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Brief Report

Effect of intermittent sitting time on acute postprandial lipemia in children

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ABSTRACT

Objective: To investigate the effect of interrupting sitting time with intermittent moderate exercise on acute postprandial plasma triglyceride (TG) in healthy children following high-fat meal consumption.
Methods: Twelve participants (8 girls; 4 boys), aged 12 ± 2 years (mean ± SD), completed two trials in the laboratory. On Day 1 (d1), sitting was interrupted with moderate intensity exercise every 30 min, and compared with day 2, (d2), where participants remained sedentary. On each testing day, participants consumed four high fat meals. Blood was sampled in a fasted state and 2-hourly for 6 h with the last sample taken on the 7th hour.
Results: Overall, there were no significant differences in the area under the concentration–time curve between day 1 and day 2, for the 12 participants combined ($p = 0.98$). However, in eight of the 12 participants, triglyceride concentrations remained high on d2 at two, four and 6 h after baseline compared with d1 ($p = 0.03$).
Conclusion: When sitting was interrupted by short bouts of moderate intensity exercise there was a reduction in triglyceride concentrations in eight out of 12 participants. Possible reasons to account for the difference in response may include sexual maturation, gender differences, genetic conditions, or the rate of digestion and intestinal absorption.

Introduction

Animal models have shown that LipoProtein Lipase (LPL) activity is suppressed during prolonged sedentary bouts leading to an increase in chylomicrons (triglyceride-rich lipoproteins) in the plasma [1,2]. LPL is an enzyme that binds to circulating chylomicrons in the blood stream and hydrolises the triglyceride within the lipoprotein [2]. Elevated levels of chylomicrons may play an important role in determining metabolic syndrome [1] and have been associated with cardiovascular risk factors such as dyslipidemia in overweight children [3]. Postprandial lipemia, the inability to clear chylomicrons quickly following intake of a high fat meal [3], may be related to inactivity, while exercise may decrease postprandial lipemia, through changes to muscle LPL [4]. The purpose of this study was to compare triglyceride (TG) acute response in healthy children following a high fat diet during prolonged and interrupted sitting with intermittent moderate exercise.

Research design and methods

Twelve healthy children (8 girls; 4 boys) aged 12 ± 2 years (mean ± SD) were recruited from eight randomly selected Auckland (New Zealand) primary schools. Access to schools was granted by school principals. In response to information sheets distributed by teachers to children, parents/caregivers returned consent and assent forms indicating willingness to participate. Participants were

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Table 1
Preliminary[a] participant characteristics

Measure	Mean	SD
Age (y)	11.5	1.57
Body mass (kg)	48.7	9.72
Height (cm)	152.6	11.10
WHO mean z-score	0.88[c]	0.59
% Time spent sitting[b] (h)	83.84	6.07
% Time spent standing (h)	10.83	4.04
% Time spent stepping (h)	5.33	2.93
Step count	76.34	21.42
Sit to stand transitions (counts)	7.64	24.4
EE (Met.h)	8.74	15.21

[a] 14 days before laboratory study.
[b] Includes sleeping hours.
[c] 81st percentile.

excluded if they engaged in high levels of extracurricular physical activity, had a prior medical condition, were taking any medications or had a current condition that would limit activity participation. Ethical approval was received by the Institution's Ethics Committee.

Preliminary measures

Anthropometric and physical activity measurements were taken two weeks prior to participation. Height (m) and weight (kg) measurements were used to calculate BMI WHO z-scores [5]. Activity measurements were collected through ActivPAL accelerometry. Accelerometers were worn for a total of four days prior to testing (d1 & d2). Recorded activity and inactivity is shown in Table 1.

