Mind, Culture, and Activity, 16: 234–262, 2009

ISSN 1074-9039 print / 1532-7884 online
DOI: 10.1080/10749030802596306

Routledge
Taylor & Francis Group

Wolves in Sheep's Clothing and Other Vygotskian Constructs

Paula M. Towsey and Carol A. Macdonald
University of the Witwatersrand, South Africa

In 2007 a South African study examined new concept formation from early childhood to adulthood ($N = 60$, 3 to 76 years old) using the Vygotsky/Sakharov Blocks procedure (also known as the functional method of double stimulation for the study of concept formation) to establish whether contemporary adults and children produced the same or similar patterns as those described by Lev Vygotsky. The study found correspondence with the processes of concept formation identified by Vygotsky and his colleagues in the 1920s and 1930s. A developmental trend consistent with Vygotsky's writings on the ontogenesis of concept formation was reflected in a positive correlation between the age of the participants and their modes of thinking. The greatest increase in this developmental trend occurred between the 11-year-old and 15-year-old participants: This finding verified Vygotsky's assertion that true conceptual thinking only becomes possible in adolescence. The functional equivalence of pseudoconcepts in role and structure led Vygotsky to call them wolves in sheep's clothing, and it would appear that many a shepherd of today is unsuspecting of such lupine behaviour. Findings on pseudoconcepts are presented in detail and illustrated with photographs depicting selected elements from the study's microgenetic analyses of these elusive yet important Vygotskian constructs.

Vygotsky (1986) wrote that the pseudoconcept deserves close scrutiny because pseudoconceptual thinking is a dominant factor in a child's "real-life" ways of thinking, and because it is an important transitional link between thinking in complexes and true conceptual thought. The functional equivalence in the *structure* and the functional equivalence in the *role* of the pseudoconcept enable communication between children and adults, and it is this equivalence that disguises the pseudoconcept's true nature. Because of this frequently overlooked similarity, Vygotsky (1934) referred to these complexes in disguise as "wolves in sheep's clothing" (p. 1074).

In South Africa in 2007, a cross-sectional study (from early childhood to adulthood) examined new concept formation to find out whether contemporary children and adults produce the same or similar patterns as those described by Vygotsky. It aimed to draw renewed attention to the strategies that human beings employ in the formation of new concepts as first described by Vygotsky in Leningrad in January 1930 and elaborated on elsewhere in his works. This replication

Correspondence should be sent to Paula M. Towsey, University of the Witwatersrand, PostNet Suite 231, Private Bag X51, Bryanston, 2021 Gauteng, South Africa. E-mail: paulat@johnwtowsey.co.za

of the original Vygotsky's Blocks study used the method of double stimulation for the study of concept formation that was developed by Vygotsky and Sakharov circa 1928. The procedure used the 22 wooden blocks of Hanfmann and Kasanin (1942) and a combination of their scoring and methodological techniques, which had been translated and adapted by them from the work of Vygotsky and Sakharov.

Vygotsky presented his descriptions of the types of preconceptual thinking that he and his colleagues found by using this instrument—the Vygotsky/Sakharov Blocks—in three major categories: syncretic representations, complexes, and potential concepts.

Syncretic thinking is arbitrary and subjective, almost solipsistic, where the bonds established between things was most aptly described at the time as incoherent coherence. However, thinking in complexes establishes bonds between things based on real concrete attributes, but where this assignment is yet to become consistently applied, and where there is a "confusion between functional and essential characteristics" (Vygotsky, 1986, p. 268, note 7): complexitive thinking is the arena for learning how to generalise. The thinking involved in establishing potential concepts is in learning how to abstract certain characteristics and not to lose sight of these once they have been abstracted. Hand in hand, potential concepts—involving abstractions—and complexes of functional equivalence to concepts—involving generalisations—develop toward building a system that becomes increasingly logical and abstract, one that grows out of its postsyncretic, concrete, and factual roots.

The various stages which complex formations pass through, as found in the blocks studies of Vygotsky and his colleagues, commence with associations. These associative, one-to-one connections are based on a fluid notion of "same": Now, it could be colour, now shape, and now colour once again. These connections are usually made back to the sample block, which is turned over to reveal its name at the beginning of the task. Associative connections are sometimes used in conjunction with the next type of complex, that of collections, which employ the notion of grouping things together because they are different and therefore complementary: This one is a circle and it has a square with it because the square is different; here, red ones are in the middle, and different colours are on the outside. The next level of complex is the chain, where early abstraction abilities open up more possibilities for things to be grouped together, but where the decisive attribute keeps moving from one connection to the next because it is yet to be logically and consistently applied. Chains establish the groundwork for diffuse complexes, where, in becoming increasingly adept at abstracting and generalising, more and more sophisticated attributes can be advanced as possible links or reasons for blocks to be grouped together.

And then there is the pseudoconcept, the last of the complexes, which operates as a bridge, a connecting link, between thinking in complexes and the final stage before true conceptual thinking becomes possible. Because of the way the pseudoconcept functions and the way it is structured, and because of what it makes possible between developing children and their culturally structured environments, and because of the implications it has for the construction of human consciousness, the pseudoconcept will be discussed in more detail than the other preconceptual constructs advanced by Vygotsky.

This type of complex was labelled a pseudoconcept by Vygotsky because it very closely resembles a true concept, and because it is frequently difficult to distinguish between the two. Pseudoconcepts have a phenotypical resemblance to true concepts because the content of both can be identical: However, the crucial difference is to be found in the method of selecting these contents. In pseudoconceptual thinking, the method of selection consists in establishing or creating

complexitive links, that is, links that are concrete and factual. In true conceptual thinking, by contrast, the method of selection consists in establishing or creating abstracted links and generalisations which go beyond the immediacy of the perceptually obvious, that is, links based on abstracted and generalised qualities.

So, the participant who selects all the circles would seem to be doing so because she has a conceptual grasp of circles as geometric shapes. But not necessarily because the preadolescent participant is more likely to be making merely an associative link based on the perceptually immediate and obvious attributes, on a "concrete, visible likeness" that is "limited to a certain kind of perceptual bond" (p. 119). What Vygotsky is implying is that real concepts depend on particular kinds of characteristics or features that are abstract, abstracted, and system-related. This would result in meanings that children attach to words, and those of adults, being at different levels: "concrete features versus abstract definitions" (Van der Veer & Valsiner, 1991, p. 265). The example of a child assigning concrete actions to abstract concepts illustrates this most clearly: "'*Reasonable* means when I am hot and don't stand in a draft'" (Vygotsky, 1986, p. 138).

In this respect, in learning to acquire the meaning that adults have put to socially and culturally constructed language, it is the coincidences of functional understanding (correct contextual usage) that encourage children to develop and elaborate on their "shadow" concepts (p. 122). These functional moments of understanding are crucial to enabling sounds to carry meaning, to enabling concepts to evolve.

Pseudoconcepts act as links, then, between thinking in complexes and thinking in concepts in a double-barrelled fashion because of the nature of predetermined meanings and because the use of pseudoconceptual generalisation is endorsed in coincidences of mutual understanding with adults. Together, these allow a child to participate in the language of the adults around her long before she is fully aware of the implications of the concepts she is using. This fortuitous set of events also contains "the germinating seed of a concept" (p. 123), which results in the transition to true conceptual thinking not being noticed by the child because she begins to operate with word meanings and to practise conceptual thinking long before she is clear about what these true operations actually are. It is in this respect that Vygotsky notes that the genetic preconditions of the "concept-for-myself" are already present in the pseudoconcept in the form of the "concept-in-itself" and the "concept-for-others", because these occur earlier in the child than the "concept-for-myself": he further asserts that this sequence is not restricted to conceptual development because it occurs as a "rule rather than the exception in the intellectual development of the child" (p. 124).

The implications of this sequence are of fundamental import to interpretations of what constitutes the human self and how human consciousness is constructed. Children develop conceptual types of reasoning out of the material they are dealing with, because it is inherently conceptual for others, and because phenotypically similar operations are endorsed by adults. Only later is awareness of one's own cognitive actions achieved, and this because of the nature and sequence of the preceding events. In this way, a child's reasoning "is constructed from the 'outside' through the necessary coincidence in the child's and the adult's representations. Human consciousness thus appears as a social construction" (Kozulin, 1990, pp. 216–217).

The classic litmus test of the kind of causal-dynamic relationships that form pseudoconcepts occurs when the name of the first upturned block is revealed. These causal dynamics are different to the types of relationships that give rise to true concepts: the logic of pseudoconceptual links tends to be fluid, changeable, and without hierarchy. This logic can tolerate—or indeed, be totally unconcerned about—contradictions. The vital point is that the participant appears to

be guided by conceptual thinking, but her reaction to correction "is one of the critical points of the experiment" (Vygotsky, 1986, p. 267, note 6). When faced with an upturned block of a different name, the participant who then says, "Oh, so it is not colour (or shape, etc)" will remove all of the blocks they had selected as possible candidates (or will give some indication that an alternative hypothesis is needed). The pseudoconceptual participant will remove only the upturned block with the different name but not the remaining blocks. When asked if she still thinks those belong together as *mur* blocks, the participant will say yes because they all have the same colour (or shape or whatever), even though she is faced with an upturned block of a different name which flatly contradicts her approach, be it shape, or colour, or a whole host of combinations.

