The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 13, Issue 2, April- June, 2025
DIP: 18.01.150.20251302, DOI: 10.25215/1302.150
https://www.ijip.in

Research Paper

Cognitive Flexibility Across Educational Transitions: A Comparative Study of Secondary School and University Students

Inaya Idris[1]*, Dr. Shivali Sharma[2]

ABSTRACT

Cognitive flexibility, the mental ability to adaptively shift thinking and behavior in response to changing demands, plays a crucial role in academic and personal success. The transition from secondary school to university marks a significant developmental phase, yet its impact on cognitive flexibility remains underexplored. This study aimed to investigate differences in cognitive flexibility between secondary school (undergraduate) and university (postgraduate) students, with an additional focus on gender-based variations. A total of 100 participants, aged 16–25, were selected using stratified random sampling and equally distributed across four subgroups: male and female students from both educational levels. The Cognitive Flexibility Inventory (CFI) was administered to assess cognitive flexibility. Data were analyzed using SPSS (Version 27.0), with descriptive statistics and independent samples t-tests employed for hypothesis testing. Results revealed a significant difference in cognitive flexibility between educational levels, with postgraduate students demonstrating higher scores compared to undergraduates. However, no statistically significant gender-based differences were observed. These findings suggest that educational progression positively influences cognitive flexibility, while gender may not be a determining factor. The study underscores the importance of implementing educational strategies that foster cognitive adaptability, particularly among undergraduate students, to better equip them for academic and real-world challenges.

Keywords: *Cognitive flexibility, Executive functioning, Adaptive behavior, Attentional control, Knowledge restructuring*

Cognitive flexibility, a vital aspect of executive functioning, enables individuals to adapt their thinking and behavior in response to novel or shifting environmental demands. This adaptive capacity involves a process of learning and knowledge restructuring, allowing individuals to generate and implement alternative strategies when faced with new or unexpected challenges. Unlike isolated cognitive shifts, cognitive flexibility involves broader changes in complex patterns of thought and behavior. It reflects the ability to modify cognitive processes—often represented as sequences of mental operations—so as to engage effectively with problems that demand innovative solutions.

[1]Researcher
[2]Assistant Professor, Amity Institute of Behavioural and Allied Sciences, Lucknow campus Amity University Lucknow, Uttar Pradesh, India.
*Corresponding Author

Received: April 10, 2025; Revision Received: May 09, 2025; Accepted: May 12, 2025

While cognitive flexibility is widely regarded as a beneficial trait, it is not universally present in all individuals or situations. Some people may persist in employing ineffective strategies, even when confronted with clear indications that a different approach is warranted. For example, a person may repeatedly attempt to open a door by pulling it, despite visible cues suggesting it must be pushed. Such cognitive inflexibility may stem from an inability to perceive environmental cues or from difficulty in conceptualizing alternative solutions. These limitations highlight the situational variability of cognitive flexibility and underscore the importance of understanding its cognitive underpinnings.

Cognitive flexibility is inherently dynamic, shaped by internal and external factors, and instrumental for adaptive functioning across diverse life domains. Although it is generally associated with positive outcomes, it remains a complex and not fully understood construct. Its relevance extends beyond the cognitive domain, influencing emotional regulation, stress resilience, and overall mental well-being. Individuals with high cognitive flexibility are more capable of managing stress, recovering from setbacks, and adjusting their behavior to meet situational demands. In contrast, cognitive inflexibility has been linked to various maladaptive outcomes, including heightened vulnerability to psychological disorders, such as anxiety, depression, and obsessive-compulsive disorder.

The current literature conceptualizes cognitive flexibility as involving two core mechanisms: attentional control and knowledge representation. Attention regulation allows individuals to monitor their environment, suppress habitual responses, and shift focus appropriately. Simultaneously, knowledge restructuring enables the reinterpretation of stimuli and the application of new strategies in response to contextual demands. Spiro and Jehng's (1990) Cognitive Flexibility Theory emphasizes the capacity to construct and reorganize knowledge in real time, especially in ill-structured domains, where rigid thinking limits adaptability.

