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Eco-Cultural Influences on Time Estimation

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ABSTRACT This paper is an attempt to study the eco-cultural influences on time estimation, with special reference to the domestication of livestock. Five groups of tribes and non-tribes were selected for the study. One group of tribes had domestic livestock while the other group did not. Non tribes consisted of urban literates, urban illiterates and rural illiterates. Time estimation by reproduction method was employed as a tool. The study found that if the stimulus presented represents the familiar environment, it facilitates one to be accurate in time estimation under short duration. On the other hand, if the stimulus presented represents the unfamiliar environment, the estimated time can be either under estimation or over estimation of the given interval under long duration.

INTRODUCTION

Time estimation is an important activity of human beings. Day to day activities require people to estimate time. All human beings estimate time irrespective of their backgrounds. Man does it unconciously and implicitly. But the question is whether all human beings estimate time alike. What influences time estimation? Are there cultural differences in estimating time? Are there environmental differences? Is it the level of education that helps time estimation? It is important to understand this for the implications it has on many aspects of cognition.

Perception of time is composed of units, which we call duration. Time estimation can be measured using durations. Duration is the interval between two successive events that may be distinguished as, filled or unfilled intervals. An unfilled interval is bounded by two perceptually discrete stimuli; duration is full when there is a continuous stimulation being delimited by an onset and cessation. The methods employed in time estimation are, method of production, method of verbal estimation and method of reproduction. Rai (1978) found that the reproduction method was most accurate for time estimation, while the verbal estimation method was the least accurate.

Many theorists propose that when a person is aware that a duration judgment must be made (prospective paradigm), the experienced duration depends on attention to temporal information, which competes with attention to non-temporal information. Therefore models of experienced duration usually emphasize attention (Block and Zakay 1996; Block et al. 1998; Brown 1997; Brown and Stubbs 1992; Macar et al. 1994; Zakay 1992, 1993, 1998; Zakay and Block 1996, 1997, 2004; Zakay et al. 1999). It is found that experienced duration decreases as the difficulty of the non temporal information processing task increases (Block 1992; Kahneman, 1973; Zakay and Fallach 1984). Culture plays an important role in time estimation. Direction of attention is derived from the influence of one's culture.

The effect of culture, socio-economic status and schooling on time estimation, has been found in some studies. Nelson and others (1999) indicate that initial differences in ability to make time estimation, dissipate. Zhou and others (2004) examined the effects of socio-economic status and indicated that low socio economic status can impede the development of childrens understanding of distance and time interrelationships, while at the same time high socio economic status does not guarantee better performance. Hill and others (2000) investigated the extent to which racial factors, cultural factors, or both, influence a person's beliefs about physical time, personal time, and experienced and remembered duration. Beliefs about duration experiences may represent an ethnic factor that transcends cultures (Zhou et al. 2004). The influence of culture and schooling has been observed in children who were growing up in isolated, agricultural villages in the Volta region of West Africa. In those communities, life was still a

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traditional one and children's experiences with time, money and mathematical computation were considerably different from those children who were attending school in the nearby towns (Fiati 1991). Among many primitive tribes, time is measured in terms of social events or tasks rather than units of duration (Ruch 1970). For example, Trobriand Islanders near New Guinea have neither past nor future tenses in their verbs. All events real and mythical are regarded as taking place in a sort of universal present (Lee 1949). Culture thus determines the attention of the people and plays an important role in time estimation ability.

An effort is made in the present study to investigate the influence of eco culture with special reference to domestication of livestock. The variable domestication of livestock has not been found in psychological research and studies. Domestication of animals and plants influenced farming and sedentary lifestyles in the past (Dyson Jr. 1968). The evolution of societies were influenced very much by the advent of livestock domestication. Domestication of livestock has been taken in the present study as a representation to the changing life styles of some of the tribal groups that are involved in the present study. Most of the tribes that are selected in the present investigation are in a process of acculturation. Acculturation is a process of culture change as a result of the influence of other cultures.

Two groups of tribes were drawn into the study. One group of tribes did not have domestic livestock while the other group had acquired domestic livestock only recently. Though, both groups geographically live at different places yet, these groups lived together in Nagarahole forest in the past for many generations. As a result of governmental programs, some groups were relocated to the periphery of the forest area. These groups have domestic livestock for their livelihood, though they do not exclusively depend on it for their livelihood, as they also work as agriculture laborers in the surrounding lands of rural people. Tribes need to interact with the people of nearby villages and therefore would also be influenced by this interaction. Hence, it was expected that the time estimation of tribes with domestic livestock would be similar to that of rural people as a result of recent acculturation.

