



Transforming Scars to Stars

A Multivariate Analysis of Factors Affecting Sustained Attention and Attention Span

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Abstract: Among the myriad factors that influence students' learning, 'Sustained Attention' remains the forerunner. With overcrowded classrooms, exhaustive syllabi to be covered in a restricted period of time and the challenge of engaging each and every learner in a mixed ability classroom, a teacher constantly grapples with the academic plague of student inattentiveness. These distracted students either resort to day dreaming or become nuclei of cliques creating chaos in the classroom causing other learners' attention to dwindle. Since centering attention on learning paves the way for academic success, it follows that a teacher has an added responsibility in securing and holding students' attention during the teaching-learning process. It's time for a breakthrough in classroom dynamics by transforming the scars in the area of students' learning behavior to stars through a re-discovery of the main causes of student distraction and how it can be curtailed. The present study delved into 4 categories of factors responsible for students' attention, namely Physical Environment, Personal Factors, Social Factors and Student Learning Preference. The sample comprised of 462 students of the secondary section of an English medium S.S.C. school in Mumbai. The Students' Sustained Attention Scale and the Students' Attention Span Scale were administered to collect the required data. Results indicated that the category of Personal Factors ranked highest in both Middle and High School students affecting their sustained attention. Further, regression analysis indicated that all the factors significantly contributed to the Attention Span of the students, with Personal Factors again making the highest contribution. This study could provide a beacon of light to teachers in devising strategies to train students in concentrating their undivided attention on learning, as they as learners play a pivotal role in their own learning process.

Index Terms –Attention Span, Physical Environment, Personal Factors, Social Factors, Student Learning Preference

I. INTRODUCTION

One of the many impediments to academic progress is that of securing and sustaining the attention of students in a given academic task or activity. Attention is an essential criterion for effective learning as it ensures that a learner is adequately engaged and involved in the learning experience. Knowledge attained through greater attention, is more resistant to deterioration and forgetting (Prakash, 2015). A review of previous literature suggests that those who can think creatively and critically possess a high ability to focus on stimuli (Piaw, 2014). It thus follows that attention is the basis of thinking. Students whose attention strays encounter difficulties in following classroom instructions, subsequently lose interest in learning, neglect their academic tasks/assignments, have problems in upholding rules and engage in deviant behavior in the classroom. This leads to the understanding that attention is also an important prerequisite for cognitive, social and emotional development during childhood. The concept of attention span is of utmost importance in the classroom, where a failure to focus can have devastating results. Comprehending how to extend student attention span, while simultaneously maintaining student focus, is a valuable skill for today's educators. While attention has been categorized in a variety of ways, psychologists often focus on two types of attention: focused and sustained. Sustained attention is documented as the traditional concept of attention, in which an individual is dedicated to a task for a period of time, usually measured on the scale of minutes (Sarter et al., 2001). While exhibiting this form of attention a learner could closely follow a lesson, while actively interacting and drawing conclusions about the material. The amount of time which a person spends in a period of sustained attention is known as Attention Span. On a self-chosen task, the attention span for adolescents and adults averages approximately 20 minutes (Middendorf, 1995), while contrastingly that of a young child lasts roughly five minutes. It is interesting to note that for individuals of all ages, the total uninterrupted attention span rarely exceeds 40 minutes, after which time repeated refocusing is required (Dukette and Cornish, 2009). Focused attention, a variant of selective attention, is attention which is devoted to an interruption, such as a doorbell chime or ringing phone (Treisman, 1969). This type of attention lasts only for a brief period of time, usually mere seconds. As focused attention is a distraction from a period of sustained attention, it does not have much implication for learning purposes. Thus it emerges, that students' sustained attention deserves rethinking if it has to be improved in a bid to elevating academic progress at school. Research has posited that enjoyable and engaging lesson plans and tasks which are intrinsically motivating will help to preserve student attention for the longest period of time. A variety of factors have been found to provide either a positive or negative influence on attention span. These could range from factors in the physical environment such as noise, congested classrooms, poor ventilation and lighting, insufficient leg space between seats, mosquitoes and pollution to personal factors such as disturbing thoughts, emotions, illnesses, fatigue, drowsiness, fear, moods, physical needs such as hunger/thirst/need to visit the washroom or

