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COGNITIVE DEVELOPMENT, INTEGRATIVE COMPLEXITY, AND LOGICAL CONSISTENCY OF PERSONAL CONSTRUCTS

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The integrative complexity and logical consistency of personal constructs were examined in groups of children with mean ages of 8.5, 13.1, and 16.1 years. Consistent with Piaget's theory, the 13- and 16-year-olds were similar and demonstrated greater integrative complexity and logical consistency than the 8-year-olds did. Our results support the predicted relationships among formal operations, integrative complexity, and logical consistency.

Keywords: personal constructs, cognitive development, logical consistency, integrative complexity, children.

In personal construct theory (Kelly, 1955), it is assumed that personality is determined by the person's constructs. Kelly's (1955) constructivist approach has occasionally been compared with Piaget's theory of child development (Adams-Webber, 1979; Bannister & Agnew, 1976); however, few scholars have empirically connected the two theories. Thus, in this study we empirically examined the relationship between cognitive development and two measures of construct system organization.

Chambers (1985a) recently proposed a measure of Piaget's (Flavell, 1963) notion of lattice structures, in which participants rank a set of variables according to their general similarity to one another, producing a coordinate grid that reflects the participant's perceived relationships between the variables. People employ different strategies in making these comparisons; for example, centrating on one feature of comparison tends

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to result in anchoring all judgements along one dimension. Such a person does not consider the many types of comparisons that are logically possible, for example by reducing another person to a stereotype and refusing to see anything but unusual, negative features. In this case, the stereotyped person is seen as consistently least like all the other people listed on the grid. Without a strategy of elaboration causing the participant to consider the many personality features that are logically possible, the perception remains fixated on negative features. From a construct theory perspective, this cognitive rigidity leads to a rigid personality and to failure to appreciate all the possibilities for alternative constructions.

There is a developmental component to the rigidity of constructions, with Flavell (1963) pointing out that "unlike the 7–11-year-old, the adolescent possesses a technique for generating all the possible combinations of…associations" (p. 213) that exist in a set of variables. Lattice structures are described as logical networks that allow adolescents to perform a combinatorial analysis—that is, to assess all of the logical possibilities implicit in a group of variables. Chambers (1985a) proposed that lattice structures could be measured by comparing the coordinate grid with its transpose. To the extent that the rows and corresponding columns are identical, the participant implicitly uses a counterbalanced strategy of elaboration of variables that meets the conditions Kirk (1982) describes as a *self-conjugate Latin square*. In such counterbalanced patterns, the rows equal their corresponding columns, such that every combination of variables is expressed without repeating any association in any row or column. This kind of systematic, as opposed to random, elaboration allows statisticians or adolescents to examine all nonredundant combinations in a set of variables. Chambers (1985a) referred to this systematic yet elaborate construction as *integrative complexity* and saw a direct parallel between lattice structures and systematically counterbalanced construction.

The link between integrative complexity and cognitive development has been supported by findings that integratively complex adults use developmentally advanced construction (Chambers, 1985a, 1985b) and demonstrate flexibility, open-mindedness (Chambers, 1983, 1985b), and credulity (Chambers, 1985c). These characteristics accompany the use of lattice structures and seem to characterize the adolescent struggle for ideals, even if these ideals are frequently naive. The integrative complexity measure has not, however, previously been used to assess the construction of children or adolescents. Given Piaget's observation of an increased use of combinatorial analysis with the advent of formal operations, it is predicted that older children (i.e., those aged around 12 years, who have reached the stage of formal operations) will be more integratively complex than those who have not reached the age of formal operations (Flavell, 1963). Support for this prediction could help to clarify the role of cognitive development in personal construct elaboration.

An additional issue addressed by construct theory and Piaget's theory is the importance of logical consistency. Flavell (1963) suggested that Piaget's theory is, in many respects, focused on the development of logical construction. When a child progresses to formal operations, s/he is able to think logically about abstractions, whereas before that time, the child's concretisms tend to precipitate contradictions. Piaget frequently illustrated this in interviews where he assessed young children's understanding of abstractions based on concrete forms, such as the conservation of quantity in clay. Although Piaget's theory does tell us a great deal about the logical consistency of perceptions of abstractions anchored in concrete forms, the theory is less easily applied to abstractions such as person perception. Personal construct theory, however, with its emphasis on grid techniques, is designed to handle such abstractions. Thus, drawing a parallel between Piaget's theory of cognitive development and construct theory methods of assessment, could extend both approaches.