Then, last but not least in Vygotsky's discussion comprising three categories of preconceptual thinking are potential concepts, which, "like pseudoconcepts, are only precursors of true concepts" (p. 137). Primitive forms of abstracting or singling out attributes can be merely learned habits or later forms which are fluid, vague impressions of similarity centred on a bundle or group of other perceived traits. The trick is to abstract, to single out, and then to hold onto the abstracted characteristic, to give it hierarchical prominence. What is needed for concrete and factual reasoning to develop into logical and abstract reasoning is the developing partnership of the ability to generalise and to abstract systematically, to make consistent use of these cognitive functions that have grown out of the earlier prototype versions of these abilities.

METHOD

This cross-sectional study involved 60 people from the Johannesburg area, ranging in age from the youngest who turned 3 the day after her session to a 76-year-old grandfather (ten 3-, 5-, 8-, 11-, and 15-year-old participants, and ten adults aged 24 to 76). To enable thorough microgenetic analysis, each response was recorded with a statically positioned DVD video camera (a most useful tool) and was supported by the researcher's observations and those of two assistants (one per session).

The participants were presented with a set of blocks from Stoelting Co. (Chicago, Illinois), the first company outside of the Soviet Union to manufacture these blocks at the request of Jacob Kasanin, circa 1937. These blocks are of the diameters and heights described by Hanfmann and Kasanin, with the difference being that the red blocks are orange and that Stoelting Co. no longer uses a board. Measurements were taken from Hanfmann and Kasanin's photograph and a board was made as closely as possible to the original as can be obtained from these measurements, and a foam template was made to ensure that each participant was presented with the same configuration of blocks.

The practical aspects of conducting research with the functional method of double stimulation in the study of new concept formation, as used in this study, could be defined as incorporating three central elements: the material, the script, and the scoring method used. The material comprised 22 wooden blocks of five colours (orange, blue, white, yellow, and green); six geometric shapes (isosceles triangles, squares, circles, hexagons, semicircles, and trapezoids); two heights; two sizes (diameters); and with the labels *cev*, *bik*, *mur*, and *lag* written underneath them (*lag* and *mur* having 5 blocks each, and *cev* and *bik* having 6). Two sets of scripts were used. For adolescents and adults, the procedure was introduced as a problem-solving activity with no time limit, and no right or wrong ways of solving it. Younger participants were invited to play a game

belonging to children from a foreign country (perhaps near the North Pole): The blocks had funny names that meant something in this foreign language. All participants were asked to talk aloud as they went and were told that they needed to sort the blocks into four groups, one to each quadrant, starting with triangular *mur* as the first example of the funny names.

Qualitative data and three sets of quantitative data were obtained in the study, based on the scoring of Hanfmann and Kasanin and an approach which adapted it for cross-sectional use and which included an element of transference.

Qualitative data were obtained by observing and recording participants' interpretation of the task, the types of reasoning processes that participants talked about during the procedure, and their reactions to the implications of wrongly placed blocks.

Quantitative data were obtained by adapting Hanfmann and Kasanin's approach to scoring the three areas above at between 0 and 12 points each for a maximum of 36 points[1] and a separate score of 16 points for the transference exercise. Supplementary scores were obtained by timing the sessions, that is, from the commencement of the first instructions to the participant either until the participant had solved the problem of the blocks or until it became evident that their concentration spans had reached their limit: Timing scores were added to the number of both correctly (3 points) and incorrectly (5 points) turned over blocks.

In the studies consulted it appeared that the element of transference was used only in studies with children. Yet Vygotsky's texts carry an insistent message about using the newly acquired concepts as part and parcel of the procedure itself: Participants are asked to apply *cev*, *bik*, *mur*, and *lag* to objects other than the blocks and to define what each of the words means. The transference exercise in the South African study comprised a set of four glasses and then four candles: 8 points were allotted for two descriptions per group of what the blocks have in common, 4 points for correct transference to all four glasses, and 4 points for transference to all four candles (see Figures 1 and 2).

RESULTS AND DISCUSSION

In this section, examples and a discussion of pseudoconceptual reasoning in particular are presented, followed by the major overall findings of the study, including the transference exercise.

Setting the Scene

There appear to be several potentially perplexing descriptions in Vygotsky's writings on pseudoconcepts. These differing descriptions presented a not inconsiderable challenge before

[1]Based on scoring developed for this research, the range of scores from 4, 6, 8, 10, and 12 in the 1942 model was maintained. It further worked on the theoretical assumption that if half of the participants in a given age group scored in the top range and half of them in the bottom range, a figure would be arrived at which would provide a yardstick for measurement for each of the six groups in this cross-sectional study. The percentage difference between scoring in this way and the original scoring method of Hanfmann and Kasanin (1942) yielded +1.67% for the 3- and 5-year-old participants, –5.83% for the 8-year-olds, –2.5% for the 11-year-olds, and +1.67% for the adolescent and adult participants (based on 10 participants per group). These attempts did not result in percentage differences that deviated too greatly from the standard Hanfmann and Kasanin method and yet provided the additional—and sought-after—benefit of providing differentiated scores indicative of the types of intellectual modes that Vygotsky (1986) wrote of.

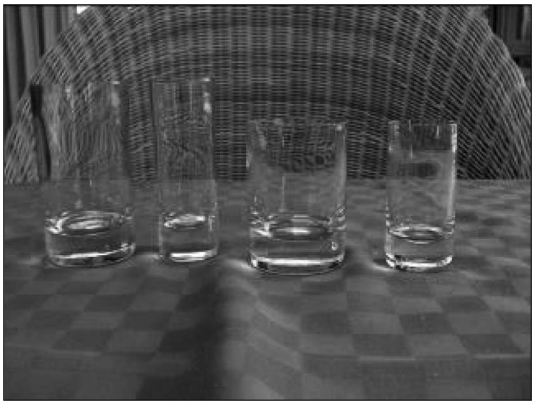

FIGURE 1 The set of four glasses used in this study.

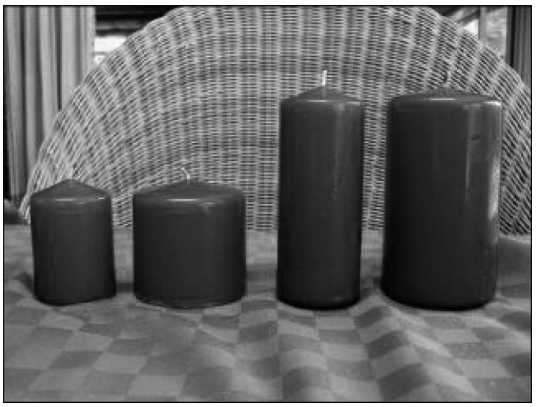

FIGURE 2 The set of four candles used in this study.

the study commenced, and for some time after it had begun, until the guises that these lupine members of the pack hide behind became more easily apparent. In a nutshell, Vygotsky (1986) maintained that, on one hand, the pseudoconcept is the last of the complexes which completes the "picture of complex thinking" and acts as a bridge to the "final, highest stage in the development of concept formation" (pp. 118–119), and, on the other, that the complexes which children from an early age build around words "are nothing but pseudoconcepts" (p. 120). These two sets of descriptions appear to indicate, then, that pseudoconcepts emerge as children learn language from early on but also that pseudoconcepts are the most sophisticated form of complexive reasoning which will appear along with mastery of potential concepts, prior to the advent of true conceptual thinking.

Yet the participants in this cross-sectional study did provide examples of both of these closely linked instances: The first, in relation to learning word meanings throughout childhood (as evidenced by the 3-year-olds in particular), and the second (as evidenced by the older preadolescent participants), in relation to what could be termed developing a system in meaning making,

and which some scholars characterise as the participant's ability to use external auxiliary means to solve a problem (or form a concept) within the field of the method of dual stimulation. What has been noted of Vygotsky's concept formation studies was the proof they found regarding different forms of meaning making by children, adolescents, and adults: The different forms of meaning making that these concept formation studies found indicates the beginning of a long process of semantic development in children that, until it reaches its culmination, will be connected by coincidences of meaning when referring to the same objects. These particular explanations, when juxtaposed with the findings on the emergence of pseudoconcepts in this study, seem to point to a developmental trend that influences one's success at using auxiliary means to create meaning, and, because there is a long process of semantic development in children, that pseudoconceptual thinking could be revealed at all levels leading up to true conceptual thinking. In this way, then, a more satisfactory interpretation can be achieved between Vygotsky's apparently perplexing descriptions of pseudoconcepts and the responses of participants in this study, which could then be linked back to his discussion of the linguistic milieu.

Of the linguistic milieu, Vygotsky asserted that pseudoconceptual thinking dominates the thinking modes of preschool and school-aged children because in their day-to-day experience the complexes they use correspond with the meanings of words that are not spontaneously developed by the children—words have (preordained and differently formed) meanings in the language of the adults, and children grow into this culturally established, verbally enriched world. And the specific language around children, with its relative stability and predetermined sets of meaning, affects the direction and nature that children's generalisations will take. Vygotsky also explained that "the child's thinking proceeds along this preordained path in the manner characteristic of the child's own stage of intellectual development" (p. 120).

This somewhat intricate discussion contributes to a more consistent theoretical setting for the presentation of this study's findings of pseudoconcepts and pseudoconceptual reasoning, in that these were found in syncretic responses, in associative ones, in collections, chains, diffuse complexes, and as pseudoconcepts "proper." What each of these instances was found to share, to varying degrees of complexity, was a tendency to link concrete, factual, and functional attributes rather than logical, abstract(ed), essential characteristics or principles; an insensitivity to inconsistencies and contradictions; and the lack of a system to compare or juxtapose one's actions against.

