

# Age and gender: Determinants of metacognition among rural adolescents

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■ **ABSTRACT** : The present study was undertaken to investigate the age and gender differentials in metacognition of rural adolescents (13-16 years). The study was carried out in rural schools of block-I, Ludhiana district. The sample comprised of 240 rural adolescents equally distributed over four grades (7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> grade), two sexes and two socio-economic groups *i.e.* middle and low socio-economic group. Metacognitive skills of the subjects were assessed using a self-structured questionnaire adapted from Metacognition Inventory (Govil, 2003) and Metacognitive Awareness Inventory (Schraw and Dennison 1994). Results revealed significant gender differentials in metacognitive skills of rural adolescents with major proportion of female respondents having high level of metacognition as well as better mean scores as compared to their male counterparts.

■ **KEY WORDS** : Metacognition, Knowledge of cognition, Regulation of cognition, Academic performance, Adolescents

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Metacognition" is one of the latest buzz words in educational psychology, but what exactly is metacognition? The length and abstract nature of the word makes it sound intimidating, yet it's not as daunting a concept as it might seem. We engage in metacognitive activities every day. Metacognition enables us to be successful learners and has been associated with intelligence. Metacognition refers to higher order thinking which involves active control over the cognitive processes engaged in learning. Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature. Because metacognition plays a critical role in successful learning, it is important to study metacognitive activity and development to determine how students can be taught to better apply their cognitive resources through metacognitive control.

In case of relationship between gender and cognitive abilities, no clear relationship has been established by researchers. For attitudinal variables males showed superior

performance level in the physical sciences but females showed superior performance level in biological sciences. In addition, in science classroom while females mostly preferred teacher demonstrations and writing about science, males preferred problem solving, watching TV about science, and learning about famous scientists (Rae, 1999). In terms of confidence, males have more confidence in their academic abilities in science (Dweck, 1986) but females have more positive perceptions than males about achievement motivation (Simpson and Oliver, 1990). However, Kahle and Meece (1994) summarized that based on the research results gender differences were not similar with respect to different age groups and content areas. Thus, it was difficult to make general conclusion about the relationship between gender and attitudinal variables. Regarding to the relationships between socio-cultural variables and gender researchers found several results. For example, females' success in scientific work was underestimated due to socio-cultural influences.

In addition, Rossiter (1982) stated that since the scientific work was seen as masculine activity, gender

stereotypical image was formed favoring males (Kahle and Meece, 1994). Family background variables influenced science achievement in an indirect way through the availability of economic capacity, the quality of home environment, parents' educational and occupational aspirations, and the quality of the schools attended. Gender role socialization within the home occurs differently for boys and girls. For example, Hoffman (1977) showed that parents gave importance to their sons' occupational success, ambitions, and intelligence whereas for their girls they valued being kind, well mannered, and having a good marriage. Moreover, at home boys found more opportunity to play scientific games than girls and those experiences enabled boys to have higher science proficiency scores (Kahle and Lakes, 1983).

In 1980s, gender was investigated with respect to socio-economic status, but this research was lack of sociological and feminist perspective. In late 1980s, gender equity became an important issue in several studies. By 1990s, researchers became interested in creating a school environment in which girl-friendly instructional strategies, topics, and curriculum would be implemented.

Researchers started to investigate the relationship among gender, race, ethnicity, economic status, and religion. Finally, after 2001 researchers started to investigate gender and urban issues.

If the self-regulation component is broken down into its constituent four items, female participants rate themselves significantly more adept than their male counterparts for three items. They perceive themselves to be better at focusing their attention and avoiding distractions when studying, at creating and using schedules to manage their responsibilities effectively and at using and developing study aids that assist with their learning. This supports results reported by Felder *et al.* (1995) although in their study females also scored more highly than their male counterparts for self-testing. However, the current study involves students from many disciplines rather than just the engineering discipline studied by Felder and his colleagues.

