



# The role of necessity in cognitive development

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## Abstract

There seem to be two kinds of nonconservers—those who think their response might change on another occasion and those who think their response would *always* be the same. After training in conservation, the former (called nonconservers without necessity) show no detectable gains in conservation, while the latter (called nonconservers with necessity), surprisingly, show significant gains in conservation.

In the present study, nonconservers with necessity were more likely than the nonconservers without necessity to think the classic conservation arguments (e.g., identity, negation, and compensation) were good and correct reasons and that the typical nonconservation reasons were poor and wrong.

In sum, the nonconservers who can support their conclusions with the deductive force of necessity, even though they are wrong in their conclusion, appear to be more developmentally advanced than other nonconservers who do not offer necessity as part of the justification for their nonconservation conclusion.

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It is one thing to know that something is true, but quite another thing to know that it *must* be true, that is *would always be* true, that it *had to be* true, that it *could not be different*, and so forth. Many things are true, but some small subset of them are also *necessarily* true, and the subject of this study is whether knowing that something that is true is also necessarily true confers a developmental advantage on the child and whether such knowledge is itself a sign of cognitive development.

According to Piaget (1971, 1986, 1987), concepts like conservation and transitivity are experienced as logically necessary truths, and such feelings of necessity constitute evidence

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of the underlying cognitive structures postulated in his theories. In other words, the feeling of logical necessity is one of the defining characteristics of *operativity* (Inhelder, Sinclair, & Bovet, 1974; Smith, 1993).

It seems, however, that there are two kinds of nonconservers, some who hold their mistaken view by necessity (*it must weigh more*) and some who do not (*it could sometimes weigh less*). The question naturally arises whether these two kinds of nonconservers differ in other ways that are related to cognitive development. Would, for example, one be easier to teach to conserve than the other?

Murray and Armstrong (1976) found that nearly all conservers feel their conservation judgments are necessary in the sense that they assert that the two quantities in question will always equal each other no matter how many times one is transformed into a different shape, etc. Surprisingly, they also found that about half the nonconservers also saw their judgments as necessary. Thus, it seems that both conservers and some nonconservers may have equivalent levels of logical competence. Similar results were found subsequently with adult conservers and nonconservers (Murray & Armstrong, 1978).

On the face of it, there are two plausible but competing views of the role of necessity in cognitive development. On one view, the nonconserver with necessity should resist any training regime that seeks to convince this nonconserver that, for example, the weight of a flattened clay ball is unchanged because, not only does the child believe that the flattened ball weighs more, but the child also believes that it *must* weigh more, would *always* weigh more, *had to* weigh more, could not weigh less, and so forth. On another view, more closely aligned with Piagetian theory, the nonconserver with necessity has already acquired the underlying and defining attribute of the operativity structure and should be fairly easily convinced that the ball's weight, despite the misleading appearances, must really be constant (or that has to be conserved). There is some evidence to support the latter view that those nonconservers with necessity are more easily and successfully trained to conserve than those without necessity (Murray & Zhang, 2000).

The present study takes up the question of whether there are other developmental correlates of the association of necessity with nonconservation; in particular, whether nonconservers with necessity will be more likely than those without necessity to evaluate correctly some classic operativity reasons (identity, negation, and reciprocity) and some traditional nonconservation reasons (appearance and action).

## 1. Method

Twenty-six first-graders, 23 second-graders, and 22 third-graders from a suburban public elementary school were given a liquid amount conservation task in which an equal amount of liquid from one of two identical glasses was poured into a tall and narrow vase and from the other glass into a short and wide bowl. The children were asked to judge whether the amounts of liquid were still equal, or if they were not, which receptacle had more (or less). Conservers of course, were those who held that the amount was still the same in the vase and in bowl, and the others were nonconservers.

The children were then asked whether they thought the result of the pouring transformation was “*always like that*” (e.g., the vase has more) or was “*just sometimes like that*”. For

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