Examining The Effects of Detraining and Retraining on Health Outcomes in Community Fitness Program Participants

Grotthus, J.L. and Dalleck, L. (Faculty Sponsor)
University of Wisconsin - Eau Claire, Eau Claire, WI

Abstract

Purpose: The primary purpose of this study was to determine if not participating in a regular community fitness program (CFP) during the summer months (12-wk) negatively impacts health (detraining). The secondary purpose was to determine if potential decreases in health for participants not exercising during the summer months could be regained after resuming the fall CFP (retraining). **Methods:** Baseline observations were collected from 27 participants. Participants were divided into two groups: summer CFP group (*N* = 15) and non-summer CFP group (*N* =12). Participants from both groups completed the fall (13-wk) CFP. The following health outcomes were measured at baseline, post-summer CFP, and post-fall CFP: waist circumference, body mass, systolic and diastolic blood pressure, energy expenditure, cardiorespiratory fitness, blood lipids, and glucose. **Results:** In the non-summer CFP group, all health outcomes worsened. Conversely, health outcomes were maintained or improved in the summer CFP group. **Conclusion:** Our data suggests that not participating in the summer CFP resulted in detraining and a worsening of numerous risk factors for heart disease. Furthermore, the non-summer CFP group failed to reach pre-summer health outcome values despite resuming regular exercise for the fall CFP. In conclusion, participation in fitness programs needs to be regular and uninterrupted to avoid diminished health.

Introduction

Exercise and physical activity improve health outcomes. A less understood question is to what extent health outcomes decrease when a structured exercise program is stopped. The current recommendation for exercise by the American College of Sports Medicine (ACSM) is 3 to 5 days of moderate intensity for at least 30 minutes *or* 3 to 5 days of vigorous intensity for at least 20 minutes; combined with weight training, flexibility and balance exercises (1). According to the STRRIDE study the minimum amount of exercise an individual should accumulate in a week should be the equivalent of approximately eight miles of walking or jogging (2). The STRRIDE study also reported a significant decrease in numerous health outcomes in a control group that performed no physical activity over a six month period. The study showed that inactive individuals had an increased mass and waist measurement. Those individuals also had a worsened LDL-cholesterol profile and decreased insulin sensitivity and an increase in fasting blood glucose values. The inactive group also experienced a decrease in cardiorespiratory fitness. In summary even relatively short periods of inactivity can have a negative outcome on health and risk factors for cardio vascular disease (CVD).

Purpose

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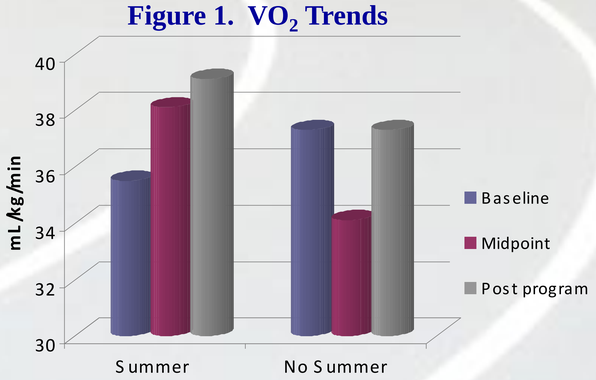
Methods

Baseline observations were collected from 27 participants. The participants were divided into two groups: those continuing the CFP into the summer (N = 15; Male =8; Female=7) and those who didn't participate in the summer (N =12 ; Male =5 ; Female =7). All participants participated in the fall semester program. The following health outcomes were measured at baseline, post-summer CFP, and post-fall CFP: waist circumference, body mass, systolic and diastolic blood pressure, energy expenditure, cardiorespiratory fitness, blood lipids, and glucose.

Statistical Analyses

All analyses were performed using Statistical Package for the Social Sciences, Version 15.0 (SPSS, Inc, Chicago, IL). Measures of centrality and spread are presented as mean SD. Mean differences in health outcomes at baseline, post-summer and post-fall between no-summer and summer groups were assessed with one-way analysis of variance (ANOVA) and, where appropriate, Tukey's post hoc tests. To identify dose-response relationships, polynomial trend analysis was used to determine whether mean differences in health outcomes were linear across baseline, post-summer, and post-fall testing periods in both summer and no-summer groups. The probability of making a Type I error was set at $p < 0.05$ for all statistical analyses.