Empirical evidence consistently links cognitive flexibility with academic success. Research by Cortés Pascual et al. (2019) and Stadler et al. (2016) highlights its central role in enhancing students' learning outcomes. Barak and Levenberg (2016) outline three principal mechanisms through which cognitive flexibility contributes to educational achievement: (1) it fosters open-mindedness, allowing students to engage with diverse perspectives and resolve conflicts through active listening and collaboration, as demonstrated by DeHaan (2009); (2) it enhances adaptability, enabling learners to shift between different concepts and strategies, a capacity found to improve problem-solving performance in adolescents (Orakcı, 2021); and (3) it supports technological adaptability, allowing students to integrate new digital tools and learning platforms into their educational routines, as observed in Ionescu's (2012) findings.

DEVELOPMENT OF COGNITIVE FLEXIBILITY

Cognitive flexibility develops across the lifespan but demonstrates notable growth during childhood and adolescence, with adolescence representing a period of heightened neuroplasticity. Activities that challenge executive functioning, such as learning new languages or musical instruments, are associated with improved cognitive flexibility, particularly in older adults who may experience a decline in this capacity over time. This skill is also integral to emotional regulation and mental health. Individuals with psychiatric conditions often exhibit reduced cognitive flexibility, highlighting its significance for psychological well-being. Neurological research suggests that specific brain networks, particularly those involved in executive functioning, play a key role in determining the

extent of an individual's flexibility, and age-related changes in these networks can either enhance or impair adaptive thinking.

The development of cognitive flexibility follows a distinct trajectory. According to Cragg and Chevalier (2012), it undergoes substantial changes from early childhood through adolescence. Blair and Razza (2007) found that children with higher cognitive flexibility show stronger foundational skills, particularly in mathematics and phonological awareness. Similarly, Bull, Espy, and Wiebe (2008) demonstrated that early performance in task-switching predicts later academic success. Furthermore, intervention studies targeting executive function in preschool-aged children, such as those by Bierman et al. (2008), have reported positive effects on school readiness. Deficits in this domain have been implicated in a range of psychiatric conditions, including autism spectrum disorder (Corbett et al., 2009), obsessive-compulsive disorder (Chamberlain et al., 2005), and eating disorders like anorexia and bulimia nervosa (Tchanturia et al., 2012), further emphasizing its broad relevance.

EXPLICATIVE HYPOTHESIS OF COGNITIVE FLEXIBILITY

An explicative hypothesis of cognitive flexibility posits that it emerges from the interaction between attentional control mechanisms and dynamic knowledge representation. Detecting contextual changes and formulating appropriate responses requires the suppression of automatic behaviors and the restructuring of existing mental frameworks. The Cognitive Flexibility Theory (Spiro & Jehng, 1990) provides a foundation for understanding how individuals construct multifaceted representations of problems, enabling them to adapt more effectively in ill-defined and shifting scenarios. This framework underscores the interplay between perceptual input and cognitive processing in determining flexible behavior.

SOME PHENOMENON RELATED TO COGNITIVE FLEXIBILITY

Several psychological phenomena are conceptually related to cognitive flexibility, including cognitive blockade, cognitive hysteresis, functional fixation, and functional reduction. Cognitive blockade refers to the sustained use of an initial strategy even when circumstances suggest a change is necessary. Cognitive hysteresis describes the tendency to maintain decisions despite conflicting evidence, often due to inadequate reassessment of the situation. Functional fixation occurs when individuals are unable to perceive alternative uses for familiar objects, and functional reduction involves overly simplistic causal reasoning that limits flexible problem-solving. While each of these constructs overlaps with cognitive inflexibility, they differ in the specific cognitive processes and behaviors they emphasize.

