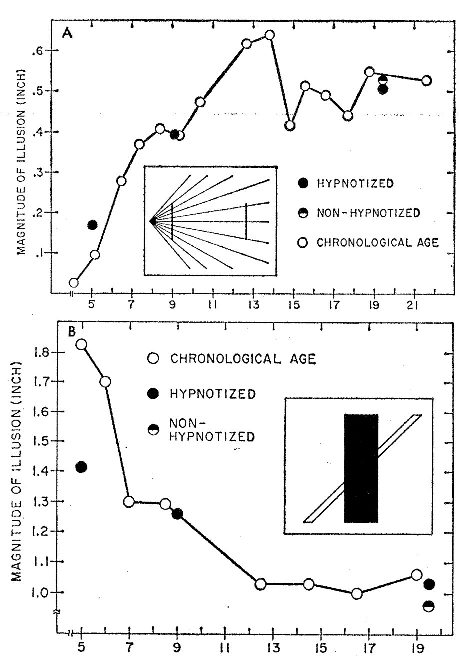

Fig. 1. (A) The equal vertical lines in the Ponzo illusion (inset) appear unequal. The graph describes the magnitude of this illusion as a function of chronological age (open circles); superimposed are the data obtained under hypnosis (solid circles). (B) The diagonal line in the Poggendorff illusion (inset) is continuous but appears discontinuous. The graph describes the magnitude of the illusion as a function of chronological age (open circles); superimposed are the data obtained under hypnosis.

The Poggendorff figure was made of metal, with the right half of the diagonal adjustable (*4*). This adjustable bar was set, in alternating order, clearly out of line either above or below the unmovable left bar. Subjects were instructed to adjust the right half of the diagonal so that it appeared to be in line with the left bar. The height of the figure was 33 cm. Both illusions were viewed binocularly at a distance of 46 cm.

For both figures, the magnitude of the illusion is calculated as the difference between the physical equality setting and the subjective equality value given by the observer. Between presentations of the Ponzo and Poggendorff figures, hypnotized subjects were asked to close their eyes while the age-regression suggestion was reemphasized.

Five control subjects, similarly selected, were presented with the same stimuli under two conditions: (i) routine instructions without suggestion of age-regression or function, and (ii) task-motivation instructions in which they were told, "I want you to be 5 years of age; you are to regress to age 5 and we shall still be able to talk to each other. You can do this for me and I am going to help you to do this by asking you some questions."

For facilitation of the task-motivation instructions, the subjects were presented with the same list of questions given to the regressed subjects in the initial stage of the experiment. These questions were presented with the suggestion to the subject that "You are now 5 years old and I want to ask you some questions." The questions included inquiries about where the subject lived, places he visited, his birthday party, and his attitudes toward school and playmates; he was also asked to print his name and write some numbers.

The samples of handwriting and the numbers taken at this session, and during age-regression 1 week earlier, were submitted to an uninformed faculty member who reported that both appeared to have been made by a child at the same stage of motor development, and that they "looked the same" in all instances. These conditions also were presented randomly and weekly.

To facilitate comparisons with the normative data obtained as a function of chronological age, these results are superimposed on the functions obtained in the previous studies. For the Ponzo illusion (Fig. 1A) the data in the abcence of age-regression, either with or without hypnosis, are similar to those obtained from subjects of comparable chronological age. With regression to age 9, there is decrease in the magnitude of the illusion, identical with that obtained with variation of chronological age; with further regression to age 5 there is further decrease in the magnitude of the illusion, which is less marked.

Analysis of variance leads to rejection of the hypothesis that the means for the four conditions are equal: F, 7.27; $P < .01$. A Newman-Keuls procedure (*6*) was employed for determination of which pairs of treatment means differed significantly: with the exception of the difference between conditions of no hypnosis and hypnosis–no regression, all mean differences are significant at $P < .05$.

