

DIALECTICAL THINKING AND CREATIVITY AMONG YOUNG ADULTS: A POSTFORMAL OPERATIONS PERSPECTIVE¹

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Summary.—This study used a post-Piagetian perspective to investigate the relation of dialectical thinking and creative performance in early adulthood. The modified version of the Social Paradigm Belief Scale was employed to measure the development of formal and dialectical thinking among 454 young adults, ages 23 to 40 years ($M=32.1$, $SD=4.8$). The Divergent Thinking Test estimated their creative performance. Scores on dialectical thinking were positively correlated and scores on formal thinking were negatively correlated with Divergent Thinking Test scores. Planned contrasts indicated that participants in the dialectical thinking group scored higher than did those in the formal thinking group on the six dimensions of the Divergent Thinking Test, i.e., Fluency, Openness, Flexibility, Originality, Elaboration, and Naming. Multiple discriminant analysis with a cross-validation examination showed the linear combination of scores on the six dimensions of creativity included in the Divergent Thinking Test discriminated between formal and dialectical thinking groups; this supported predictions about the relation between postformal thinking and creativity among young adults.

In general, two major approaches have been used to study creativity (Mayer, 1999; Sternberg, 2001). The psychological measurement approach considers creativity an individual ability that may be conceptualized in terms of descriptive theories. This approach primarily evaluates individual differences in creativity and creative performance. The second approach focuses on describing the creative process, with the aim of understanding the internal processes underlying creativity. However, the latter has not addressed corresponding developmental relation of cognitive development with creativity. Thus, a better understanding of the emergence of creativity requires a developmental approach in which the factors that underpin this developmental achievement are considered (Ross, 1977; Roskos-Ewoldsen, Black, & McCown, 2008).

Although creativity remains ill-defined, researchers considering this phenomenon from different perspectives tend to agree that the creative process and products emerging from such processes share certain charac-

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teristics. Novelty constitutes the first of these shared characteristics, with most definitions of creativity based on the assumption that the creative product is novel, atypical, or unusual (Guilford, 1967; Amabile, 1996). Another dimension of creative performance is value, that is, the creative response is also required to be effective or useful or to represent an appropriate solution in problem solving (Torrance, 1962; Amabile, 1983). In principle, most common definitions of creativity combine the elements of novelty and value (see Rothenberg & Hausman, 1976; Mayer, 1999, for similar viewpoints).

Most studies on creativity have originated in philosophy (e.g., Kuo, 1996), the psychology of personality (e.g., Mahon, Yarcheski, & Yarcheski, 1999; Burch, Hemsley, Pavelis, & Corr, 2006; Schaffer & Mezick, 2006), educational psychology (e.g., Bisset, 2000; Dollinger, 2006; Davidson, Bromfield, & Beck, 2007), and social psychology (e.g., Amabile, 1983; Amabile, Hennessey, & Grossman, 1986; Amabile, Goldfarb, & Brackfield, 1990); however, the relation between cognitive development and creativity has received little attention in these domains (Niaz & De Nunez, 1991). The effect of cognitive development on creative functioning is central to understanding that development (Roskos-Ewoldsen, *et al.*, 2008).

A post-Piagetian perspective on adult cognitive development suggests that the epistemological perspective characterizing this stage derives from the transition between the final Piagetian developmental stage of formal operations (Piaget, 1950) and the post-Piagetian developmental stage of postformal operational thinking (Arlin, 1984; Koplowitz, 1984; Kramer & Woodruff, 1986). Many have argued that the notion of formal operations does not provide an adequate description of mature adult thinking. It has been claimed that the important problems occupying adult thought are ill-defined and open-ended, and that problem-solving at this stage involves defining or identifying the model to be employed to solve the problem rather than applying established logical algorithms derived from models to the problem. That cognitive structures underlying postformal thinking retain the analytic power of formal thinking but transcend the limitations which constrain the latter (Basseches, 1984) have been hypothesized. This view is consistent with data from studies testing this hypothesis (e.g., Kramer & Melchior, 1990; Kramer, Kahlbaugh, & Goldston, 1992; Kahlbaugh & Kramer, 1995). Such researchers examined the development of dialectical thinking during early adulthood and explored its relation with creativity. In particular, the present study investigated whether the development of dialectical thinking in early adulthood facilitates creative performance.

