

# Energy Expenditure of Sport Stacking

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## Abstract

Sport stacking is a popular activity taught in many physical education programs. The activity, although very popular, has been studied minimally, and the energy expenditure for sport stacking is unknown. **PURPOSE:** To evaluate the energy expenditure of sport stacking. **METHODS:** Thirty-seven subjects (25 youths, mean age =  $11 \pm 1.6$  years, 17 boys, 8 girls; 12 adults, mean age  $25.3 \pm 3.8$  years, 5 men, 7 women) participated in this study. Subjects reported to the laboratory, were informed of the procedures, signed consent forms, and were fitted with head gear and a mouthpiece to collect expired gases via a metabolic cart. Subjects stood stationary for 5 min for baseline readings to be measured. Subjects then sport stacked for 5 min, performing as many 3-6-3 stacks as possible. Subjects had to be able to complete a 3-6-3 stack in less than 8 seconds to be included in the study. The number of stacks completed was recorded. Descriptive statistics were used to summarize the mean and variability of the energy expenditure while standing and stacking for each subgroup. Repeated measures ANOVA was used to compare the mean energy expenditures between standing and stacking and among sex and age group categories. **RESULTS:** The youth and adult groups performed  $31.2 \pm 6.5$  and  $31.5 \pm 4.4$  stacks in 5 min, respectively, and these values were not significantly different. No significant differences in energy expenditure between males,  $8.0 \pm 0.4$  ml/kg/min or  $2.3 \pm 0.1$  METS, and females,  $7.5 \pm 0.4$  ml/kg/min or  $2.1 \pm 0.1$  METS, ( $P = 0.381$  for ml/kg/min,  $P = 0.337$  for METS) were noted while stacks were performed. The average energy expenditure while stacking for the youths,  $8.4 \pm 0.3$  ml/kg/min or  $2.4 \pm 0.1$  METS, exceeded that of the adults,  $7.0 \pm 0.4$  ml/kg/min or  $2.0 \pm 0.1$  METS, ( $P = 0.024$  for ml/kg/min,  $P = 0.018$  for METS). Overall, the mean energy expenditure while standing was  $5.5$  ml/kg/min or  $1.6$  METs, compared to  $9.9$  ml/kg/min or  $2.9$  METs while stacking; significant differences were noted ( $P < 0.0005$ ) between the standing and stacking mean values. **CONCLUSIONS:** Sport stacking has an energy expenditure of  $2.9$  METs, and it is similar to other activities involved in typical physical education courses (e.g., weight lifting light to moderate, archery, bowling, volleyball, walking  $2.5$  mph).

## Purpose

The purpose of this study was to evaluate the energy expenditure of sport stacking.

## Methods

**PARTICIPANTS:** Thirty-seven subjects (25 youths, mean age =  $11 \pm 1.6$  years, 17 boys, 8 girls; 12 adults, mean age  $25.3 \pm 3.8$  years, 5 men, 7 women) participated in this study.

**PROCEDURES:** Subjects reported to the laboratory, were informed of the procedures, signed consent forms, and were fitted with head gear and a mouthpiece to collect expired gases via a metabolic cart. Subjects stood stationary for 5 min for baseline readings to be measured. Subjects then sport stacked for 5 min, performing as many 3-6-3 stacks as possible. Subjects had to be able to complete a 3-6-3 stack in less than 8 seconds to be included in the study. The number of stacks completed was recorded. The study design and its protocol were approved by the Institutional Review Board of the University of Wisconsin-La Crosse.

**ANALYSES:** Descriptive statistics were used to summarize the mean and variability of the energy expenditure while standing and stacking for each subgroup. Repeated measures ANOVA was used to compare the mean energy expenditures between standing and stacking and among sex and age group categories.

## Results

The youth and adult groups performed  $31.2 \pm 6.5$  and  $31.5 \pm 4.4$  stacks in 5 min, respectively, and these values were not significantly different. No significant differences in energy expenditure between males,  $8.0 \pm$

$0.4$  ml/kg/min or  $2.3 \pm 0.1$  METS, and females,  $7.5 \pm 0.4$  ml/kg/min or  $2.1 \pm 0.1$  METS, ( $P = 0.381$  for ml/kg/min,  $P = 0.337$  for METS) were noted while stacks were performed. The average energy expenditure while stacking for the youths,  $8.4 \pm 0.3$  ml/kg/min or  $3.1 \pm 0.5$  METS, exceeded that of the adults,  $7.0 \pm 0.4$  ml/kg/min or  $2.6 \pm 0.7$  METS, ( $P = 0.024$  for ml/kg/min,  $P = 0.018$  for METS). Overall, the mean energy expenditure while standing was  $5.9$  ml/kg/min or  $1.7$  METs, compared to  $10.2$  ml/kg/min or  $2.9$  METs while stacking; significant differences were noted ( $P < 0.0005$ ) between the standing and stacking mean values.

**Table 1. Stacks Performed and Energy Expenditure while Standing and Sport Stacking**

	Stacks Performed	Energy Expenditure Standing		Energy Expenditure Sport Stacking	
		ml/kg/min	METs	ml/kg/min	METs
Youth	$31.2 \pm 6.5$	$6.3 \pm 1.1$	$1.8 \pm 0.3$	$8.4 \pm 0.3$	$3.1 \pm 0.5$
Adults	$31.5 \pm 4.4$	$4.9 \pm 1.5$	$1.4 \pm 0.4$	$7.0 \pm 0.4$	$2.6 \pm 0.7$
Males	$29.9 \pm 6.3$	$6.1 \pm 1.2$	$1.7 \pm 0.3$	$10.7 \pm 1.8$	$3.1 \pm 0.5$
Females	$33.6 \pm 4.6$	$5.5 \pm 1.6$	$1.6 \pm 0.4$	$9.5 \pm 2.4$	$2.7 \pm 0.7$
Overall	$31.4 \pm 5.9$	$5.9 \pm 1.4$	$1.7 \pm 0.4$	$10.2 \pm 2.2$	$2.9 \pm 0.6$

## Conclusion

Sport stacking has an energy expenditure of  $2.9$  METs. Its energy expenditure is similar to other activities involved in typical physical education courses (e.g., weight lifting light to moderate, archery, bowling, volleyball, walking  $2.5$  mph). Thus, sport stacking could be deemed a valuable activity for physical education courses.



**Figure 1.** Above is a male subject performing as many 3-6-3 stacks as possible in 5 minutes while having his expired gases collected via a metabolic cart.



**Figure 2.** An adult female is shown sport stacking while her expired gases are collected via a metabolic cart.