SOCIAL INTERACTION AND METACOGNITIVE DEVELOPMENT: METACOGNITIVELY STIMULATIVE ASPECTS OF ADULT-CHILD INTERACTION

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The results of an investigation of metacognitively stimulative aspects of mother-child interaction will be presented and a reconceptualization of metacognition focusing on its experiential basis offered. The investigation was an observational study of first grade children and their mothers. Their interaction was organized around game-like and homework-like tasks in the Zone of Proximal Development. Metacognitively more developed children proved to have mothers who included a language of thinking in mediating the tasks and were highly sensitive to the child's metacognitive experiences (confusion, excitement, etc.). Three general issues regarding the nature of metacognitive processes will be discussed in the light of these results, and relying on the theory of Vygotsky: their contextuality, their distributed nature and their culture-specificity.

Key words: Metacognition, mother-child interaction, self-regulation.

The basic impulse to conduct this research on the impact of social interaction on metacognitive development has come from two sources: 1. A need for a theoretical reconsideration of metacognition from a Vygostkian perspective, 2. A practical concern for metacognitive development being neglected in the schooling system in Yugoslavia and the burden of cognitive development put on the shoulders of the parents.
Reconsidering metacognition

Although Brown, discussing the theoretical sources of metacognition (Brown, 1987) highlighted four pertinent issues in psychology (verbal report as data from classical introspective psychology, executive control from cognitive psychology, self-regulation from Piaget and the transference from other-regulation to self-regulation from Vygotsky), only two of these had substantial impact on metacognitive research: the cognitive (Sternberg, 1982, 1984; Demetriou, Efklides and Platsidou, 1993) and Vygotskian (Vygotsky, 1978, 1986; Wertsch, 1978). However, a complete integration even of these two approaches was achieved neither on the conceptual nor on the empirical level, which eventually contributed to the split of metacognition (Brown, 1994, Wertsch, 1994) into self-regulation and theory of mind. In a sense, this split was already incorporated in the very concept of metacognition, covering a broad range of phenomena — knowledge of own cognitive functioning, regulation of own cognitive activity and experiential corollaries of this activity (Flavell and Wellman, 1977), without the explication of integrative links between them. Hence, knowledge and regulation tended to be dealt with separately and in a particularized way, and the experiential aspect of metacognition gradually faded out from the scope of metacognitive research. This state of affairs also undoubtedly resulted from methodological problems in registering and measuring metacognitive phenomena, due to the hidden and subtle character of these processes, their sensitivity to contextual variations and the ease in falsifying introspective accounts. However, as much as this particularization seems understandable from the viewpoint of scientific rigor, it can be considered unfortunate if one bears in mind that metacognition gained interest predominantly due to its potential heuristic value derived from its overarching nature.

Metacognition as a Vygotskian topic

Capitalizing upon the theory of Vygotsky in a more complete manner might prove fruitful in overcoming the conceptual and theoretical difficulties of metacognitive research, briefly described above. Indeed, metacognition can be considered as Vygotskian topic par excellence. Metacognitive development can be conceived as the core phenomenon of development envisioned by Vygotsky, since it involves mastering of own mental processes, their voluntary control, establishing links between different functions and creating new functional systems. In this vein, Braten (1991a,b, 1992) in his reconsideration of the theoretical sources of metacognition, finds all four sources, identified by Brown, linked and embedded in Vygotsky’s theory. Braten’s analysis focuses predominantly on highlighting the ways in which
knowledge and regulation enhance each other in the course of development described by Vygotsky and reinforced by many empirical investigations later on. Hence, one of the main conceptual problems with metacognition (the knowledge / regulation split) should have not existed at all, if the potentials of the full scope of Vygotsky’s theory had been taken into account earlier on, is Braten’s general conclusion.

