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The role of hiking activities in improving balance skills to the students of Sports University of Tirana

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Abstract
Through this study, we aim to assess the immediate feedback of hiking on balance and to evaluate gender differences in exercising balance skills. 10 girls and 14 boys aged 19 - 21 years, hiked every two days for 20 days. Each hike day lasted several hours and involved elevation gain on uneven terrain, according to a preset program. Static balance skills were measured by using the Leonardo Mechanography Ground Reaction Force Platform, in two testing sessions, before starting the hiking program and after completing it. In each testing session, the balance test was executed twice, first with eyes open and then with eyes closed. Sway index and relative path length scores were used as indicators of static balance skills. It resulted that hiking has positive effects on balance skills and girls experience more improvement in balance skills than boys. The Sway Index scores, in the open eyes trial, were decreased 26.76% ($p < 0.05$) for the male group, 37.39% ($p < 0.05$) for the female group and 30.38% ($p < 0.05$) for the whole group of participants. In the closed eyes trial, the Sway Index scores after hiking were decreased 30.23% ($p < 0.05$) for the male group, 46.87% ($p < 0.05$) for the female group and 37.3% ($p < 0.05$) for the whole group of participants. The relative path length scores, recorded after hiking, were reduced in both open eyes and closed eyes trials, with respectively 14.54% ($p < 0.05$) *and* 16.46% ($p < 0.05$) *for the male group, 18.23%* ($p < 0.05$) *and* 26.35% ($p < 0.05$) *for the female group* and 16.08% ($p < 0.05$) *and* 20.62% ($p < 0.05$) *for the whole group of*

participants. In future it would be beneficial to further study the effect of hiking on both motor and balance skills. An intervention study structured to evaluate the effect of improving motor skills through hiking, as a strategy for exercising balance, is needed.

Keywords: Hiking, Balance Skills, Outdoor Activities

Introduction

Balance refers to both the body remaining in place and moving around its horizontal or vertical axis (Gallahue and Donnelly 2003) and the process for maintaining postural stability (Wescott, Lowes, and Richardson 1997). More specifically, according to Gallahue and Donnelly (2003), axial movements, such as bending, stretching, twisting, turning, swinging, body inversion, body rolling and landing/stopping, are all considered being balance skills.

Now days, there is too much debate about the best interventions to exercise balance and reduce the risk of falls. Novel balance rehabilitation tools, such as virtual reality games, have been proposed. They are thought to have advantages over regular exercise training, because they provide an environment of enjoyment through gaming, which enhances attention and motivation. According to Scanlan and Simons (1992), enjoyment is an important factor that may lead to greater involvement in the activity. However, virtual reality games use in everyday practice is rather limited, mainly because of unfamiliar cognitive demands for the patient. We hypothesized that hiking could be a good substitute to those games. Hiking does not put much cognitive demands on the patient, because it consists of everyday movements, such as walking and climbing. Furthermore, hiking is rather motivating, especially if group support is provided, and it enhances attention while trying to prevent falling episodes.

Through this study, we aim to assess the immediate feedback of hiking on balance and to evaluate gender differences in exercising balance skills.

Material and Methods

Participants

The participants of the study were 24 physical education students aged 19 - 21 years. The sample comprised 10 girls and 14 boys, who were involved in the same hiking program.

All participants provided written informed consent and the study was approved by the Sports University of Tirana.

Design and Data Collection

The applied hiking program comprised living at an established camp, 900 meters above sea level, and hiking every two days for 20 days. Each hike day lasted several hours and involved elevation gain on uneven terrain. At the beginning hikes were 10 – 13 km long round – trips, on trails that gained less than 450m of elevation. They gradually progressed to 22 km round – trips with 1000 m of elevation gain. The terrain was mostly mountainous and the average walking speed was 0.45 m/s, although hiking rates were variable according to terrain elevation and slope.

All participants in this study performed the same balance tests two days before starting the above-mentioned hiking program and two days after completing it. Static balance skills were measured by using the Leonardo Mechanography Ground Reaction Force Platform. In the test procedure, the participants stand for 5 seconds on one leg, balanced on a flat square surface (660mm x 660mm) 70 mm high. The free leg is bent backwards and the arms are wide opened at both sides. Participants are free to choose the right or left leg to execute the test. There was no practicing time before the test. The test was executed twice, first with eyes open and then with eyes closed. At the end of the balance tests, area of 90% standard ellipse (Sway Index) and path length for second (relative path length), for both trials were recorded.

Statistical Analysis

Data were processed with the SPSS statistical package for Windows. ANOVA data, derived from the t-Test: Paired Two-Sample for Means, are presented in table 1 to 4. Outcomes of statistical analyses were evaluated on the basis of probabilities. In order to estimate any possible gender difference in testing results after the hiking program, the testing results were analyzed not only for the whole group of participants but also specifically for the male group and the female one.

