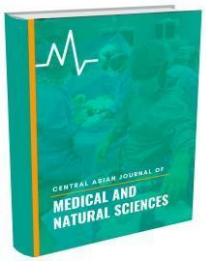

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Article

Specific Features of Attention in Students During the Learning Process

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Abstract: This article investigates the dynamics of attention in first- and second-year university students throughout the academic year. The study was conducted at Qarshi State University and involved a total of 125 students — 27 male and 98 female — divided into first-year (n=63) and second-year (n=62) groups. Attention was assessed using the Schulte-Gorbov table method on the NS-Psychotest apparatus (Neurosoft), which measures the speed and flexibility of attentional switching; results were recorded in seconds, with shorter completion times indicating higher attentional efficiency. Measurements were carried out at four stages: at the beginning of the academic year (September), before examinations (January), after examinations (February), and at the end of the academic year (May). This longitudinal design allowed the researchers to track the wave-like pattern of attentional changes across the full academic cycle. All tests were administered during morning hours under standardized conditions. In first-year male students, the baseline task completion time was 55±2.4 seconds, while in female students it was 48±3.4 seconds, indicating higher attentional efficiency in females at the outset. Before the examination session (January), task completion time increased significantly in both groups — to 62±1.8 s in males and 56.3±2.3 s in females — and these changes were statistically significant ($P<0.05$). After examinations (February), partial recovery was observed in both groups; however, indicators did not return to baseline levels. By the end of the academic year (May), attention efficiency deteriorated again to 62.8±2.2 s in males and 58±1.2 s in females ($P<0.05$). A similar pattern was observed in second-year students. Baseline values were slightly higher (i.e., completion times were longer) than in first-year students, suggesting a degree of residual cognitive strain already present at the start of the academic year. The most pronounced change was recorded in second-year female students, whose completion time increased from 50.3±2 s to 63±4 s before examinations ($P<0.05$). Recovery after examinations was partial, and by May, values remained significantly higher than baseline in all groups ($P<0.05$ in males; $P<0.01$ in females). The results demonstrate that academic workload and examination stress have a measurable and consistent negative impact on attentional performance in university students. The incomplete recovery of attentional indicators between assessment points reflects the cumulative effect of academic stress across the academic year.

Keywords: Attention, Schulte-Gorbov table, academic stress, cognitive functions, university students, examination period, attentional dynamics, adaptation.

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Introduction

During the adaptation period in higher education, students undergo significant psychophysiological changes. Adaptation is described as a process through which all body systems achieve balance in order to adjust to new conditions and maintain functional stability [1]. For first-year students, the combination of a new academic environment, independent living, and increased academic workload collectively acts as a powerful

stressor [2]. In this context, cognitive functions — particularly attention — are recognized as one of the most sensitive indicators of the nervous system's functional state [3].

Attention is defined as the ability to direct and sustain one's mental activity toward a specific object, and it serves as an essential foundation for the effectiveness of the learning process [4].

Numerous studies have demonstrated that academic stress has a distinct effect on attentional performance. For instance, sustained exposure to stress has been shown to impair a range of cognitive functions, including attention [5]. A study by Li et al. found that under stressful conditions, attention and working memory change in an interrelated manner [6]. Some studies have also noted that chronic academic stress may, to a certain degree, improve attentional control. However, the majority of researchers emphasize that a sharp increase in stress leads to a decline in attentional performance [7].

When studying attention in students, cognitive load is a matter that warrants serious consideration. A study by Taylor et al. demonstrated that excessive academic workload reduces attentional resources and negatively affects overall learning efficiency [8].

The influence of gender on changes in attention during the learning process is also noteworthy. A number of studies indicate differences between males and females in terms of the speed and stability of attention. According to the findings, female students show slightly higher attentional performance compared to male students; however, this difference may shift under the influence of stress [9].

In our country, broad-scale reforms are being implemented, directed at improving educational quality. The development of education and the more effective organization of student activities have been placed among the most pressing issues at the national level. Ensuring optimal adaptation of students to the academic process has been designated as a priority objective [10]. Nevertheless, research devoted to the systematic monitoring of cognitive functions — particularly attention — throughout the academic year remains insufficient. Existing studies are often limited to single-point measurements, and their findings do not fully reflect the dynamic changes that occur in students over time. Taking the above into consideration, the present study aimed to investigate the dynamics of attention in students during the academic process.[11]

Materials and Methods

In the present study, the dynamics of attention over the course of the academic year were examined in first- and second-year students using the Schulte–Gorbov table on a modern psychodiagnostic device (Neurosoft). The Schulte–Gorbov table is a widely used and standardized method for the objective assessment of attentional speed and stability. The test measures attentional switching — that is, the speed at which attention shifts — with results expressed in seconds. The shorter the time required to complete the task, the higher the assessed level of attentional performance [12].