even personal depression. Other factors affecting attention could be Social Factors ranging from chatter of classmates, teacher's favoritism towards particular students, undisciplined behavior of other students, peer pressure and preference for a teacher or more importantly Student Learning Preferences which include factors relating to their preferred learning styles, teaching strategies used by teachers, monotony in teaching, subject preferences or methods of transacting the curriculum. While not all aspects affecting attention span are controllable by an instructor, student focus can be radically improved if a teacher makes an effort to involve students and minimize distraction. The present research endeavours to assess and compare the factors affecting Sustained Attention in Middle and High School Students and their relationship with Attention Span. The findings of such an endeavor could well serve to help teachers unearth how students' attention in the teaching-learning process could be enhanced, establishing its undeniable role in the learning process and helping them assume accountability for their own learning.

II. AIM AND OBJECTIVES

The aim of the study was to assess the factors affecting Sustained Attention in Middle and High School students and to explore its relationship with Attention Span. The objectives were as follows:

- To assess the factors affecting Sustained Attention in Middle/High School students.
- To identify the most predominant class of factors affecting Sustained Attention in Middle and High School students.
- To compare the factors affecting Sustained Attention in Middle and High School students.
- To ascertain the combined relationship of Physical Environment, Personal Factors, Social Factors and Student Learning Preference with Attention Span in Secondary School students.

III. HYPOTHESIS

The following null hypothesis was formulated for the study:

There is no significant combined relationship of Physical Environment, Personal Factors, Social Factors and Student Learning Preference with Attention Span in Secondary school students.

IV. RESEARCH METHODOLOGY

The research design employed was descriptive and included a survey. Moreover, the present investigation was of the co-relational type as it aimed to study the combined relationship of Physical Environment, Personal Factors, Social Factors and Student Learning Preference with Attention Span in Secondary school students.

4.1 Population and Sample

The sample comprised of 462 students of the secondary section (standards V to IX) of a private-aided English medium school in Mumbai, affiliated to the S.S.C Board of Education selected by the convenience sampling technique.

4.2 Data and Sources of Data

At first, the researcher obtained the permission of school authorities to conduct the study. Data were kept confidential and all ethical principles of conducting research were followed. The tools used for data collection were as follows:

- The Students' Sustained Attention Scale: A 4 point Likert scale comprising of 20 items related to 4 categories of factors responsible for Sustained Attention, namely, Physical Environment (PE), Personal Factors (PF), Social Factors (SF) and Student Learning Preference (SLP).
- The Students' Attention Span Scale: A 4 point Likert scale comprising of 12 items pertaining to common experiences students may have encountered when working or concentrating on a task.

4.3 Theoretical framework

The dependent variable of the study was Attention Span, while the independent variables of the study included Physical Environment, Personal Factors, Social Factors and Student Learning Preference. The operational definitions of the key terms included in this study have been given below.

1. **Factor Affecting Attention:** Any aspect interfering with students' concentration on a given academic task or activity.
2. **Physical Environment:** Any factor in the classroom environment which is a source of physical discomfort to students leading to their distraction from a given academic task/activity.
3. **Personal Factors:** Any individual reason which shifts a student's focus from a given academic task/activity.
4. **Social Factors:** Any interpersonal reason which shifts a student's focus from a given academic task/activity.
5. **Student Learning Preference:** A unique set of the student's inclinations for learning which are based on a range of intrinsic and extrinsic factors.
6. **Attention Span:** The maximum time duration for which a student can focus on a given task or activity without being distracted.
7. **Middle School:** A school for children between the ages of 10 and 12 which usually includes grades five to seven.
8. **High School:** A school for children between the ages of 13 and 15 which usually includes grades eight to ten.

4.4 Statistical Analysis

- **Descriptive analysis:** It included the summary of the mean percentage of the 4 categories of factors responsible for Sustained Attention, namely, Physical Environment (PE), Personal Factors (PF), Social Factors (SF) and Student Learning Preference (SLP). The magnitude of these variables was computed, tabulated and the results were depicted graphically.