In skill component situation is reversed with males perceiving themselves as doing better, but a closer look at the results indicates that the significant difference on this component is entirely due to one item, with males scoring significantly higher on information processing or the ability to process ideas by mentally elaborating on them and organizing them in meaningful ways. Some researchers (Geake and Cooper, 2003) have suggested that this might be explained by how the male and female brain communicates, whereas other researchers (Gurian, 2002) claim that male and female brains are 'wired' differently. These claims are discounted by neuroscientists (Northen, 2004) who suggest this is simplistic and erroneous because the brain is a tensile organ and responds to external stimuli, so in order to understand gender differences in cognition we must consider

biology and experience. For example, the differences in information processing scores might equally be a result of females not wishing to overrate themselves in an area which is stereotypically masculine, in which case it is not a question of males perceiving themselves as better on this item but of female reluctance to identify with the highest scores in this area. Nonetheless, there is evidence which suggests that males perform better in those cognitive tasks that depend heavily on information processing ability. A number of studies suggest that males and females process information differently (Gilligan, 1982; Meyers-Levy, 1989) with males encoding fewer details than females. Consequently if females process more details, then males must use heuristics in their processing of information (Meyers-Levy, 1985; Meyers-Levy and Maheswaran, 1991) and this tendency to use heuristics when processing information might be explained in two ways. Firstly, the amount of information stored in long term memory is dependent upon the amount of information processed. As males encode fewer details (Meyers-Levy, 1985) they would recall less information for decision-making. Hence they resort to using heuristics to compensate for the lack of stored information. Secondly, the presence of contrasting information in the data set causes cognitive strain (Kahneman, 1973). Faced with contrasting information, normative decision theories suggest that people pay greater attention to details in order to reconcile contrasting information. As females pay greater attention to details than males, this suggests that males and females do not react to contrasting information in the same way. Females deal with contrasting information by increasing processing effort whereas males make greater use of heuristics (Chung and Tang, 1998). Both of these explanations are consistent with our results, suggesting that perhaps males perceive themselves as being better at information processing because they make greater use of heuristics to process ideas in meaningful ways. The downside of this approach is that some detail is inevitably lost in the processing.

A developing body of research (Tversky and Kahneman, 1973; Cupchick and Leventhal, 1974; Leventhal and Cupchick, 1975; Cupchick and Poulos, 1984; Darley and Smith, 1995) supports the view that males use more heuristics when processing information and irrespective of whether these differences are due to nature and/or nurture, they appear to be consistently observable. Whilst this remains speculative and will require further investigation, the picture that emerges from this study is of a characteristically different approach to learning and study strategies taken by males and females. The male approach seems to result in poorer attitudes to study and less anxiety but suffers from potential loss of information detail in comparison to females. However, females would be expected to develop heightened abilities in terms of concentration, use of schedules, developing study aids and higher anxiety levels if they perceive themselves to be suffering from

information overload as a result of their different approach to information processing.

Against this backdrop the study envisaged with the following objectives:

- To study the socio-demographic background in formation of the respondents.
- To examine the age related changes in metacognition of rural adolescents.
- To investigate the impact of gender on metacognition of rural adolescents.

## ■ RESEARCH METHODS

### Locale of the study :

The study was conducted in Ludhiana city of Punjab state.

### Selection of sample :

The sample for the present study comprised of randomly selected 240 rural adolescents studying in grade 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> from Ludhiana district.

### Research instruments :

The following standardized tools were used to collect the relevant data for the study.

Personal information sheet was used to assess the socio-personal profile of the adolescents, viz., age, gender, family type, family size, number of siblings, birth order, education and occupation of the parents and monthly income of the family.

Socio-economic status scale developed by Meenakshi (2001) was used to identify the adolescents from different socio-economic status families (low and middle). This scale consists of six different aspects, viz., education, profession, monthly income, resources, surrounding and social involvement.

Self-structured metacognitive questionnaire. The self-structured metacognitive questionnaire consisted of 67 statements out of which 23 statements were drawn from Metacognition Inventory (Govil, 2003) and 44 from Metacognitive Awareness Inventory (Schraw and Dennison, 1994). Thus, the self-structured metacognitive questionnaire provided a wide spectrum in-depth probe into the level of metacognitive skillfulness of the rural adolescents.