Chambers (1983) developed a measure of logical consistency using the same coordinate grid method used to derive the integrative complexity measure. The measure has been shown to reflect inconsistencies produced by having participants consciously create grids containing contradictions arising from distortions of truth (Chambers & Stonerock, 1985). Logical inconsistency has been found to correlate with the following personality measures indicative of conflict: frustration, conflict, tension (Chambers, 1983), alcoholism (Chambers & Sanders, 1984), indecisiveness (Chambers, 1984a), neuroticism, anxiety, guilt, and threat (Chambers & Epting, 1985). These studies have been focused largely on the ill consequences of encountering one's own inconsistencies. However, the emotional struggles of adolescence may actually suggest an upswing in the recognition of contradictions and consequent conflicts. Inhelder and Piaget (1958) have shown that the contradictions that characterize preoperational construction pass with their recognition, so that confusion is soon followed by a more logical understanding. However dramatic the confusions and conflicts of adolescence, the rise of consciousness does lead to greater logical consistency. Therefore, we predicted that adolescents (i.e., those who have reached the ages of formal operations) will be more logically consistent compared to younger individuals.

Method

Participants were 75 students in third, eighth, and eleventh grades (M_{ages} = 8.5, 13.1, and 16.1 years, respectively), each of whom completed a coordinate grid (Chambers, 1983, 1985e) to rank a set of people (self, mother, father, girl you like, boy you like, a girl you dislike, and a boy you dislike) according to their general similarity to one another. Because of time constraints imposed by some of the schools, the eighth- and eleventh-grade children were tested in groups. Sheets of paper with seven sections were presented to the participants. Each section included the seven people meeting the above characteristics, with one person (referred to as the target) listed above each section. The people in each section were ranked in relation to the section's target person, with the assumption that the target persons were most like themselves.

The third graders were not expected to understand the rather complex administration procedure described above; therefore, we administered the grid to each of them individually. Cards with drawings of people and the names of people meeting the above characteristics were shown to each child. The children associated the various people with each card and care was taken to ensure that the child always remembered which cards represented which people. The cards were then randomly placed on a table before the participant, with the target placed to the side. The child was asked to look at each card carefully and decide which person was most similar to the person set aside. This card was then removed and the child chose the next most similar, and so on.

Integrative complexity was measured by subtracting each grid from its transpose and summing the absolute values of the differences. Logical inconsistency was measured by the analysis described by Chambers (1985e). Spearman correlations between the participant's rows of ranks—referred to as *explicit ranks*—were derived. These correlations were then ranked across the rows of the correlation matrix, to form *implicit ranks*. Inconsistencies occur when the explicit and implicit ranks differ. The general measure of inconsistency was derived by finding the sum of the absolute differences between the implicit and explicit ranks. This analysis was repeated for each participant.

Results

The integrative complexity means and standard deviations were as follows: $M_{\text{third grade}} = 62.28$, $SD = 10.83$, $M_{\text{eighth grade}} = 51.44$, $SD = 9.44$, $M_{\text{eleventh grade}} = 49.68$, $SD = 9.14$. Analysis of variance incorporating Duncan's multiple range test showed that the third graders' mean was significantly higher than those for the eight and eleventh graders, $F(2, 72) = 18.88$, $p < .0001$. The latter two groups did not differ significantly.

The logical consistency means and standard deviations were as follows: $M_{\text{third grade}} = 34.92$ $SD = 11.13$, $M_{\text{eighth grade}} = 25.52$, $SD = 9.25$, $M_{\text{eleventh grade}} = 23.76$, $SD = 10.70$. Analysis of variance incorporating the Duncan procedure showed that third graders were significantly more inconsistent compared to the older children, $F(2, 72) = 8.32$, $p < .001$. Eighth and eleventh graders did not differ in consistency.

Discussion

Our results are consistent with the prediction that children who have not yet reached the age of formal operations would be less integratively complex and less logical than older children. To the best of our knowledge, we are the first to make an explicit empirical link between construct theory and Piaget's theory, using children as participants. Provided these results are meaningful, we encourage further research on person perception from a developmental orientation. The coordinate grid has been used in numerous studies of adults, and a direct link between these studies and Piaget's theory has the potential to integrate theoretical and experimental literature in construct theory and developmental psychology. The objectivity and relative ease of administration of the grid procedure make it potentially very valuable to psychologists.

The following study limitations should be acknowledged: Third-grade children were assumed to be too young to understand the group instructions given to the older participants. However, the older children could not be spared for long enough to be tested individually. Our compromise of testing younger children individually and older children in groups, may have introduced a confounding variable; consequently, the results should be interpreted with care. It is likely that the younger children were actually given a better chance of succeeding on the tasks because the experimenter continuously checked to make sure the third graders understood the task, which was not possible with the older children. Future researchers should seek to avoid such potential problems. Additional studies in which the coordinate grid is used really have few limitations on the subject matter for construction. In this study, we addressed person perception, whereas others could address any number of factors, such as games, feelings, philosophical beliefs, and actions. If further empirical links can be forged, construct theory and Piagetian theory are likely to benefit from one another for years to come.

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