Meeting the Pack: Wolves Large and Small

The words *cev*, *bik*, *mur*, and *lag* did not serve to organise the activity of the 3-year-olds in this study: The instructions were ignored in favour of creating syncretic heaps, chainlike syncretic heaps, and towers instead. The House of the Big Bad Wolf appeared, and rainbows, and Daddy blocks, Mummy blocks, and Baby blocks, and "lello" ones, and round ones that roll off the table (again and again). As these children experienced some difficulty using words for shapes and colours consistently, perhaps it is not surprising that foreign words simply demanded too much of them.

What became evident in this study, starting with the 3-year-olds, is that a pseudoconcept is not an incorrect concept, or an incomplete concept, although it can in part be both of these things. It can be incorrect or incomplete because the initial notion or attribution of meaning is unstable: the links or connections between things, or leading back toward a particular word, are

unstable and fluid. Also, these links often battled to obtain hierarchical prominence, particularly when first steps were made in abstracting certain characteristics, but also in cases where the presence of other perceptual characteristics interfered with focusing. Pseudoconceptual reasoning in these young participants also arose when they shifted their attention, for example, from shape to colour, when required to follow instructions.

In Figure 3, the orange circle is being removed from the two blue circles because "it's not the same."

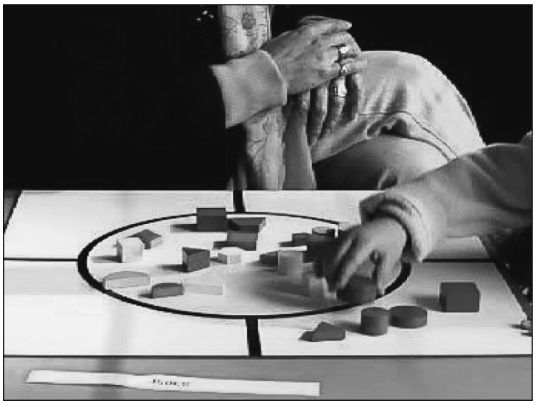

FIGURE 3 (S305F) Pseudoconceptual reasoning within a syncretic representation.

In Figure 4, three blocks are the same because they are yellow and two new ones ("Find blocks that are a *different* colour") are "different colours."

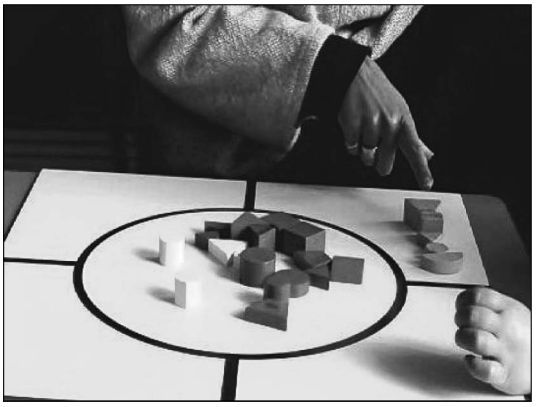

FIGURE 4 (S307M) Pseudoconceptual reasoning within a syncretic representation.

In Figure 5, four orange blocks are the same because they are the same colour, but not the orange *cev* trapezoid (slightly hidden, middle) because it is "not the same." No explanations were forthcoming.

FIGURE 5 (S305F) Pseudoconceptual reasoning within a syncretic representation.

The Participant in Figure 6 was insisting that the two *cev* blocks (middle) are small circles, whereas the *lag* circle, the *bik* circle (behind it) and the two stacked white blocks (a *mur* circle and a *mur* hexagon) are big circles.

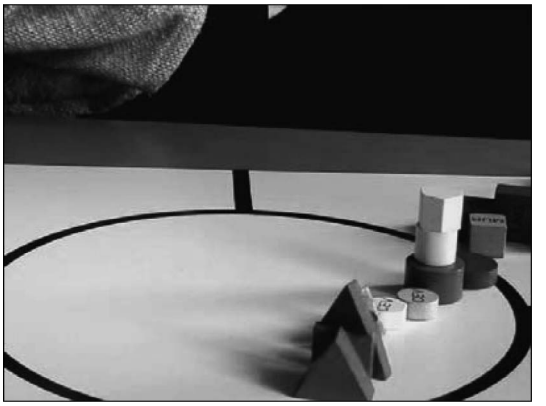

FIGURE 6 (S309F) Pseudoconceptual reasoning within a syncretic representation.

Fifteen minutes into her session, the participant was asked to find all the big blocks and all the little ones (see Figure 7a). The blocks were then put back into the middle of the board and mixed up really well and she was asked to find all the really big blocks and all the really tiny, little blocks: She repeated the sorting in exactly the same way she had before, down to the last block, and insisted (pointing) that these were the little, tiny blocks, and "those [top left] are all the big ones." (see Figure 7b).

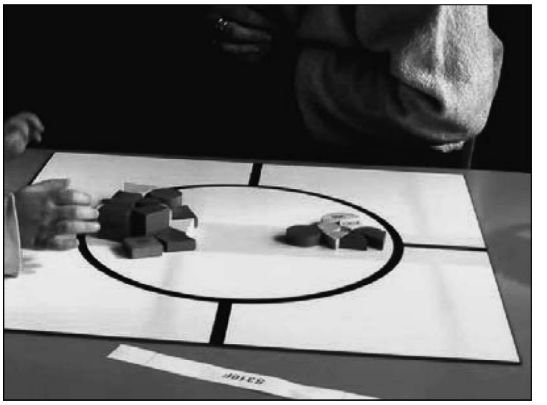

FIGURE 7a (S310F) Pseudoconceptual reasoning within a syncretic representation.

FIGURE 7b (S310F).

It was rather difficult preventing the 5-year-old participants, who were generally far less spontaneous than the 3-year-olds, from simply turning the blocks over: Their responses, when they didn't, ranged from syncretic responses; to matched pairs, associations, and collections; to one participant who noted size almost immediately and sorted the blocks accordingly in a surprisingly consistent manner.

When starting, 6 participants selected a block similar in shape and 4 selected a block of the same colour. However, because half the participants immediately turned the selected block over, these participants, who said "I can't read," had been sufficiently exposed to lettering to see that the word underneath the new block was different to *mur*. This created a conflict which interrupted the initial link to the sample block. Subsequently, 7 participants simply turned over more blocks or resorted to trial-and-error guessing or more random placements.

With the exception of the participant who made up his own game with the blocks, and another who paid no attention to the names at all, none of the remaining eight 5-year-olds would have been able to complete the game without continuous prompting. What Hanfmann and Kasanin referred to

as the totality was not an aspect that came into consideration when these 5-year-olds were faced with the problem of the blocks, not only because they needed prompting to continue but because it seems they were unable to embrace the requirements of the task as a whole. Most of the explanations these participants offered for their moves were post hoc descriptions of the blocks which faced them following mainly one-to-one connections (pairs and associations) and seemingly random movements when the basis for these was exhausted: It is also possible that these seemingly random movements were guided by some underlying intuitive response to the physical characteristics of the blocks.

This participant would not include the orange *cev* trapezoid in the orange group because it was "different." No reason was forthcoming (see Figure 8).

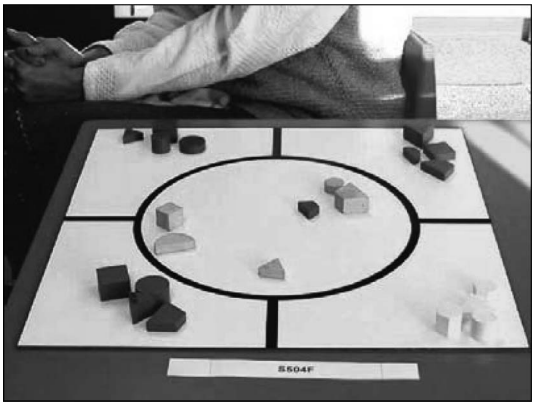

FIGURE 8 (S504F) Pseudoconceptual reasoning within an associative complex.

When reminded that four groups were required, this participant's solution was that the outer blocks (curved in front of her) were "a earth" with the colours of the earth all in a row. When asked about the blocks in the middle, she said that they were "a desert." (see Figure 9).

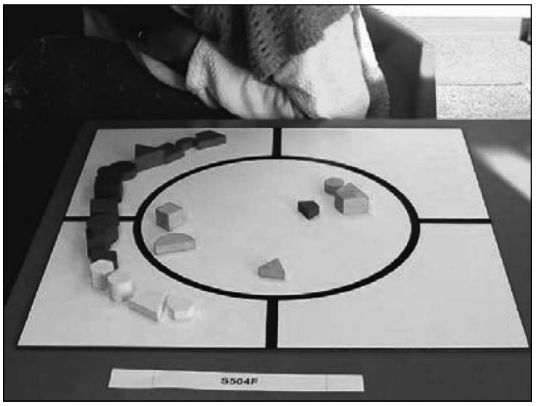

FIGURE 9 (S504F) Pseudoconceptual reasoning within a syncretic representation (immediately following the photograph above).

