

# Logical Consistency and the Child: A Critical Examination of Piaget's View\*

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Jean Piaget is a well known developmental cognitive psychologist whose main interest centres around genetic epistemology—the study of the way knowledge is acquired in individuals. It is Piaget's belief that many traditional epistemological problems can be solved by empirical means (Piaget 1965).

Much of Piaget's work deals with the development of logic in children. His own method of investigating children's thought is an interview approach, where the experimenter has a clear idea of the questions he wants to ask but where the direction and form of subsequent questions is determined by the child's answers.

The claim that will be examined in this paper is the contention that young children (below twelve or so) see no necessity for certain logical laws such as the law of non-contradiction on a conceptual level. This claim has been advocated by Piaget (1966) and also by Johnson (1976), following Piaget.

Piaget contends that complex logical modes of thinking are developed from the child's overt activities on macroscopic objects. In infancy the actions are overt sensorimotor behaviours. As the child grows older, the actions become progressively internalized, first at a simple, concrete level and then at more and more complex levels as abstract, systematized thought (Piaget 1974, 65-91).

He argues that our feeling of necessity for logical and mathematical laws exists because it mirrors a prior necessity in reality, 'constructed' by us as children. Initially the child has to master a logic of sensorimotor coordination, i.e., an understanding of the logic of class inclusion and ordering. On this basis the child constructs the structures of logic and mathematics. Piaget argues that, although the child follows the principle of non-contradiction on a behavioural level, he does not follow the law on a conceptual level until around the age of twelve (Piaget 1967). The evidence appealed to is the purported fact uncovered by Piaget that children below the age of about twelve appear to see no necessity for the law of non-contradiction and often contradict themselves. This is related to Piaget's contention that the recognition of the necessity of the laws of formal logic does not occur in the child until certain mental structures are 'constructed', usually in early adolescence.

Johnson (1976, 7) refers to the following passage from Piaget:

... Tu (7½) thinks that boats float 'because they are wood'.—*Why does wood stay on the water?—Because it is light* and the little boats have sails.—And those that have no sails, why do they not sink?—*Because it is light.*—... And how about big boats?—*Because they are heavy.*—Then heavy things stay on top of water?—*No.*—Does a big stone?—*No, it*

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sinks.—and big boats?—They stay because they are heavy.—Is that the only reason?—No.—What else?—Because they have sails.—And when these are taken away?—Then they are less heavy.—And if the sails are put on again?—The same thing happens. *They stay on the water because they are heavy.* [Piaget 1966, p. 242 (italics mine).]

Johnson (1976, 7) believes the fact that children feel no compulsion to be consistent in what they say is just what we would expect of those who do not recognize any necessity for the law of non-contradiction. Johnson anticipates the objection that perhaps the child contradicts himself because he does not really understand what he is being asked and argues that:

... such a stipulation certainly flies in the face of the fact that this child can point out light/heavy objects, floating/sinking objects, and small/large boats without error. Piaget himself considers the possibility that the children do not understand the questions they are being asked as a line of objection against his method, and points out that on the level of conscious formulation the responses the children make show clearly that they do understand. [1976, 8.]

Johnson concludes that:

*The law of non-contradiction is not automatically binding as soon as one has mastered a language*, and therefore, logical necessity is not tied only to the condition of learning a language. The necessity of certain formal operations such as non-contradiction must either derive from something entirely different from language, or from language plus other ingredients. [1976, 3 (italics mine).]

However, *even if* Piaget and Johnson's interpretation of Tu's responses is correct and the child is being inconsistent it does not follow that the child is being irrational. A belief  $q$  will be irrational for a person  $P$  at a time  $t$  if there is a belief  $p$  held by  $P$  at  $t$  which is inconsistent with  $q$ . But it is not necessarily irrational for a person  $P$  to believe both  $q$  and  $p$  at the same time, when  $p$  is inconsistent with  $q$ . This is only irrational if the person realizes that he holds two beliefs that are inconsistent.

There are several points to be made regarding the example chosen by Piaget and Johnson to illustrate the point that children see no necessity for the law of non-contradiction. The child is certainly not saying 'p' and 'not p' at the same time. Piaget's discussion with Tu starts with what Tu has to say about *little wooden boats* (e.g., toy wooden models, etc.). When Piaget shifts to talk about 'big boats', we are led to believe that Tu is being asked a question about *extremely large boats* (perhaps, boats not made of wood), e.g., battleships, aircraft carriers, tugboats, the Queen Mary, etc. But it may be that Tu isn't interpreting Piaget's question in this way at all. For example, Tu may be taking 'big boats' to refer to much larger wooden toy boats. These are heavy compared to smaller-scale toy models and are less heavy when the sails are taken off (if they have any). It appears to this writer that Tu believes that some heavy things float on water while other heavy things (a big stone) do not. So, we need to get clear what Tu takes the reference of 'big boats' to be as well as the reference of 'boats made out of wood'. What Tu does say, given Piaget's report, is the following:

(1) *Boats made out of wood* float because they are light.

