HOW SYMBOLIC MEANING INFLUENCES TIME PERCEPTION

Mioni, G.*, Zakay, D.° and Stablum, F.*
*Department of General Psychology, University of Padova, Italy
° Department of Psychology, Tel Aviv University, Israel

Abstract

The present study investigated how symbolic meaning affected time perception in school age children. Four groups took part at the study: Group 1 (n=16; mean age 4.88 yrs); Group 2 (n=13; mean age 6.38 yrs); Group 3 (n=16; mean age 7.31 yrs) and Group 4 (n=16; mean age=8.31 yrs). Participants were engaged in a time reproduction task. Stimuli employed could be static or moving vehicles (car and truck). The moving vehicles moved from one side to the other of the computer screen in 11 or 21 sec. Static stimuli were presented at the centre of the screen for the same durations as the moving stimuli. Significant differences between groups were found. Younger participants under-reproduced the duration more than did older participants. Effect of stimulus duration, vehicle and movement were also found. Particularly interesting is the interaction between vehicle and duration. When the movie lasted 21 sec, the car, that recalled the idea of fastness, was significantly under-reproduced compared with the truck, which recalled the idea of slowness. Younger children were more affected by the movement. The results suggested a meaning effect in temporal perception of school age children and that this effect was sensitive to age.

One important dimension that controls our lives and a large part of our behaviour is time. For example, crossing a busy street safely requires estimation of speed and time, or time to contact (Block, Zakay, & Hancock, 1999). Most of the studies conducted on time perception are laboratory research; however, most of our activities are conducted in uncontrolled environment. The importance to investigate different variables that could influence our temporal experience has theoretical and practical implications.

A second important question is to discover the moment at which human beings develop the ability to perceive time (Piaget, 1979). Piaget (1979) theorised that temporal cognition is gradually acquired during several developmental stages and child's temporal perception differing from adult's temporal perception until the child completes all the developmental stages. Some authors showed that the ages between 6 and 8 years old may be considered to constitute an important transition period (Pouthas, Droit-Volet, Jacquet, & Wearden, 1990). The manifestation of temporal ability in young children seems to depend on characteristics of context and of the task to be performed (Espinosa-Fernández, de la Torre Vaces, García-Viedma, García-Gutiérrez, & Torre Colomenero, 2004).

Different methods could be employed to test time perception (e.g. time estimation, time production or time discrimination). In this study we used the time reproduction task. In the time reproduction methods, participants experience target duration and are subsequently required to reproduce that duration (Block et al., 1999). This methods does not require the knowledge or use of conventional units and therefore may detect developmental differences between groups when involve different duration.

To summarise this study investigate temporal abilities in children from 4 to 8 years old and how the perception of movement affects time perception. In particular we would like to investigate how children experience time and how the environment acts on children subjective experience of time. Stimuli with different symbolic meaning will be employed (fastness or slowness). Which is the symbolic meaning that we assigned to the imagines and how this symbolic meaning may influence children temporal perception? How children perceive movement and how watching vehicle moving affect children time perception? These are the

questions addressed in this study. We predict that younger participants will be less accurate than older participants; moreover we predict an effect of duration in the way that longer duration would be under-reproduced more than briefer one. In this study we employed two stimuli that recall the meaning of fastness (car) and slowness (truck) to investigate the effect of symbolic meaning on time perception. We predict that observing a stimulus that recall the meaning of speed affect participant's performance in the way that stimuli that recall the meaning of fastness will be under-reproduced and stimuli that recall the meaning of slowness will be over-reproduced.

Data collected in this study will be discussed according to the Attentional-gate model. According to the Attentional-gate model duration judgments are strictly related to the amount of attention a person allocates to temporal information but also to the arousal level which influences the rate of the pacemaker (Zakay & Block, 1996; Block et al., 1999). The meaning of the stimulus presented could acts on different stages of the temporal process and different predictions could be made if the effect of meaning acts on the pacemaker or on the attentional gate. If the meaning of the stimulus act on the pacemaker, when a stimulus that recall the meaning of slowness is presented, speed rate should decrease; while, when a stimulus that recall the meaning of fastness is presented the speed rate should increase. If this is the case the stimulus "car" (fastness) should be over-reproduced compared to the stimulus "truck" (slowness). However, if the meaning of the stimulus presented acts on the attentional gate, when a stimulus that recall the meaning of slowness is presented, the duration is perceived longer; while, when a stimulus that recall the meaning of fastness is presented the duration is perceived briefer. If this is the case, the stimulus "car" should be under-reproduced compare to the stimulus "truck".

