EXPLORING MENTAL TIMELINES: PERCEIVED DURATION IN ILLITERATE AND LITERATE INDIVIDUALS

A thesis submitted in the partial fulfilment of the requirement for the degree of

MASTER OF ARTS IN PSYCHOLOGY

(Clinical)

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CERTIFICATE

This is to certify that the thesis entitled " **Exploring Mental Timelines: Perceived Duration in Illiterate and Literate Individuals"** being submitted in partial fulfilment of requirements for the award of the degree of **Master of Arts in clinical psychology, submitted in the Thapar School of Liberal arts and Sciences, Thapar Institute of Engineering and Technology, Patiala** is a bonafide work carried out under the supervision of Dr. Anuj Kumar Shukla, Professor, school of liberal arts and sciences, Thapar Institute of Engineering and Technology, Patiala and that no piece of this venture has been submitted for the honor of some other degree.

(Mehak Jain)

This is to certify that the above statement made by the student concerned is correct and true to the best of my knowledge.

Dr. Anuj Kumar Shukla

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CANDIDATE'S DECLARATION

I hereby declare that the work presented in this thesis entitled "**Exploring Mental Timelines: Perceived Duration in Illiterate and Literate Individuals"** is submitted in partial fulfilment of requirements for the award of the degree of **Master of Arts in clinical psychology, submitted in the Thapar school of liberal arts and sciences, Thapar Institute of Engineering and Technology, Patiala** is an authentic record of my work carried out under the supervision and guidance of Professor Dr. Anuj Kumar Shukla, school of liberal arts and sciences, Thapar Institute of Engineering and Technology, Patiala and referred other researcher's work which is duly listed in the reference section.

The matter embodied in this thesis has not formed the basis for awarding any other degree of this or any other university.

Date: May 2023

Place: Patiala (Mehak Jain)

This is to certify that the above declaration made by the student concerned is correct and true to the best of my knowledge.

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ABSTRACT

Education has become a societal norm, with the belief that educated individuals possess a higher social standing and enhanced cognitive abilities. Numerous studies have examined the impact of education on various cognitive tasks and consistently reported differential performance between literate and illiterate individuals. However, studies contradict this notion of divergent cognitive task performance among these groups. Despite this body of research, whether education influences temporal processing in literate and illiterate individuals remains to be determined. This question holds particular importance, considering that literacy involves formal training in reading and writing, which contributes to the development of a mental timeline that runs from left to Right. On this mental timeline, the left side is associated with shorter durations, while the right side is associated with longer durations. It is reasonable to assume that literate individuals, trained to read and write from left to Right, benefit from this formal training in developing their mental timeline.

Conversely, illiterate individuals lack such formal training, potentially hindering the formation of their mental timeline. Therefore, the objective of this thesis is to investigate the influence of literacy on temporal processing, specifically concerning the development of the mental timeline. To accomplish this, we conducted a temporal bisection task involving two groups: literate and illiterate individuals. In this task, participants were presented with left and right arrows displaying varied durations and were asked to judge whether the presented duration was longer or shorter. These results suggest that there are no significant differences between literate and illiterate individuals in the development of the mental timeline. This implies that literacy itself may not directly influence the formation of the mental timeline, as illiterate individuals might have developed their mental timeline through different daily activities. In conclusion, this study provides insights into the relationship between literacy, temporal processing, and the development of the mental timeline. It suggests that literacy may not be the sole determinant of mental timeline formation, as individuals who lack formal literacy training can still exhibit similar temporal processing patterns. Future research could further explore the underlying factors that contribute to the development of the mental timeline in diverse populations.

Keywords: timing, time perception, position, magnitude, timeline representation, temporal sensitivity.

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CHAPTER 1

INTRODUCTION

Education plays a crucial role in contemporary society as it encompasses the acquisition of essential skills such as reading, writing, and various cognitive abilities. This process can be seen as a systematic cultural transmission that occurs during formal schooling. Formal education, along with the educational system, are fundamental components of modern civilization and serve as key structures within the intelligent information environment. These institutionalized structures contribute significantly to socialization and the transmission of cultural values. Among the cognitive skills influenced by human civilization's evolution, reading, and writing hold significant importance (Vygotsky, 1962). Writing, in particular, is a relatively recent invention, dating back approximately 6,000 years in human history. It seems unlikely that specialized brain regions specifically evolved to facilitate reading and writing abilities (Ardila, 2004). Instead, preadapted brain regions are believed to support these cognitive processes. Preadaptation refers to structures that were initially developed to serve a specific function but have now become instrumental in achieving different objectives. Unlike natural language, reading is not a species-wide adaptation but rather a cognitive talent acquired through formal schooling. It is one of several cognitive abilities that individuals acquire through education rather than being innate adaptations shared universally by all human beings. According to Varney (2002), reading and writing "evolved through cultural developments that became 'typical' human abilities within the last 200 years in Europe and America, and only after World War II. In summary, education holds immense significance in contemporary society. It encompasses the development of cognitive skills such as reading and writing, which have been shaped by the evolution of human civilization. While specialized brain regions specifically dedicated to reading and writing are unlikely to have evolved, preadapted brain regions are likely involved in supporting these cognitive processes. Reading, a cognitive talent acquired through formal schooling, is not a species-wide adaptation like natural language. Instead, it is a product of cultural developments that became prevalent in Europe and America over the last two centuries, particularly after World War II.

