Supervision and programming of resistance training leads to positive effects on body composition in community programmes

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ACSM 2016 | Boston, MA

Abstract

Purpose. Many sedentary adults possess not only a high body fat percentage (BFP), but also low lean body mass (LBM). The latter may predispose metabolic disease such as Type-2 Diabetes. The majority of public health messaging around physical activity centres on habitual (e.g. walking) or purposeful (e.g. jogging) aerobic activity. However, few positive effects on muscle mass result from such activities. Whilst resistance training (RT) is an obvious solution, its effectiveness in public health settings is not demonstrated. We report two community-based RT studies, Study 1 delivered to a sedentary population, Study 2 to overweight and pre-diabetic patients.

Methods. In Study 1 (48-weeks), participants (n=364) were allocated to either programmed-exercise (PROG), un-programmed use of a community gym (FREE), or monthly physical activity counseling (PAC). A wait-list control (CONT) was employed. In Study 2 (12-weeks), overweight and pre-diabetic patients (n=141) were randomly assigned to 12 sessions of either supervised exercise (SUP), PAC, or the two combined (COMB). A wait list control was employed.

Results. In Study 1, ANOVA indicated significant differences between treatments. PROG performed significantly better than CONT on strength (p= .048) and LBM (p= .009). FREE performed significantly better than CONT on strength (p= .029). Paired-sample t-tests indicated that PROG improved significantly pre-post on strength (p= .001), LBM (p= .036) and BFP (p= .006), whilst improvements in strength only were observed in FREE (p= .01) and PAC (p= .014). In Study 2 ANOVA indicated no significant differences between treatments. However paired-sample t-tests indicated that SUP improved significantly pre-post on strength (p= .01) and BFP (p= .027), with a clear trend also in LBM (p= .074), whilst significantly improved strength only was observed in COMB (p= .026) and PAC (p= .016).

Conclusions. In both studies, whilst statistically significant increases in strength were observed across all treatments, significant improvements in both strength and body composition were observed only in programmed and/or supervised conditions. Collectively data suggest that the programming and supervision of resistance training is beneficial in community settings when improvements in body composition are desired.

Introduction

The aim of the present paper is to report two community-based RT interventions, delivered to a previously sedentary population (Study 1), and as part of a GP Exercise Referral programme to overweight and pre-diabetic patients (Study 2). We report these two studies together as the two were linked in that promising data derived from an inactive yet healthy population in Study 1 and a less healthy population in Study 2. We believe the commonalities across findings and complementary conclusions are worthy of joint dissemination. Data reported were collected as part of larger projects examining community-based exercise interventions in public health.

Methods

Study 1. In Study 1 (48-weeks) participants (n=364) were offered, in a semi-randomised design, one of two intervention pathways. Those choosing the fitness centre pathway were randomised to a structured exercise programme (STRUC) or free/unstructured exercise (FREE). Those choosing a non-fitness centre pathway were randomised to physical activity counselling (PAC) or to a measurement only wait-list control condition (CONT).

For the structured exercise programme (STRUC) participants had access to all fitness centre facilities and received an individualised exercise programme to follow which combined aerobic and resistance training. The unstructured fitness centre based exercise (FREE) allowed participants to have access to all fitness centre facilities but they received no structured programme to follow. Physical activity counselling (PAC) participants did not have access to any fitness centre facilities. Exercise professionals were instructed to meet participants once each month and deliver counselling sessions according to the 5 A's model. The control group (CONT) was a wait-list group that did not have access to any fitness centre facilities, nor did they receive any PAC.

Study 2. In Study 2 (12-weeks), participants (n=141) who were residents of South-East London, UK, overweight and/or obese (BMI 25-35), and/or at increased risk of Type 2 Diabetes were randomly assigned to 12 sessions of either supervised exercise (SUP), PAC, or the two combined (COMB). A wait-list control (CONT) was employed.

SUP received one session per week of a structured and supervised intervention. This intervention was already delivered as part of the care pathway of the local health trust. PAC received one session per week of PAC, the sessions being structured around the model proposed by Haase et al. [1]. COMB received a combination of PAC (sessions in weeks 1, 3, 5, 7, 9 & 11) and SUP (sessions in weeks 2, 4, 6, 8, 10 & 12). A wait-list control condition was facilitated by a legitimate 12-week waiting list for entry into the GP referral programme. All participants, including controls, received a treatment, although we collected data for the first 12-weeks of the intervention only.