Methods

Four groups of school age children took part in the study. Group 1 (n=16; F=5; mean age 4.88; SD=.80); Group 2 (n=13; F=6; mean age 6.38 yrs, SD=.50) Group 3 (n=16; F=10; mean age 7.31 yrs; SD=.47) and Group 4 (n=16; F=4; mean age=8.31 yrs; SD=.47). Participants were tested in a quiet room in their own school (Padova, Italy) and engaged in a time reproduction task. Four videos with moving stimuli and four videos with static stimuli were presented. The videos showed a car or a truck moving from the upper right corner to the lower left corner for 11 or 21 sec of the computer screen (Figure 1). In the static condition the same stimuli (car and truck) were presented at the centre of the screen and were displayed for 11 or 21 sec as in the moving condition. At the end of each video participant were instructed to keep press the space-bar as long as the duration of the video presented. A practice phase was included before the tasks, no feedback was provided.

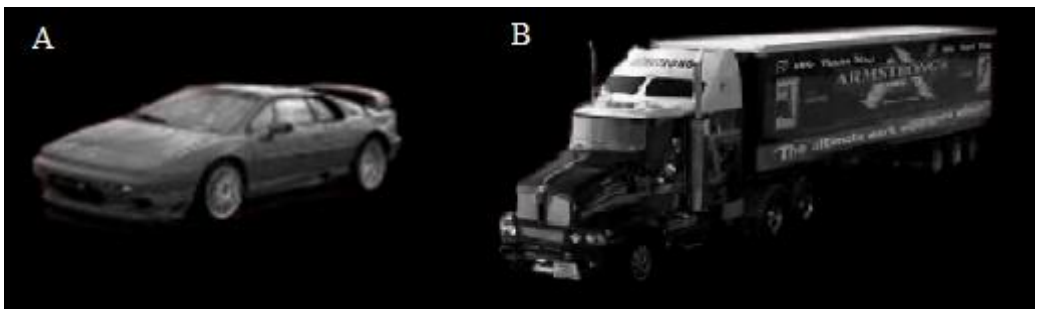

Figure 1. Moving and static stimuli. (A) Car; (B) Truck.

Time reproduction data were analysed in terms of relative errors. *Relative error* was obtained by dividing each participant's time reproduction by the time duration of the sample interval presented for that trial. This measure provides a standard score across the different time intervals, with coefficients above 1.0 reflecting overproductions, and coefficients below 1.0 reflecting underproductions.

Results

Relative errors were analysed using a four-factor design analysis of variance (ANOVA): 4 Group (Group 1, Group 2, Group 3 and Group 4) × 2 vehicle (car vs. truck) × 2 movement (static vs. moving) × 2 durations (11 vs. 21 sec). Significant effects of group [$F(1,57)=16.77$, $p<.001$], vehicle [$F(1,57)=3.84$, $p<.05$], movement [$F(1,57)=5.22$, $p<.05$] and duration [$F(1,57)=44.19$, $p<.001$] were found. Younger participants under-reproduced the duration of the stimuli more than older participants (.09, .40, .55 and .66, respectively) and the under-reproduction increased as the stimulus duration increased (.50 vs. .35). Significant effects of vehicle [$F(1,57)=3.84$, $p=.05$] and movement [$F(1,42)=5.22$, $p=.05$] were also found. Both vehicle where under-reproduced but the car was under-reproduced more than the truck (.41 vs. .44), moreover moving stimuli where under-reproduced more than the static one (.40 vs. .45). Significant interactions duration × vehicle [$F(1,42)=42.212$, $p<.001$] (Figure 1) and group × duration × vehicle [$F(1,42)=42.212$, $p<.001$] were found (Figure 2). No other significant interactions were found.