## ■ RESEARCH FINDINGS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

### Socio-personal characteristics of the respondents :

Data pertaining to demographic profile of the rural adolescents from different socio- economic strata have been presented as per age, gender, birth order, number of siblings,

education and occupation of parents, type and size of family (Table 1). The information about socio- personal characteristics of the respondents is presented in Table 1 has been discussed under the following heads:

<b>Table 1: Socio-personal characteristics of the respondents</b>			
Socio-personal characteristics	Male (n=120)	Female (n=120)	Overall (n=240)
Age (years)	f	f	f
13	39 (32.50)	38 (36.67)	77 (32.08)
14	16 (13.33)	20 (15.00)	36 (15.00)
15	27 (22.50)	24 (15.83)	51 (21.25)
16	38 (31.67)	38 (32.50)	76 (31.67)
<b>No. siblings</b>			
Only child	4 (3.33)	3 (2.50)	7 (2.92)
One	36 (30.00)	18 (15.00)	54 (22.50)
Two	44 (36.67)	40 (33.33)	84 (35.00)
More than two	36 (30.00)	59 (49.17)	95 (39.58)
<b>Maternal education</b>			
Illiterate	27 (22.50)	28 (23.33)	55 (22.92)
Up to 5 <sup>th</sup>	48 (40.00)	43 (35.83)	91 (37.92)
6 <sup>th</sup> to 10 <sup>th</sup>	42 (35.00)	41 (34.17)	83 (34.58)
10 <sup>th</sup> to +2	2 (1.67)	5 (4.17)	7 (2.92)
Graduate	1 (0.83)	3 (2.50)	4 (1.67)
Postgraduate	0	0	0
<b>Paternal education</b>			
Illiterate	15 (12.50)	27 (22.50)	42 (17.50)
Up to 5 <sup>th</sup>	34 (28.33)	31 (25.83)	65 (27.08)
6 <sup>th</sup> to 10 <sup>th</sup>	66 (55.00)	53 (44.17)	119 (49.58)
10 <sup>th</sup> to +2	3 (2.50)	6 (5.00)	9 (3.75)
Graduate	2 (1.67)	3 (2.50)	5 (2.08)
Postgraduate	0	0	0
<b>Maternal occupation</b>			
House wife	92 (76.67)	83 (69.16)	175 (72.92)
Business	5 (4.17)	10 (8.33)	15 (6.25)
Service	16 (13.33)	16 (13.33)	32 (13.33)
Farming	1 (0.83)	1 (0.83)	2 (0.83)
Labourer	6 (5.00)	10 (8.33)	16 (6.67)
<b>Paternal occupation</b>			
Non-working	2 (1.67)	0	2 (0.83)
Business	22 (18.33)	21 (17.50)	43 (17.92)
Service	26 (21.67)	22 (18.33)	48 (20.00)
Farming	17 (14.17)	14 (11.67)	31 (12.92)
Labourer	53 (44.17)	63 (52.50)	106 (48.33)
<b>Family type</b>			
Nuclear	70 (58.33)	76 (63.33)	146 (60.83)
Joint	50 (41.67)	44 (36.67)	94 (39.17)

Figures in parentheses indicate percentages

### Age :

The selected adolescents were in the age group of 13-16 years. Overall picture revealed that almost an equal number of respondents belonged to 13 years and 16 years of age (32% and 31.7% , respectively). However, 32.5 per

cent male respondents belonged to 13 years of age, 13.3 per cent to 14 years of age, 22.5 per cent to 15 years and rest 31.7 per cent belonged to 16 years of age. Similarly, in case of female respondents, 36.7 per cent belonged to 13 years of age, 15 per cent to 14 years of age, 15.8 per cent to 15 years and rest 32.5 per cent belonged to 16 years of age.

#### *Number of siblings :*

Few subjects (2.92%) had no siblings whereas 22.50 per cent had one sibling, 35 per cent had two siblings and rest 39.58 per cent had three or more than three siblings.

#### *Maternal education :*

Regarding the educational level of mothers, major proportion of the respondents' mothers was either under matric or matric (37.92% and 34.58%, respectively). However, 22.92 per cent were illiterate. Only 1.67 per cent were graduates and none was post graduate.

Whereas, in case of male respondents, 40 per cent were educated up to 5<sup>th</sup> grade, followed by 35 per cent matriculate, 22.50 per cent illiterate, 1.67 per cent were holding senior secondary or a diploma certificate and only 0.83 per cent mothers of rural boys were graduates. However, none of the mother was post graduate.