H1: The tribe with domestic livestock would be more accurate than the tribe without domestic livestock in time estimation.

Non tribes were also included in the study. Non tribes consisted of urban and rural groups. Urban groups consisted of literates and illiterates. Cross cultural studies have quite often reported education (schooling) and urbanization as important factors in determining the level of performance on cognitive tasks. Urban people give importance to time, and people generally talk of wasting time, or using time effectively. Therefore, it was also expected that the urban group would be more accurate in time estimation.

H2: The tribe with domestic livestock would be less accurate in time estimation compared to the urban group and similar to the rural sample.

METHODOLOGY

Participants: The participants consisted of five groups of tribes and non tribes. Non-tribes consisted of rural, urban and urban literates. There were 70 participants of both sexes in each group. participants in the study were as follows; tribes with domestic livestock, tribes without domestic livestock, rural illiterates and urban illiterates, urban literates. Method of purposive sampling was used.

A variety of groups were selected based on the eco-cultural model of Berry (1987) for the study. Tribes with domestic livestock were selected from Hunsur, Karntaka State, India. The participants were drawn from the following settlements namely, Ayyana Kere haadi, Bharathavadi haadi, Dasanapura haadi, Kappana Katte haadi, Kolavige haadi, Neralekoppa B. haadi and Thuppada Kola haadi. Tribes without domestic livestock were selected from Nagarahole forest (Rajiv Gandhi National Park), Karnataka, India. The participants were drawn from the following settlements namely, Anemala haadi, Bawali haadi (Konegadde), Chemana Kolli haadi, Goluru haadi, and Maanimoole haadi.

Rural illiterates were selected from the following villages of Karnataka for the study; Basthi halli, Jatti hundi, Hadinaru, Moolepetlu, Nagana halli, and Pampina hosa halli. Urban illiterates were selected from Bangalore city, Karnataka, who have been in the city environments since birth. Urban literates were drawn from Mysore city, Karnataka. People who had their education from primary school to post-graduation were selected as subjects.

Tools

Time Estimation by Reproduction Method: To estimate this, the experiment involved subjecting the participant to listening to a series of continuous sounds made by using a hard object against another hard surface.

The experiment was conducted in two series; filled and unfilled series. There are two durations under each series, namely, short and long. 20 seconds duration was considered as short and 60 seconds was considered as long. In the filled series, the duration is filled with tapping sounds and in unfilled series; there are only 2 such tapping sounds to indicate the beginning and the end of the duration.

PROCEDURE

Filled Series: The experimentor instructs the subject to be attentive. The experimentor fills the duration with taps and asks the subject to reproduce the same.

Unfilled Series: The experimentor taps at the beginning of the duration and presents another tap at the end. The subject is instructed to reproduce a similar duration.

Filled series		*Unfilled series*	
Short	*Long*	*Short*	*Long*
20 seconds	60 seconds	20 seconds	60 seconds

RESULTS

Table 1 presents mean and standard deviation values for the time estimation for filled series by various groups. Table 2 shows results of multivariate analysis for the variable time estimation for filled and unfilled series short and long intervals. Results (F=6.65; df= 4) revealed that the groups differed significantly ($p < 0.01$) for filled series short interval. The analysis also revealed that neither there was a difference between the sexes, nor sex ´ group interaction was significant. The results (F = 0.51; df= 4) for filled series long interval revealed that the groups did not differ significantly. The analysis also revealed that the time estimation under filled long interval was significantly lower ($p < .02$) in females (M = 53.31; SD = 13.93) than males (M = 57.37; SD = 16.34). However, it showed a non- significant group sex interaction revealed that the score pattern of sex difference was same in all groups.

Results for unfilled series short interval (F=4.84; df= 4) and for long interval (11.31; df= 4) revealed that the groups differed significantly ($p < 0.01$). The analysis also revealed that neither there was a difference between the sexes, nor sex ´ group interaction was significant.

The results of post-hoc comparisons for time estimation are presented in table 3. The mean (24.07; SD = 8.74) in filled series short interval was significantly higher than all other groups for

Table 2: Multivariate analysis for time estimation test.