FACTORS THAT INFLUENCE COGNITIVE FLEXIBILITY

The development of cognitive flexibility can be influenced by a variety of individual and environmental factors. Childhood trauma, socioeconomic adversity, and psychological disorders such as ADHD and autism spectrum disorder can hinder its development. While numerous studies have explored these influences in early development, less attention has been paid to cognitive flexibility in late adolescence and young adulthood, particularly in college students. Preliminary findings suggest that deficits in attention regulation and mindfulness may contribute to lower levels of cognitive flexibility in this group. Furthermore, while some research reports no significant gender differences in cognitive flexibility, this remains an open area of investigation.

COGNITIVE FLEXIBILITY AND ACADEMIC CAREER PATHS

Emerging evidence links high cognitive flexibility in university students with reduced anxiety, increased motivation, and stronger academic performance. This skill is also associated with effective learning strategies, language acquisition, and mathematical competence. Importantly, students exhibiting greater cognitive flexibility are more likely to develop a robust professional identity during their early university years. Despite its significance, cognitive flexibility remains understudied within the context of academic transitions and identity formation in higher education.

This research seeks to explore the relationship between cognitive flexibility and academic level among Indian secondary and university students, while also examining potential gender differences. The findings aim to contribute to a more comprehensive understanding of how cognitive flexibility develops during critical educational stages, offering insights relevant to educational policy, mental health interventions, and future research on adaptive cognitive processes.

Rationale of the Study

In today's rapidly evolving educational landscape, cognitive flexibility—the capacity to shift thinking and adapt to changing situations—has become increasingly vital for academic success and psychological well-being. It plays a key role in problem-solving, emotional regulation, and the ability to navigate complex learning environments. Despite its significance, limited research has explored how cognitive flexibility varies across academic levels and gender, particularly within the Indian educational context.

Adolescence and young adulthood, represented by secondary school and university students respectively, are critical stages in cognitive and emotional development. These periods involve distinct academic demands and transitions that may influence how cognitive flexibility develops or manifests. Understanding these differences can provide valuable insight into how students adapt to academic challenges and develop key life skills.

Additionally, while gender differences in cognitive flexibility have been suggested in some studies, findings remain inconsistent and largely unexplored in diverse cultural settings like India. A gender-based analysis within this context may help identify specific needs and inform more inclusive educational practices.

This study aims to examine the relationship between cognitive flexibility and academic level among Indian secondary school and university students, while also exploring potential gender differences. The findings are expected to contribute to a deeper understanding of cognitive development across educational stages and support the design of effective interventions in education and mental health.

Hypotheses

- There will be a significant difference in cognitive flexibility between secondary school and university students, with university students demonstrating higher levels of cognitive flexibility.
- There will be a significant difference in cognitive flexibility between male and female students, with female students exhibiting higher cognitive flexibility.

SAMPLING METHODOLOGY

Stratified random sampling was utilized to ensure balanced representation across four demographic subgroups. The final sample comprised 100 participants:

- 25 Male Secondary School Students
- 25 Female Secondary School Students
- 25 Male University Students
- 25 Female University Students

Inclusion Criteria

- Age range: 16–25 years
- Enrollment: Currently studying in secondary school (grades 11–12) or university (postgraduate level)
- Language proficiency: Fluency in English or the institution's language of instruction
- Cognitive status: No reported cognitive or learning impairments

Exclusion Criteria

- Participants outside the age range (16–25 years)
- Not enrolled in secondary school or university
- Limited proficiency in the language of instruction
- Reported cognitive or neurological impairments
- Prior participation in similar cognitive flexibility studies

Procedure

Participants were recruited from secondary schools and universities using stratified random sampling. Upon receiving informed consent, participants were administered the Cognitive Flexibility Inventory (CFI). Data collection spanned four weeks, resulting in 100 valid responses. Statistical analyses, including descriptive statistics and t-tests, were conducted to identify significant differences in cognitive flexibility across groups.

Research Instrument

Cognitive Flexibility Inventory (CFI): A self-report measure designed to assess the ability to adapt cognitive strategies and perspectives. It evaluates:

- Perceived control over difficult situations
- Tendency to consider multiple viewpoints
- Capacity to generate alternative solutions

Reliability: The CFI demonstrates strong test-retest reliability (coefficients between 0.75 and 0.81) (Dennis & Vander Wal, 2010).

