

## Stand More, Sit Less, for Better Metabolic Health

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### ABSTRACT

Sedentary behaviors are associated with metabolic risks such as weight gain, high adiposity, and abdominal/visceral fat deposition. The American College of Sports Medicine recommends a minimum of 150 mins per week of moderate to vigorous physical activity for health benefits. Adherence, however, is poor due to the prolonged sitting hours required for most modern jobs and the excessive television viewing habits. Emerging studies show that interrupting long sitting hours with intermitted breaks of light activities attenuates the pernicious effects of sedentariness. While most studies and policy guidelines focus on physical activity interventions, there is a lack of data on the benefits of standing over sitting during the day. **PURPOSE:** To determine the contribution of standing-to-sitting time proportions on body fat distribution and resting energy expenditure. **METHODS:** Ninety-two volunteers (41 males, 51 females) participated in the study (Age:  $26 \pm 9$  years, BMI:  $28 \pm 7$  kg/m<sup>2</sup>). Total physical activity level, time spent sitting, and time spent standing were determined for all participants wearing an accelerometer for seven days. Participants were categorized into standing (N=51; 25 males, 26 females) and sitting groups (N=41; 16 males, 25 females). The standing group had longer-standing hours with a stand-to-sit ratio of 0.5 and above, while the sitting group had longer-sitting hours with a stand-to-sit ratio below 0.5. Metabolic health indicators namely, body fat percentage and fat distribution (abdominal/android obesity) were determined using dual x-ray absorptiometry while resting metabolic rate was analyzed by indirect calorimetry. Unpaired t-tests were used to compare the mean value of outcome measures between groups. Data are presented as mean  $\pm$  SD and  $p < 0.05$  was considered significant. **RESULTS:** The standing group spent an average of 30% and 44% of their sedentary time standing and sitting respectively, while the sitting group spent an average of 16% and 58% of their sedentary time standing and sitting respectively. No significant differences were observed in total times spent in physical activity and total sedentary time among both groups ( $p > 0.05$ ). However, longer-sitting hours, compared to longer-standing hours were characterized by significantly higher body mass index ( $30.1 \pm 6.5$  kg/m<sup>2</sup> vs  $26.4 \pm 7.1$  kg/m<sup>2</sup>;  $p < 0.05$ ), android-to-gynoid fat ratio ( $1.08 \pm 0.22$  vs  $0.85 \pm 0.22$ ;  $p < 0.05$ ), android fat ( $43.8 \pm 11.6$  % vs  $27.1 \pm 12.7$  %;  $p < 0.05$ ), and higher total body fat percentage ( $38.1 \pm 8.8$  % vs  $28.6 \pm 8.3$  %;  $p < 0.05$ ). Furthermore, resting metabolic rate was higher among the standing group as compared to the sitting group ( $24.2 \pm 3.0$  Kcal/Kg vs  $22.2 \pm 3.5$  Kcal/Kg;  $p < 0.05$ ). **CONCLUSION:** These results indicate that greater proportion of time spent in standing, relative to sitting, may contribute to lower body fat, abdominal obesity, and greater resting energy expenditure independent of physical activity level. Exercise prescriptions for health maintenance and enhancement should integrate recommendations to minimize extended sitting hours and encourage the substitution of sitting time with standing.