

A COMPARATIVE STUDY ON DEVELOPMENTAL AND GENDER DIFFERENCES ON METACOGNITION

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Abstract: *The present study is designed to compare the level of metacognition between young and old people. The subject were given metacognition questionnaire (MCQ-30), which is concerned with beliefs people have about their thinking. Subject needs to tick /choose the response with which they are agree. The study was done to understand how metacognition develop. Does it increase or decrease with age? 40 samples (20 subject of age 18-26 and 20 subjects of age 50-58, further 20 male and 20 female) were selected through simple random technique. MCQ-30 was used for assessing Metacognition of subjects under investigation. This was a comparative study of old and young people and gender difference.*

Key Words: *metacognition, developmental effects, general intelligence, working memory, Cognitive Self Consciousness*

1. INTRODUCTION:

Metacognition is defined most simply as “thinking about thinking.” Metacognition consists of two components: knowledge and regulation. Metacognitive knowledge includes knowledge about oneself as a learner and the factors that might impact performance, knowledge about strategies, and knowledge about when and why to use strategies. Metacognitive regulation is the monitoring of one’s cognition and includes planning activities, awareness of comprehension and task performance, and evaluation of the efficacy of monitoring processes and strategies. Recent research suggests that young children are capable of rudimentary forms of metacognitive thought, particularly after the age of 3. Although individual developmental models vary, most postulate massive improvements in metacognition during the first 6 years of life. Metacognition also improves with appropriate instruction, with empirical evidence supporting the notion that students can be taught to reflect on their own thinking. Assessment of metacognition is challenging for a number of reasons: (a) metacognition is a complex construct; (b) it is not directly observable; (c) it may be confounded with both verbal ability and working memory capacity.

2. METACOGNITION:

John Flavell originally coined the term metacognition in the late 1970s to mean “cognition about cognitive phenomena,” or more simply “thinking about thinking” (Flavell, 1979, p. 906). Subsequent development and use of the term have remained relatively faithful to this original meaning. For example, researchers working in the field of cognitive psychology have offered the following definitions:

“The knowledge and control children have over their own thinking and learning activities” (Cross & Paris, 1988, p. 131)

“Awareness of one’s own thinking, awareness of the content of one’s conceptions, an active monitoring of one’s cognitive processes, an attempt to regulate one’s cognitive processes in relationship to further learning, and an application of a set of heuristics as an effective device for helping people organize their methods of attack on problems in general” (Hennessey, 1999, p. 3)

“Awareness and management of one’s own thought” (Kuhn & Dean, 2004, p. 270)

“The monitoring and control of thought” (Martinez, 2006, p. 696)

As Kuhn and Dean (2004) explain, metacognition is what enables a student who has been taught a particular strategy in a particular problem context to retrieve and deploy that strategy in a similar but new context. The authors note that in cognitive psychology, metacognition is often defined as a form of executive control involving monitoring and self-regulation, a point echoed by other researchers (McLeod, 1997; Schneider & Lockl, 2002). Further, Schraw (1998) describes metacognition as a multidimensional set of general, rather than domain-specific, skills. These skills are empirically distinct from general intelligence, and may even help to compensate for deficits in general intelligence and/or prior knowledge on a subject during problem solving.

Constituent Elements of Metacognition

Metacognition has two constituent parts: knowledge about cognition and monitoring of cognition (Cross & Paris, 1988; Flavell, 1979; Paris & Winograd, 1990; Schraw & Moshman, 1995; Schraw et al., 2006; Whitebread et al., 1990). Several frameworks have been developed for categorizing types of knowledge about cognition. For example, Flavell (1979) defines cognitive knowledge as knowledge about one's own cognitive strengths and limitations, including the factors (both internal and external) that may interact to affect cognition. He classifies such knowledge into three types: (1) "person" knowledge, which includes anything one believes about the nature of human beings as cognitive processors; (2) "task" knowledge, which includes knowledge about the demands of different tasks; and (3) "strategy" knowledge, which is knowledge about the types of strategies likely to be most useful. Flavell notes that these different types of knowledge can interact, as in the belief that one should use strategy A (versus strategy B) to solve task X (rather than task Y).