Relation of Dialectical Thinking With Creativity

Formal and postformal operational thinking represent two possible

modes of adult cognitive development (Kramer, *et al.*, 1992; Kahlbaugh & Kramer, 1995). Formal operational thinking involves manipulating the logical relations among abstract propositions, considering all logically possible states of affairs and using the experimental method to test hypotheses (Labouvie-Vief, 1982; Benack, 1984). It may be said formal operational thinkers solve problems by modeling them as "closed systems" comprised of a finite number of variables which can be related in a finite number of ways (Basseches, 1984). Formal thinkers expect this formal operational analysis to produce a single right answer which could hold in all similar circumstances and across time. Contradictions (inconsistent observations or disagreements by other people) are regarded as signs that something is wrong with the solution (Kahlbaugh, 1989). Hence, formal operational analysis does not appear to provide an adequate account of the creativity inherent in emergent ideas (i.e., of theory creation rather than theory testing). Creativity in fields based on formal analysis, such as science and related disciplines, appears to require cognitive operations which retain the power of systematic thinking on the one hand, while transcending the limitations which inhere in such systemization on the other. Formal thinking alone cannot generate infinite possibilities; a closed system can generate only limited numbers of possible relations among limited numbers of variables (Sinnott, 1989).

Dialectical thinking, referring to a holistic, organized worldview in which phenomena are interpreted in terms of dialectic, represents the major mode of postformal operational thinking (Kramer & Woodruff, 1986; Basseches, 1989). This kind of thinking does not appear to develop until at least young adulthood (Basseches, 1984). Dialectical thinking represents a developmental transformation (i.e., developmental movement through forms) occurring via constitutive and interactive relationships. From a dialectical perspective, all phenomena show continual movement, and contradiction is seen as inherent in all knowledge. Knowledge is construed as deriving from an active process whereby phenomena are conceptually organized and reorganized rather than as a passive accumulation of fixed external truths. If creativity is characterized as a response to ill-defined problems involving cognitive divergence from existing ways of thinking which lead to the creation of relations among elements previously considered as dissociated or even contradictory, how might dialectical thinking contribute to creativity?

When a given object or event is viewed from a dialectical perspective, it is likely to be seen as a process rather than as a thing, as changing rather than static; such events would be understood as parts of a larger whole and understood in relation to other phenomena. Dialectical thinking allows multiple and novel perceptions of identical events. A dialectical per-

spective expands perceptions of reality, enables perceptions characterized by greater variety and connectedness, and constitutes central features in the creative process.

Further, dialectical thinking may be particularly useful in facilitating creativity because this perspective assumes all ideas are evolving (Basseches, 1989). Where formal thinkers tend to change their ideas only when such ideas are "in error," dialectical thinkers view such changes as natural, expected, and valuable (Basseches, 1984). Thus, a dialectical perspective on knowledge encourages movement away from traditional paradigms and toward innovative reconceptualizations. This process has been viewed as characteristic of creative thinkers (Kramer, 1989).

In addition, contradictions represent signs of trouble, irritants to be ignored when possible and eliminated when necessary for formal thinkers (Kramer, 1989). In contrast, the dialectical thinker views knowledge as evolving from contradictions within theories or from those emerging between theories and the external factors to which they presumably refer (Manzo, 1992). Therefore, contradictions are seen by dialectical thinkers as opportunities for intellectual growth. Dialectical thinking serves as a "roadmap" for researchers who understand creativity as integrating or relating ostensibly contradictory ideas or frameworks, as in Rothenberg and Hausman's "Janusian thinking" (1976) or Koestler's idea of "bisociation" (1964).

Finally, the essence of dialectical thought is the apposition of opposites, thesis and antithesis, to achieve synthesis, a common ground, through the removal of ostensible contradictions (Hoffman, 2004). Contradiction is considered essential to the processes leading to synthesis, perhaps representing higher abstraction. Indeed, Riegel (1973) noted that dialectical thinking is the process by which contradictory experiences are transformed into momentarily stable structures. Hence, the thesis-antithesis-synthesis movement represents the emphasis on change within dialectical thinking (Basseches, 1984). The dialectical thinker responds to contradictions by trying to form a synthesis, a new higher-order relation among ostensibly opposed ideas or perceptions (Basseches, 1989). A dialectical thinking individual encountering contradictions resolves these by looking for higher order syntheses which create new and more complex systems encompassing the old contradictory elements (Sternberg, 2001). The tendency of dialectical thinkers to reconcile contradictions promotes the generation of novelty and the perception of new relations.