In addition to this fundamental benefit, two other points or implications of a Vygotskian approach should be stressed. The experiential aspect of metacognition, although listed in the earliest definitions of metacognition (Flavell and Wellman, 1977) except the investigations of the "feeling of knowing" phenomenon (Nelson, et al. 1984, 1986), has not gained much attention from investigators. Neither was its relation to knowledge/awareness and regulation satisfactorily resolved. However, the theory of Vygotsky opens the possibility of a new look upon the role of metacognitive experiences as well. Development is conceived by Vygotsky neither as maturation nor as learning, but as a unique interplay between the natural and the cultural processes – it is the cultural framing of personal experiences. Hesitancy, confusion, doubt, not-being-sure-what-to-do-next, as well as surprise, excitement, eagerness, delight, the "aha" experience, the scale from feeling uncertainty to feeling certainty, and other "cognitive emotions" (Scheffler, 1991) and "intellectual passions" (Perkins, 1992) which constitute the "soft stuff" thinking is made of, might productively enlarge the list of metacognitive experiences. Dealing with these experiences, their legitimization and building regulation and awareness upon them, so painfully lacking in the teaching process in schools (Kovac-Cerovic and Seizova, 1991), might be the main road for enhancing or even constructing metacognitive development. (Relying on this argument: we have developed a metacognition fostering program of a series of educational workshops for grade school children, Kovac-Cerovic et al., 1993). Moreover, in this way, metacognition is seen as becoming culturally shaped, and variations in cultural ways of regulating and being aware of own mental processes might become visible on the level of metacognition. Also, meaning making, as the basic activity of the interpretative mind (Bruner, 1990) can be conceived as one of the core metacognitive processes, in the cognitive analyses embedded in planning, but in non-laboratory settings clearly distinct and recognizable.

Therefore, the basic underlying assumption of this study is derived from the Vygotskian conception of development. The mechanism of metacognitive development is seen as internalization, proceeding from other-regulation or joint regulation to self-regulation, i.e. from being interspsychical toward becoming intrapsychical. The process of metacognitive development is expected to occur in adult-child interactions in the Zone of Proximal Development (ZPD; Vygotsky, 1978), during which the adult is expected to gradually hand over metacognitive
control to the child (Wertsch, 1978). However, Wertsch's initial description of how metacognitive functioning is distributed in the mother-child dyad, and changed in the course of solving a task (Wertsch, 1978) has been subject of critical re-examinations. Kontos (1983) in her microanalytic study did not find enough empirical evidence to support Wertsch's conclusion that the roots of metacognition are in the mother-child interaction. On the other hand, Elbers et. al. (1992) found that Wertsch's account is understating the role of the child. When using more naturalistic situations, they found (as did others, e.g. Ignjatovic-Savic, et.al, 1988) that the child is far more active in constructing the actual nature of interaction than in the jigsaw-puzzle task used by Wertsch. Also, descriptions of the mechanisms underlying interaction in the ZPD, condensed into different metaphors ("scaffolding", Wood, 1986; "appropriation", Rogoff, 1990; "construction zone" Newman, Griffin and Cole, 1989; "negotiation of meanings", Wertsch, 1989) acknowledge the complexities of adult-child interaction in the ZPD, but nevertheless leave us in a hesitancy about the actual ways in which metacognitive development is constructed through social interaction. The purpose of this study, stated in most general terms, was to make the necessary preliminary steps to approach an investigation of metacognitive development and its enhancement during mother-child interaction, as well as to open the issue of cross-cultural differences in this respect.

The study

The following study was aimed to describe the ways in which mothers are (or are not) using the opportunity created by interacting with their children on tasks which are in the Zone of Proximal Development of the children to foster the child's metacognitive development. Those features of the interaction which can be considered the most important for fostering of metacognitive development are derived from the theoretical reconsideration of metacognition in the socio-cultural perspective, described above. They are:

- Handing over the metacognitive control to the child and rendering requested activities meaningful for him,
- Making metacognitive regulation transparent for the child (especially planning, monitoring and checking),
- Promoting metacognitive awareness (using a language of thinking in interaction with the child),
- Dealing with metacognitive experiences (making them possible and legitimate for the child, and building upon them appropriately, both regarding the timing and the developmental direct-edness of the adult's interventions).
Social Interaction and Metacognitive Development

The actual research is dealing with mother-child interaction in the situations resembling every-day activities (games and school assignments) and targeted at the age when metacognitive development is most likely starting to unfold (7-8 years). It is embedded in a greater longitudinal project investigating mother-child interaction and its developmental effects, which was conducted 1983-93, at the Institute of Psychology in Belgrade.

Sample

The original sample for the longitudinal study consisted of 50 infants from Belgrade, stratified by gender (25 boys and 25 girls), age (9, 12, 15, 18, and 21 months) and by their mother's education (% attendance elementary school, 50% high school, 25% college graduated). For the second visit, when the majority of data for this study has been collected, 42 children and their mothers from the original sample were investigated (33 in first grade, 9 in their last preschool age). At the third data collection period the sample comprised of 32 fourth grade and 9 third grade children.