Time Perception

Time perception is a fundamental aspect of human consciousness and plays a significant role in shaping our perception of the world and our sense of self. However, understanding how we perceive time is a topic of ongoing debate. Both time and number can be represented spatially, with their magnitude representation potentially being innate, while their spatial position representation is acquired. In Western culture, the mental timeline represents past and future events or short and long durations on space's left and right sides, respectively. The development of the mental timeline for duration has been investigated through developmental experiments. It is interesting to note that time is often conceptualized and represented spatially in language, such as phrases like "We waited a long time" or "Take a look back over your career." This suggests that the notion of time as a subjective construct derived from the movement of objects through space has persisted over time. Various researchers have explored the connection between time and space. James (1890) drew parallels between the experience of time and place, suggesting that a position in time corresponds to a position in space. Piaget (1969) claimed that time and space are linked. Studies have shown that even young children struggle to distinguish between the concepts of time and space, perceiving lengthy duration as equivalent to a great distance. This association between duration and spatial distance is observed not only in adults and children but also in neonates and monkeys. The study of time perception, also known as time conception, delves into the subjective experience of time and is explored within the fields of psychology, cognitive linguistics, and neuroscience. It focuses on individuals' impressions of the duration of events and how they perceive the unfolding of time. Age-related differences in time may indicate unique patterns of development of automatic and voluntary spatial attentional processes emphasizing the need to take attentional capability into account when interpreting duration judgments task results. The mental timeline emphasizes spatial position and categorical spatial relations, while theories like ATOM (A Theory of Magnitude) frame time regarding coordinate spatial relations. Studies have found that patients with right hemisphere damage and spatial neglect tend to underestimate stimulus duration, indicating that the right hemisphere plays a part in magnitude processing. On the other hand, patients with left hemisphere lesions do not exhibit the usual effects of leftward prismatic adaptation on timing performance, implying a function for the left hemisphere in processing relative location.

Throughout history, different cultures have had distinct understandings of time. The ancient Greeks recognized the distinction between objective time (kairos) and chronological time (Chronos). Karl Ernst von Baer made significant contributions to time perception research by highlighting species-specific differences. The concept of the specious present, coined by Clay & Kelly (1882) and expanded upon by William James, refers to the brief moment of constant awareness that serves as the prototype for all imagined times. He developed this idea, suggesting that the specious present might be comprehended as the temporal analog of a sensory item. The subjective impact of time between the two following events is represented by perceived duration. While it is impossible to directly experience or comprehend another person's sense of time, scientific tests can objectively evaluate and determine perception. For example, studies have shown that even rats, with their cortex completely removed, can estimate time periods of around 40 seconds, suggesting that time estimation may be a low-level operation. Temporal illusions and experiments shed light on the neural processes underlying time perception, with different brain regions processing different durational ranges.

In summary, time perception is a complex and multifaceted phenomenon. The mental timeline, spatial representations, and the concept of the specious present all contribute to our understanding of how we perceive time. Ongoing research continues to uncover the intricate relationship between time and our cognitive processes.

Types of Temporal Experience

Ernst Pöppel (1978) identified several fundamental aspects of our perception of time, which he referred to as "elementary time experiences." These include the experiences of duration, non-simultaneity, order, past and present, and change. Non-simultaneity can be understood as perceiving the order of events in time. However, it is possible to recognize that two events occur at different times when they are relatively close together without being able to determine which event came first (Hirsh & Sherrick, 1961).

Temporal illusions refer to distortions in our perception of time. There are three types of temporal illusions:

1) Estimating time intervals
2) Estimating time duration
3) Judging simultaneous events.

One commonly observed temporal illusion is the telescoping effect. It occurs when people recall recent events. Backward telescoping depicts distant events as occurring further back in time than they happened, whereas forward telescoping depicts distant events as occurring more recently than they did.

Vierordt's Law

Vierordt's law is a psychological principle that suggests a tendency for individuals to underestimate longer durations and overestimate shorter durations. In other words, it states that people naturally perceive longer intervals of time as shorter and shorter intervals of time as long. For example, let's consider a scenario where a person is asked to estimate the duration of two tasks: Task A, which takes 10 minutes to complete, and Task B, which takes 2 minutes to complete. According to Vierordt's law, individuals may tend to underestimate the 10-minute duration of Task A and perceive it as shorter than it is. On the other hand, they may overestimate the 2-minute duration of Task B and perceive it as longer than its actual duration. This phenomenon can be observed in various everyday situations as well. For instance, when waiting for an important event or an appointment, time may seem to pass slowly, making the wait feel longer than it actually is. On the contrary, when engaged in an enjoyable activity or in a state of flow, time may appear to fly by quickly, making the duration feel shorter than it truly is Vierordt's law highlights the inherent biases and limitations in our subjective perception of time, demonstrating that our perceptions can deviate from objective measurements.