The 5-year-olds discussed next offered post hoc descriptions of the blocks they had grouped by association and collection. They were not bothered by contradictions or inconsistencies in these post hoc explanations because they simply shifted their logic fluidly from descriptions of colour, for example, to those of any other attribute. Their reactions were somewhat akin to having flexible morals, in that when someone picks you out about one aspect of your testimony, you simply switch your emphasis to another aspect without any regard for the implications to your conscience.

The moments of correction to this collection (Figure 10) were revealed by an orange *lag*, a white *cev*, and a green *bik* (in the corners, names revealed), which this participant reasoned as meaning, ". . .just one name for the same colour . . . like all the other names aren't the same colour. . . . So, all the names are actually the colours and [pause] there aren't any colours [left] in the middle."

When asked about the newly turned blue *bik* that flatly contradicted this observation, he said, ". . . [the] same names can go in the—what—the places the one's called [i.e., the *bik* corner]" (which he placed at top left), demonstrating a fluid move in association from colours as names to the area or place as names. Further fluid logic reasoned that "What I'm doing . . . I'm turning over the one and if it's the same then I put it next to them [of the same label]".

And "So . . . if it's not the same group then you put it in another group that's called the group" (see Figure 10).

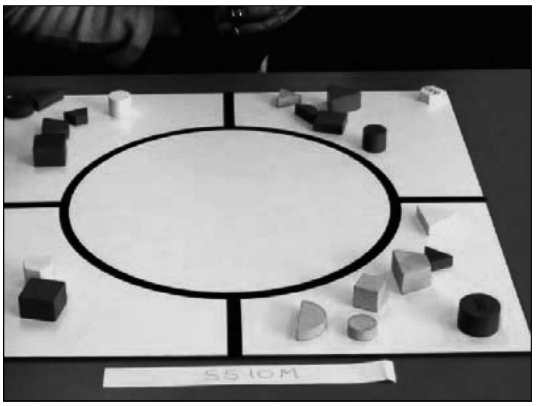

FIGURE 10 (S510M) Pseudoconceptual reasoning within a collection complex.

A classical pseudoconceptual insistence that the two circular *mur* blocks (Figure 11, top right) would be *cev* blocks "because they are circles," even though five of the *cev* blocks had their names revealed, and only one of them was a circle. When asked about the *lag* and *bik* groups containing circles (all names revealed), he continued to insist that the two *mur* circles would belong to the *cev* group because they were circles and looked "nearly the same" and because there was also a blue and a white block in the *cev* group (see Figure 11).

One glance at Figure 12 would seem to indicate that this participant has solved the problem of the blocks. However, questioning revealed it to be a pseudo-solution (Hanfmann & Kasanin's term), which could also be termed a Full House solution. Once all of the names had been

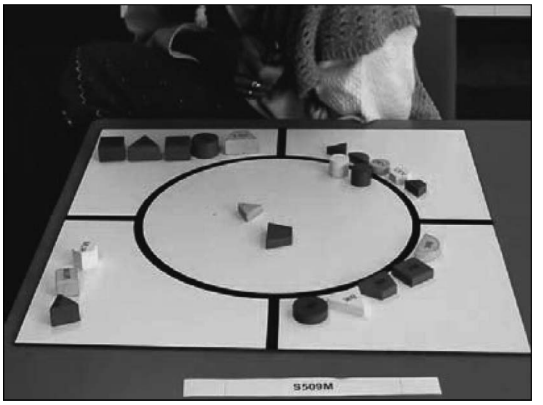

FIGURE 11 (S509M) Pseudoconceptual reasoning within an associative complex.

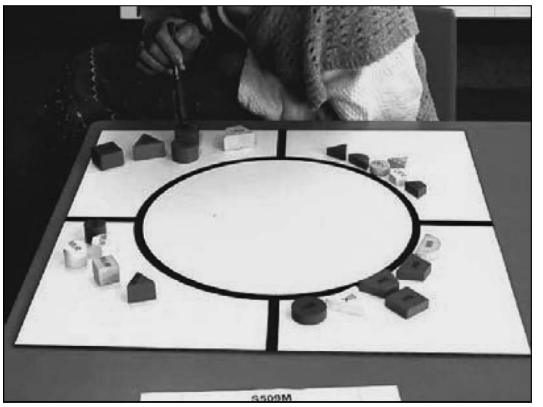

FIGURE 12 (S509M) Pseudoconceptual reasoning within an associative complex (a short time after the photograph above was taken).

revealed, the post hoc description, given one group at a time with prompting, was that there were two colours that were the same and that the other blocks were of different colours from the two that were the same (elegant, but lacking in symmetry). When questioned about the two white *mur* blocks (bottom left), because there was no white *lag* block (and no green *mur* block, and no pair of blue blocks), the participant moved from an apparently conceptual approach to colour to introducing shape (similar shape) to justify their inclusion in the *mur* group.

As this study progressed, it was noted that pseudoconcepts emerged in ways more subtle than through an insistence on shape or colour. Pseudoconcepts, it is true, could take the more obvious form of an orange circle not being the same as two blue ones (as previously): This was because the associations and connections the participant was making were different to the researcher's, because she hadn't abstracted the circle and the researcher had. Yet pseudoconcepts could also be discerned in the participants' disregard for the implication of their moves in relation to the

totality even before the first block was turned. This disregard for the totality became evident in certain cases because participants hadn't applied the same principle consistently to all four groups, and in others, because they hadn't even taken the bigger picture—the totality—into consideration.

The 8-year-old participants' responses ranged widely from several hesitant, random, and fluid associations, to one "explains all" pseudo-solution, to one where only one possibility was advanced, to early complexes such as associations and collections, to chains and detailed descriptions.

All 10 participants required prompting of some kind, and 4 of them were inclined to turn blocks immediately. However, these 8-year-olds paid more attention to the role of the names of the blocks and to the instructions: 2 selected "colour," 2 selected "colour" and "shape," 5 selected "shape," and 1 selected a trapezoid because it reminded him of a triangle with the top cut off. The parenthesis here indicates that these participants were dealing with concrete and factual blocks—triangular blocks, square ones, orange blocks, or blue ones. Guiding principles of "colour" or "shape" had not yet been abstracted: This interpretation is based on the observation that not one of these 8-year-olds created more than one group of blocks without prompting, because of the fluidity and inconsistency of many of the responses, and because their responses to newly turned blocks (when prompted) were that blocks belonged together because of their names (n = 6), and in only 3 cases because the blocks were different in some way. These last 3 participants' interactions with the blocks were seemingly bolstered by their ability to entertain or grasp more clearly the requirements of the task and their ability to work towards and arrive at a solution.

In Figure 13 the participant was faced with a dilemma when reminded that four groups were required—he was not able to move beyond his initial confident approach and was unable to offer any alternative solutions.

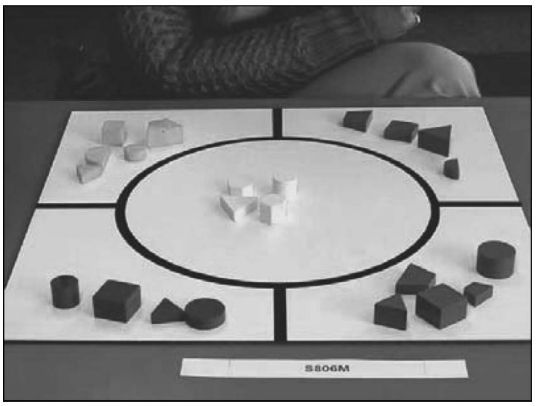

FIGURE 13 (S806M) Pseudoconceptual stumbling block when only one possibility is advanced.

Despite the perceptually obvious groups with their names revealed, the participant in Figure 14 insisted that the unturned yellow *cev* circle (top right) belonged to the *bik* group because it was yellow and that the unturned white *bik* triangle needed to be included "because it is an odd

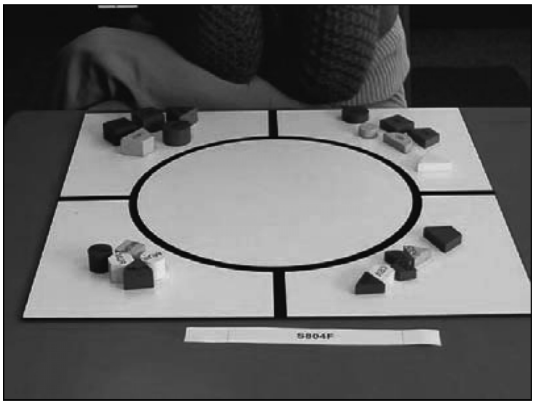

FIGURE 14 (S804F) Pseudoconceptual reasoning within a collection complex.

colour." The unturned orange *bik* trapezoid (bottom right) needed to be with the *cev* group because it was the same height. Throughout her session, this participant's approach was one of collections ("I put this one here because it is *completely* different!") and early chains, and it seems that the fluidity of this approach prevented the development of a regard for the totality and the need for consistency.

FIGURE 15a (S805F) Pseudoconceptual reasoning within an early chain complex.

In Figure 15a the participant seemed to have solved the problem of the combination of height and diameter (size). However, it is what subjects say about their reasoning that sheds light on it: the *lag* blocks (top left) were "big"; the *bik* ones (top right) were "almost the same size as each other" and had "the same name"; and *mur* and *cev* were each simply "all the same size" and "all the same size". These inconsistent descriptions and her approach of sorting by the perceptually obvious, as opposed to the conceptual, were evident in her attempt to resort the blocks.