Design

The general strategy was to analyze mother-child interaction concerning its metacognitive stimulativeness and to assess the correlations of the interactive indices with metacognitive development, intelligence and grades. Additionally, an analysis of the early antecedents of metacognitively stimulative interaction has been conducted. Most situations for assessing mother-child interaction and the child's metacognitive development were designed for the purposes of the present study in the second data collection period (at the children’s age 7-8 years). All investigations were conducted in the child’s home, and were video or audio-taped. The tapes were analyzed and coded by two independent observers for each situation (different two for each situation). The home visit started with situations assessing metacognitive development of the child, without mother’s presence. Later on, the mothers were asked to come and help the child, and the interactive situations were administered. The children’s intelligence was tested with the New Belgrade Revision of the Binet (Milinković et al, 1976). Information on school-grades was gathered from the first semester of the school-year, as being more discriminative than those from the second semester. For assessing early interaction, two videotaped situations from the first data collection period (infant age: 9-21 months) were used and coded in the same manner as data recorded at the second visit.
Procedure

**Metacognitive development** was assessed through the following indices/situations: *Metamemory Interview* (MMI). A modification of Kreutzer, Leonard and Flavell’s (1975) metamemory interviewing procedure was used. The modification consisted of a slight cultural adaptation of the questions and tasks and the development of a scoring system for assessing each child’s metamemoric functioning (Stanišić, 1991). *Guessing Game* (GG). This game assessed the metacognitive regulation of the child’s searching activity and the ease by which the child adopted an efficient searching strategy was assessed. A set of 32 cards (used for assessing concept formation by Bruner, Goodnow and Austin, 1967) were displayed in front of the child (each category in a row) and a game initiated where the child or examiner were trying to find out (within 10 guesses, followed by YES, or NO answers) which of the pictures the other is thinking of. Examiner and child alternated. There were 5 phases, 3 for assessing the child (1.-baseline, the other 2 after modeling) and two in which the examiner displayed (at first tacitly, then explicitly, by turning upside down the categories of pictures for which the child said NO) the most efficient searching strategy (searching for categories instead of particular items, and keeping track of questions and narrowing down possible guesses by elimination of categories).

*Forbidden Colors Game* (FCG). This game was used to assess the child’s aptness to use external aid as mediator of his/her thinking processes. It is an adaptation of Leontiev’s experiment, reported by Vygotsky and Van der Veer (Vygotsky, 1978, Van der Veer, 1994). It is a verbal game containing 2 series of approximately 15 question-answer episodes. The Examiner asks questions, some of them referring to colors. In answering, the child has to follow 2 rules of the game: not to mention the "forbidden color" named by the Examiner in advance, and not to mention any color twice during the same series of questions. In the second phase, 10 colored cards were given to the child in order to aid him in answering the next series of questions more successfully, but without actual explanation how, when and why to use them. The level of appropriate card usage in phase two and percentage of correct color answers were registered.

**Metacognitively stimulative aspects of mother-child interaction** were assessed in the following situations at K-Gr.1 age:

*Forbidden Colors Game with Mother* (FCGM). This situation constituted the third phase of the FCG when the mother (not present at phases 1 and 2) was asked to help the child to learn to use the cards to play better.

*Guessing Game with Mother* (GGM). In this situation the mothers’ way of promoting the child’s categorical search was assessed in a
more spontaneous game then in GG (guessing the object in the room the other is thinking of).

Underlining Text (UT). This situation was introduced only to grade 1 children. The mother was asked to help the child in selecting and underlining the most important parts of a two passage text from a 2nd grade textbook.

From all these situations the following variables were extracted:

- A scale of metacognitive problems created by the mother in the course of interaction (from no problems detected, through insufficient upgrading of the child’s process, not providing a mental model, not providing opportunity for the child’s metacognitive experiences to occur, these experiences overruled, to straightforward creating of metacognitive problems for the child by confusing messages, several contrary instructions, etc.) (MC NOP)

- The assessed zone of mother’s intervention (future, potential, actual, past, according to an elaboration of the concept of the ZPD in Ignjatovic-Savic, Kovac-Cerovic, Plut and Pesikan, 1988) rated for each situation separately, then combined in 2 variables: the best (Zone optimistically assessed, ZOOPT) and the worst (Zone pessimistically assessed, ZOPES).

- Mother’s activity in participating (AKTM),

- Mother’s directiveness (DIRM)

- From the Underlining Text situation, being the most sensitive and fruitful for the phenomena under the scope of the present study, several additional variables were selected:

- Two representative indices of the child’s negotiated activity and role in the task through: (a) Who was the actual underlining agent and how independently he/she translated the selected important part into a line with a definite starting and ending point, UAG, and (b) Who was the important part selecting agent, IMPAG;

- A variable tapping the meaning making aspect of metacognition through the ways mothers mediated the main task feature to the child, i.e. the genres in translating the "underlining the important parts of the text" request (MEDE);

- The child’s participation in thinking allowed or asked for by the mother, from an explicit invitation to think with the respective straightforward use of the language of thinking to the denial of any possibility for the child having thinking experiences while solving the task (ITH).