- **Inferential Statistics:** As this study focused on determining the combined relationship of Physical Environment (PE), Personal Factors (PF), Social Factors (SF) and Student Learning Preference (SLP) with Attention Span in Secondary school students, a correlational research design was chosen as part of Inferential Statistics, wherein data were analyzed using regression analysis. The One Way ANOVA was then employed to compute whether the measurement of the variables differed significantly between groups. When P value was less than 0.05, the difference was considered statistically significant and highly significant not when P-value was less than 0.01 and 0.0001.

V. RESULTS AND DISCUSSION

5.1 Results of Descriptive Statistics of Study Variables

Table 1 shows the magnitude of the variables of the study

Table 1

Magnitude of the Variables of the Study

VARIABLE	GROUP	MEAN	PERCENT MEAN	MAGNITUDE
Physical Environment (PE)	Middle School	12.13	47.53	MODERATE
	High School	11.8	45.33	
Personal Factors (PF)	Middle School	10.97	39.8	LOW
	High School	10.19	34.6	
Social Factors (SF)	Middle School	13.11	54.06	MODERATE
	High School	12.88	52.53	
Student Learning Preference (SLP)	Middle School	12.61	50.73	MODERATE
	High School	12.15	47.66	

From Table 1 it can be concluded that Mean Percentage of Physical Environment, Social Factors and Student Learning Preference was Moderate in Middle and High School Students while the Mean Percentage of Personal Factors was Low. The highest Mean Percentage of Social Factors could be attributed to the fact that these Middle and High School Students were at the pre-adolescent and adolescent stage of their development. It follows that at this age they would have been more predisposed to peer pressure, friend circles, relationship with their peers and teachers, peer competition and teacher preference interfering with their attention.

Figure 1 provides a graphical representation of the data in Table 1

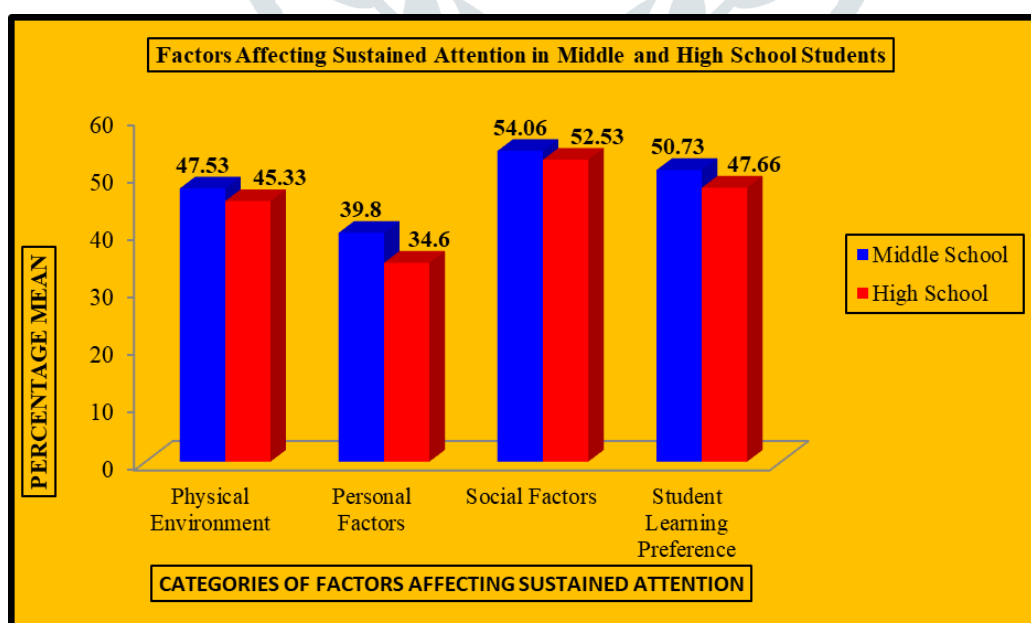


Figure 1: Factors Affecting Sustained Attention in Middle and High School Students

5.2 Results of Inferential Statistics of Study Variables

The Null hypothesis states that there is no significant combined relationship of Physical Environment, Personal Factors, Social Factors and Student Learning Preference with Attention Span in Secondary school students. Table 2 shows the inter-correlations between the mentioned variables.