Validity: The inventory has established convergent validity through significant correlations with measures of coping, depressive symptoms, and cognitive adaptability, supporting its effectiveness as a research tool.

RESULT

Table 1 Descriptives for UG and PG students

Group Statistics

CLASS_DIFF		N	Mean	Std. Deviation	Std. Error Mean
CLASS	UG	50	113.7800	13.11066	1.85413
	PG	50	120.1000	16.80895	2.37714

Table 2 Class difference in cognitive flexibility

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
							95% Confidence Interval of the Difference	
		t	df	P value	Mean Difference	Std. Error Difference	Lower	Upper
CLASS	Equal variances assumed	-2.096	98	0.039	-6.32000	3.01473	-12.30264	-0.33736
	Equal variances not assumed	-2.096	92.515	0.039	-6.32000	3.01473	-12.30707	-0.33293

Table 3 Descriptives for gender variation

Group Statistics

TOTAL_GENDER		N	Mean	Std. Deviation	Std. Error Mean
TOTAL	GIRLS	50	115.7600	11.83830	1.67419
	BOYS	50	118.1200	18.21598	2.57613

Table 4 Gender difference in cognitive flexibility

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
							95% Confidence Interval of the Difference	
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TOTAL	Equal variances assumed	-0.768	98	0.444	-2.36000	3.07235	-8.45698	3.73698
	Equal variances not assumed	-0.768	84.125	0.445	-2.36000	3.07235	-8.46958	3.74958

DISCUSSION

An independent samples *t*-test was conducted to examine differences in cognitive flexibility scores (as measured by the CLASS_DIFF variable) between secondary school-undergraduate (UG) and university - postgraduate (PG) students. Descriptive statistics indicated that UG students (n = 50) had a mean score of 113.78 (SD = 13.11), whereas PG

students (n = 50) demonstrated a higher mean score of 120.10 (SD = 16.81). Levene's test for equality of variances was not statistically significant, $F(1, 98) = 2.434$, $p = .122$, suggesting that the assumption of homogeneity of variance was met.

The results of the independent samples *t*-test revealed a statistically significant difference in cognitive flexibility between the two groups, $t(98) = -2.096$, $p = .039$. The mean difference was -6.32, with a 95% confidence interval ranging from -12.30 to -0.34. These findings indicate that university students scored significantly higher on the measure of cognitive flexibility compared to their secondary school counterparts. This suggests that the transition to higher levels of education may contribute positively to the development of cognitive flexibility, possibly due to increased exposure to complex academic tasks, problem-solving opportunities, and greater autonomy in learning environments at the postgraduate level.

A second independent samples *t*-test was performed to explore gender-based differences in cognitive flexibility scores. Descriptive statistics showed that female participants (n = 50) had a mean score of 115.76 (SD = 11.84; SE = 1.67), while male participants (n = 50) had a slightly higher mean score of 118.12 (SD = 18.22; SE = 2.58). Levene's test for equality of variances yielded a statistically significant result, $F(1, 98) = 10.119$, $p = .002$, indicating a violation of the homogeneity of variances assumption. As a result, the analysis was conducted using the "equal variances not assumed" correction.

The *t*-test indicated that the observed difference between the groups was not statistically significant, $t(84.125) = -0.768$, $p = .445$. The mean difference of -2.36 (95% CI [-8.47, 3.75]) suggests that, on average, females scored slightly lower than males, but the difference was not sufficient to reach statistical significance. Since the confidence interval includes zero, this further confirms the absence of a meaningful gender-based difference in cognitive flexibility within the sample.

Taken together, these findings underscore the significance of educational level in shaping cognitive flexibility, with university students exhibiting enhanced adaptive thinking skills relative to secondary school students. However, the lack of significant gender differences suggests that cognitive flexibility is not substantially influenced by gender within the examined educational contexts. These insights have important implications for educational policy and practice, emphasizing the value of academic progression in fostering cognitive adaptability, while also supporting gender-inclusive strategies for cognitive development.