Kappa Effect

The Kappa effect, also known as perceived time dilation, is a temporal illusion that can be observed in experiments where consecutive stimuli are separated in space, auditory cues, or tactile sensations. This effect causes the perceived temporal duration between the stimuli to be significantly longer or shorter than the elapsed time. To illustrate the Kappa effect, let us consider a journey divided into two parts, A and B, each taking the same time. However, part A covers a longer physical distance compared to Part B. According to the Kappa effect, when mentally comparing these two sub-journeys, part A may subjectively appear to take longer than part B, even though the objective duration is the same for both (Leekham et al., 2010; Jakobsen et al., 2013). This phenomenon demonstrates that factors beyond the objective passage of time can influence our perception of time. The spatial or sensory separation between consecutive stimuli can distort our perception of temporal duration, leading to the Kappa effect. This effect highlights the complex nature of our temporal experiences and the role that spatial or sensory cues play in shaping our subjective perception of time.

Oddball Effect

Humans often have a tendency to overestimate the perceived duration of the first and last events in a series of identical events. This peculiar phenomenon may serve as an evolutionary adaptation, playing an "alerting" role in our perception of time. It is consistent with stories of time appearing to slow down during dangerous situations. Interestingly, this effect seems to be most pronounced when the visual stimuli are increasing in size on the retina, such as when objects are approaching or "looming" toward the observer. Conversely, the effect can be eliminated when the stimuli are contracting or believed to be moving away from the viewer. The impact of this time perception phenomenon can be reduced or even reversed when a static oddball stimulus is presented among a sequence of expanding stimuli. However, recent research has contradicted this claim and found that the oddball-induced time dilation effect is not as significant as previously believed (Ristic et al., 2002; Jakobsen et al., 2013; & Gregory et al., 2016). These findings highlight the complexities of our perception of time and how various factors, such as the order of events and visual cues, can influence our subjective experience of duration. The overestimation of duration for initial and final events, particularly in the context of approaching stimuli, suggests that our perception of time is intricately linked to our evolutionary history and adaptive mechanisms.

CHAPTER 2

LITERATURE REVIEW

Zakay (1990) conducted a study on time perception, where participants were asked to estimate the passage of time using standard units such as seconds or minutes. They estimated using number values or line lengths instead of guessing the exact number of minutes or seconds. Another method used a rating scale with endpoints labeled as "short time interval" and "long time interval," or "time passed quickly" and "time passed slowly." Time production, another dependent variable, involved participants pressing and releasing a button when they believed two minutes had elapsed. This method allowed researchers to investigate time perception in humans and other animals. A third type of dependent variable involved participants recreating a specific period. They were shown a time gap without knowing the exact duration and were then asked to reproduce the same duration. Lastly, a comparison process was used, where participants were presented with two different durations and asked to determine which was longer. This method could also utilize a forced-choice approach with two alternatives. These procedures were used in experiments where participants were aware they would be making time judgments.

In time studies, different levels of time are commonly used as the independent variable. Some studies focus on assessing longer periods, such as hours, while others examine shorter durations of 4 or 12 seconds. It has been observed that people tend to overestimate short periods and underestimate longer intervals. Memory plays a role in the estimation of longer durations exceeding 5 seconds.

Haggard et al., (2002) conducted an experiment involving participants clicking a button that caused a flash of light after a delay. Through habituation, participants experienced a perceived shortening of the amount of time that passes between pressing the button and seeing the flash. As a result, several participants felt the flash occurred before hitting the button. Participants frequently reported experiencing it again when the latency and spatial distance between the button and the flash were lowered. Crossing the hands over the midline impairs tactile temporal stimulus order judgment, implying a link between tactile signals and visuospatial processing. However, congenitally blind participants showed no reversal of temporal order judgment when crossing their arms, indicating that their tactile signals are arranged in time without visuospatial reference.

Volet & Coull (2015) investigated the influence of temporal and geographical information on children's duration and distance assessments. They found that space influenced time more than time influenced space in young children, suggesting the development of a spatial concept of time. However, these studies focused on the effect of spatial magnitude on time perception rather than spatial position. The interference caused by a left-right oriented mental timeline in time judgments was studied in children aged 5 to 10 years old, revealing the acquisition of a concept of time during development.

Coull, J. & Volet (2018) conducted experiments to find out the age at which the mental timetable for length begins to form. Children and adults conducted temporal bisection tasks in which the relative spatial position was manipulated by arrow direction and lateralized stimulus placement. The findings showed that even 5-6-year-olds' sense of duration was influenced by spatial location when the stimuli were non-symbolic and manipulated visually. This suggested using a mental line representation for stimulus length beginning at age five, with a short duration on the left side of space and a long duration on the Right.

Another study by Yadav; Tiwari; & Singh (2019) examined the effect of time durations on time perception using the prospective judgment of the time paradigm. Participants engaged in a dual-task paradigm, estimating elapsed time while performing an executive task. Time judgments were measured using a reproduction method. The findings indicated that short-term time estimates were more accurate than medium- and long-term estimates. Overall, these studies shed light on various aspects of time perception, including the estimation of time intervals, time production, reproduction of time periods, and the influence of spatial factors on time judgments.