(2) *Big boats* float because they are heavy.

Now (1) and (2) are not logically contradictory with each other. One reason is that, on Tu's understanding of Piaget's questions, 'boats made out of wood' and 'big boats' need not be coextensional. Another problem is that it is unclear whether 'light' and 'heavy' are contrasting terms whose meanings are defined in comparison to water, i.e., 'x is light if and only if x's density is less than that of an

equal volume of water' and 'x is heavy if and only if x's density is more than that of an equal volume of water'; or whether 'light' and 'heavy' are to be understood in terms of the *kind of material* that an object is composed of. It's conceivable that *both* interpretations (or some other) are operative in this case. Furthermore, water is a difficult medium to think about and there is much about it that ought to be confusing for an inquisitive mind. Although many light objects like wood float, many heavy objects like boats float also. The difficulty is further compounded by the fact that the same object may behave differently with only a slight variation in conditions. For example, the human body can both sink and float in water. The dialogue is not probing enough to determine what the child understands by the terms he uses. It would have been more useful if the child was asked more questions about boats in general: for example, What about the Queen Mary? speed boats? row boats? and so on.

Piaget (1966, 242) explains Tu's behaviour as follows:

In the first case (light floating boats) the water is thought of as strong and supporting the boat, in the second case (heavy floating boats) the boat is thought of as strong and supporting itself. But as a matter of fact, the child is not aware of this opposition. He is subject to contradiction because he is unable to resolve this condensation of heterogeneous explanations.

It seems to this writer that Tu is giving two different explanations in the case of light and heavy boats but that Tu is not being inconsistent. That is, Tu is giving two explanations, each for a different domain of objects. When Piaget asks 'Why does wood stay on the water?' the child replies, 'Because it is light and the little boats have sails'. One is not sure here whether the child interprets the question to be 'Why does *any* piece of wood stay on the water?', or, 'Why do wooden boats stay on the water?' In addition, the phrase '. . . the little boats have sails' may not be offered as part of an explanation; rather, the child may be throwing in extraneous information about the little boats he has seen. I agree with Piaget that the child explains the fact that light boats float because water supports them. Sails on little boats have no causal role with regard to floating. On the other hand, with regard to why heavier boats float, Tu gives a different, more complex explanation. He does not consider just being heavy causally sufficient for floating since he denies that being heavy is the only reason. From the dialogue it seems that sails play a crucial role in whether or not big boats float. However, notice that when Piaget asks the child what happens when sails are taken away from big boats the child is aware that the boats don't sink. This is a crucial move. The child seems to believe that once the sails are taken away the boat becomes 'less heavy' (light) and then the explanation for light boats becomes relevant. When Piaget asks him what will happen if the sails are put on the big boat again Tu says, 'The same thing happens. They stay on the water because they are heavy'. Now the boat is heavy again and the sails play a causal role in whether the boat floats. The child is mistaken, of course, when he believes that heavy boats float when they have self-supporting structures (sails), and the inference from 'heavy' to 'less heavy' (light) when the sails are taken off may not be justified but being mistaken in explanation doesn't imply that one is being contradictory.

Piaget and Johnson also underestimate the importance of adhering to the law of non-contradiction in everyday discourse. What would it be like for there to be a language in which this law did not hold? In such a language, it would be possible for it to be the case that a proposition expresses the thought which is both *A* and *not A*. But this is impossible, since such a thought would be no thought. In other words, the law of non-contradiction simply states that if a

thought is expressed in words, what is expressed is *not* not itself. This is simply a necessary condition for expressing thought at all. That is, we could not distinguish what was expressed from what was not expressed, since what was expressed cannot be distinguished from its negation. When one speaks a language, or expresses a thought, in order to say something significant and informative, what one is saying must be distinguished from what one is not saying. This is a simple logical fact that underlies the possibility of thought expression itself.

In conclusion, the view espoused by Piaget and Johnson that children below the age of twelve see no necessity for the logical law of non-contradiction is problematic. First of all, Piaget's dialogues with children that are considered supportive of this position are not clearly so. Secondly, Piaget and Johnson underestimate the necessary nature of following the logical law of non-contradiction in everyday discourse. The mere possibility of saying something significant and informative at all presupposes that the law of non-contradiction is enforced.

#### REFERENCES

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