Limitations and Suggestions

1. **Sample Size and Scope**: The study was limited to a relatively small sample of 100 participants drawn exclusively from selected secondary schools and universities in India. While stratified random sampling was employed to ensure subgroup representation, the sample may not fully capture the diversity of educational institutions, cultural backgrounds, or socio-economic factors across the broader student population.
2. **Cross-Sectional Design**: The study utilized an ex post facto, cross-sectional design, which restricts the ability to draw causal inferences regarding the relationship between educational level and cognitive flexibility.

CONCLUSION

This study investigated the differences in cognitive flexibility across educational levels and gender among secondary school and university students in India. The findings revealed a statistically significant difference in cognitive flexibility between secondary school and university students, with university students demonstrating higher levels of cognitive flexibility. This suggests that advanced academic exposure and life experiences associated with higher education may contribute to the development of adaptive thinking and problem-solving skills.

In contrast, the study found no statistically significant gender-based differences in cognitive flexibility, despite slight variations in mean scores. This indicates that cognitive flexibility may not be inherently influenced by gender, at least within the sample and context studied.
Overall, the study contributes to the growing body of research emphasizing the importance of cognitive flexibility as a key component of academic and psychological development. These findings underscore the need for educational institutions to implement programs and pedagogical strategies that actively foster cognitive adaptability, particularly during critical educational transitions. Future research, guided by the limitations and suggestions outlined, can further elucidate the developmental trajectories and contextual influences on cognitive flexibility across diverse student populations.

REFERENCES

Al-Saadi, G. T. N., & Al-Badri, N. a. A. (2023). The level of cognitive flexibility among university students. steps.esciencepress.net. https://doi.org/10.33687/jshss.002.02.007

Amelchenko, E. M., Bezriadnov, D. V., Chekhov, O. A., Anokhin, K. V., Lazutkin, A. A., & Enikolopov, G. (2023). Age-related decline in cognitive flexibility is associated with the levels of hippocampal neurogenesis. Frontiers in Neuroscience, 17. https://doi.org/10.3389/fnins.2023.1232670

Artawijaya, L. M., & Supratiwi, M. (2024). Cognitive flexibility and resilience in adolescents: Exploring gender differences and cultural implications. *Nusantara Journal of Behavioral and Social Sciences, 3*(4), 151–160. https://doi.org/10.47679/njbss.202462

Cañas, J. J., University of Granada, & University of the Basque Country. (2006). Cognitive flexibility. In Cognitive Flexibility. https://doi.org/10.13140/2.1.4439.6326

Carter, D. B. (1985). Relationships between Cognitive Flexibility and Sex-Role Orientation in Young Adults. Psychological Reports, 57(3), 763–766. https://doi.org/10.2466/pr0.1985.57.3.763

Ciairano, S., Bonino, S., & Miceli, R. (2006). Cognitive Flexibility and Social Competence from Childhood to Early Adolescence. EBSCOhost. https://openurl.ebsco.com/EPDB%3Agcd%3A10%3A12459082/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A22573719&crl=c

Corbo, I., Troisi, G., Marselli, G., & Casagrande, M. (2024). The role of cognitive flexibility on higher level executive functions in mild cognitive impairment and healthy older adults. BMC Psychology, 12(1). https://doi.org/10.1186/s40359-024-01807-5

Deák, G. O., & Wiseheart, M. (2015). Cognitive flexibility in young children: General or task-specific capacity? *Journal of Experimental Child Psychology, 138*, 31-53. https://doi.org/10.1016/j.jecp.2015.04.003

Er-Rafiqi, M., Guerra, A., Gall, D. L., & Roy, A. (2021). Age-related changes of cognitive flexibility and planning skills in school-age Moroccan children. Applied

Neuropsychology Child, 11(4), 669–680. https://doi.org/10.1080/21622965.2021.1934471