Early precursors of metacognitively stimulative interaction at age 9-21 months were assessed through two situations (for detailed description and partial analyses of situations under scope at wave 1 see Ignjatovic-Savic et al., 1988):
Picture Book Viewing (PBV). This situation was aimed to assess the amount of joint attention of the infant and the mother while viewing a novel picture book. A detailed coding system was developed and differing levels of joint attention scored.

Ring Assembly Task (RAT). This task was administered only to 18 month’s infants (N=20). The mother had to teach the child to complete a sequence of activities in assembling a wooden plate with a hole in the middle, 2 rings of different size, and a toy-trumpet on each other in the correct order, to beep the trumpet at the end and then to decompose the assembly. The main variable derived from this situation was the proximity of other-regulation (from direct, physical moving of the child’s hands to more verbal and indirect playful ways of regulating).

Results and discussion

Indices of metacognitive development

Correlations between different tasks are shown on Table 1.

Table 1: Correlations of indices of development

<table>
<thead>
<tr>
<th></th>
<th>BINET</th>
<th>MM</th>
<th>FCG(%)</th>
<th>FCG(CARD)</th>
<th>GG(PH.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM</td>
<td>.57**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCG(%)</td>
<td>.48*</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCG(CARD)</td>
<td>.56*</td>
<td>.44</td>
<td>.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GG(PH.1)</td>
<td>.23</td>
<td>.31</td>
<td>.13</td>
<td>.53*</td>
<td></td>
</tr>
<tr>
<td>GG(PH.2)</td>
<td>.03</td>
<td>.17</td>
<td>.19</td>
<td>.27</td>
<td>.62**</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Most of the correlations of the different indices across these tasks are low, not significant, except in four cases:
- FCG card usage with GG strategic guessing at phase 1. (.53*), accordingly, these 2 situations are connected, but tapping somewhat different aspects of MC functioning
- FCG card usage with IQ .56*
- FCG percentage of correct answers in the first series (without cards) with IQ .48*
- MM with IQ .57**, hence MM seems to be a correlate of IQ, but clearly a different phenomenon.
According to this evidence, metacognition cannot be conceived as a homogenous phenomenon. Theoretical elaborations of metacognition indeed approve such a finding. However, since the two included games focus on the regulative aspect of metacognition, we must conclude that, even in this respect, we are dealing with a set of related but not overlapping mechanisms. However, card usage seems to detect an important process, related to all other, otherwise not related variables, and in this sense it might reflect the organizing nature of metacognition.

Indices of mother-child interaction at age 7-8

Correlations between different interactive indices are shown on Table 2.

Table 2. Correlation of interactive indices

<table>
<thead>
<tr>
<th></th>
<th>MCNOP</th>
<th>ZOOPT</th>
<th>ZOPES</th>
<th>AKTM</th>
<th>DIRM</th>
<th>UAG</th>
<th>IMPAG</th>
<th>MEDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOOPT</td>
<td>.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZOPES</td>
<td>- .72**</td>
<td>-.58*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKTM</td>
<td>-.31</td>
<td>.25</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIRM</td>
<td>-.46*</td>
<td>-.23</td>
<td>.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAG</td>
<td>.49*</td>
<td>.38</td>
<td>-.25</td>
<td>-.37</td>
<td>-.44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMPAG</td>
<td>.45</td>
<td>.30</td>
<td>-.24</td>
<td>-.64**</td>
<td>-.44</td>
<td>.61*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEDT</td>
<td>.46</td>
<td>.43</td>
<td>-.34</td>
<td>-.57*</td>
<td>-.32</td>
<td>.58*</td>
<td>.79**</td>
<td></td>
</tr>
<tr>
<td>ITH</td>
<td>.75**</td>
<td>.36</td>
<td>-.53*</td>
<td>-.62**</td>
<td>-.58*</td>
<td>.68**</td>
<td>.78**</td>
<td>.83**</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Clearly, the highest correlations have been detected between the variables derived from the same situation, UT; specifically, the way the mothers mediated the task to the child and the extent to which they involved them in thinking, as well as the child’s active role in selecting the important parts of the text. At the same time, the level of the child’s involvement in thinking (asked for or permitted by the mother, and encompassing the use of the respective language of thinking by the mother) seems to be a focal variable of interaction, having significant negative correlations with the pessimistic appraisal of the developmental directedness of the mother’s interventions (the worst of all registered types in the same dyad), her directiveness and level of activity/engagement in solving the tasks, but high positive correlations with the other variables except the optimistic appraisal of the
developmental directedness of the mother's interventions (the best of all displayed interactions by the same dyad). The two indices of the child's active role in underlining and selecting the important parts of the text (UAG and IMAG), although connected, but not overlapping, also correlate with the most important interactive indices. The scale of metacognitive problems created by the mother (from no problems to severe problems) seems to be a crucial variable, having significant negative correlations with the ZOPES and the mother's directiveness (DIRM), but positive ones with the extent of child's engagement in underlining and the explicitness of the invitation to think received from the mother. Mother's directiveness and activity behave in a similar way, showing either that the coding system did not succeed in disentangling them or that active task-related involvement of the mothers has a similar detrimental effect on the other aspects of interaction to unfold as her directiveness has. In any case, both activity and directiveness are negatively correlated with all other indices of interaction, except ZOPES. ZOPES and ZOOPT, although behaving clearly differently, and having the significant negative intercorrelation, do not seem mutually exclusive, which justifies the inclusion of both ways of treating the variety of developmental directedness of intervention displayed by the mothers in the course of interacting with the child on different tasks. It has to be noted, that the variables extracted by theoretical reconsideration of metacognition in the light of the sociocultural theory (dealing with metacognitive experiences, meaning making and the language of thinking) have been shown, according to the correlational evidence, to be important indices of the mother-child interaction. The more global variable, ZOPES also seems to be sensitive to the ways mothers cope with metacognitive experiences of the children. Interactive indices across the age range from 1 to 8 years.