In general, dialectical thinking may be seen as providing directions for cognitive processes which are seen by many as central to creativity: Expect your way of thinking to change. Consider the problems from mul-

multiple perspectives. Look out for contradictions and pay close attention to them. Create ways of relating and synthesizing issues which seem to be in opposition or inconsistent. It also helps an individual to support the emotional tensions in the creative process by asserting that these are neutral and valuable parts of the evolution of thought and that they eventually lead to the creation of new and more adequate knowledge. The present study predicted that dialectical thinking would be positively associated with creative performance, and creative performance would be used as an indicator to differentiate the preeminent mode of thinking between dialectical thinking and formal thinking.

METHOD

Participants and Procedure

The sample was comprised of 454 young adults (225 women, 229 men; 23 to 40 years of age; $M = 32.1$, $SD = 4.8$) who were stratified into three demographic areas, northern, central, and southern Taiwan. Participants read a consent form which also informed them of the importance of this research. After participants signed consent forms, they were asked to complete questionnaires about their cognitive development, as measured by the modified Social Paradigm Belief Inventory (Kramer, *et al.*, 1992), and about their creativity, as measured by the Divergent Thinking Test (Lin & Wang, 1994). The present study was approved by the institutional review board of National Sun Yat-Sen University.

Measures

Cognitive development.—The Social Paradigm Belief Inventory, developed by Kramer, *et al.* (1992), was used to evaluate the levels of cognitive development achieved by participants. The original inventory was a 27-item, forced-choice test wherein respondents chose one of three statements (formal, relativistic, or dialectical) with which they most agreed. The scale showed internal consistencies ranging from .60 to .84 ($M = .72$, $SD = .11$). The test-retest correlation for the scale over a 2-wk. interval was .77. The correlation between the scale total score and the mean ratings on an in-depth interview measure of worldviews was .42. With regard to convergent and discriminate validities, the correlations of Social Paradigm Belief Inventory total scores and the other paradigm inventories, the Organicism–Mechanism Paradigm Inventory (Germer, Efran, & Overton, 1982) and the World Hypotheses Scale (Harris, Fontana, & Dowds, 1977), were significant in the expected directions. The scale was only minimally related to social dogmatism and was not significantly related to intolerance of ambiguity, verbal intelligence, and social desirability (see Kramer, *et al.*, 1992, for more details). The present study adopted a version of this original measure modified by presenting formal ($M = 16.6$, $SD = 3.3$) and

dialectical ($M=10.4$, $SD=3.3$) statements for each item (Chiou, 2004). In the modified version of the Social Paradigm Beliefs Inventory, relativistic statements were excluded because postformal operations theorists have proposed that relativistic thinking represents a subset of postformal operational thinking (e.g., Kramer & Woodruff, 1986; Basseches, 1989; Kramer, *et al.*, 1992). The following are the statements from three sample items. Item 6: (a) Change is unnatural. This is because people need traditional values to correct society's problems, and deviating from such values would be destructive (formal thinking statement). (b) Change is natural. This is because there will always be problems whose solutions may dramatically change old ways of thinking (dialectical thinking statement). Item 8: (a) In a war, there is usually a right side and a wrong side. This is because if both sides disagree, logically they couldn't both be right (formal). (b) In a war, both sides contribute to the problem. This is they belong to the same world and are part of the problems in that world (dialectical). Item 10: (a) There is no one right person for anyone. This is because characteristics one finds attractive will also seem unattractive in some ways (dialectical). (b) There is a right person for anyone. This is because some people just belong together since they have the same type of personality and as a result are perfectly compatible (formal). Revellé's beta coefficient of the modified Social Paradigm Belief Inventory was .78 for the present sample. The 1-mo. test-retest reliability was .77.