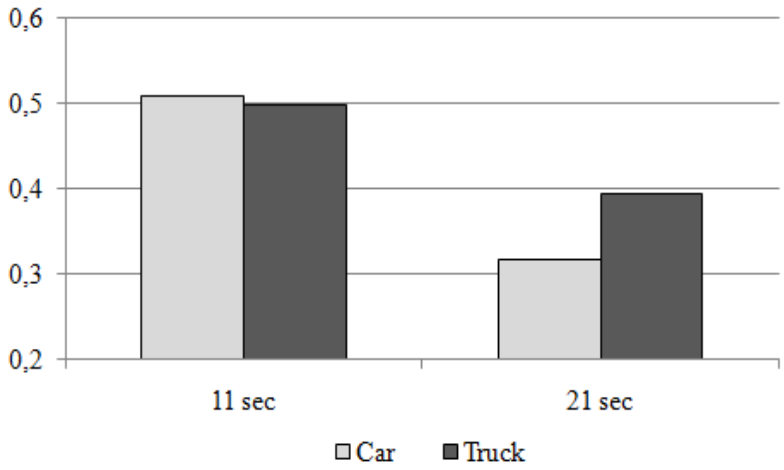

Figure 1. Time reproduction task. Interaction duration × vehicle.

Significant difference was found between vehicles when presented for 21 sec. Both stimuli were under-reproduced but the car was under-reproduced more than the truck. No significant difference was found were the stimuli were presented for 11 sec. Moreover significant differences were found between duration in the way that longer stimuli were under-reproduced more than briefer stimuli.

Moreover, significant differences were found within Group 2, 3 and 4 between all duration, only Group 1 equally under-reproduced 11 and 21 sec stimuli (Figure 2). Reproducing longer stimuli determined higher under-reproduction. Significant effect of vehicle was found when participants were tested with 21 s stimuli.

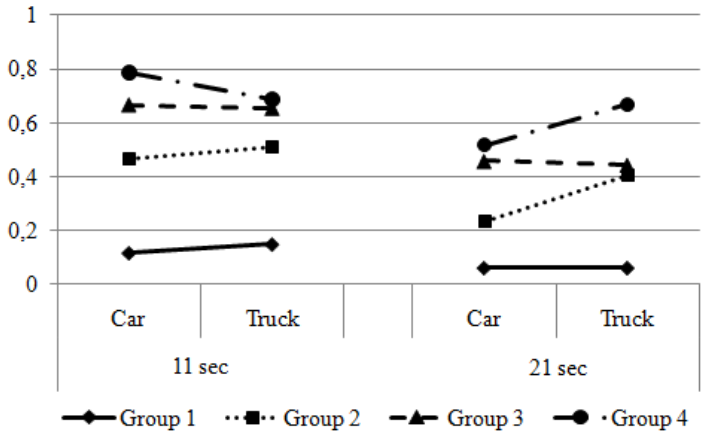

Figure 2. Time reproduction task. Interaction group × duration × vehicle.

Conclusion

This study investigates temporal perception in school age children and the effect of symbolic meaning and movement on temporal perception. A time reproduction task was employed and we analysed relative errors as indicator of under- or over-reproduction. Older participants better reproduced all duration demonstrating that time perception improved with age. The higher under-reproduction presents in younger children could be analysed according to the notion that children may have limited attentional resources and this is more evident with longer duration (Block et al., 1999). Moreover, significant effect of meaning was found when participants reproduced 21 sec stimulus duration. When the car was presented (meaning of fastness), participants under-reproduced the duration more than when the stimulus presented was a truck (meaning of slowness). The results suggested that the effect of meaning acts on the attentional gate rather than on the pacemaker.

References

Block, R.A., Zakay, D., and Hancock, P.A. (1999). Developmental changes in human duration judgments: A meta-analytic review. Developmental Review, 19, 183-211.

Espinosa-Fernández, L., de la Torre Vaces, L., García-Viedma, M., García-Gutiérrez, A., and Torre Colomenero, C.J. (2004). Temporal performance in 4-8 year old children. The effect of chronological information in task execution. Acta Psychologica, 117, 295-312.

Piaget, J. (1979). The child's conception of time. [Original manuscript 1945] New York: Norton.

Pouthas, V., Droit-Volet, S., Jacquet, A.Y., & Wearden, J.H. (1990). Temporal differentiation of response duration in children of different age: Developmental changes in the relation between verbal and nonverbal behaviour. Journal of the Experimental Analysis of Behavior, 53, 21-31.

Zakay, D., & Block, R.A. (1996). The role of attention in time estimation processes. In M.A. Pastor & J. Artieda (Eds.), Time, internal clocks and movement (pp. 143-164). Amsterdam, Netherlands: North-Holland/Elsevier Science.