The trend is similar with the Poggendorff illusion (Fig. 1B). The magnitudes of the illusion in the absence of age-regression and for the 9-year age-regression group are essentially identical with those already obtained, while the data for the 5-year group are in the same direction but less marked. Analysis of variance leads to rejection of the hypothesis that the means of the four conditions are all equal: F, 4.10; $P < .05$.

A Newman-Keuls procedure, computed to determine which pairs of the treatment means differed significantly, revealed significant difference between the conditions of no hypnosis and hypnosis with regression to age 5, and between the conditions of hypnosis and hypnosis with regression to age 5, at $P < .05$.

The data for the control group, obtained under the condition of no task-motivation, were statistically equivalent to those obtained from subjects of the same chronological age: 1.74 cm for the Ponzo and 2.39 cm for the Poggendorff. Under the task-motivation instructions, the values of both illusions increased; for the Ponzo illusion the change was opposite to that obtained at younger ages, the mean value being 2.50 cm; for the Poggendorff figure, 3.23 cm.

Our data indicate that age-regression instructions under hypnosis result in magnitudes of illusion that are more typical of younger ages than of the chronological ages of the subjects. The control data, as well as the fact that our subjects had no knowledge of the developmental functions for these illusions, support the position that the subjects were using or failing to use visual cues in a manner appropriate to earlier stages in perceptual development. Whatever processes of perceptual development are responsible for the observed changes in the magnitude of these illusions as functions of chronological age, they are apparently not irreversible. Such results are also of theoretical importance for understanding of the mechanisms of hypnosis; at the same time they provide a methodology for the study of developmental changes in perception.

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References and Notes

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7. Supported by NIH grants HD 00151 and MH 08061.

22 January 1968

Wastes from Fusion Reactors

We wish to prevent a possible serious misinterpretation of a recent report by one of us (*1*). For each 1000 Mw_e of power produced daily by a deuterium-tritium nuclear-fusion reactor, some 3×10^6 curies of tritium will be produced in a surrounding moderator, and a larger quantity will be continually circulated through various parts of the system. It is the intent in such systems to generate excess tritium to compensate unavoidable losses and to provide more fuel in the sense of a "conventional" nuclear breeder. Apparently the report can be interpreted to mean that the entire excess may eventually be vented to the atmosphere—directly, or indirectly when tritiated components are serviced, reprocessed, or otherwise treated. Such release of tritium would be serious, although by no means comparable to an equivalently large release of material from a fission breeder.

In fact no such release of tritium will take place in practice, not only because of considerations of radioactive contamination, but also because the excess tritium is absolutely essential to operation of any deuterium-tritium fusion system. Tritium decays at 6 percent per annum; estimates of the tritium inventory required in a fusion reactor vary markedly at this early stage of the research, but the amount may well be fuel supply for 1 year. This large requirement results from temporary holdup in such things as surcharged structural components and reprocessing time for vacuum-pump material. Thus, with a breeding ratio of 1.15 to 1 (tritium produced : tritium consumed), the postulated inventory implies an excess of 9 percent per annum. The fuel-doubling time will be 8 years; a longer time would be economically uncomfortable.

In addition to these needs, the fusion system must compensate the loss in surcharged system components from which it is not economic to recover the tritium. This "loss" is better described as a permanent holdup; it does not lead to a general contamination problem unless the tritium-containing materials are mishandled. Under any controlled-fusion scheme envisaged, these materials will be disposed of in such a way that no hazard will ensue. The radioactive contamination will be mild compared with that from fission-reactor components; generally the statement that fusion reactors produce little radioactive waste to be discharged to the environment is true. This fact should not imply that there are not large quantities of radioactive tritium to be handled.

The point made in the report that new schemes must be developed for expeditious handling of tritiated materials deserves attention. The amounts of tritium in use will be vastly larger than those to which we are now accustomed, and present methods of controlling tritium, applied during reprocessing of fission-fuel elements (that virtually ignore trace amounts), will certainly not suffice for handling of fusion-system components. Suitable schemes must be (and certainly will be) developed to match the peculiar problems posed by fusion-power systems.

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11 January 1968