Research Gap

Few studies have examined the association between the mental line from left to Right. The individual groups formed are only sometimes found in the existing literature. The additional study involves an additional information component that has yet to be delved into earlier studies. The mental timeline in Western culture depicts the short/long length of space's left/right sides. As a result, the study pinpoints the age at which the mental schedule for duration begins to develop. Previous studies examined the existence of mental timeline among literate population. It has been argued that the education (reading and writing) has been key contributor to mental timeline. Therefore, it is still unclear whether reading and writing is important to contribute to the formation of mental timeline. Thus, we studied the temporal processing among literate and illiterate assuming the lack of reading and writing would lead to distorted mental timeline.

Motivation of Study

The purpose of the experiment was to investigate the influence of the mental timeline on time perception in adults. Specifically, the study aimed to examine whether time perception is influenced by central time judgments when participants focused their attention on a fixator that induced a shift in attention and judgment based on the magnitude and representation of a number line. To see whether the mental timeline has an effect on perceived duration caused by an underestimation of stimulus on the left side or an overestimation of stimuli on the right side, the experiment included control conditions. These control conditions involved using vertical arrows and presenting stimuli at the central location. By comparing the left or right-sided stimuli to these control conditions separately, the researchers could assess the specific impact of spatial position on time perception. This study provides insights into the relationship between literacy, temporal processing, and the development of the mental timeline. Therefore, conducted the study to pinpoint that can illiterate mental time representation. The time perception is controlled by central time judgments among the adult population looking at fixator that causes a shift in attention and judgment depending upon the magnitude and the number line representation. The process that produces a relationship between duration and geographic position is less evident than the process that produces an association between temporal order and spatial position. One apparent possibility is that time passes as we read from left to Right. Our reading duration increases as we travel from left to Right on the page, providing a relationship between duration and position. Therefore, the experiment has been conducted to estimate the perceived duration for each group in terms of the Point of Subjective Equality (PSE) for both the populations- illiterate and literate and can literate and illiterate individuals demonstrate a tendency to underestimate time when it is associated with the left side of space, while overestimate time when it was associated with the right side of space.

Objective of the Study

The study's objective is to show that the spatial position influences perceived duration, indicating using a mental timeline to represent duration from a relative population. To influence time perception and whether the time perception is controlled by central time judgments among illiterate and literates looking at fixator that causes a shift in attention and the judgment depending upon the magnitude and the mental number line representation. In addition, to test if reading and writing is crucial to mental timeline, we would expect to see the overestimation for right side compared to left side in literate. We expect no difference in the temporal processing for left and right side of the space among illiterates.

CHAPTER 3

METHODOLOGY

Sample

A total of 64 participants, both males and females, participated in the study. Out of which, 33 were literate, and 31 were illiterates. The age range was 18-40 years for both age groups. The average age for the literate was 24.24 years, and the average age for the illiterate was 28.22 years.

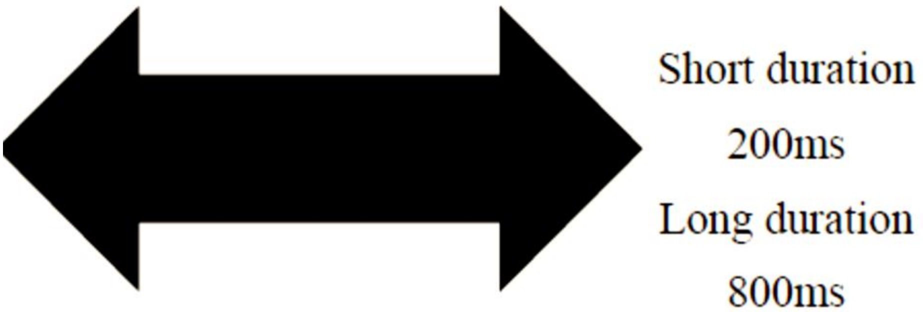
Materials

The individuals were assessed individually in a quiet room. Open Sesame software (a psychology software program) was used to control stimulus presentation and data collection. The rightward and leftward arrows were formed and appeared on the computer screen with a fixator. Manual responses were given with the left and right hands. However, given the increasing complexity of this experimental design, in which simultaneous manipulation of arrow direction and stimulus location was attempted to simplify the task for illiterate and literate groups by asking them to answer by pressing the correct key. A within and between-group subject design was used. Descriptive measures and paired sample t-test was used. The independent variable is stimulus duration conditions, whereas the dependent variable is PSE (time perception).