Source	*Dependent variable*	*df*	*F*	*Sig.*
Group	Filled-short	4	6.65	0.01 (HS)
	Filled-long	4	0.50	0.73 (NS)
	Unfilled-short	4	4.84	0.01 (HS)
	Unfilled-long	4	11.31	0.01 (HS)
Sex	Filled-short	1	0.32	0.57 (NS)
	Filled-long	1	5.97	0.01 (HS)
	Unfilled-short	1	0.10	0.74 (NS)
	Unfilled-long	1	0.49	0.48 (NS)
Group*Sex	Filled-short	4	2.11	0.07 (NS)
	Filled-long	4	1.22	0.30 (NS)
	Unfilled-short	4	0.61	0.65 (NS)
	Unfilled-long	4	1.48	0.21 (NS)

HS- Highly significant, NS-Not significant.

Table 1: Descriptive data of five groups on the variable time estimation filled series – short and long durations.

		Filled series				*Unfilled series*			
		Mean		*SD*		*Mean*		*SD*	
Groups	*N*	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*	*Short*	*Long*
Tribes without domestic livestock	70	20.49	56.87	5.82	15.67	24.59	70.70	6.55	16.79
Tribes with domestic livestock	70	24.07	54.93	8.74	13.19	21.00	55.71	5.81	13.64
Rural illiterates	70	20.46	55.89	4.99	19.03	22.75	57.51	7.16	13.03
Urban illiterates	70	20.59	54.21	6.78	19.02	24.37	62.80	8.22	19.39
Urban literates	70	19.24	56.27	3.03	7.83	20.63	58.73	6.03	9.22
Males	200	21.13	57.37	5.83	16.34	22.56	61.58	6.86	15.54
Females	150	20.76	53.31	6.99	13.93	22.80	60.45	7.13	15.89

Table 3: Multiple comparisons and post hoc tests results for the variable time estimation.

(I) Group	*(J) Group*	*Filled-short*	*Filled-long*	*Unfilled-short*	*Unfilled-long*
Tribes with domestic livestock	Tribes without domestic livestock	0.01*	NS	0.02*	0.01*
	Rural illiterates	NS	NS	NS	0.01*
	Urban illiterates	NS	NS	NS	0.01*
	Urban literates	NS	NS	0.01*	0.01*
Tribes without domestic livestock	Rural illiterates	0.01*	NS	NS	NS
	Urban illiterates	0.01*	NS	0.03*	0.04*
	Urban literates	0.01*	NS	NS	NS
Rural illiterates	Urban illiterates	NS	NS	NS	NS
	Urban literates	NS	NS	NS	NS
Urban illiterates	Urban literates	NS	NS	0.01*	NS

NS – Non Significant
*The mean difference is significant at the .05 levels.

the tribes without domestic livestock, indicating that this group had estimated significantly more time than given in comparison to all other groups.

The mean (24.59; SD = 6.55) under short interval of unfilled series for the group tribes with domestic livestock was significantly higher than tribes without domestic livestock (M = 21.00; SD = 5.81) and urban literates (M = 20.63; SD = 6.03), indicating that this group had estimated significantly more time in comparison to these two groups. Tribes without domestic livestock differed significantly from urban illiterates (M = 24.37; SD = 8.22), indicating that the urban illiterates had reported more time than tribes without domestic livestock. Urban illiterates with a higher mean (24.37) differed significantly from urban literates (M = 20.63) indicating that the urban illiterates experienced more time than urban literates.

The mean (70.70; SD = 16.79) under long interval of unfilled series for tribes with domestic livestock was significantly higher than all other groups, indicating that this group had experienced and reported significantly more time than all others ($p < 0.05$). Tribes without domestic livestock (M = 55.71; SD = 13.64) differed significantly from urban illiterates (M = 62.80; SD = 19.39), indicating that the urban illiterates had experienced more time in comparison with tribes without domestic livestock.

DISCUSSION

The main findings of the present study are

1. Tribes with domestic livestock and those without showed that they differ significantly.
2. It was observed that there was no significant difference between tribes with domestic livestock and the rural sample.
3. The impact of education was observed in the present study.