Table 2- Inter-Correlations between the Variables of the Study

	Physical Environment	Personal Factors	Social Factors	Student Learning Preference	Attention Span
Physical Environment	1	0.396	0.37	0.347	0.308
Personal Factors	0.396	1	0.321	0.315	0.369
Social Factors	0.37	0.321	1	0.271	0.21
Student Learning Preference	0.347	0.315	0.271	1	0.313
Attention Span	0.308	0.369	0.21	0.313	1

The multiple regression equation is as follows:

$Y = a + b_1X_1 + b_2X_2 + \dots + b_k X_k$ where 'a' is the starting point constant analogous to the intercept in a simple two-variable regression, and b_1, b_2, \dots are the unstandardized regression weights for X_1, X_2 and the other independent variables. In the present analysis $a = 14.1203$ and the values of b are as indicated below. The values listed in Table 3 as B , are the standardised regression weights.

Table 3- Standardised Regression Weights

	b	B	B x r_{xy}
Physical Environment	0.2247	0.1356	0.0417
Personal Factors	0.3861	0.2488	0.0918
Social Factors	0.0556	0.0321	0.0068
Student Learning Preference	0.297	0.1787	0.0559
Multiple $R^2 = 0.1962$			
Adjusted Multiple $R^2 = 0.1891$			
Standard Error of Multiple Estimate		4.2285	

Where,

X_1 : Physical Environment (PE)

X_2 : Personal Factors (PF)

X_3 : Social Factors (SF)

X_4 : Student Learning Preference (SLP)

Y: Attention Span (AS)

Table 4 shows the ANOVA summary for the given data.

Table 4- ANOVA Summary of the Variables of the Study

Source	SS	df	MS	F	P
Regression	2011.671	4	502.9178	27.88	<.0001
Residual	8242.632	457	18.0364		
Total	10254.303	461			

Interpretation: The null hypothesis states that there is no significant combined relationship of Physical Environment, Personal Factors, Social Factors and Student Learning Preference with Attention Span in Secondary school students. However, the high F and low p values ($p < .0001$) observed in Table 4 indicate that the null hypothesis is discredited. Thus, it can be asserted that the variables are significantly related.

5.3 Research Implications

The findings in Table 2 indicate that the Inter-correlation coefficient of Personal Factors and Attention Span is 0.369 which is the highest as compared to that between Student Learning Preference and Attention Span which is 0.313, which is considerably higher than the inter-correlation coefficient of Physical Environment and Attention Span which stands at 0.308. The lowest inter-correlation exists between Social Factors and Attention Span which is 0.21. From this data, it surfaces that intrinsic factors make a greater contribution to Attention Span than extrinsic factors. This implies that once students gain self-control over their interest, attitudes, emotions, feelings, mindset and physical well-being without letting them interfere in the learning process; it would help them direct their wholehearted attention to the task in focus. Several other studies too have reported that human cognitive processes are affected by emotions, including attention (Vuilleumier, 2005). Age and motivation are also known to affect sustained attention ability. Older adults display higher motivation and less mind-wandering than younger adults and children during sustained attention tasks. With a strong sense of self-regulatory skills, students will be able to better concentrate on tasks during in-school activities, comprehending information, thus growing to their highest academic potential.

Going further, it is interesting to note that the manner in which the teacher presents the content so as to cater to students' learning styles also makes a significant contribution to their Attention Span. Thus, it is imperative that a classroom teacher breaks the monotony of instruction by employing creative strategies, attention catchers, multiple media and the skill of questioning to keep students constantly engaged and attentive. Gump (2004), Asadi (2004) and Mangal (2004) suggested that the attractiveness of content, the possibility of taking notes in class, the connection of learning resources with the students' understanding, developing a sense of curiosity in what is being taught and teacher feedback are among the most critical factors affecting the attention span of students in the classroom. A study conducted by Servatyari et al. (2019) and Haresabadi et al. (2016) revealed that manifold and constructive strategies could be utilized by educators to elevate student concentration. Furthermore, teacher's mastery of content, proficiency in the subject, and the use of appropriate teaching methodologies played the most significant role in extending students' attention span. In fact, if teachers do not master the subject matter adequately, they cannot easily answer students' questions and resolve difficulties even if they are good at teaching. Besides teachers should be skilled at motivating students to attend classes so that they better understand the subject matter. Teachers can use creativity and different teaching methods to engage students. Studies in this regard suggest that effective teaching occurs when teachers can appropriately use a blend of several methods in a class to increase students' attention span (Rahal, 1997).

