BATTING AND BUTTON-PRESS REACTION TIME IN PRIMARY, JUNIOR HIGH AND HIGH SCHOOL BASEBALL PLAYERS

Masahiro Shinya[1, 2], Lisa Komuro[3], Hirofumi Kobayashi[1, 2], Hiroki Obata[1, 2] and Kimitaka Nakazawa[1, 2]

Department of Life Sciences, The University of Tokyo, Tokyo, Japan[1]
CREST, Japan Science and Technology Agency, Tokyo, Japan[2]
Department of Human and Environmental Sciences, Ochanomizu University, Tokyo, Japan[3]

The focus of this study was how baseball players acquire rapid visuo-motor processing during developmental stages. We compared simple and Go/Nogo reaction times in a button-press task and a swing-a-bat task between different age groups of teenage baseball players. Though reaction time, swing time and total reaction time were shorter in the older group, baseball-specific visuo-motor skills could not be investigated by our experiment. These results indicate that the general neural foundations underlying baseball performance develop over the school years.

KEY WORDS: Go/Nogo reaction time, development

INTRODUCTION: Baseball players develop rapid visuo-motor processing through many years of intensive training. The key question is how this ability is acquired over a course of developmental stages. Visuo-motor processing time can be measured by recording the reaction time involved in a task. Kida et al. (2005) reported that the Go/Nogo reaction time paradigm is an effective way to assess baseball-specific visuo-motor processing time. Reaction time also depends on the complexity of reactive motor tasks. Therefore, one's reaction time should be longer when one swings a bat in a Go/Nogo reaction time paradigm compared to when he or she presses a button in a simple reaction time paradigm. The difference in reaction times between the simple and Go/Nogo reaction paradigms and/or that between button-press and swing-a-bat tasks could reflects baseball-specific visuo-motor skills. The purpose of this study was to test whether the aforementioned differences in reaction times would be smaller in high school players than in primary school players.

METHODS: Fifteen primary school (age: 11.0 $\pm$ 0.6 years), 23 junior high school (age: 13.6 $\pm$ 0.5 years) and 35 high school (age: 16.7 $\pm$ 0.4 years) baseball players participated in this study, all of whom were male. All of the participants provided informed consent before the experiment. Both simple and Go/Nogo reaction times were measured. Participants were instructed to react to a green LED as soon as possible for all tasks but not to a red LED for the Go/Nogo task. Two different reactions were tested: pressing a button and swinging a bat in a batter's box. An accelerometer was attached to the bat to detect the onset of the bat swing. A laser sensor was used to detect the instant when the bat passed above the home plate (hence, we define this instant as expected contact). Swing time was defined as the interval between the swing onset and expected contact. Total reaction time was defined as the sum of the reaction time and swing time. For the button-press task, 5 successful trials were averaged. For the batting task, the mean value of 10 trials was calculated. Reaction times were compared between paradigms (simple vs. Go/Nogo), between tasks (button-press vs. batting) and between age groups using a three-way repeated measures ANOVA. For batting tasks, reaction time, swing time and total reaction time were compared between paradigms and age groups using a two-way repeated measures ANOVA.

RESULTS: Reaction times were shorter in older groups. The mean simple button-press reaction time was 216 ms in primary school players and 181 ms in high school players, while

the Go/Nogo button-press reaction times were 294 ms and 241 ms, respectively. However the interaction was not statistically significant. Batting reaction times were longer than button-press reaction times in both paradigms and in all age groups. No significant interaction was observed between task (button-press vs. batting) and age group on reaction time. In addition to reaction times, swing time and total reaction time were also shorter in older age groups, but again, without any age-group-related interactions (Figure 1).

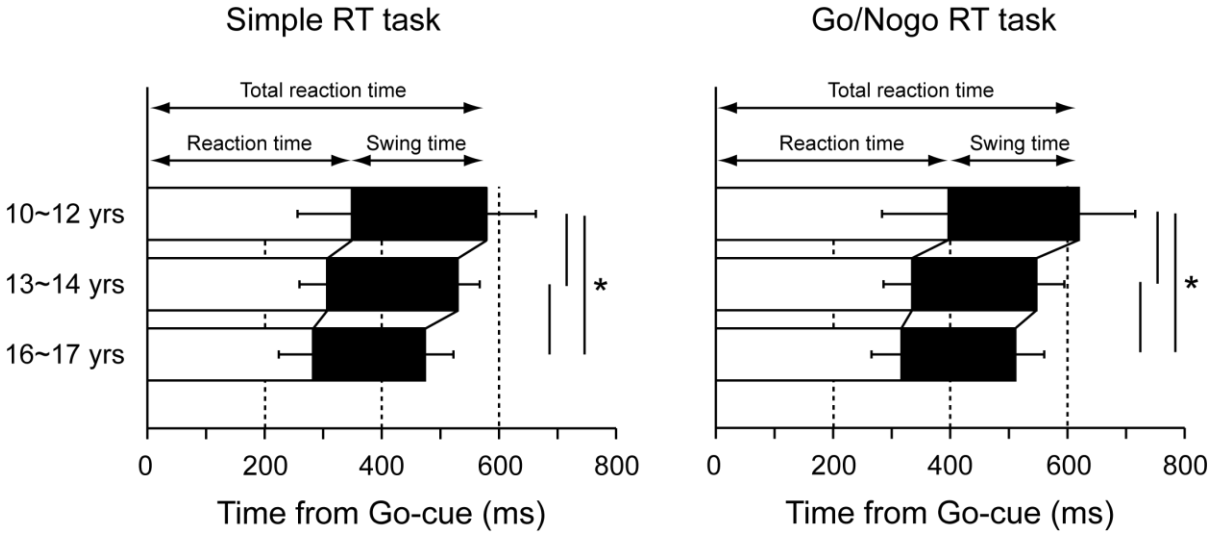

Figure 1: Batting reaction time in teenage baseball players.
White bars show reaction time and black bars show swing time. Vertical lines are for visualization. Three age groups are shown as a range of players instead of primary, junior high and high school. * p < 0.05.

DISCUSSION: Reaction time, swing time and total reaction time shortened remarkably as school age increases. This is consistent with previous findings that reaction time declines sharply during childhood and middle adolescence (Andersen et al. 1984). However, our original hypothesis was contradicted by the lack of age-group-related interactions indicating that the development of baseball-specific visuo-motor skills could not be probed by our measurements. Future studies should include control groups featuring other athletes/non-athletes should encompassing a wider range of ages/skills.

CONCLUSION: Reaction time, swing time and total reaction time shortened remarkably as school age increases. Although we could not find evidence that intensive baseball training improves visuo-motor skills, it would be worthwhile to investigate the significant changes in neural function when coaching young athletes.

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