Procedure

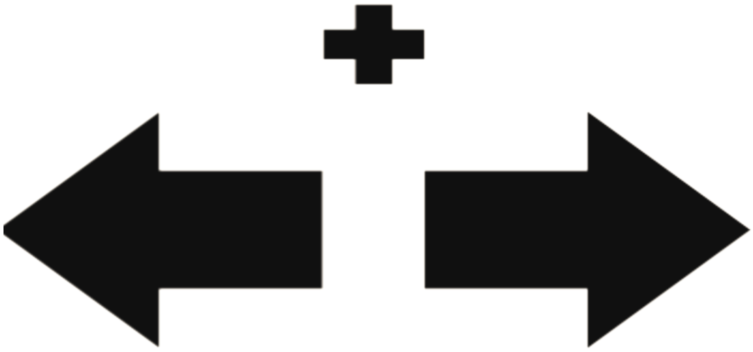
Training Phase

Observation Phase



Feedback Phase

Testing Phase (Task)

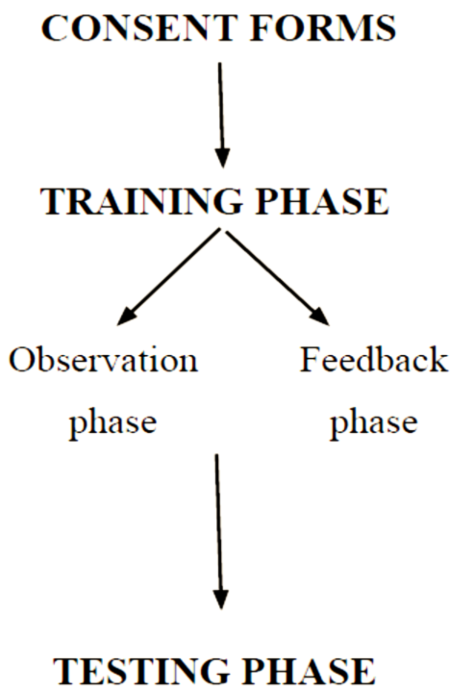


Press ‘S’ for short duration

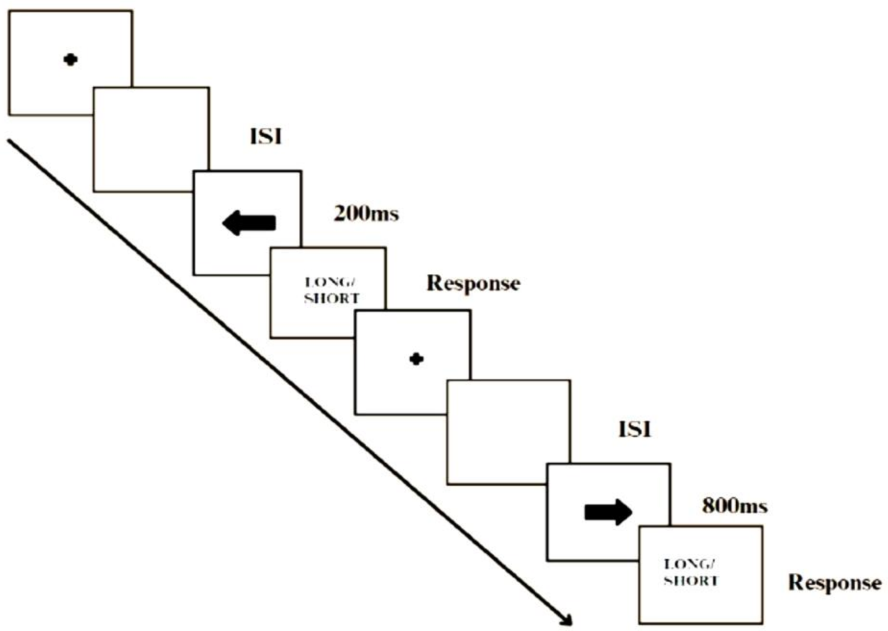
Press ‘L’ for long duration

The subject was asked to sit comfortably in a well-lit, quiet room. Informed consent was obtained from the participant, and they were assured that information collected from them would be kept confidential. On receiving the informed consent, the participant was asked to perform a training phase that took 3-4 minutes on open sesame software. The screen was presented in front of the participant. Participants completed a temporal bisection task in which an arrow was displayed in the center of the screen for either the short (200ms) or long (800ms) standard duration. The subjects were instructed to respond instantly when the stimulus was shown for a short or long standard time. Each trial began with the fixator in the center of the computer screen. The experimenter pressed the spacebar when the subject was ready, and the stimulus was displayed. The participant was presented with a 'left arrow" or "right arrow" for varied duration. The participant had to judge whether the presented duration was closer to short or long, then responded with either "S" or " L" keypress, respectively. There were 20 trials in a training phase. For the illiterate population, the keywords “S" and "L" were marked with a white sticker on the keyboard to distinguish the respective keys. Then, the testing phase immediately followed the training. When the participant was ready to participate, the experimenter hit the spacebar to begin the experiment. The participant had to focus on the fixation point and was presented with a "left arrow" or "right arrow" for a varied duration where the participant had to press the corresponding key respectively, depending on whether they judged the stimulus duration was short or long. Each participant had 140 trials throughout the testing period. Similarly, the keypress “S” and “L" were marked with white stickers for the illiterate population. In this experiment section, the participants were not given feedback for each response as in the training phase. After the completion of the experiment, the participants' log file was saved. Responses were collected, and an analysis was made.