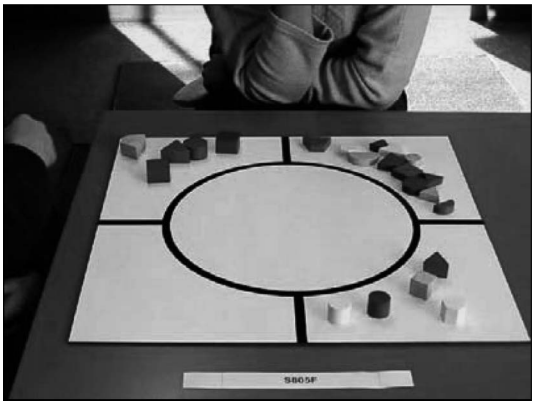

FIGURE 15b (S805F).

Figure 15b is an example of the fluidity and changeable nature of the connections made by collections leading to early chains: This attempt at resorting demonstrated that the combination of height and diameter had not been formed in a stable manner and also showed a pseudoconceptual disregard for obvious inconsistencies. For this participant, the names of the blocks meant that they had to be put together, and, only when prompted, because they represented some particular quality.

The participant in Figure 16 used the physical characteristics of the blocks to explain her view of volume and proportion. She maintained that if one were to mould this stack of (*lag*) blocks into a tower, it would be a different "try" to what would happen if one were to do this with the *cev* and the *mur* blocks: that the volume of each tower would be different. However, she also maintained that because the *cev* and *mur* blocks were smaller than the *lag* ones that the principle of proportion would not apply in the same way to all three towers in relation to the blocks that would make them. She was convinced that the proportion of these *cev* and *mur* blocks to the towers they would make would not be the same as it would for the *lag* tower, that

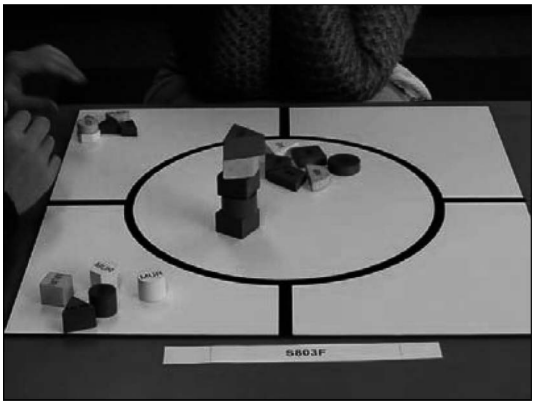

FIGURE 16 (S803F) Pseudoconceptual reasoning of volume and proportion.

the proportion for each would be different (in other words that because the volume of each was different, the proportion would be too).

This participant volunteered to explain her reasoning for how she had approached the blocks as follows:

> I thought in the beginning it was colour or wider. When I realised that once I put the blocks in the corners, if I put the small ones in this corner [*cev*] it would make more sense as a relative but if I chose this one [*bik*] it wouldn't make sense; it wouldn't be a relative. I held them in my hand and weighed them and then memorised them . . . because in my family, my father and brothers do the same thing; my mom and me do the same things. The mothers would buy make-up and bags. . . . If I go shopping with my best friends we would get the same things . . . my brothers . . . would look for girls. We wouldn't look for girls . . . my father and his friends would buy nails and tape.

The 11-year-old participants' responses represented some measure of extreme between relying on the immediately perceptually obvious at one end of the spectrum and exploring an increasing number of possibilities for sorting the blocks at the other. Their responses ranged from what seemed to be the only physiognomic response in the study, through to unstable chains and chainlike reasoning by one participant and two of diffuse and inconsistent approaches, to concrete but more consistent approaches by five participants. One participant offered a highly elaborate and sophisticated response that entertained a good number of possibilities for sorting the blocks before he arrived at the combination of height and diameter.

Three participants did not take the totality into consideration at all, as inconsistencies occurred throughout their sessions, and the three participants who noticed size or height focused more on the blocks than on inconsistencies. Two participants took a small measure of the implication of their moves in relation to the totality but did not follow these through to a logical conclusion. Only one participant in this group was mindful of the moves he was making in logical relation to the totality ("It messes it up!"): He was the youngest participant in this study to do so.

Nine of the 10 participants selected shape as their first attack on sorting the blocks, a trend that "seems to predominate on the intermediate level" (Hanfmann & Kasanin, 1942, p. 39). This group's selection of shape as their first move was the highest in comparison with the other five groups in this cross-sectional study. Two participants turned blocks immediately; 1 created no groups until prompted; 5 created one group each but needed prompting for what to do next; 1 was hesitant before creating four groups; and 1 participant created four groups immediately, although he was not entirely happy with it because the extra shapes and too many colours made the solution less clear-cut than he would have liked it to be.

Whereas only one of the 8-year-olds mentioned the number of sides of the blocks, four of the 11-year-olds mentioned or used the number of sides of the blocks as a possibility for sorting them. Further, five participants advanced the possibility of a number of elements in combination as possible solutions to sorting the blocks. Three of these participants, by linking together various attributes of the blocks, and combinations of attributes, seemed to be forming emerging principles of some kind for sorting the blocks, along with their increasing sensitivity to the need for some kind of consistency.

In Figure 17, the participant described the *mur* blocks (top right) as "all the same height and kind of like the same round . . . [and] the flatness" and that "I did the same with this [*lag*] one" (bottom right), ignoring the flat *bik* square. His description for the as yet unnamed *bik* group (bottom left) was "These are all the thin ones" and of the *cev* group (top left) "most of the small

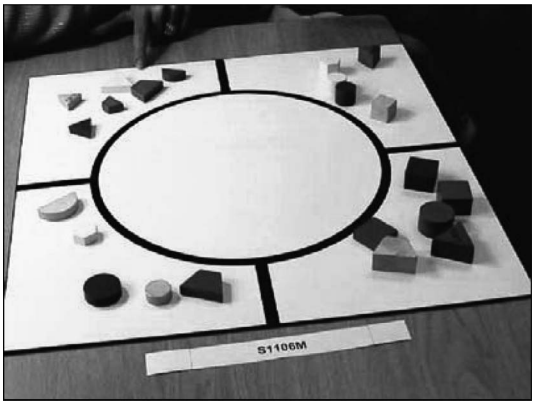

FIGURE 17 (S1106M) Pseudoconceptual inconsistencies when size or height is noted almost immediately, in combination with chain-like groupings.

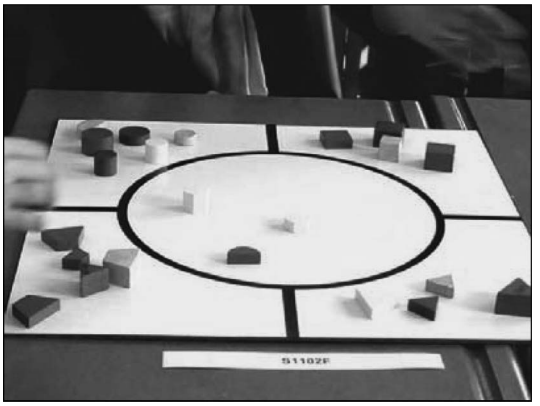

FIGURE 18 (S1102F) A (classical) pseudoconcept within a diffuse complex.

ones here," although it was not until shortly after this that he noticed the mixture of large flat blocks and small flat ones and corrected them accordingly.

After the participant in Figure 18 had grouped possible *mur* candidates (bottom left), she created the group of circles (top left) and elected to turn over the green *lag* triangle from the *mur* group—"Woo!" she said. When prompted about "Woo," she quickly took all of the unturned triangles out of the *mur* group (bottom left) and placed them in the *lag* group (bottom right). Disregarding the implication of the triangular *mur* exemplar to her groups so far, and to the trapezoids which had been placed with it, she then created the group of squares (top right). It was, however, the "left-over" blocks in the middle that led to her being "Stuck," rather than the incompatibility for the shape approach evident in the two upturned triangles.

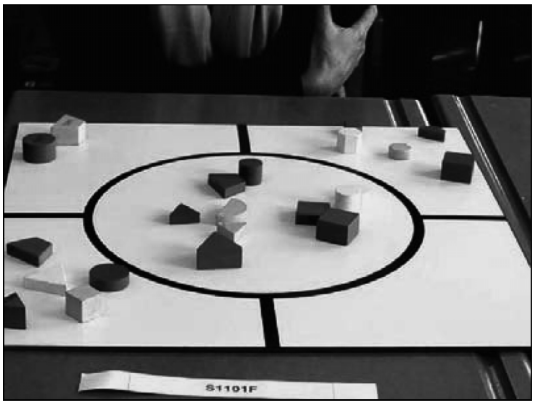

FIGURE 19 (S1101F) Pseudoconceptual reasoning merging into the classical pseudoconcept "proper" within a diffuse complex.

As shown in Figure 19, this participant's second attempt at sorting (after the *lag* trapezoid had been turned) was that one of each colour per group (starting at top right) was a possibility, but then, interestingly, when it came to the second group (*mur* at bottom left) she said, "Triangle, square, one cut-off one, and a circle." These moves demonstrated the fluidity and instability of her approach, where colour was given less prominence after only one group, and she had created a delightful chain in the *mur* group.