3. DIFFERENCE BETWEEN COGNITION AND METACOGNITION:

It will be useful to reveal the difference between cognition and metacognition while explaining the concept of metacognition. The concepts of cognition and metacognition are different although they are related to each other. While metacognition is necessary to understand how a task will be performed, cognition is required to fulfill a task (Schraw, 2001). While cognition means being aware of and understanding something, metacognition is being aware of and knowing how one learns in addition to learning and understanding something (Senemo-lu, 2005). According to Gourgey (1998), on the other hand, cognition is necessary to form the learning process and information while metacognition is required for individuals to observe, develop, and evaluate their own processes and apply their knowledge to new situations. Therefore, metacognition is a basic requirement for cognitive effectiveness. It is necessary to understand the relationship between metacognition and cognition. Metacognitive activities occur before cognitive activities (planning), during activities (monitoring) or after activities (evaluating). We can give as an example a student who uses self-observation strategy during reading to exemplify the relationship between metacognition and cognition. The student knows that s/he cannot comprehend (meta cognition) what s/he is reading. At the same time, s/he knows that s/he can understand the text better when s/he prepares a conceptual map or make summary (cognition)

4. REVIEW OF LITERATURE:

However, there is some debate as to whether metacognition changes as we age. On the one hand, we might expect greater life experience leads to more accurate self-knowledge and greater metacognitive efficiency. On the other hand, convergent evidence has revealed a specific neural basis for metacognitive efficiency in human prefrontal and parietal cortex (Fleming, Huijgen, & Dolan, 2012; Fleming, Weil, Nagy, Dolan, & Rees, 2010; McCurdy et al., 2013; Rounis, Maniscalco, Rothwell, Passingham, & Lau, 2010; Yokoyama et al., 2010) regions which are also highly susceptible to aging-related atrophy (Raz et al., 2005; Resnick, Pham, Kraut, Zonderman, & Davatzikos, 2003) and therefore metacognitive efficiency may be expected to decrease as we age. Such a hypothesis is consistent with reports that lack of awareness of cognitive, physical and perceptual abilities in healthy older adults can be problematic in everyday life. (Hertzog & Hultsch, 2000) demonstrated that there are notable changes in self-appraisal as we age, and these tend to centre on inaccuracies regarding beliefs about cognitive ability and control over cognition. Older adults tend to demonstrate increased over-confidence compared to actual performance when compared to younger adults (Dodson, Bawa, & Krueger, 2007; Hansson, Rönnlund, Juslin, & Nilsson, 2008). For example when older adults between the ages of 65–91 years old were asked about their driving abilities, 85% of the drivers in this age range rated themselves as 'good' or 'excellent' drivers despite an increased frequency of accidents (Ross, Dodson, Edwards, Ackerman, & Ball, 2012). In contrast, other studies report significant age differences in the accuracy of confidence judgments about recall and recognition (Bender & Raz, 2012; Dodson et al., 2007; Huff, Meade, & Hutchison, 2011; Kelley & Sahakyan, 2003; Pansky, Goldsmith, Koriati, & Pearlman-Avnion, 2009; Perrotin, Isingrini, Souchay, Clarys, & Tacconat, 2006; Soderstrom, McCabe, & Rhodes, 2012; Souchay, Isingrini, & Espagnet, 2000; Souchay, Moulin, Clarys, Tacconat, & Isingrini, 2007; Toth, Daniels, & Solinger, 2011; Wong, Cramer, & Gallo, 2012) learning of emotional information (Tauber & Dunlosky, 2012), and study-time allocation (Froger, Sacher, Gaudouen, Isingrini, & Tacconat, 2011). In addition, the neural correlates of metacognitive judgments have been found to differ between younger and older adults (Chua, Schacter, & Sperling, 2009).

Accordingly, Daniels, Toth, and Hertzog (2009) found that older adults had lower accuracy of immediate JOLs for predicting old/new item recognition, but reasoned that this may reflect age-related memory deficits as opposed to deficits in metacognition. In the present study we employ a recently developed signal detection theoretic measure, meta-d'/d' (Maniscalco & Lau, 2012), to circumvent this problem. Meta-d'/d' quantifies the efficiency with which confidence ratings discriminate between correct and incorrect trials in each task domain (perception and memory). Importantly, meta-d'/d' is a relative measure: given a certain level of processing capacity (d'), meta-d'/d' quantifies the extent to which a metacognitively optimal observer is aware of their performance.

Previous literature has also drawn conceptual similarities between characteristics of memory metacognition and executive functions (Fernandez-Duque, Baird, & Posner, 2000; Pannu & Kaszniak, 2005; Shimamura, 1995; Souchay et al., 2000). In particular it has been suggested that any age-related decline in metacognition may be due to executive limitations associated with aging (Souchay & Isingrini, 2004). Again, however, results from initial studies examining this issue are mixed. FOK but not JOL accuracy has been shown to significantly correlate with executive function (Souchay, Isingrini, Clarys, Tacconat, & Eustache, 2004), indicating that perhaps only some forms of metacognitive judgement require intact executive function to be completed accurately. Perrotin, Belleville, and Isingrini (2007) compared patients with mild cognitive impairment (MCI) to healthy age-matched controls in their FOK abilities. FOK accuracy was primarily related to primary memory performance in MCI patients, whereas in control participants it was linked to executive function

5. STATEMENT OF THE PROBLEM:

“A Comparative study to assess the effect of developmental age and gender on metacognition”

OBJECTIVES

- To assess the knowledge regarding developmental differences on metacognition
- To assess the knowledge regarding gender differences on metacognition

6. HYPOTHESIS:

According to the review of literature it is expected that :

There will be a significant effect of developmental age and gender on metacognition

7. METHODOLOGY:

Sample: The sample for the present study consisted of 20 adults in the 18 to 30 age group & 20 in the 48 to 60 age group from Chandigarh.