A similar trend was noted for the mothers of female respondents with majority (35.8%) educated up to 5<sup>th</sup> grade, followed by 34.17 per cent up to matric, 23.33 per cent illiterate, 4.17 per cent up to +2 and rest 2.50 per cent graduate. None of the mother was post graduate.

#### *Paternal education :*

A similar trend as in case of mothers was observed for the fathers of male as well as female subjects with majority of fathers' educated up to matric (49.58%) followed by 27.08 per cent up to 5<sup>th</sup>, 17.50 per cent illiterate, 3.75 per cent up to +2, 2.08 per cent graduate and none as post graduate.

However, it was noted that major proportion (55%) fathers of male respondents were matriculates, followed by 28.3 per cent up to 5<sup>th</sup> standard, 12.5 per cent were illiterate, 2.5 per cent were +2 or diploma and only 1.67 per cent were graduate. None of the father was post graduate.

Whereas, 44.17 per cent mothers of female respondents were matriculate, followed by 25.8 per cent were educated up to 5<sup>th</sup> standard, 22.5 per cent were illiterate, 5 per cent were +2 or diploma and only 2.5 per cent mother had a graduate degree. None of the mother was post graduate.

#### *Maternal occupation:*

Regarding occupation of mother, it was interesting to note that majority (72.92%) of the mothers irrespective of male and female respondents were housewives and the percentage was higher in case of mothers of male respondents (76.67%) as compared to the mothers of female

respondents (69.16%).

Only 13.3 per cent mothers of male respondents were in service and this percentage was comparable in case of mothers of female respondents (13.3%). However, 4.2 per cent mothers of male respondents were in business and 8.3 per cent of female respondents. 5 per cent of mothers were labourer in case of boys where as in case of female, 8.3 per cent of mothers were labourer and only 0.83 per cent of mothers were in farming.

#### *Paternal occupation :*

Major proportion (44.17%) of fathers of the adolescent males were labourer, where as 21.67% were engaged in private or Government service, followed by business (18.33%), some of them (14.17%) were involved in farming, 1.67 per cent were non-working.

Similar trend was observed for the fathers of female respondents. Majority (52.50%) of them were labourer, 18.33 per cent were in service, 17.5 per cent in business, and 11.67 per cent in farming.

#### *Family type :*

The data revealed that major proportion (60.83%) of rural adolescents belonged to nuclear families and rest (39.17%) belonged to joint families.

However, 58.33 per cent of male respondents belonged to nuclear families and rest 41.67 per cent were from joint families. Whereas 63.33 per cent of female respondents belonged to nuclear family and rest 36.67 per cent were from joint families.

Thus, major proportions of the respondents were either 13 or 16 years old and rest were 14 or 15 years old. Major proportion of the respondents had two or more than two siblings. In case of education of parents, major proportion of mothers and fathers were educated up to matric level and none was post graduate and only few were graduate. Most of the mothers were housewife and fathers were engaged in farming. The next most preferred occupation was daily labourer. Majority of respondents had nuclear family.

#### **Age related changes in the metacognition of rural adolescents :**

Table 2 metacognitive profile of respondents across age and gender.

Table 2 presents the mean scores of rural adolescents at various age levels across two sexes. The data indicated no logical trend in the level of metacognition with regards to advancing age. However, in case of males it was observed that for 13 to 14 years the mean scores for metacognition improved but dropped again during 15 to 16 years. Also, these differences in the mean scores of metacognition were found to be statistically significant (F-ratio=3.80 and 3.19;  $p < 0.05$ ). Similar advances and drop was observed in case of

females also. But in case of females there were no statistically significant differences in the mean scores of metacognition at different ages. However, at all ages the mean scores of girls were better than those of boys.

**Table 2 : Differences in the mean scores ( $\pm$  S.D) of metacognition by age and gender (n=240)**

Gender	13 years	14 years	15 years	16 years	F-ratio
	Mean $\pm$ S.D	Mean $\pm$ S.D	Mean $\pm$ S.D	Mean $\pm$ S.D	
Males	3.20 $\pm$ 0.29	3.42 $\pm$ 0.35	3.17 $\pm$ 0.34	3.08 $\pm$ 0.38	3.80*
Females	3.37 $\pm$ 0.31	3.44 $\pm$ 0.50	3.37 $\pm$ 0.35	3.33 $\pm$ 0.31	0.39
Overall	3.29 $\pm$ 0.31	3.43 $\pm$ 0.43	3.25 $\pm$ 0.35	3.21 $\pm$ 0.37	3.19*

\* Indicate significance of value at P=0.05

### Genderwise changes in the metacognition of rural adolescents :

Table 3 through 5 reflects the impact of gender on the development of metacognitive skillfulness among rural adolescents.