Table 1_t-Test: Paired Two Sample for Means for Sway Index scores (Open Eyes Trial)

	Male		Female		Total	
	Before Hiking	After Hiking	Before Hiking	After Hiking	Before Hiking	After Hiking
Mean	12,292	9,002	8,894	5,568	10,876	7,571
Variance	38,553	24,790	19,156	9,605	32,215	20,763
Observations	14	14	10	10	24	24
Person Correlation	0,3001		0,4907		0,417	
Hypothesized Mean Difference	0		0		0	
df	13		9		23	
t Stat	1,839		2,6759		2,890	
P(T<=t) one-tail	0,044		0,0126		0,004	
t Critical one-tail	1,770		1,833		1,7138	
P(T<=t) two-tail	0,088		0,0253		0,0082	
t Critical two-tail	2,160		2,2621		2,0686	
Relative difference		26,76%		37,39%		30,38%

Table 2 t-Test: Paired Two Sample for Means for Sway Index scores (Closed Eyes Trial)

	Male		Female		Total	
	Before Hiking	After Hiking	Before Hiking	After Hiking	Before Hiking	After Hiking
Mean	33,787	23,571	34,895	18,537	34,249	21,473
Variance	341,277	93,510	458,428	69,133	372,5917	86,3341
Observations	14	14	10	10	24	24
Person Correlation	0,267242		0,22800		0,069773	
Hypothesized Mean Difference	0		0		0	
df	13		9		23	
t Stat	1,660027		2,448371		2,844976	
P(T<=t) one-tail	0,060412		0,01842		0,004584	
t Critical one-tail	1,77093		1,833112		1,713871	
P(T<=t) two-tail	0,120824		0,036855		0,009169	
t Critical two-tail	2,160368		2,262157		2,068657	
Relative difference	30,23%		46,87%		37,3%	

Table 3 t-Test: Paired Two Sample for Means for Relative Path Length Scores (Open Eyes Trial)

	Male		Female		Total	
	Before Hiking	After Hiking	Before Hiking	After Hiking	Before Hiking	After Hiking
Mean	102,517	87,604	102,941	84,167	102,694	86,172
Variance	1215,937	501,532	1312,0166	473,8751	1200,7124	471,9009
Observations	14	14	10	10	24	24
Person Correlation	0,589788		0,736109		0,647074	
Hypothesized Mean Difference	0		0		0	
df	13		9		23	
t Stat	1,9774354		2,3746553		3,062674	
P(T<=t) one-tail	0,0347959		0,0207952		0,0027567	
t Critical one-tail	1,7709333		1,8331129		1,7138715	
P(T<=t) two-tail	0,0695918		0,0415904		0,005513	
t Critical two-tail	2,1603686		2,2621571		2,068657	
Relative difference	14,54%		18,23%		16,08%	

Table 4 t-Test: Paired Two Sample for Means for Relative Path Length Scores (Closed Eyes Trial)

	Male		Female		Total	
	Before Hiking	After Hiking	Before Hiking	After Hiking	Before Hiking	After Hiking
Mean	179,436	149,899	182,392	134,323	180,667	143,409
Variance	1947,746	1156,510	737,641	1034,893	1391,757	1120,172
Observations	14	14	10	10	24	24
Person Correlation	0,291985		0,57049		0,345237	
Hypothesized Mean Difference	0		0		0	
df	13		9		23	
t Stat	2,341503		5,45802		4,49384	
P(T<=t) one-tail	0,017894		0,0002		8,21872	
t Critical one-tail	1,770933		1,83311		1,71387	
P(T<=t) two-tail	0,035788		0,0004		0,000164	
t Critical two-tail	2,160368		2,26215		2,06865	
Relative difference	16,46%		26,35%		20,62%	

Results

The interpretation of results was based on the estimated mean difference between the Sway Index scores and relative path length scores recorded before and after performing the hiking program. It resulted that hiking, was associated with better balance skills as the Sway Index scores, in the open eyes trial, were decreased 26.76% *($p < 0.05$)* for the male group, 37.39% *($p < 0.05$)* for the female group and 30.38% *($p < 0.05$)* for the whole group of participants (table 1). In the closed eyes trial, the Sway Index scores after hiking, were decreased 30.23% *($p < 0.05$)* for the male group, 46.87% *($p < 0.05$)* for the female group and 37.3% *($p < 0.05$)* for the whole group of participants (table 2). The relative path length scores, recorded after hiking, were reduced in both open eyes and closed eyes trials, with respectively 14.54% *($p < 0.05$) and* 16.46% *($p < 0.05$) for the male group, 18.23% ($p < 0.05$) and* 26.35% *($p < 0.05$) for the female group* and 16.08% *($p < 0.05$) and* 20.62% *($p < 0.05$) for the whole group of participants (table 3 and 4)*. Based on the above mentioned data, we concluded that hiking has positive effects on balance skills.

Discussion

The first research task of this study was to assess the immediate feedback of hiking on balance. Although we had preliminary evidence that elevation gain on uneven terrain is important for exercising balance skills, we did not have studies, where balance skills after hiking activities were evaluated. In this study, sway index and relative path length scores were used as indicators of static balance skills. The resultant association between these variables and hiking activities may have a few implications. First, common strategies employed to improve balance, require high motor skills and sometimes they put new cognitive demands on the patient. Hiking, instead, does not put any new demand on the patient. Anyone who can walk is perfectly capable of hiking. Second, hiking is an easy way to enjoy the outdoors and enjoyment is a significant predic-

tor of physical activity engagement (Kremer, Trew, and Ogle 1997; Wallhead and Buckworth 2004). Patients may make the distinction between involvement in physical therapy as an enjoyable experience and physical therapy as a demanding one.

The second research task of this study was to evaluate gender differences in exercising balance skills through hiking. Our results showed that at the end of the same hiking program, girls experience more improvement in balance skills than boys. This finding goes in line with other findings (Toole and Kretzschmar 1993; Wieczorek and Adrian 2006) that revealed that girls make fewer errors in the balance skill exercises.

In future it would be beneficial to further study the effect of hiking on both motor and balance skills. An intervention study structured to evaluate the effect of improving motor skills through hiking, as a strategy for exercising balance, is needed.

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