Tools: Following tools have been employed for the current study.

1. Metacognition questionnaire-30(A. wells, S.C.Halton, 2003). MCQ-30 is a self- report inventory that consists of 30items, pertaining to five dimensions of metacognition i.e. lack of cognitive confidence, positive belief about worrying, cognitive self consciousness, positive belief about uncontrollability & danger and need to control thought (6 items for each dimension). Each item is provided with four response alternatives (Do not agree, Agree slightly, Agree moderately, Agree very much) and the subjects are to put a tick mark against any option that applies to them. There is no time limit, but generally it takes around 20 minutes for completion. The scoring for all the items remains the same i.e 1,2,3,4 whether the items are positive or negative.

Statistical Analysis: The responses to various tests were scored according to the directions set in the manuals of the test and with the help of scoring keys. Means were computed for the difference sets of data and ANOVA was applied to test the significance of mean difference between male and female students.

8. RESULTS AND DISCUSSION:

The following tables show the Raw scores of the sample and Summary Table of the Statistical Analysis applied for calculation of the results:

	OLD	YOUNG
FEMALE	667	660
MALE	628	560
TOTAL	1295	1220

SUMMARY TABLE

SOURCE OF VARIANCE	SS	Df	MS	F
A(SEX)	483.025	1	483.025	2.38
B(AGE)	140.625	1	140.625	0.69
AB	93.025	1	93.025	0.458
WITHIN	7307.7	36	202.992	

9. DISCUSSION:

The aim was to study developmental and gender differences on metacognition. The Sample for the present study consisted of 20 adults in the 18 to 30 age group & 20 in the 48 to 60 age group from Chandigarh. The Scale used for the study was Metacognition questionnaire-30(A. wells, S.C.Halton, 2003). MCQ-30 is a self- report inventory that

consists of 30 items, pertaining to five dimensions of metacognition i.e. lack of cognitive confidence, positive belief about worrying, cognitive self consciousness, positive belief about uncontrollability & danger and need to control thought (6 items for each dimension). Each item is provided with four response alternatives (Do not agree, Agree slightly, Agree moderately, Agree very much) and the subjects are to put a tick mark against any option that applies to them. There is no time limit, but generally it takes around 20 minutes for completion. The scoring for all the items remains the same i.e 1,2,3,4 whether the items are positive or negative. The hypothesis of our study was that there will be a significant effect of developmental age and gender on metacognition.

The Results of the study were Table 1 shows the total score of Old people as 1295 and young people as 1220. Table 2 is summary table which shows the calculated F- ratio, F-ratio for Gender is 2.38, F- ratio for Developmental age is 0.69, F-ratio for Interaction of both Gender and Development age is 0.458. The calculated values are checked at 0.05 Significance level, it was observed that calculated value is less than critical value thus results came out to be Non-Significant and we accept null hypothesis. Thus the results show no difference in metacognition between developmental and gender differences. The study also shows that however, the literature on laboratory measures of metacognition such as confidence judgments and JOLs has shown mixed results. Some studies reveal stable or even improved accuracy of confidence ratings with age for general knowledge (Dodson et al., 2007; Pliske & Mutter, 1996), problem solving (Vukman, 2005), or memory recall tasks (Lachman, Lachman, & Thronesbery, 1979). Similarly, studies investigating JOLs, FOKs and “judgments of forgetting” have found that older adults’ predictions of recall or recognition were as good as those of younger In many of these studies it has proven difficult to decouple metacognitive accuracy from age-related changes in performance. Common measures of metacognitive accuracy such as the gamma correlation are affected by task performance (Masson & Rotello, 2009), potentially confounding changes in metacognition with age with changes in performance. For example, if two individuals A and B have identical metacognitive ability, but A performs better than B on the primary task, A’s metacognition score will appear higher than B’s due to this performance confound. adults (Eakin, Hertzog, & Harris, 2014; Haber, 2012; Halamish, McGillivray, & Castel, 2011)

10. CONCLUSION:

The measures of subscales also show that there is no difference in Lack of Cognitive Confidence between developmental ages. The measure of Positive Belief about Worrying is high among age group of 48 to 60 as compared 18 to 30. The measure of Cognitive Self Consciousness is high among age group of 18-30 than 48 to 60. The measure of Negative Belief about Uncontrollability and Danger is high among age group of 48 to 60 than 18 to 30. The measure of Need to Control Thoughts is high among the age group of 18 to 30 than 48-60.

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