Temporal bisection task



Task Figure



CHAPTER 4

RESULTS AND DATA ANALYSIS

MS Excel was used to analyze the data and to record all the responses and the reaction time and response time through which further analysis was made. Statistical packages for the social sciences (SPSS) were used to compute the participants' data and derive the results. It is a statistics software package used for interactive or batch statistical analysis. It was acquired by IBM in 2009. SPSS is widely used for statistical analysis in social sciences, market researchers, health researchers, survey companies, and government. Many features of SPSS can be programmed with a command syntax language. It simplifies the task of handling complex data and its analyses. The proportion of “long” and “short” responses was calculated in each experimental condition. The point of subjective equality (PSE) was determined and is any of the points along the stimulus axis where an observer judges a variable stimulus (visual, tactile, auditory, and so on) to be equivalent to a standard stimulus. For the data analysis, the mean and standard deviation was computed. The mean was calculated to find the average score of the given set of values or the sample, whereas the standard deviation was calculated to find the measure of dispersion that shows the spread of scores. The greater the standard deviation, the greater the spread of scores around the mean.

Table 1: Descriptive statistics for the literate population.

	N	Mean	SD	SE	Coefficient of variation
PSE_Left	33	0.538	0.063	0.011	0.118
PSE_Right	33	0.481	0.069	0.012	0.143

(PSE- Point of subjective equality, N- Total number of participants, M- Mean, SD- Standard deviation, SE- Standard error)

It is seen from Table 1 that the mean and standard deviation of the left side came out to beµ=0.538 and ±0.063, respectively. The mean and standard deviation of the right side are µ=0.481 and 0.069. The standard error for PSE_left came out to be 0.011, and PSE_right came out to be 0.012. The coefficient of variation for both PSE_Left and PSE_Right came out to be 0.118 and 0.143, respectively.

Table 2: Paired sample T-test for the literate population

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
PSE_Left	-	PSE_Right	6.092	32	< .001	1.061	0.178

Note. Student's t-test.

(PSE- Point of subjective equality, t- t value or t score, df- degree of freedom)

For data analysis, the paired sample T-test was done to calculate the ratio of the difference between the mean of the two sample sets and the variation that exists within the sample sets.

The t value (t) was 6.092, and the degree of freedom (df) was 32. Cohen's d came out to be 1.061, and the standard error of Cohen's d was 0.178. Paired t-test indicates the significant results between PSE_Left and PSE_Right conditions that differ significantly from each other. $t=6.092$, $p<.001$,Cohen's d= 1.061

Bar plot

Figure 1: PSE_Left- PSE_Right

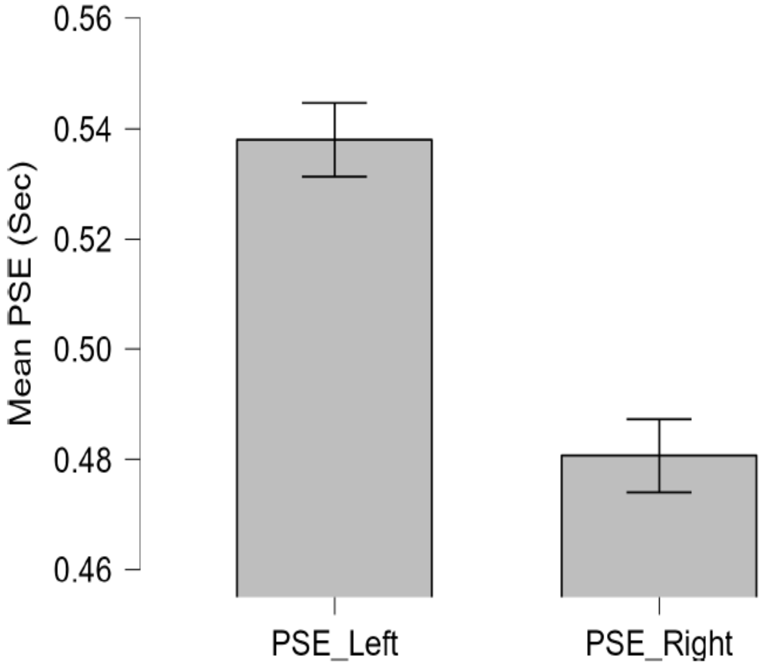


Figure 1 illustrates the comparison and effect of left and right perceived duration. The point of subjective equality (PSE) was determined and is any location along a stimulus dimension at which an observer judges a variable stimulus (visual, tactile, auditory, and so on) to be similar to a standard stimulus. To compare the difference between mean PSE Left and mean PSE Right. The mean PSE value for the left is 0.54, and the mean PSE value for the Right is 0.48. There is a difference in the perceived time duration. The analysis confirmed the significant main effects of both arrow and location on perceived duration judgment.

Now, for the data analysis, the mean and standard deviation was computed for the illiterate population. The values are given in Table 4.

Table 4: Descriptive statistics for the illiterate population

	N	Mean	SD	SE	Coefficient of variation
PSE_Left	31	0.381	0.078	0.014	0.205
PSE_Right	31	0.357	0.068	0.012	0.191

(PSE- Point of subjective equality, N- Total number of participants, M- Mean, SD- Standard deviation, SE- Standard error)

The mean was calculated to find the average score of the given set of values or the sample, whereas the standard deviation was calculated to find the measure of dispersion that shows the spread of scores. The greater the standard deviation, the greater the spread of scores around the mean. It is seen from Table 1 that the mean and standard deviation of the left side is μ=0.381 and 0.078, respectively. The mean and standard deviation of the right side are μ=0.357 and 0.068, respectively. The standard error for PSE_left came out to be 0.014, and PSE_right came out to be 0.012. The coefficient of variation for both PSE_Left and PSE_Right came out to be 0.205 and 0.191, respectively.