An observation that deserves to be focused on is that Physical Environment as a category of factors affecting sustained attention made a considerably low contribution to the Attention Span. This fact is supported by the probable explanation that the research study was conducted in a Convent school where classrooms were clean and hygienic, spacious, well ventilated and bright so as not to hinder students from paying attention to the learning activity at hand. The school infrastructure and seating arrangement were reasonably comfortable and a silence zone maintained around the school campus while classes were in progress keeping noise pollution minimal. However, contrastingly previous research has shown that by decreasing environmental distractors, it is possible to increase concentration alongside other factors (Silva and Santos, 2013). Additionally, front benchers have been known to report increased concentration.

In the present study the contribution made by Social Factors to the Attention Span was the lowest. This is evident from the fact that being an all-girls school discipline issues were at bay. Girls by their very nature are well-behaved, focused, self-driven and rarely give in to peer distractions during class. This has also been substantiated by research evidence which suggests that Attention Deficit and Hyperactivity Disorder (ADHD) affect boys three to nine times more than girls (Siegel and Smythe, 2005). Studies have also found that girls showcased better performance and a higher level of inhibitory control in comparison to boys (Biederman et.al., 2002). Previous research studies have suggested that teacher support in the classroom plays a noteworthy role in student behaviors and their self-regulatory skills. These skills in turn allow students to nurture friendships, manage inter-personal relationships and collaborate well with their peers. All-in-all, teacher support, academic and emotional, affects learning in the classroom setting (Merritt et. al., 2012). A teacher's positive attitude and encouraging feedback, are more likely to promote better involvement of students.

What deserves a special mention is that a combination of Physical Environment coupled with Personal Factors ranked highest in influencing students' Attention Span. This suggests that a comfortable and convenient learning environment promotes focused attention in class. A child's mental and emotional state, along with their physical well-being also deserves to be emphasized while devising strategies to improve sustained attention. Teachers must arrange the classroom in a manner that is conducive to learning and put children at ease by releasing them from their anxieties, inhibitions and irrational fears to prepare the ground for subsequent learning. Rotation of seats and different seating arrangements according to need should be permitted for children to view the blackboard/ LCD screen easily, pay better attention to the teacher and feel involved in the teaching learning process, leaving less scope for distraction to set in. Parallel to this finding, previous studies have mentioned that some of the factors influencing concentration include personal factors like nutrition, intellectual conflicts, mastery of the subject coupled with physical factors like the use of teaching aids, the light, and ventilation of the classroom (Ozturk et. al., 2008).

All these findings drive home the fact that attention span depends upon a multitude of intrinsic and extrinsic factors relating to the learner. This has also been corroborated by Stablum (2002) who proposed that school plays a substantial role in the developmental context for the student. His/her presence at school, the environment and the encounters therein, lead him/her through a cognitive, emotional, and social transformation. Thus it can be summarized that the classroom climate, people around and everything specifically concerning the student assumes an important role in attention span, which can be enhanced by an effective teacher who brings true meaning to the purpose of Education.

VI. CONCLUSION

Achieving success in holding student attention would only be possible through a multipronged approach. This can be done through a gamut of strategies ranging from catering to different learning styles in a mixed ability classroom, minimizing distractions through interactive lessons, employing a participatory rather than passive approach in the teaching learning process and building teacher-student connect. Once attention is secured, the instructor needs to shift his gaze to expanding the attention span by adopting a plethora of techniques to sustain student concentration. Lessons should not be planned for extensive periods which surpass the human span of attention, but rather be structured to include appropriate resources and activities characterized by variety and ample scope for student participation and involvement. The teacher should maintain an enthusiastic attitude and resort to the use of positive reinforcement whenever possible. Humor could interestingly serve to ignite the spark of learning in students, breaking the monotony in dull classrooms and rekindling their interest in academic tasks. Ushering of technology into traditional teaching could help education transcend the boundaries of a classroom making learning a vibrant and fun-filled experience. If educators understand and appreciate the limited attention span of students and work dedicatedly to overhaul this barrier, then there would be the much needed breakthrough in classroom teaching and student performance. This would ensure that classroom education achieved its true purpose of helping students rid the scars in their learning and evolve into stars.

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