Her emerging approach of one of each colour and of one of each shape per group involved quite a lot of swapping blocks around, although, instead of stopping to count the colours (and the shapes), she continued with much rearranging and increasingly random moves to get the blocks to fit her idea of one shape per group. Then this participant noted that there were only two semicircles (something that she had not perhaps been quite aware of earlier when she created a "cut-off" group of trapezoids and semicircles), but this observation did not influence her insistence that there had to be a way to find one shape per group. By ignoring this fact (as well as her earlier disregard about the effect of the *cev* semicircle's name on her "cut-off" idea until prompted) she demonstrated clearly the pseudoconceptual nature of her approach.

The participant in Figure 20 was the only one of the 11-year-olds to be mindful of the implications of his moves in terms of the totality of the blocks. He started by forming four groups based on shape, and he hesitated before assigning the two semicircles to the trapezoid group and the two hexagons to the group of circles: "It's confusing. . . . It just is. Because you don't know how it could be . . . about colour or shape." He further noted (of his four "problem children"), "We've got different random shapes [pointing to the semicircles and trapezoids] and" so, too, with the hexagons. Over the next few minutes, with prompting but making his own deductions, he eliminated shape (counting six types—too many—"It messes it up!"); colour (also by counting); and in response to the suggestion that it had to be something else if not colour and shape, he quirkily suggested, "The names on the bottom?" Height was abandoned (only two), and then one triangle per group but which couldn't work because there was one triangle too many. The participant's manner of moving between the perceptually obvious and considering these in relation to the whole was not always consistently so, which is why his next responses are presented here as examples of the pseudoconcept proper.

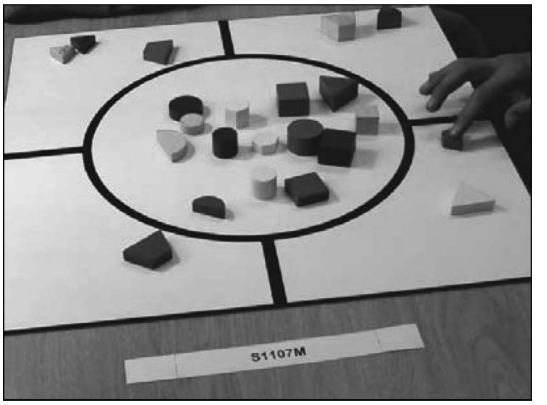

FIGURE 20 (S1107M) A pseudoconcept "proper" even when becoming mindful of the totality.

After the second *cev* triangle had been revealed (top left), this participant had placed the *cev* trapezoid next to the two *cev* triangles but eliminated that approach because although he had thought "it could be size," he then took it away because "it has its top cut off" (shape becoming a reason to abandon size). He then attempted to allocate one trapezoid (there are four) per group, and this time, he placed the *bik* trapezoid, not the *cev* one, with the *cev* triangles. Where is the pseudoconcept? It is cleverly disguised in those two *cev* triangles—precisely because there are two of them: Two triangles in one group would logically prevent the allocation of one shape per group as an approach. Further, as he had earlier eliminated this approach of one shape per group because there were too many triangles, it appeared that when he noticed the number of trapezoids his focus on their number took on a greater significance than his earlier reason for eliminating the one-shape-per-group approach.

The highest scoring of the 11-year-old participants was the only one, and the youngest in this study, to formulate the principle of the double dichotomy. He explored many elaborate and sophisticated reasons for grouping the blocks (14 modified approaches) before arriving at the simplicity of the double dichotomy. This participant was highly articulate and his well-developed use of language could have been taken as an indication of mature, logical, abstract thinking.

This participant quickly abandoned the shape approach because the semicircles were not circles, squares, triangles, "or rhombuses." Colour was also tried on for size and abandoned.

By 7 minutes into the session, the participant advanced this solution as a possible one where the bottom right-hand group had six sides, the triangles had five, the circles had three, and the group at top right was not working because the number of sides did not work out (see Figure 21a). However, the participant was prepared to leave this group there for now. Four blocks were turned over (he chose them), which seemed to confirm his hypothesis—"I think I got it right." When the *mur* hexagon was turned over, he said, "Oh, no!" and moved to turn another block over. When asked to explain "Oh, no!" he responded by saying, "I thought *mur* would have five faces but this one has six" (there were actually eight by his original tally). When it was pointed out that it had eight sides, he immediately responded by saying that perhaps the sorting could be on the basis of even-numbered sides. After some discussion, where he was thinking things out aloud to himself, he turned over another block. Although he had not made any move to remove the blocks placed

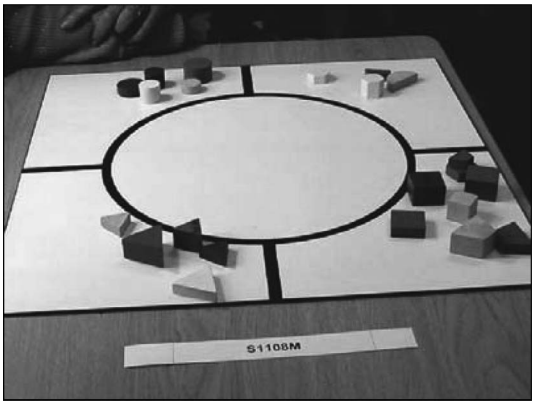

FIGURE 21a (S1108M) A highly elaborate diffuse complex with the emergence of "ideas" coupled with pseudoconceptual inconsistencies.

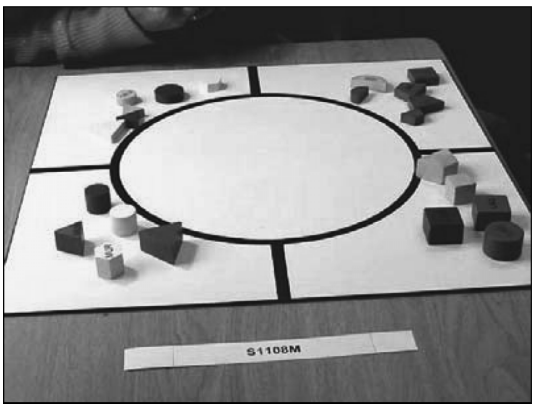

FIGURE 21b (S1108M).

according to the number-of-sides hypothesis, he agreed that "it didn't make sense [the newly turned *lag* block]" and "it's probably not working . . . neither would colour . . . or angles . . .".

In Figure 21b, it could be interpreted that this participant had begun to get an idea of height and diameter. However, his descriptions for the groups belied this interpretation and were indicative of a regression to a more diffuse mode of thinking, compared with the elaborateness of the participant's earlier and more logical approaches. Although it could be argued that Hanfmann and Kasanin's observation that some participants who start with a more logical approach can move to a less logical one as the session continues (because it is so easy to be overwhelmed by the possible combinations of colour, size, shape, and height), it is more likely that this applied only in part to this participant. It seemed clearer that the sophistication of his suggestions and ideas was not uniformly applied across the four groups, and this matter was a clearer indication of a pseudoconceptual disregard for the totality, in addition to the less clearly formulated

approaches that he seemed to be trying on for size. For example, the *mur* group was analysed at one stage as "having only minor differences . . . related to colour . . . whereas here [*bik*], the differences are more pronounced," and he later wanted to see "in which areas *bik* is differentiated": As accurate as these analyses and observations were, his approach did not question the validity of the underlying principles that were not being logically or consistently applied.

In a logico-semantic analysis of Vygotsky's work, attention is drawn to a particular law of Vygotsky's, which, as a transitional law, operates within the category of intramental functions: specifically, between spontaneous mental functions and higher mental functions. This fourth law is cited as follows: "The common law of development is that realization and acquisition are peculiar only to the highest level of the development of a function. Obviously, this law can be called the law of realization and acquisition [awareness and mastery]" (Meshcheryakov, 2007, p. 162). What is significant about this law is that it depicts the cardinal difference in the responses of the adolescent and adult participants as a group, by delineating what it was about their thinking strategies that were in stark contrast to those of the younger groups presented so far. Forward, then, to the 15-year-olds . . .

Four of the 15-year-old participants approached the problem of the blocks with the implications for the totality evident in each of their moves: in other words, if an idea or approach would affect the stability of the totality negatively, it was abandoned. This approach was indicative of the hypothesis-testing approach in which the participants either tried out moves physically and then abandoned the ones that yielded inconsistent groups or examined the blocks in the middle of the board analytically or mathematically. Four more participants were prepared to allow for exceptions as part of their approach to the blocks by noting that the exceptions did exist, and, with prompting, that they were not entirely unhappy with this. These eight adolescent participants seemed to have in place, or were consolidating, a "system" of sorts which provided the cohesiveness of a boundary and the symmetry of logical appreciation within which to explore ideas. Only two participants did not appear to regard the totality of the set of blocks in their approaches.

None of the 10 adolescent participants needed prompting to begin this task. Opening approaches included one participant who first considered colour—6 with a consideration of shape; 1 with elevation; another who considered volume by analysing the blocks in the middle of the board; and another who analysed the blocks in the middle, eliminating possibilities before committing herself to the combination of height and circumference. The four highest-scoring participants gave every indication of looking for a principle as the basis for the solution (rather than dealing merely with attributes), and 4 more modified their hypotheses to include differing attributes as the game unfolded. In the case of these eight participants, instead of merely observing and suggesting possibilities based on physical characteristics, they acted on the blocks by manipulating and arranging them into new relationships, such as mirrored pairs of blocks across the four quadrants, or symmetrical patterns within and across the groups, or by creating subgroups according to height and diameter within each group.

Only two participants appeared to be dealing more with attributes or with blocks rather than principles: This was evident in their inconsistent approaches and somewhat insensitive reactions to contractions during their sessions.