Table 5: Paired sample T-test for the illiterate population

Measure 1		Measure 2	Test	Statistic	z	df	p	Effect Size	SE Effect Size
PSE_Left	-	PSE_Right	Student	4.699		30	< .001	0.844	0.078
			Wilcoxon	439.000	3.743		< .001	0.770	0.203

Note. For the Student t-test, effect size is given by Cohen's *d*. For the Wilcoxon test, effect size is given by the matched rank biserial correlation.

(PSE- Point of subjective equality, t- t value or t score, df- degree of freedom)

In the above table, PSE_Left and PSE_Right are used, respectively, the student t-test and the Wilcoxon test. The degree of freedom (df) came out to be 30. The p-value for the student t-test is <.001, whereas for the Wilcoxon test, the p-value is <.001. Cohen's d came out to be 1.061, and the standard error of Cohen's d was 0.178. The effect size for the student t-test came out to be 0.844, and the SE effect size came out to be 0.078, whereas in the Wilcoxon test, the effect size came out to be 0.770, and the SE effect size came out to be 0.203. The PSE_Left and PSE_Right were computed using Wilcoxon test. The result came out to be significant: t(30)=3.743, p<.001

Bar Plot

Figure 1 illustrates the comparison of PSE left and right that shows the effect of Right and left, i.e., short and long perceived duration.

PSE_Left- PSE_Right for the illiterate population

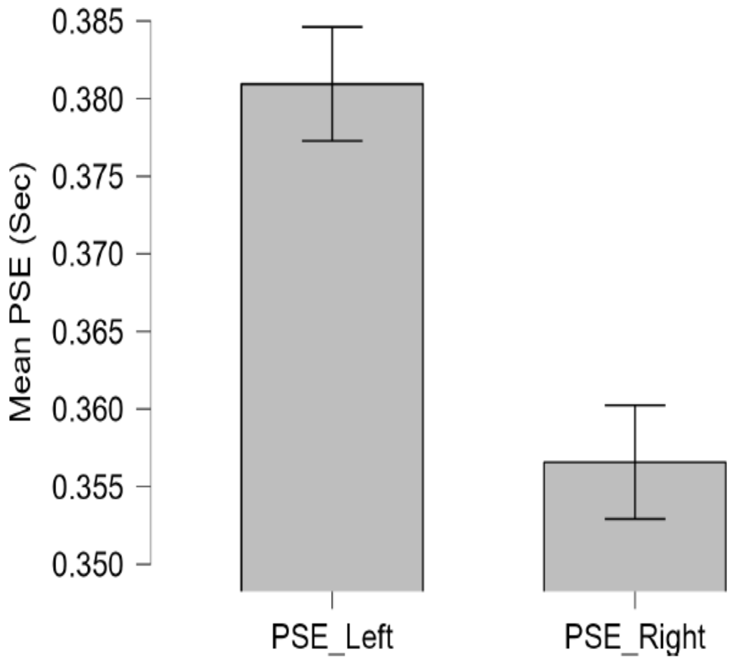


Fig 1: To compare the difference between mean PSE Left and mean PSE Right. The mean PSE value for the left is 0.380, and the mean PSE value for the Right is 0.355. There is a difference in perceived time duration. The analysis confirmed the significant main effects of both arrow and location on perceived duration judgment. The influence of spatial position on perceived time and temporal sensitivity, using arrow direction and stimulus placement as within-subject and between-subject parameters.

CHAPTER 5

DISCUSSION

The study aims to determine the impact of left versus right-lateralized stimuli on perceived length in literate and illiterate populations. There were 64 participants, both males and females participated in the study. Out of which, 33 were literate, and 31 were illiterate. The age range was 18-40 years. For the same, an experiment was conducted. The hypotheses were formed, i.e., no arrow direction (left versus Right) lateralized stimuli influence perceived duration. Either arrow direction or stimulus location would not modulate duration judgments in illiterates and would imply that it was not due to a lack of a mental timeframe. There were no noticeable effects of arrow or location on temporal sensitivity. However, the pattern of stimulus location significantly modified perceived duration in both populations. It was hypothesized that right-sided stimuli would be overestimated compared to left-sided stimuli. A potential explanation for this unexpected discovery is that the spatial position indicated by the arrows and the location of the stimulus interacted with one another. Although the estimated duration of attended stimuli is longer than that of unattended stimuli (Brown,2008), focused attention may have caused individuals to overestimate the duration of the stimuli. Data, on the other hand, confirms (Volet & Coull, 2015) that the direction of the arrow had a substantial impact on perceived duration, with rightward-facing stimuli being assessed longer than leftward stimuli. Nonetheless, the impact sizes were minor and should be regarded with caution. Also, the study by Larocci et al., (2009) showed that in 5-year-olds, the combination of arrows and lateralized locations lowered performance on a spatial signal's methodology. The ability to employ predictive arrows to recognize a lateralized target swiftly was lost when the presentation of an uninformative but salient peripheral stimulus immediately preceded the arrow cue. We could only investigate the effect of stimulus placement on perceived duration in this age group if 5-year-olds correctly performed our duration estimate test correctly. Adults might have demonstrated even more potent effects of stimulus position if their responses had been presented vocally when no response interference was allowed.