Hypothesis 1 expected that the tribe with domestic livestock would be more accurate than tribe without domestic livestock in time estimation. Comparisons between tribes with domestic livestock and those without showed that they differ significantly.

The results indicated that the subjects from tribes without domestic livestock over estimated the short interval in filled series and underestimated the long interval under unfilled series. On the other hand, subjects from tribes with domestic livestock and urban illiterates overestimated both short and long intervals under unfilled series.

Tribes without domestic livestock had over estimated the short interval under filled series. It could be because tribes without domestic livestock live in forests where they hear a monotonous constant sound of insects. The filled series could have been strange and new for this group. This group, perhaps were attentive to the stimulus throughout, as it was of short duration. Stimulus that is unfamiliar to a person's environment makes a person alert and attentive. If a person focuses on temporal information processing, more time signals are processed (Zakay and Block 2004). Culture could determine the focus of attention.

Further, this study showed that the tribes without domestic livestock had estimated the given duration accurately under unfilled series, short interval. This could be due to the familiar environment that the stimulus represents. It indicates that the empty interval allowed them to experience their natural environment throughout as it was of the short duration. As it was of short

duration, perhaps it was easier to pay attention throughout the given interval.

Hypothesis 2 expected that the time estimation for tribes with domestic livestock would be less accurate compared to the urban, and similar to the rural sample. It was observed that there was no significant difference between tribes with domestic livestock and the rural sample. It can be assumed that time estimation changes easily as a result of the influence of other cultures. Time perception may also be influenced by the domestication of livestock. As they need to interact with the people of nearby villages, they need to know the time of the day. Time estimation of tribes with domestic livestock could be similar to that of rural people, as a result of imitation, since they live in contact with the villagers. This leads to the assumption that time estimation may be influenced by acculturation.

In the present study, the tribes with domestic livestock and urban illiterate groups, over estimated the short interval under unfilled series. This indicates that stimulus that is unfamiliar to a person's environment makes a person alert and attentive. Hence, it allows a person to be attentive and experience the given time throughout. More time signals are processesed when more attention is focused on a given stimulus (Zakay and Block 2004).

A similar trend has been observed for tribes with domestic livestock, rural illiterates, urban illiterates, and urban literates for short series under filled series. Filled series represent the familiar environment for these groups. It means that these groups live in environments where the noise level is high. It can be assumed that if the given stimulus represents the environment we live in, the estimated time would be approximately accurate for short intervals.

Tribes without domestic livestock under estimated the given duration under long interval unfilled series. It could be due to the similarity between the stimulus presented and the environment in which they live. It shows that the empty interval represents their familiar and natural environment. In such a situation, attention is divided and tends to fluctuate involuntarily (Ruch 1970). When a concurrent non-temporal task is more demanding, a person has fewer attentional resources available, to allocate to temporal information processing, and fewer time signals accumulate in the cognitive counter (Zakay and Block 2004).

Tribes with domestic livestock and urban illiterates, over estimated long duration under unfilled series. It could be due to the curiosity and attention given to the stimulus presented as it represented unfamiliar environment. Both these groups may have been attentive to the given stimulus, throughout. Higher the attention, greater the signals processed (Zakay and Block 2004; Warden 2004).

The impact of education was observed in the present study. Urban literates were accurate in the two series compared to others, though not statistically significant. Urban literates were significantly different from urban illiterates under short intervals unfilled series. It indicates that education also facilitates accuracy in time estimation. The results of the test conducted showed that though participants from the urban illiterate group were attentive, when it came to reproducing the stimulus, they fell short.

Though there was no significant difference in long intervals under filled series, groups in the study underestimated the interval. Epsionosa and others (2003) found greater underestimation under long intervals. The present study also showed that there was no significant difference among the groups. Tysk (1983) found that there was no significant difference in long intervals. In addition, the study showed that women significantly underestimated the long intervals under filled series. Sex differences in magnitude and variability of duration judgments have been observed to be small but statistically significant (Block et al. 2000).

In the light of the above findings, it can be stated that not all the hypotheses formulated were proved. But a clear pattern emerged that if the stimulus presented represents the familiar environment, it facilitates one to be accurate in time estimation under short duration. On the other hand, if the stimulus presented represents the unfamiliar environment, the estimated time can be either under estimation or over estimation of the given interval under long duration. The study undertaken implies that eco-cultural differences are bound to be there, though acculturation also leads to change.

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