Contents lists available at ScienceDirect

HOMO – Journal of Comparative Human Biology

Reaction time: Does it relate to weight status in children?

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ARTICLE INFO

ABSTRACT

It has been recently reported that reaction time (RT) is related to weight status [measured by body mass index (BMI)] in young, adult and older people. However, there is little evidence for children, and the similar studies included small sample of participants. The aim of this study was to evaluate the relationship between a new RT test and weight status among a sample of 7–11 year old schoolboys. Therefore, 533 apparently healthy schoolboys underwent clinical reaction time (RT_{clin}) measurements and standard anthropometry. Participants according to different obesity indices [waist circumference (WC), waist to height ratio (WHtR), BMI and fat%] were assigned to different weight status categories. Results indicated that time of RT_{clin} decreased as age of the boys increased ($F = 63$; $P < 0.01$). No significant difference was observed for RT_{clin} among the BMI, WC, WHtR and fat% categories after controlling for age ($P > 0.05$). In conclusion, it seems that there is no relationship between simple RT (measured by RT_{clin}) and weight status in the boys. Additional studies for finding relationship between RT and weight status are needed by including larger samples of participants, various age groups and various RT tests.

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Introduction

Reaction time (RT) is the time interval between the application of a stimulus and the appearance of appropriate voluntary response by a subject. It involves stimulus processing, decision making

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and response programming. There is growing evidence that RT is altered by various factors such as age (Der and Deary, 2006; Luchies et al., 2002; Rose et al., 2002), sex (Adam et al., 1999; Dane and Erzurumluoglu, 2003; Der and Deary, 2006), caffeine and some drugs (Durlach et al., 2002; Spencer et al., 2009), some illnesses (Smith et al., 2004) etc. For example, simple RT shortens from infancy into the late 20 s, then increases slowly until the 50 s and 60 s, and then lengthens faster as the person gets into his 70 s and beyond (Der and Deary, 2006; Luchies et al., 2002; Rose et al., 2002). It has been shown that males have faster RT than females, and female disadvantage is not reduced by practice (Adam et al., 1999; Dane and Erzurumluoglu, 2003; Der and Deary, 2006). Smith et al. (2004) reported that minor upper respiratory tract infections increased RT. Durlach et al. (2002) showed that caffeine reduced RT. Spencer et al. (2009) reported that if children with attention deficit hyperactivity disorder were given Methylphenidate, their times on a recognition RT task were both shorter and less variable. On the other hand, some researchers have just recently reported that RT is related to weight status [measured by body mass index (BMI)] in young, adult and older people (Deore et al., 2012; Gunstad et al., 2007; Kamijo et al., 2012a,b; Nene et al., 2011; Nikam and Gadkari, 2012; Skurvydas et al., 2009). However, there is little evidence underlying relationship of RT and weight status in children (Kamijo et al., 2012a,b). Furthermore, previous similar studies for measuring weight status used just BMI (Deore et al., 2012; Gunstad et al., 2007; Kamijo et al., 2012a,b; Nene et al., 2011; Nikam and Gadkari, 2012; Skurvydas et al., 2009). In addition, they used small sample of participants in their studies (Deore et al., 2012; Kamijo et al., 2012a,b; Nene et al., 2011; Nikam and Gadkari, 2012; Skurvydas et al., 2009). Therefore, the present study aimed to evaluate the relationship between simple RT and various obesity indices among a sample of 7–11 year old children.

Methods

Data

In 2012–2013, this cross-sectional study's data were drawn from a sample of 533 schoolboys of three schools, in the capital Ardabil of Ardabil Province, North West of the Iran. Ardabil is located about 70 km from the Caspian Sea, cold and semi-arid, with an area of 18,011 km^2, and 564,365 inhabitants (Ardabil – Wikipedia, the free encyclopedia, 2013). From a list of boys' urban public schools, three were selected randomly. The nature and purpose of the study were explained to all schoolboys (n = 1058) before invitation for participating in the study. Inclusion criteria for participation in this study were as follows: being 7–11 years old, being apparently healthy and without significant diseases or musculoskeletal injury. Exclusion criteria were as follows: known presence of chronic disease (Smith et al., 2004), and use caffeine containing drinks (such as tea, etc.) and any medication before the RT test (Durlach et al., 2002; Spencer et al., 2009). Children who were invited and passed the inclusion and exclusion criteria of the study and gave their consent verbally (n = 751) were given written consent forms for their parents approval. Total of 578 signed consent forms were collected and the owners were recruited into the study. However, at the end of the study, complete data were collected from 533 participants (dropped data because of absence, illness, withdrawal from the study for some personal reasons, etc.). Age of the participants was determined from their date of birth in their school register. Measuring of the RT and anthropometric variables were done in the empty room. The measurements took place when a participant was at rest. For this purpose, at the time of physical education lessons, some of the students were selected and underwent the measurements. All measurements were taken during the spring of the year 2012. General characteristics of the participants are shown in Table 1. The present study was approved by the Human Ethics Committee of the Ardabil Department of Education, and the experiment was performed in accordance with the ethical standards of the committee and with the Helsinki Declaration.

Anthropometric variables

Weight was measured in underwear and without shoes with an electronic scale (Type SECA 861) to the nearest 0.1 kg, and height was measured barefoot in the Frankfurt horizontal plane with a telescopic height measuring instrument (Type SECA 225) to the nearest 1 mm. BMI was calculated as body weight