To begin with, the participant in Figure 22 selected a *cev* triangle and immediately turned it over. She then tried height (physically measuring the blocks against each other); the corners of the blocks; and moved on to combinations of flat trapezoids and triangles (bottom left), and tall triangles and squares (top left), although her remaining groups did not conform to this combination. The participant was unsure of where to place the *lag* trapezoid left in the middle of the board.

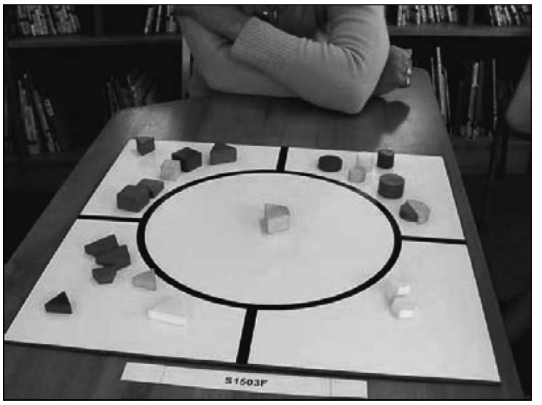

FIGURE 22 (S1503F) Pseudoconceptual reasoning in an elaborate diffuse complex.

Inconsistent principles across the board can clearly be seen: Although the group of trapezoids and triangles at bottom left was consistent in that all of them were flat and had a similar shape, the *mur* group (top left), which had started with all the tall triangles and squares, included a flat square. The approach of height paired with shape further broke down with the group at top right, where the circles were put together, regardless of height, and the two hexagons were placed together into a group of their own because they were different shapes altogether. Why the participant should have had a dilemma about where to place the *lag* trapezoid was not as clear.

Subsequent moves resulted in her placing semicircles and trapezoids together because they were incomplete versions of the other group, which contained the circles and the hexagons (an elegant solution): She was satisfied with her solution (incomplete blocks, their complete counterparts, squares, and triangles) and was not concerned about its inconsistency.

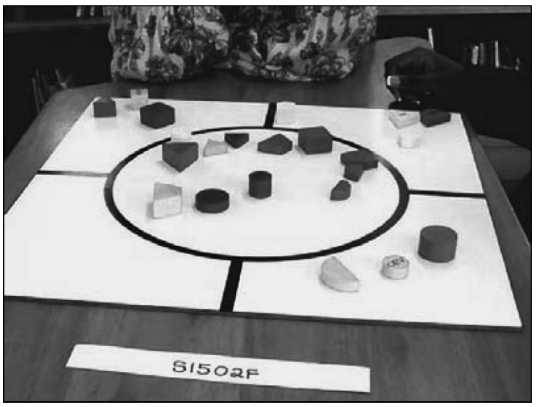

FIGURE 23 (S1502F) Pseudoconceptual reasoning in an elaborate diffuse complex.

When the participant in Figure 23 had earlier suggested that halving the squares would allow a group of squares and triangles, it was pointed out that isosceles rather than equilateral triangles would result. Nevertheless, she created two groups with one triangle and two squares in each and another with two circles and a semicircle. Then the *bik* trapezoid (top right) was turned over: The participant responded by removing the two squares that had been placed alongside the *bik* triangle and said that now the two hexagons could be included in this group instead. Her pseudoconceptual grasp of these implications was that, first, we had explored the "cutting-in-half" square/triangle debate; second, the *bik* triangle and the *bik* trapezoid would not result in a hexagon when put together; third, she made no subsequent move to remove the *lag* square from the *mur* group at top left, or the semicircle from the *cev* group at bottom right. This photograph also depicted this participant's incomplete appreciation for the moves she was making in relation to the totality (only three groups). However, she continued with this approach for another 5 minutes before admitting that it wasn't working and that she had in fact tried it before.

One of the most obvious differences between the adults in this study and the other groups is that all of the adults conducted their moves in solving the problem of the blocks with the implications of these moves in relation to the totality. Even those who explored the possibilities of representative allocation of shape or colour or some other combination would be halted by this awareness ("Oh, I can't do that because it won't work for four groups in the same way"). Further, while some of the adults in this study might have in some cases "lumped" the "left-overs" into one of the groups (eg, those who sorted by shape), the difference between this type of grouping and that of the preconceptual and pseudoconceptual participants was that the adults were bothered or uncomfortable with this because it implied inconsistent principles.

None of the adults required prompting to begin solving the problem posed by the blocks: Two selected colour as their first consideration, three selected shape, one participant looked for a pattern in the *mur* group that could yield an approach for the others, one participant considered shape and number of edges, and three participants analysed the blocks in the middle of the board. Even so, there was a range of levels of performance within this group of adults, from what became an apparently more random approach to the blocks (this participant admitted afterward that he "had a problem with names"), to one of mathematical and statistical analysis of the blocks, which, when extrapolated out to the other groups of shapes, resulted in a logically deduced solution. The adults in this study did not give any indication of pseudoconceptual thought or reasoning.

THE OVERALL FINDINGS

The first finding of the 2007 study could be framed as a question: *If a study with Vygotsky's Blocks on a small group of South Africans in 2007 found correspondence with descriptions of the thinking strategies of Russian adults and children of more than 70 years ago, what would the implications be for contemporary cultural psychology and education?*

Confirmation of Vygotsky's original hypothesis concerning the different kinds of preconceptual reasoning techniques by participants of different ages was found in this study: Microgenetic analysis of each response (assisted greatly by that most useful tool, a digital video camera)

revealed preadolescent children making associative connections; collections; chains; diffuse and increasingly sophisticated links of characteristics of the blocks; and pseudoconceptual reasoning, which also occurred throughout many of their engagements with the blocks. All of these, including the syncretic responses of the younger children, brought to life Vygotsky's writings on developmentally different types of reasoning processes, and all of these were intricately linked, language-associated "complex" activities: "complex" in terms of the name that Vygotsky applies to this kind of preconceptual reasoning, and "complex" in terms of the dynamic interrelations between thought and language.

The second finding of the study was a developmental trend consistent with Vygotsky's writings on the ontogenesis of concept formation, surprisingly clear from so small a sample. The unfolding of this trend from the syncretic to the concrete and factual to the intermediate phase before true conceptual thought became evident was reflected in a positive correlation between the age of the participants and their modes of thinking. This finding verified Vygotsky's assertion that true conceptual thinking only becomes possible in adolescence. The figure below depicts a graph of each age category in relation to the adapted overall group scoring. The 3-year-old participants are represented by Category 1, the 5-year-olds by Category 2, and so on up to the adult participants, by Category 6.

As can be seen in Figure 24, the correlation indicated by the line of best fit is approximately linear and indicates a positive correlation where as the age group increases so do the adapted overall group scores increase steadily and systematically.

Third, and of significance, the study found that the greatest increase in the developmental trend occurred between the 11-year-old and 15-year-old participants, *exactly* where Vygotsky predicted it would be: The "radical change," the dramatic increase in participants being able to take in and hold on to the totality of the task, the move toward more logical and abstract(ed) connections between things was in greater evidence in the responses of the adolescents than it was in the 11-year-old group. Figure 25 depicts each age category in relation to the adapted overall group scoring as percentages of the maximum possible total.

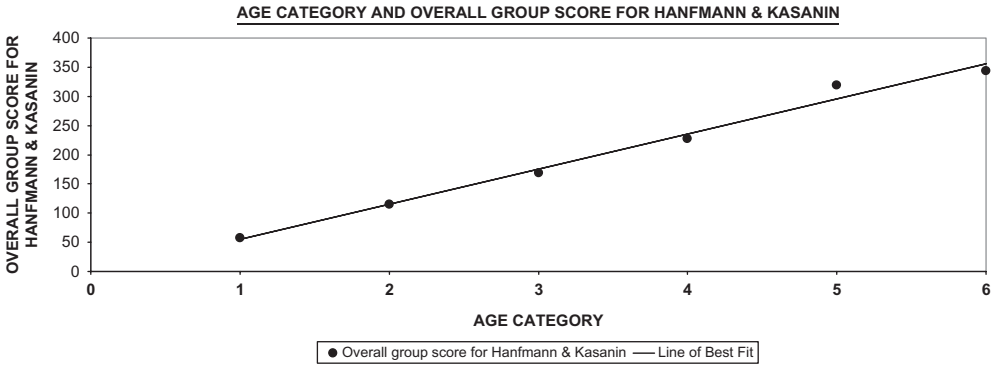

FIGURE 24 Adapted overall group score and line of best fit (reprinted with permission [Towsey, 2007]).

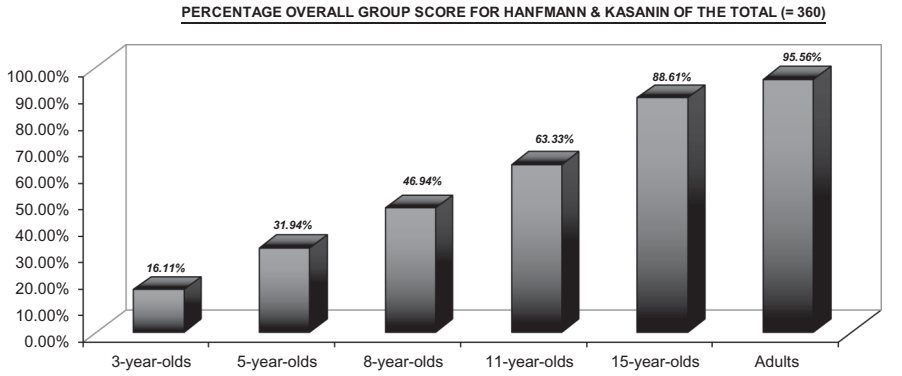

FIGURE 25 Adapted overall group score as a percentage of the maximum possible total of 360 (reprinted with permission [Towsey, 2007]).