Respondents were asked to choose which of two statements (i.e., a formal statement or a dialectical statement) was closer to their own beliefs. Separate scores were computed for the number of formal statements chosen and the number of dialectical statements chosen. With regard to the classification of cognitive thinking groups, the "highest z score method" described by Kramer (1990) was applied to classify participants into formal or dialectical thinking groups. This method typically produces a definitive and discriminating classification to convert participants' frequencies for each statement into z scores and assigns them to a level based on their highest attained z score. Specifically, each participant's dialectical thinking score and formal thinking score were converted into separate z scores. The higher of these z scores was used to classify the participant into a group based on thinking level. This method was used to classify 264 participants (58%) into the formal thinking group and 190 (42%) into the dialectical thinking group.

Creativity.—The creativity of participants was measured on the Divergent Thinking Test, which was modified by Lin and Wang (1994). This test includes 12 unfinished drawings (stimulus drawings) to be completed within 20 min.; it does not involve verbal proficiency and therefore is suitable for Chinese participants (Lin & Wang, 1994). This test has six di-

mensions measuring creative performance: Fluency, Openness, Flexibility, Originality, Elaboration, and Naming.

Two raters, who were both professionals in creativity education, were recruited to establish the interrater reliability. According to Lin and Wang (1994), the interrater reliability for the scores on six dimensions ranged from .88 to .99, a satisfactory level of consistency. The 1-mo. test-retest correlation coefficients of the six dimensions ranged from .44 to .68. Cronbach coefficients alpha, measuring internal consistency, ranged from .45 to .87. The Torrance Test of Creative Thinking (Torrance, 1966) was the criterion test for scale validation. Scores on all six dimensions of the Divergent Thinking Test correlated positively with the criterion test total scores for adolescent, youth, and adult groups, with correlation coefficients ranging from .26 to .55.

The Divergent Thinking Test was administered in a group format. Each participant's finished drawings were scored according to the scoring criteria set out in the test manual. The score for fluency was the number of drawings completed by each participant. Openness for each drawing was scored using a 3-point scale, using ratings of 0: Only drawing in the interior space of the stimulus drawing, 1: Only drawing in the exterior space of the stimulus drawing, and 2: Drawing in both interior and exterior space of the stimulus drawing. The score for Flexibility was the number of corresponding categories for the completed drawings. Originality for each drawing was scored for its probability of appearance in the norm on a 3-point scale, using ratings of 0: Higher or equal to 5%, 1: Between 2% and 5%, and 2: Less than 2%. Elaboration for each drawing was rated on a 3-point scale in terms of symmetry, with ratings of 0: Drawing in both external and internal space of the stimulus drawing is symmetric, 1: Drawing in the external space of the stimulus drawing is symmetric, and 2: Drawing in the internal space of the stimulus drawing is symmetric. Naming for each drawing was scored on a 3-point scale in terms of vocabulary, with ratings of 0: No title naming or naming with a single noun, 1: Use of an adjective or a modifier for a noun, and 2: Use of an imaginative title. Hence, possible total scores for Fluency and Flexibility ranged from 0 to 12. Possible total scores for Openness, Originality, Elaboration, and Naming ranged from 0 to 24. Higher total scores on a dimension represent more creative performance.

RESULTS

Correlation Analysis

In Table 1 are the means and standard deviations of responses to the tests, as well as the Pearson correlations among the measures. The Formal Thinking scores were negatively correlated with the six dimensions

TABLE 1
MEANS, STANDARD DEVIATIONS, AND PEARSON INTERCORRELATIONS*
AMONG EIGHT MEASURES (N = 454)

Measure	M	SD	Pearson <i>r</i>							
			1	2	3	4	5	6	7	8
1. Dialectical Thinking	10.4	3.3								
2. Formal Thinking	16.6	3.3	-1.00							
3. Fluency	10.3	0.9	.47	-.47						
4. Openness	14.7	1.8	.51	-.51	.52					
5. Flexibility	7.6	1.4	.46	-.46	.48	.59				
6. Originality	14.6	1.7	.51	-.51	.47	.63	.61			
7. Elaboration	14.3	1.7	.48	-.48	.51	.66	.60	.64		
8. Naming	14.8	1.8	.41	-.41	.54	.61	.66	.61	.67	

* $p < .001$.

of creativity, with values ranging from $-.41$ to $-.51$. More importantly, dialectical thinking scores (i.e., postformal thinking modes) were positively correlated with these creative dimensions, values ranged from $.31$ to $.38$. These findings were consistent with the predictions and suggest dialectical thinking might be closely related to creative performance among young adults as percent common variance accounted for ranged from 9 to 14%.