**Table 3 : Per cent distribution of rural adolescents according to gender and their level of metacognition (n=240)**

Levels of metacognition (mean score)	Male (n=120)		Female (n=120)		Z-value
	(f)	(%)	(f)	(%)	
High (>3.46)	23	19.17	56	46.67	4.53*
Average (3.46-3.10)	53	44.17	29	24.17	3.27*
Low (<3.10)	44	36.67	35	29.17	1.72*

\* Indicate significance of value at P=0.05

Table 3 depicts the per cent distribution of rural adolescents according to gender and their level of metacognition. The data presented bring to light statistically significant (Z-value = 4.53, 3.27 and 1.72; p<0.05) gender differences in the levels of metacognition among the rural adolescents. More number of girls showed up in high (46.67%) level of metacognition as compared to their male counterparts who showed up in higher number (44.17%) in the average category of metacognition. However, a large number of boys (36.67%) and girls (29.17%) were found to fall in the low level of metacognition.

**Table 4 : Gender differences in mean scores ( $\pm$ S.D.) of the respondents at various levels of metacognition (n=240)**

Level of metacognition (mean score)	Boys	Girls	t-value
	Mean $\pm$ S.D. (n=120)	Mean $\pm$ S.D. (n=120)	
High (>3.46)	3.62 $\pm$ 0.13	3.67 $\pm$ 0.14	2.87*
Average (3.46-3.10)	3.29 $\pm$ 0.10	3.29 $\pm$ 0.09	0
Low (<3.10)	2.81 $\pm$ 0.23	2.92 $\pm$ 0.14	4.47*

\* Indicate significance of value at P=0.05

The data shown in Table 4 indicate that the girls had slightly higher mean scores in the category of high (3.67) as well as low (2.92) level of metacognition as compared to the boys. However, the mean scores at average level of metacognition were comparable for both the sexes (3.29). These differences

were found to be statistically significant at high and low levels of metacognition (t-value=2.87 and 4.47; p<0.05)

Table 5 presents the comparison of mean scores of metacognition irrespective of levels across two sexes. The data revealed that girls were having significantly (t value = 4.00; p<0.05) higher metacognition mean scores (3.37  $\pm$  0.34) as compared to boys (3.19  $\pm$  0.35). Thus, it can be concluded that girls had better metacognitive skills than boys. These findings are in line with the studies conducted by Marsh and Yeung (1998); Royer *et al.* (1999); Halpern and LaMay (2000) and Wigfield and Eccles (2002) Gender differences in cognitive functioning and achievement do not always favour one sex with the literature related to intelligence testing suggesting that males outperform females on tests of visuo-spatial ability and mathematical reasoning (Gallagher *et al.*, 2002; Halpern, 2004; Skaalvik and Skaalvik, 2004; Lawton and Hatcher, 2005) whereas females do better on tests involving memory and language use (Huang, 1993; Temple and Cornish, 1993; Lowe *et al.*, 2002). These argue that data from the learning and study strategies inventory (LASSI) allow a practical metacognitive analysis suggesting significant gender differences in certain areas of self-perceived performance.

**Table 5 : Comparison of mean scores ( $\pm$  S.D.) of metacognition irrespective of levels across two sexes (n=240)**

Gender	Metacognition mean	S.D.	t-test
Males (120)	3.19	$\pm$ 0.35	4.00*
Females (120)	3.37	$\pm$ 0.34	

\*Indicate significance of value at P=0.05

### Conclusion :

The results indicate no logical developmental trend with regard to the mean scores of metacognition of rural adolescents by age. However, some improvement in metacognition was observed in 13 years to 14 years which again dropped in 15-16 years of age group. But statistically significant gender differences were observed in the level of metacognition among the rural adolescents with higher number of girls having better metacognitive abilities as compared to their male counter parts. This may be because the girls are more focused and have lesser number of distractions as compared to boys during the adolescent years, who are more active in the peer group activities.

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