Gopnik, A., O'Grady, S., Lucas, C. G., Griffiths, T. L., Wente, A., Bridgers, S., Aboody, R., Fung, H., & Dahl, R. E. (2017b). Changes in cognitive flexibility and hypothesis search across human life history from childhood to adolescence to adulthood. Proceedings of the National Academy of Sciences, 114(30), 7892–7899. https://doi.org/10.1073/pnas.1700811114

Gruber, A. J., Calhoon, G. G., Shusterman, I., Schoenbaum, G., Roesch, M. R., & O'Donnell, P. (2010). More is less: A disinhibited prefrontal cortex impairs cognitive flexibility. Journal of Neuroscience, 30(50), 17102–17110. https://doi.org/10.1523/jneurosci.4623-10.2010

Hohl, K., & Dolcos, S. (2024). Measuring cognitive flexibility: A brief review of neuropsychological, self-report, and neuroscientific approaches. Frontiers in Human Neuroscience, 18. https://doi.org/10.3389/fnhum.2024.1331960

LaClair, M., Febo, M., Nephew, B., Gervais, N., Poirier, G., Workman, K., Chumachenko, S., Payne, L., Moore, M., King, J., & Lacreuse, A. (2019). Sex differences in cognitive flexibility and resting brain networks in Middle-Aged marmosets. eNeuro, 6(4), ENEURO.0154-19.2019. https://doi.org/10.1523/eneuro.0154-19.2019

Masley, S., Roetzheim, R., & Gualtieri, T. (2009). Aerobic exercise enhances cognitive flexibility. Journal of Clinical Psychology in Medical Settings, 16(2), 186–193. https://doi.org/10.1007/s10880-009-9159-6

Mengxia, L. (2024b). Preschoolers' cognitive flexibility and emotion understanding: a developmental perspective. Frontiers in Psychology, 15. https://doi.org/10.3389/fpsyg.2024.1280739

Monni, A., Scandola, M., Hélie, S., & Scalas, L. F. (2022). Cognitive flexibility assessment with a new Reversal learning task paradigm compared with the Wisconsin card sorting test exploring the moderating effect of gender and stress. Psychological Research, 87(5), 1439–1453. https://doi.org/10.1007/s00426-022-01763-y

Pehlivan, N. N., & Coşkun, H. (2023). Influence of Perceived Social Support on Forgiveness in University Students: Examining the Mediator Role of Cognitive Flexibility and Moderator Role of Gender. Influence of Perceived Social Support on Forgiveness in University Students: Examining the Mediator Role of Cognitive Flexibility and Moderator Role of Gender, 5(3), 192–200. https://doi.org/10.35365/ctjpp.23.3.01

Wang, C., Zhang, Z., Wiley, J. A., Fu, T., & Yan, J. (2022). Gender differences in pleasure: the mediating roles of cognitive flexibility and emotional expressivity. BMC Psychiatry, 22(1). https://doi.org/10.1186/s12888-022-03945-9

Wang, Z., Akaliyski, P., Ma, C., & Xu, Y. (2024). Cognitive flexibility and academic performance: Individual and cross-national patterns among adolescents in 57 countries. *Personality and Individual Differences*, *217*, 112455. https://doi.org/10.1016/j.paid.2023.112455

Yeniad, N., Malda, M., Mesman, J., van IJzendoorn, M. H., Emmen, R. A. G., & Prevoo, M. J. L. (2014). Cognitive flexibility in children across the transition to school: A longitudinal study. *Cognitive Development*, *31*(1), 35-47. https://doi.org/10.1016/j.cogdev.2014.02.004

Zmigrod, L., Rentfrow, P. J., Zmigrod, S., & Robbins, T. W. (2018). Cognitive flexibility and religious disbelief. Psychological Research, 83(8), 1749–1759. https://doi.org/10.1007/s00426-018-1034-3

Acknowledgment
The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest
The author(s) declared no conflict of interest.

How to cite this article: Idris, I. & Sharma, S. (2025). Cognitive Flexibility Across Educational Transitions: A Comparative Study of Secondary School and University Students. *International Journal of Indian Psychology, 13*(2), 1625-1634. DIP:18.01.150.20251302, DOI:10.25215/1302.150