Differences in Creativity by Cognitive Development

The z-score method was used to divide participants into two levels of cognitive development based on their highest attained z score (Kramer, *et al.*, 1992). Overall, 264 participants were classified into the formal thinking group and 190 participants were classified into the dialectical thinking group. A one-way MANOVA was conducted to examine differences between means in the six dimensions of creativity simultaneously between the two cognitive thinking groups. The result indicated that the dialectical thinking group was significantly more creative than was the formal thinking group ($F_{6,447} = 259.49$, $p = 1.2e-142$; $\eta^2 = .77$, 95%CI = $.65-.89$). In addition, planned contrasts by *t* tests were conducted to compare differences between means for the two groups in terms of the six dimensions of creativity separately. The *t* tests showed a consistent pattern of differences between means for the two cognitive groups. Participants in the dialectical thinking group scored significantly higher than those in the formal thinking group on all dimensions of creativity at $p < .001$ (see Table 2).

Multiple Discriminant Analysis

Multiple discriminant analysis was applied to examine whether scores on the six dimensions of creativity (Fluency, Openness, Flexibility, Originality, Elaboration, and Naming) were correlated with membership in a cognitive thinking group (0: = Formal thinking group, 1: Dialectical think-

TABLE 2
MEANS AND STANDARD DEVIATIONS FOR TWO COGNITIVE THINKING GROUPS

Creativity	Formal Thinking Group (<i>n</i> = 264)		Dialectical Thinking Group (<i>n</i> = 190)		<i>t</i> *
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Fluency (0–12)	10.0	0.8	10.8	0.8	9.22
Openness (0–24)	13.2	0.7	16.5	0.8	32.50
Flexibility (0–12)	6.7	0.8	9.0	0.8	25.10
Originality (0–24)	13.3	0.5	16.5	0.7	34.72
Elaboration (0–24)	12.9	0.6	16.1	0.8	31.82
Naming (0–24)	13.5	0.8	16.5	1.1	26.29

**p* < .001.

ing group). For cross-validation, the total sample was randomly classified into either an “analysis sample” (*n* = 227) or a “holdout sample” (*n* = 227). Within the analysis sample, 127 participants (56%) were in the formal thinking group and 100 (44%) were in the postformal thinking group.

Simultaneous multiple discriminant analysis (see Table 3) indicated that the linear combination of the six dimensions of creativity could effectively differentiate the two cognitive groups. The derived canonical discriminant function was: Y (discriminant *z* score) = $-16.72 + (-0.48)$ Fluency + (-0.02) Openness + (-0.47) Flexibility + 1.14 Originality + 1.78 Elaboration + (-1.11) Naming (for which Wilks $\lambda = .21$, $\chi^2_6 = 349.48$, $p = 9.7e-73$). The hit rate of correct classification in the analysis sample was 96%, which was more than 25% above the proportional chance criterion ($0.56^2 + 0.46^2 \approx 53\%$; Press’s $Q = 192.43$, $df = 1$, $p = 9.2e-44$). The hit rate of correct classification in the holdout analysis sample was 96%, which was also more than 25% above the chance criterion. These findings indicated that the discriminant validity was satisfactory. Note discriminant coefficients are sub-

TABLE 3
MULTIPLE DISCRIMINANT ANALYSIS OF SIX DIMENSIONS
OF CREATIVITY FOR COGNITIVE THINKING GROUPS

Discriminant Variable	Standardized Discriminant Coefficient	Discriminant Loading*
Fluency	-0.38	.88
Openness	-0.20	.79
Flexibility	-0.44	.79
Originality	0.95	.64
Elaboration	1.57	.58
Naming	-1.13	.18
Hit Rate, %		
Analysis Sample (<i>n</i> = 227)	96%	
Holdout Sample (<i>n</i> = 227)	92%	

Note.—This subsample included 127 high formal scorers and 100 high dialectical scorers, whereas the holdout sample included 137 high formal scorers and 90 high dialectical scorers. **p* < .01.

ject to multicollinearity; the discriminant loadings of the variables referring to correlations between discriminating variables and standardized canonical discriminant functions (i.e., shared variance) were more appropriate for understanding the contribution of each discriminant variable to the discriminant function (Hair, Anderson, Tatham, & Black, 1998). In the analysis sample's data, the discriminant loadings of the six discriminant variables were all significantly positive at $p < .01$, ranging from .18 to .88, which indicates that participants who scored higher on the six dimensions of creativity also exhibited a higher likelihood of being in the dialectical thinking group.