On the other hand, the trend for effect to be more significant in children than adults could be due to non-temporal contextual variables such as sensory modality (Volet & Hallez, 2018), stimulus amount (Volet et al., 2008), visual relevance (Charras et al., 2017), or, in this case, stimulus location. The significant variation in perceived time between left and right-lateralized stimuli shows that the discrepancy should be understood as underestimating left-sided stimuli while overestimating right-sided ones. Vicario et al., (2009) discovered a similar tendency in a cross-modal timing investigation of adults. In their study, auditory distractors presented to the left ear were evaluated to either the Right or both the ears were shown to have a shorter duration. However, distractors were shown to the right ear and had the same temporal effect as bilateral distractors. Most studies on the mental timeline directly compare left and right lateralized stimuli, making it impossible to distinguish whether the effects are due to an overestimation of right-sided stimuli and an underestimation of left-sided stimuli. It is uncertain why left-sided stimuli influence duration processing more than right-sided stimuli. However, our findings imply that future investigations of the mental timeline should ideally include a spatially neutral condition to investigate if this tendency holds. According to one theory, right hemisphere specialization for spatial attention (Corbetta & Shulman, 2002), preferentially weights processing of stimuli presented in the right hemisphere. of an effect than those of right-lateralized stimuli.

This developmental distinction added to the evidence that the mental timeline is a culturally acquired representation of time (Bonato et al., 2012; Nez & Cooperrider, 2013; Winter et al., 2015; Magnani & Musetti, 2017). However, we have discovered evidence that illiterates may understand duration along a left-right axis because the words on the left are read first. A mental association is built between the order of occurrences in time and relative spatial position by displaying spatial location physically (left/right side of the screen) rather than symbolically (left/right arrow). Thus, cultural standards influence how we conceptualize temporal order: events that happen first are shown on the left, whereas events that happen later are shown on the Right (Fuhrman & Boroditsky, 2010; Hendricks & Boroditsky, 2015). Our findings and other previous findings (e.g., Vallesi et al., 2008; Vicario et al., 2008) demonstrate that these cultural standards influence our perception of duration: On the left, short-duration events are displayed. In comparison, longer-duration events are represented on the Right. The process that would provide a relationship between duration and spatial position is less apparent than the one that would produce an association between temporal order and spatial position. However, one obvious hypothesis is that time passes as we read right to the left. As a result, when we go from left to Right on the page, our reading duration increases, establishing a relationship between duration and location. Of course, the connection would have to be restored each time we began another line, making it less robust as well as understanding why there is less evidence from experiments for a mental timeline for duration than for a mental timeline for chronological order (Bonato et al., 2012). Thus, the hypothesis is accepted as it shows no such difference, and the results are similar for both populations. These results suggest that there are no significant differences between literate and illiterate individuals in the development of the mental timeline. The left side is underestimated, whereas the right side is overestimated, which represents the mental timeline too can be processed by illiterates because while doing the task, the illiterates may do it from left to Right. The illiterates may also have associated the mental timeline representation during the experiment.

CHAPTER 6

CONCLUSION, IMPLICATIONS, LIMITATIONS, SCOPE FOR FUTURE RESEARCH

Conclusion

The current study aimed to determine the influence of left versus right-lateralized stimuli on perceived duration in either the population, namely literates and illiterates between the ages of 18 and 40. The hypotheses were formed. There is no influence of arrow direction (left versus Right) lateralized stimuli on perceived duration. It was also hypothesized that right-lateralized stimuli would be overestimated in comparison to left-lateralized stimuli. There was no such difference, and the results were similar for both populations. The left side was underestimated, whereas the right side was overestimated, which represents the mental timeline too can be processed by illiterates because while doing the task, the illiterates may do it from left to Right. The illiterates may also have associated the mental timeline representation during the experiment.

Implications

Studies on time perception and perceived duration judgment are essential in studying cognitive and mental timeline aspects. The current study intends to investigate the influence of left versus right-lateralized stimuli on perceived duration in literate or illiterate populations. Thus, this area of research is new and has implications for researchers and clinicians. Cognitive experts can also use it to design new experiments considering the population difference.

Limitations

There were many limitations of this study. The sample size needed to be bigger, making it challenging to generalize results. The ratio of males and females was also significantly less, because of which gender differences could not be taken into account. Targeting other female and male adult populations should be made to generate a more solid relationship among the examined constructs. The outcome of an experiment may yield an inaccurate reflection of what would be seen in the real world.

Scope for future research

This study has great scope for future research. Increasing the sample size and working on a population with somewhat primary education but not formal. Also, keeping an equal ratio of males and females can yield better results. Neuropsychological assessments could be applied to assess attentional function, and future research should look into how underlying cognitive capacity influences the effect of spatial setting on perceived duration. It must clarify the diverse and overlapping contributions of spatial and sensorimotor experience to the notion of time for future research.

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