

The influence of moderate intensity physical activity on postprandial lipemia in men

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Postprandial lipemia is the presence of a conspicuous amount of fat in the blood after a meal, and, if elevated, represents a risk factor for cardiovascular disease. A promising tool to influence postprandial lipemia is physical activity. Physical activity bouts performed immediately before intake of high fat meals have been shown to lower postprandial lipemia in non-endurance trained people. However, information is scarce about the effects of physical activity doses, appropriate for sedentary subjects, on postprandial lipemia in a normal daily life setting. The aim of this thesis was to investigate, in a series of studies, the influence of physical activity bouts that could be included in daily routine and, therefore, would represent a rather low threshold for the target sedentary population group to take up a more active lifestyle. To make an extrapolation to real life possible, the meal compositions, sizes and frequency of intake simulated a Western eating pattern.

In the first study, we investigated the influence of 30 minutes of cycling - an exercise bout corresponding to the current minimal recommendation of daily health-maintaining physical activity - on postprandial lipemia. Each of 12 untrained, but otherwise healthy, young men performed, in a randomized order, three activity trials (30 minutes of ergometer cycling with different energy expenditure, but at most moderate intensities) and an inactive control trial to elucidate the minimal energy expenditure necessary to reduce postprandial lipemia. After the activity bouts or the corresponding period of resting in the inactivity trial, two commercially available, mixed meals with a macronutrient composition according to the current nutritional recommendation were served three hours apart. Each meal provided approximately one third of the estimated daily energy requirement. The results showed that none of the cycling bouts with intensities of 26, 37, and 48 % of maximum oxygen uptake (VO_{2max}), respectively, lowered postprandial lipemia compared to the inactive control. The duration and/or intensity of a physical activity bout according to the current minimal activity recommendation, thus, seem not to be sufficient enough to lower postprandial lipemia in healthy young men. Therefore, in a second study, we were looking for the minimum duration of a brisk walking bout that lowers postprandial lipemia. The intensity was chosen as moderate (50 % of VO_{2max}) so that the exercise bout might still be included in a daily routine. On

the basis of the literature, the threshold duration was hypothesized to lie between 30 and 90 minutes. The study design was similar to the previous one in respect to the meal pattern and meal characteristics, but with different activity bouts. The activity trials consisted of 30, 60, or 90 minutes of brisk walking on the treadmill. The results showed, compared to inactivity, no activity effect on postprandial lipemia after 30 minutes of walking and only a modest, but statistically insignificant, 14 and 15 % attenuation after 60 and 90 minutes of walking, respectively. These results were contradictory to other studies that showed a significant decrease (38 - 49 %) of postprandial lipemia after moderate intensity exercise lasting one hour or more. However, in the latter studies, single high fat meals were used as test meals, and therefore, we suggested that this beneficial effect of physical activity can only be observed when the provided meal contains a large amount of fat. This assumption was checked in the third and final study of this series. In that study, the influence of 60 minutes of brisk treadmill walking was compared to inactivity when either two normal-sized mixed meals, each one providing one third of the estimated daily energy and fat requirement, analogous to the previous two studies, were served, or one double-sized meal, providing two third of the estimated daily energy and fat requirement at once was served. On the one hand, the results confirmed those of the previous study by finding no influence of the 60 minutes walking session on postprandial lipemia in the trials where the normal daily meal pattern with two normal-sized mixed meals was applied. On the other hand, postprandial lipemia was also not lowered after the single large mixed meal, even though the absolute fat content of this meal was only slightly lower than that in the formerly mentioned studies where single high fat meals were used and a positive influence of the moderate exercise bout was found. Therefore, we concluded that to measure an attenuation of postprandial lipemia after moderate exercise in healthy young men, the test meal used does not only have to be high in fat in absolute, but also in relative terms. It seems that the other macronutrients, i.e., carbohydrate and protein, and fiber in a mixed meal influence the postprandial metabolism in a way that a potential effect of the exercise session might be abolished.

In conclusion, this thesis showed that a light or moderate physical activity bout up to 90 minutes performed immediately before meal intake has no significant positive influence on postprandial lipemia in untrained, but otherwise healthy young men, when the study design included a meal pattern of a normal daily life. This is in contrast to studies where a single high fat meal, with a fat content far exceeding usual and recommended fat intake in absolute as well as relative terms, was used as a test meal. Therefore, without questioning the health beneficial effect of moderate physical activity per se, the relevance for real life of the beneficial effect of the activity bout on postprandial lipemia found in studies applying high fat meals remains at best questionable.