DISCUSSION

In this paper, it has been argued that the development of dialectical thinking, compared to formal thinking, might facilitate the development of creativity in early adulthood. A dialectical view should foster awareness of novelty and of relations among phenomena. Further, a dialectical view of knowledge seems likely to foster habits of thought which promote set-breaking, attention to contradictions, and attempts at synthesis, important features of creative processes generally. Overall, these findings are congruent with the predictions. The correlation analysis indicated that formal thinking and the six dimensions of creative performance were negatively associated. These results are consistent with the original hypothesis, which held that formal thinking is a single, closed system of cognitive transformations that do not relate to creative performance. Niaz and De Nunez (1991) demonstrated that the "most mobile" adolescent students performed best on creativity tests, whereas "fixed" students performed better on tests of formal reasoning. The correlations of measures of formal thinking and creativity for young adults were in accord with their findings about the relation of creativity with formal reasoning. Scores on a measure of dialectical thinking correlated positively with all six dimensions of creative performance. The correlations were consistent with the inferences discussed in the literature review, indicating that the emergence of dialectical thinking in early adulthood may be related to creativity and could facilitate creative performance. The dialectical thinking group consistently had higher means than those of the Formal thinking group on all six dimensions of creativity. Differences between means for the two cognitive groups were consistent with the Pearson correlations, indicating that dialectical thinking and creative performance may exhibit parallel developmental relation. In addition, multiple discriminant analysis suggested that scores on six creative dimensions would distinguish between the two groups.

The number of participants was quite large. The influence of sample size on statistical significance should be considered when evaluating the

findings obtained in the present study. This study is limited by its cross-sectional design so causality cannot be inferred between cognitive development and creativity. It can be argued that the purported independent variable (i.e., dialectical thinking) in a given correlation may be affected by the purported dependent variable (i.e., creative performance) or that both are affected by some unmeasured variable. Researchers must employ a longitudinal design which would allow assessments of causal relations between dialectical thinking and creativity among adults. For example, the development of dialectical thinking in early adulthood could represent a necessary, but not a sufficient, condition for the emergence of creativity. If so, young adults exhibiting great creativity should also be dialectical thinkers. It would be important to investigate other personal factors which might contribute to adult creativity, such as attitudes toward divergent thinking (McCrae, 1987; Williams, 2004), openness to experience (McCrae & Costa, 1997; George & Zhou, 2001), adult wisdom (Sternberg, 2001), coping ability (Carson & Runco, 1999), and critical thinking (Bisset, 2000), etc. In addition, researchers could address whether the development of affect and acquisition of expertise in specific domains also contribute to adult creativity, how adult creativity differs from creativity in childhood or adolescence, and what experiences contribute to the growth of creativity in early adulthood. To avoid a mono-method bias which might threaten construct validity, studies might employ multiple formats or methods used in structural-developmental psychology to assess cognitive development in early adulthood. This suggestion is also important to measurement of adult creativity. A complete measure of creativity may capture creative production of adults in real-world situations.

In conclusion, based on the postformal operations perspective, this study has provided some empirical support for the relation of cognitive development with creativity in early adulthood. Cognitive development and creativity may be closely related events in adults. The development of dialectical thinking may facilitate creative performance by young adults. The major features of dialectical thinking (e.g., generation of novel and new relations, unconventional set-breaking, and synthesizing aspects of previously understood contradictions) have been described likely important in creativity. Research into cognitive development and creative thinking, based on the structural-developmental approach, could provide new insights for promoting creativity through adult education; such approaches would differ from psychometric or creative process approaches. Experiences that challenge the models used to understand the self and the world tend to be met with avoidance and defensiveness. Nonetheless, dialectical skills might be fostered through appropriate educational experiences and support for the painful experiences of disequilibrium and uncertainty associated with challenging traditional modes of thinking.

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