The study was conducted in four stages: at the beginning of the academic year, before examinations, after examinations, and at the end of the academic year. The total number of participants was 125, of whom 27 were male and 98 were female (63 first-year and 62 second-year students). All assessments were carried out during morning hours. Prior to testing, participants were informed about the purpose and significance of the study, as well as the correct procedure for completing the tasks.

The Schulte table task simultaneously activates visual search, working memory, and mental arithmetic, which enhances its value as a tool for comprehensive cognitive assessment [13].

Results and Discussion

The findings of the study are presented in the Table 1. And Table 2. below.

Table 1. Dynamics of attentional changes in first-year students (seconds).

№	Study group	Stages of the study			
		Beginning of academic year	Before exams	After exams	End of academic year
		September	*January*	*February*	*May*
1.	Male students, n=15	55±2.4	*62±1.8	58±2.2	**62.8±2.2
2.	Female students, n=48	48±3.4	#56.3±2.3	53±1.4	##58±1.2

*Note. P<0.05; the January result is statistically significant compared to September.
**Note. P<0.05; the May result is statistically significant compared to September.

#Note. P<0.05; the January result is statistically significant compared to September.
##Note. P<0.05; the May result is statistically significant compared to September.

Table 2. Dynamics of attentional changes in second-year students (seconds).

№	Study group	Stages of the study			
		Beginning of academic year	Before exams	After exams	End of academic year
		September	*January*	*February*	*May*
1.	Male students, n=12	61.5±2.6	65±1.8	62±2.1	*68±2
2.	Female students, n=50	50.3±2	#63±4	56.5±2.7	##60.5±2.7

*Note. P<0.05; the May result is statistically significant compared to September.

#Note. P<0.05; the January result is statistically significant compared to September.
##Note. P<0.01; the May result is statistically significant compared to September.

At the first stage of the study — the beginning of the academic year — the task completion time for first-year male students was 55±2.4 seconds, and for female students 48±3.4 seconds. It is evident that attentional performance was higher in female students. This difference may be attributed to neuropsychological differences between the sexes. Prior to examinations (Stage 2), the task completion time increased to 62±1.8 seconds in male students and 56.3±2.3 seconds in female students, with these changes being statistically significant (P<0.05). In other words, a notable decline in attention was observed in both groups as a result of sustained academic activity. This outcome may additionally be explained by excessive strain on the nervous system that intensifies during the period of examination preparation.[14]

At Stage 3 — following the examinations — the attentional performance score in male students was 58±2.2 seconds (53±1.4 seconds in female students). A recovery in attentional performance was observed in both groups after the examinations. However, neither group's results returned to the baseline level, indicating that recovery was incomplete.

At Stage 4 of the study, male students completed the attentional task in 62.8±2.2 seconds and female students in 58±1.2 seconds, with these changes being statistically significant (P<0.05). The decline observed in May is attributed to cumulative mental fatigue that accumulated during the second half of the academic year, combined with preparation for the upcoming examination session.

Table 2 presents the dynamics of attentional changes in second-year students. At Stage 1 of the study, the time spent on the attentional task was 61.5±2.6 seconds for male

students and 50.3±2 seconds for female students. Compared to first-year students, the attentional performance of second-year male students at the beginning of the academic year was somewhat lower, suggesting that a certain level of functional strain was already present in second-year students at the outset of the academic year.

At Stage 2 (before examinations), the task completion time extended to 65±1.8 seconds for male students and 63±4 seconds for female students. Following the examinations, these values improved to 62±2.1 seconds and 56.5±2.7 seconds, respectively. Although recovery was noticeable in both groups, the results did not return to the September baseline, which is consistent with the recovery pattern observed in first-year students.

At Stage 4 of the study, attentional speed reached 68±2 seconds for male students and 60.5±2.7 seconds for female students, with results being statistically significant compared to September.

A comprehensive comparison of the results across both academic years revealed several important patterns. First, across all groups, attentional performance followed a wave-like dynamic throughout the academic year: a decline before examinations, partial recovery after examinations, and a renewed decline toward the end of the academic year. Second, at the beginning of the academic year, female students demonstrated higher attentional performance than male students in both years. Third, the recovery process in participants was incomplete, which is considered an objective indicator of cumulative mental fatigue accumulated during the academic process.[15]

Conclusion

Cognitive functions in students undergo changes throughout the academic year under the influence of various factors. Cognitive indicators such as attention and memory, which are at a high level at the beginning of the academic year, decline considerably under the pressure of academic workload, assignments, individual student motivation, and other factors. These indicators rise again in the period preceding examinations, then decline once more under the cognitive load of the second semester. Toward the end of the academic year, a renewed improvement is observed. It can be stated that this type of dynamic characterizes students' adaptation to the academic process. As a result of such adaptation, cognitive functions in second-year students do not fluctuate as sharply throughout the academic year. The observations and assessments conducted in the present study support this conclusion to a considerable extent.

The preliminary findings of this study provide scientific justification for the need to systematically monitor students' cognitive functions in higher education institutions and to distribute academic workload more effectively.

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