As can be seen in Figure 25, the percentage increases per age group from the 3-year-old participants through to the 11-year-old participants are between 15% and 16%, and the most marked increase is that between the 11-year-old participants and the adolescents at slightly more than 25%. Of interest, there was not a great gap between the 15-year-olds and the adults.

Transference to Other Things

In Table 1, the scores for all six groups in the transference exercise are presented. Of the two areas of greatest increase, the first was between the 5- and 8-year-olds, where the increased verbal ability of the 8-year-olds rose by an astonishing 48.75%. The 8-year-olds had paid more attention to the names of the blocks than did the 5-year-olds, even though in only three cases was this because the names meant something (other than meaning they belong together). The levels of transference by the 8- and 11-year-olds could inadvertently have been bolstered because colour and shape (both of which have to be overcome to arrive at the solution of the

TABLE 1
Transference Exercise Overall Group Scores for all Participants

Transference Exercise Overall Group Scores for all Participants

	3-Year-Olds	*5-Year-Olds*	*8-Year-Olds*	*11-Year-Olds*	*15-Year-Olds*	*Adults*
Describes what blocks have in common (0–80)	0	7	43	63	74	80
Correctly identifies glasses *cev*, *bik*, *mur*, *lag* (0–40)	0	5	24	18	31	29
Correctly identifies candles *cev*, *bik*, *mur*, *lag* (0–40)	0	3	26	27	39	31
Total transfer score (0–160)	0	15	93	108	144	140
%	0%	9.37%	58.12%	67.5%	90.0%	87.5%

Note. $N = 60$. Scoring ranges between 0 and 160.

blocks) are not present in either the candles or the glasses: The candles and the glasses represent the essential, not the functional characteristics of *cev*, *bik*, *mur*, and *lag*. However, because these participants achieved levels of success of close to 60 and 70%, respectively, the concrete and factual nature of their transference could be mistaken (by adults) for evidence of true conceptual competence. The second-greatest increase in the transference exercise is between the 11-year-olds and adolescents, where the increase in verbal ability rises from 63 points to 74, and where the increase in overall score is 22.5%. Significantly, the ability of the adolescents to transfer to the glasses and the candles was the highest of the six groups in the study.

Before Closing . . .

The younger participants in this study all came from private schools in the affluent northern suburbs of the city, and the adults all worked for a financial services company where mathematics and the ability to judge risk are required: the results may be better than with less privileged participants.

Further, cognisance must be taken of the warnings of fellow researchers past and present that the Vygotsky/Sakharov Blocks present the researcher with challenges: The procedure is difficult to conduct and analyse, most particularly so if one is working alone and without a collaborative researcher. Then, too, are several difficulties with the way in which Vygotsky tended to present theory and empirical evidence to his readers. Furthermore, it requires a certain fortitude to link together what one has read of Vygotsky's theoretical constructs with what is happening when one is faced with participants engaged with the blocks, talking and moving and making up and changing their minds, sometimes at a furious pace. In this respect, the digital video recorder allows microgenetic analysis far greater access into events as they unfold than would be the case if one were to recreate each session according to annotated notes alone. This "cultural tool" could be used to pinpoint chainlike logic, for example, and allow the researcher to differentiate it from, say, a diffuse complex, amid the astonishing fluidity characteristic in younger participants' engagement with the blocks.

The reality is that Vygotskian analysis is analysis of change, and the blocks procedure is about highly dynamic change, not only because the blocks are about processes but also because of the dynamic relationships present in meaning-making activities. Even if there are other procedures that are easier to administer, these venerable blocks seem predisposed to bring Vygotsky's writings to life and to flesh them out. This fleshing out can be seen in the form of the pseudoconcepts, which appeared in a variety of guises. It also allowed one to witness and respond to very genuine and determined efforts such as demonstrating a factual and concrete notion of proportion or overlooking the implications of only two semicircles. The blocks yielded taxing arguments about volume, grouping blocks according to classical and nonclassical shapes, stacking blocks of the same shape to see if a consistent pattern emerged of two stacked blocks of the same diameter coupled with two that were not, and creating subdivisions within each group of pairs of blocks based on size. These very special blocks evoked some degree of frustration, expressions of delight, careful and deliberate explanations for each and every single move, outright laughter, and genuine joy at arriving at the correct solution. There were also statistical and mathematical analyses of great sophistication, which, when extrapolated out to the other shapes, yielded the correct solution.

In a nutshell, this research granted one the privilege of observing the human side of human beings solving problems, exploring possibilities, learning new concepts, using their amazing "natural biologically grounded intelligence" sculpted by culture, by language, by the language

we speak every day at school and at home, by the language of mathematics, by "the word," into what Vygotsky (1986) so aptly describes as "historically developed human intelligence" (p. 139).

And although some of the discussion in this article may seem to point to a *teleos* of sorts leading to fixed, dry, unchanging scientific concepts, this is not the intention of the theory or the method. It is about meaning making—these blocks were designed to engender the formation of new concepts and, at the same time, to reveal the processes involved as this takes place: As children begin constructing what particular culturally determined meanings there are in the words around them, they are in the process of developing a system that harmonises generalisations and abstractions. Their method of constructing meaningful links is based initially on the syncretic, and then on the concrete and factual, which becomes increasingly intricate as children's abilities to abstract and generalise are honed. Gradually, consistency and hierarchy are achieved in how threads of meaning are woven together: These achievements are as crucial to a system as generalisations and abstractions are. Once past the syncretic, three qualitatively different areas of activity become clear. The first involves generalising and abstracting any factually present attribute and linking these in concrete, factual, and functional fashion: developing a protosystem. The second involves comparing, judging, synthesising: developing a system. And the third involves insight and consolidation: using one system to understand another.

Yet for meaning-making activity to acquire meaning at all, intrinsically and extrinsically, mediation by "the word" is the ever-present guiding star.

Two Quotations Seventy-Six Years Apart

A cultural psychologist recently expressed an interesting perspective about pseudoconcepts: She had this to say about these preconceptual constructs, and contemporary cultural psychology, and, interestingly, processes akin to those found in this study:

> Pseudoconcepts [are] a kind of an "animal" that has been almost totally overlooked in the cultural historical activity theory approach to cognitive development. Through a discussion of pseudoconcepts, one could follow the development of a functional constellation of cognitive processes that support meaning formation in micro- and onto-genesis. This domain of investigation has been neglected (in comparison to other areas of CHAT)—even though it partially reveals the relationship between the semiotic sign as a mediator of the culturally developed concepts on one hand, and the individual development on the other. (W-M. Roth, personal communication, 2007)

Perhaps it is that this South African study found concept formation processes that correspond with those of participants from a different country and in a different century because the task involves "the word" and coloured shapes familiar to schooled populations in both countries, and because the activity takes place in a school-like discourse. But there again, the accumulated evidence of many more contemporary studies with the Vygotsky/Sakharov Blocks might have a great deal to say about this rather overlooked aspect of Vygotskian cultural-historical psychology. The findings of the South African study would not be out of place if summarised as are those in the following quotation, worth citing here in full:

> The principal findings of our study may be summarized as follows: The development of the processes that eventually result in concept formation begins in earliest childhood, but the intellectual

> functions that in a specific combination form the psychological basis of the process of concept formation ripen, take shape, and develop only at puberty. Before that age, we find certain intellectual formations that perform functions similar to those of the genuine concepts to come. With regard to their composition, structure, and operation, these functional equivalents of concepts stand in the same relation to true concepts as the embryo to the fully formed organism. To equate the two is to ignore the lengthy developmental process between the earliest and the final stages. (Vygotsky, 1986, pp. 105–106)

ACKNOWLEDGMENTS

This article is based on a study conducted in partial fulfilment of a master's degree by Coursework and Research Report at the University of the Witwatersrand, South Africa, in 2007. The second author was the supervisor.

REFERENCES

Hanfmann, E., & Kasanin, J. (1942). Conceptual thinking in schizophrenia [Monograph No. 67]. *Journal of Nervous and Mental Diseases*.

Kozulin, A. (1990). *Vygotsky's psychology: A biography of ideas*. Cambridge, MA: Harvard University Press.

Meshcheryakov, B. (2007). Terminology in L. S. Vygotsky's writings. In H. Daniels, M. Cole, & J. Wertsch, (Eds.), *The Cambridge companion to Vygotsky* (pp. 155–177). Cambridge, UK: Cambridge University Press.

Towsey, P. (2007). Exploring *cev*, *bik*, *mur*, and *lag*, in the new millennium. *Cultural-Historical Psychology Journal*, pp. 96–100.

Van der Veer, R. & Valsiner, J. (1991). *Understanding Vygotsky: A quest for synthesis*. Oxford UK: Blackwell.

Vygotsky, L. (1934). Thought in schizophrenia. *Archives of Neurology and Psychiatry*, *31*, 1063–1077.

Vygotsky, L. (1986). *Thought and language*. Cambridge, MA: MIT Press.