Figure 1. VO_2 Trends



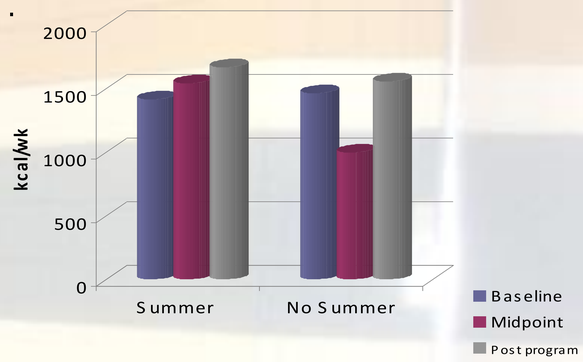
Results

There were significant differences in VO_2max in the summer group, F (2,24) = 3.149, p < 0.05). Tukey's post hoc procedures indicated subjects participating in the summer program had a significantly higher VO_2max ($p < 0.05$) post-summer vs. baseline (38.2 vs. 35.5 mL/kg/min) and post-fall vs. baseline (39.1 vs. 35.5 mL/kg/min). Trend analysis showed that VO_2max changed favorably ($p < 0.05$) across baseline, post-summer, and post-fall in the summer group (Figure 1). There were significant differences in energy expenditure in the summer group, F (2,24) = 4.321, p < 0.05). Tukey's post hoc procedures indicated subjects participating in the summer program had a significantly higher energy expenditure levels (p < 0.05) post-summer vs. baseline (1545 vs. 1419 kcal/wk) and post-fall vs. baseline (1670 vs. 1419 kcal/wk). Trend analysis showed that energy expenditure changed favorably ($p < 0.05$) across baseline, post-summer, and post-fall in the summer group (Figure 2). Although not significant (p > 0.05), there were decreases in nearly all health outcomes from baseline to post-summer in the no-summer group. Further, despite resuming regular exercise for 3-months, health outcomes tended to remain lower than baseline values (Table 1).

Table 2. Baseline, Midpoint and Post Program Health Outcomes.

	Baseline		Midpoint		Post program	
	Summer	No summer	Summer	No summer	Summer	No Summer
Waist girth (cm)	99.9 ±11.6	90.5±16.1	100.5±13.7	93.6±17.2	98.9±8.5	91.7±16.7
Mass (kg)	91.5 ±17.4	81.6±19.2	90.2±17.2	82.2±19.4	90.7±17.23	81.9±19.7
Systolic BP (mmHg)	123.4 ±5.9	111.3±33.5	121.4±10.6	122.3±14.1	123.3±11	122±11.9
Diastolic BR (mmHg)	79.8 ±7.6	73.6±7.7	77.1±7.4	78.8±5.4	78.2±7.2	76.5±6.9
Energy Expenditure (kcals)	1419.4 ±390.4	1467.3±518.5	1545.2±475.1	1000±705.8	1670±648.1	1559.7±911.4
Cardiorespiratory fitness (mL/kg/min)	35.5 ±8.1	37.3±5.9	38.1±7.7	34.1±8.1	39.1±11.1	37.3±8.4
Total Cholesterol (mg/dL)	185.7±37.2	186.8±39.8	199.2±43.7	194.7±48.9	178.4±22.9	188.8±38.9
HDL-Cholesterol (mg/dL)	45.7±11.7	61.7±24.8	43.6±12.5	50.8±6.0	46.6±10.4	50.9±6.6
LDL-Cholesterol (mg/dL)	114.4±37.9	111.5±38.3	126.8±32.0	116.8±44.9	104±21.0	112.5±34.1
Triglycerides (mg/dL)	146.4±75.2	107.3±39.6	144.6±61.1	137.8±55.1	133.4±50.5	128.9±19.5
Blood Glucose (mg/dL)	110.7±20.3	104.2±24.1	111.4±32.7	102.2±19.5	101.8±16.4	97±10.9

Figure 2. Energy Expenditure Trends



Discussion

- High cardiorespiratory fitness decreases mortality from CVD. Elevated fitness also reduces risk of mortality from CVD and all-cause mortality in individual with numerous risk factors for CVD.
- The cardiorespiratory fitness in the no summer group dropped 8.6% from baseline to midpoint. In contrast, the summer-group increased fitness 6.8%. Post program the summer-group increased fitness 9.2 % and the non-summer exercise group returned to baseline level of fitness.
- Energy expenditure has a dose-response relationship with health outcomes. The higher amount of exercise an individual can perform will yield increased health outcomes. Expending 14 to 23 kcal/kg/wk can increase or maintain current health as displayed in the STRRIDE study.
- The energy expenditure of the non-summer group dropped 31.8% from baseline to midpoint. Conversely the summer exercise group increased energy expenditure 8.1%. As shown on Figure 2 the exercise group was able to continually show increases in energy expenditure. Whereas the no exercise group had to work back to their previous expenditure.

Conclusions

- Being inactive for 12 weeks resulted in a detraining by the non-exercise group. There was a worsening of several health outcomes and risk factors for cardiovascular disease.
- Even after resuming an exercise program the non-exercise summer group failed to reach previous health outcomes. The exercise group, however, was able to continually improve on the benefits of exercise.
- In order to achieve an increase or maintain favorable health outcomes, this study demonstrates that fitness/exercise programs should be continuous and uninterrupted. Suspending an exercise program can lead to a decrease in health.

References

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Acknowledgements

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