Significant correlations between interactive indices at these two remote age levels have not been detected, partly due to the restricted sample size (N=20 for RAT). However, it seems that the worst extreme of mother-regulation (physically moving the child's hands while assembling the rings) still has recognizable counterparts at age 7-8: all four mothers engaged in this way of regulating their infant's activity displayed high directiveness and low sensitivity to the child's metacognitive experiences at wave two. Another surprising result is discussed in the next section.

Interactive indices and variables of metacognitive and cognitive development

Significant correlations between interactive and developmental indices are shown on Table 3.
Table 3: Correlations between interactive and developmental indices.

<table>
<thead>
<tr>
<th>BINET</th>
<th>FCG(card)</th>
<th>MM</th>
<th>SCHOOL GRADES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCNOP</td>
<td>.48**</td>
<td>JOINT ATT</td>
<td>.45*</td>
</tr>
<tr>
<td>MDT</td>
<td>.58**</td>
<td>ZOPES</td>
<td>-.43*</td>
</tr>
<tr>
<td>ITH</td>
<td>.51**</td>
<td>ZOOPT</td>
<td>.40*</td>
</tr>
<tr>
<td>UAG</td>
<td>.52**</td>
<td>(MCNOP, UAG, MEDT, ITH close to significance)</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

The most important interactive indices are found to be correlated with the BINET IQ, and partially metamemory (which is also connected to IQ). This finding, of course, leaves the possibility for two disparate interpretations: either these indices depict stable interactive features, which have already impacted metacognitive and hence cognitive development by the age of 7-8 years, or mothers during the interaction actually tailor the treatment of their children according to the child’s witnessed competence, thus presumably further reinforcing their intellectual capacities or incapacities. Card usage in FCG and the school-grades collected 3 years later correlate significantly only with the most general interactive indices, the developmental directness of the mother’s interventions. Another result is, though, surprising: joint attention level from the Picture Book task is significantly correlated (.45*) with FCG card usage, indicating the possibility that joint attention might be one of the precursors of metacognition.

Aspects of metacognitive regulation absent in the mother-child interaction

Yet another way of analyzing interaction was to search for and identify elements of interaction which are focused on specific metacognitive processes, or metacomponents, listed by Sternberg (1984). The rationale of this analysis was that, in order to become internalized or mastered, these processes of metacognitive regulation have to become the object of interaction, or at least become transparent to the child. Also, in this manner, implicit cultural differences might become visible, since Sternberg’s listing of results from his investigations of the North American population. Hence, the presence of planning, checking and self-monitoring was registered in the interactions as well as the overall fluctuation of maternal involvement (Table 4.)

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a fundamental mechanism of constantly re-generating an authoritarian mode of thinking in the society.

Conclusion

This study dealt with the metacognitively stimulative aspects of mother-child interaction, based on a Vygotskian reconsideration of metacognition and its development. It was shown that theoretically relevant but empirically novel aspects of interaction can be detected in the realm of mother-child interaction - specifically, dealing with metacognitive experiences, meaning making, language of thinking. Also, a tentative cultural pattern of interaction has been recognized, fostering close mother-child relationships but ignoring metacognition, which, coupled with the impact of schooling, might be potentially detrimental to individual independent functioning.

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