Experimental design and procedures

All participants were required to attend two trials (08:00–16:15) following a 12-h fast. Each trial was separated by a period of six days. On arrival to the laboratory, participants provided a blood sample and were asked to wear an ActivPAL accelerometer. On d1, participants (experimental trial) engaged in their choice of sedentary activities but completed 4 min of moderate intermittent activity (197 ± 51 steps) every 30 min starting at 09:25. The

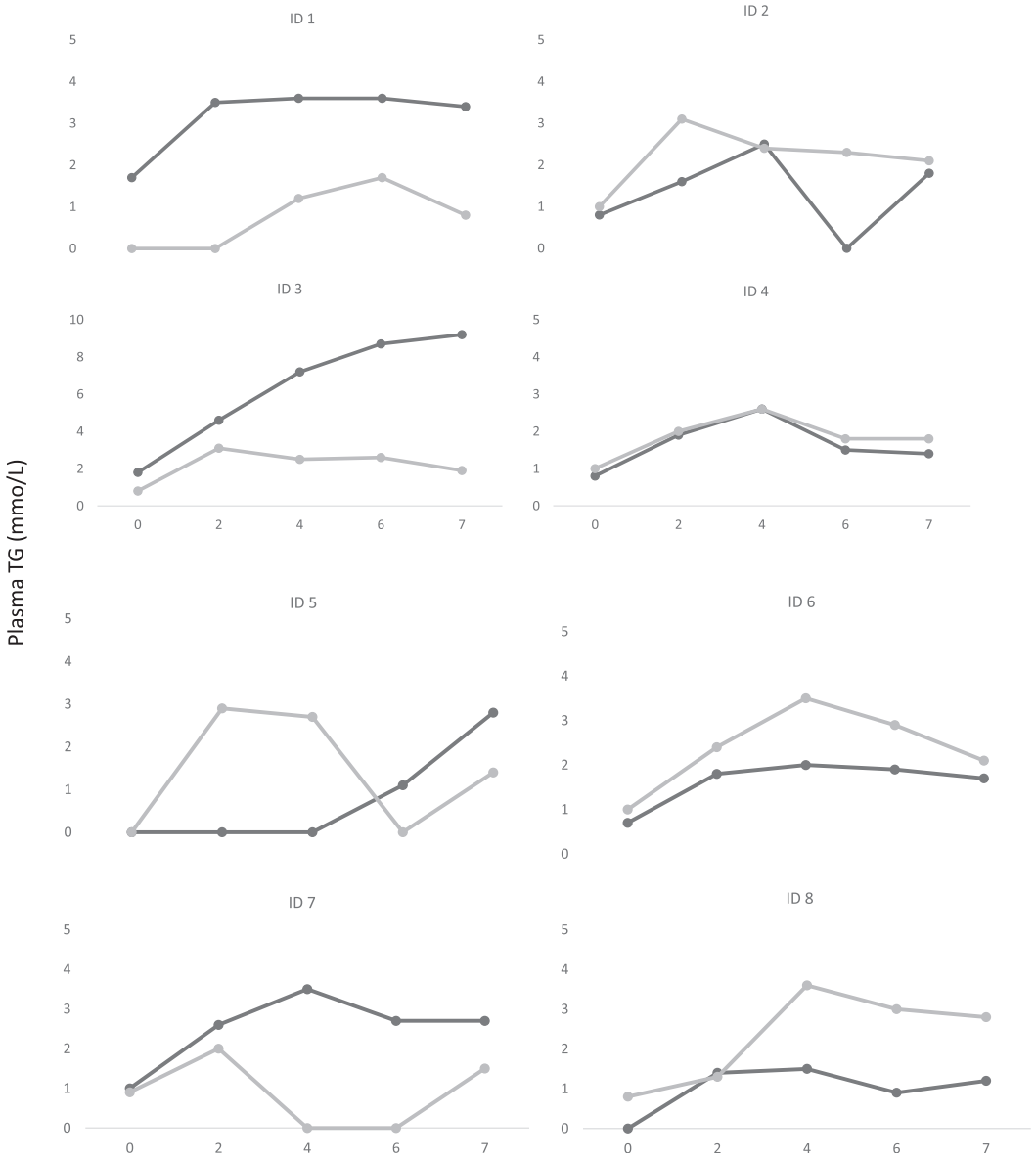

Figure 1. Plasma TG concentrations [mmol/L] in the fasted state and over 7 h after ingestion of high-fat meals for each participant (ID) during sitting interrupted with moderate exercise (●) and sitting (○).