Results

Table 1. One-way ANOVA comparing percentage change in dependant variables at baseline and 48 between treatments

Dependent variable	STRUC		FREE		PAC		CONT		F(3,343)	p
	M	SD	M	SD	M	SD	M	SD		
Body Fat Percentage	-5.0	25.6	-0.5	19.2	-1.8	12.1	1.6	15.9	1.9	.117
LBM	2.5	20.9	-.99	17.87	2.42	11.86	-2.6	12.7	4.4	.005*
Pred 1RM Total	21.6	58.5	30.5	78.1	10.7	26.1	4.7	39.0	3.6	.014*

* Denotes statistically significant difference between treatment groups where alpha was set at 0.05

Table 2. Paired samples t-test comparing absolute changes in dependant variables at baseline and 48 weeks for each treatment

Treatment	Dependent variable	Change over baseline		95% CI		t	df	Sig
		M	SD	Lower	Upper			
STRUC	Pred 1RM total (kg)	18.5	35.9	11.2	25.8	5.022	94	.000*
	Body Fat %	-2.6	9.4	-4.4	-0.7	-2.803	103	.006*
	LBM (kg)	2.4	11.5	0.2	4.6	2.130	103	.036*
FREE	Pred 1RM total (kg)	18.4	52.2	7.8	29.0	3.457	95	.001*
	Body Fat %	-0.4	6.3	-1.7	0.7	-.729	104	.467
	LBM (kg)	-0.4	9.5	-2.2	1.4	-.436	104	.663
PAC	Pred 1RM total (kg)	7.2	21.9	1.5	13.0	2.536	57	.014*
	Body Fat %	-0.7	4.0	-1.7	0.2	-1.566	68	.122
	LBM (kg)	1.0	5.2	-0.2	2.3	1.640	68	.106
CONT	Pred 1RM total (kg)	2.5	31.7	-5.9	10.9	.598	56	.552
	Body Fat %	0.2	4.7	-0.9	1.3	.374	68	.710
	LBM (kg)	-1.7	7.8	-3.6	0.1	-1.863	68	.067

* Denotes statistically significant difference between treatment groups where alpha was set at 0.05

Table 3. One-way ANOVA comparing percentage change in dependant variables between treatments

Dependent variable	SUP		COMB		PAC		CONT		F(3,110)	p
	M	SD	M	SD	M	SD	M	SD		
LBM	.92	2.05	.48	1.90	.54	1.55	.14	2.40	.657	.580
Body Fat Percentage	-1.6	2.99	-.27	4.77	-.28	3.33	-.18	3.77	.725	.539
Pred 1RM total	9.33	10.52	6.57	14.13	7.08	10.03	3.17	10.73	1.447	.234

* Denotes statistically significant difference between treatment groups where alpha was set at 0.05

Table 4. Paired samples T-test comparing absolute change in dependant variables at baseline and 12 weeks for each treatment

Treatment	Dependent variable	Change over baseline		95% CI		t	df	Sig
		M	SD	Lower	Upper			
SUP	Pred 1RM total (kg)	.92	2.05	-.01	1.94	1.90	17	.074
	LBM (kg)	-1.65	2.99	-3.09	-.21	-2.40	18	.027*
	Body Fat %	9.33	10.5	4.26	14.40	3.86	18	.001*
COMB	Pred 1RM total (kg)	.48	1.89	-.26	1.23	1.33	26	.195
	Body Fat %	-.27	4.77	-2.16	1.61	-.29	26	.771
	LBM (kg)	6.57	14.12	.86	12.28	2.37	25	.026*
PAC	Pred 1RM total (kg)	.54	1.55	-.18	1.27	1.56	19	.134
	Body Fat %	-.28	3.33	-1.80	1.24	-.38	20	.705
	LBM (kg)	7.08	10.03	1.52	12.63	2.73	14	.016*
CONT	Pred 1RM total (kg)	-.04	2.06	-.63	.56	-.13	47	.900
	Body Fat %	-.18	3.77	-1.2	.92	-.33	46	.741
	LBM (kg)	3.17	10.73	-.08	6.44	1.96	43	.056

* Denotes statistically significant difference between treatment groups where alpha was set at 0.05

In Study 1, a one-way ANOVA indicated significant differences between treatments for LBM (p= .005) and strength (p = .014) (Table 1). Post-hoc tests revealed that STRUC performed significantly better than CONT on strength (p= .048) and LBM (p= .009). FREE performed significantly better than CONT on strength (p= .029). Paired-sample t-tests indicated that STRUC improved significantly pre-post on strength (p= .001), LBM (p= .036) and BFP (p= .006), whilst improvements in strength only were observed in FREE (p= .01) and PAC (p= .014) (Table 2).

In Study 2 ANOVA indicated no significant differences between treatments (Table 3). However paired-sample t-tests indicated that SUP improved significantly pre-post on strength (p= .01) and BFP (p= .027), with a clear trend also in LBM (p= .074), whilst significantly improved strength only was observed in COMB (p= .026) and PAC (p= .016) (Table 4).

Summary and Conclusion

In both studies, whilst statistically significant increases in strength were observed across all treatments, significant improvements in both strength and body composition were observed only in programmed and/or supervised conditions. Collectively data suggest that the programming and supervision of resistance training is beneficial in community settings when improvements in body composition are desired.

Future research will need to further examine potential dose-response relationships in community-based RT, and examine the effects of RT on a broader range of dependent variables. Furthermore it should seek to examine both programme-based and individual difference factors likely to explain the relatively variable response to RT in such settings.

References

[1] Haase A, Taylor, A., Fox, K., Thorp, K., Lewis, G. Rationale and development of the physical activity counselling intervention for a pragmatic TRial of Exercise and Depression in the UK (TREAD-UK). Mental Health and Physical Activity. 2010;3(2):85–91.

Acknowledgements

ukactive would like to thank the followin g sponsors:

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The ukactive Research Institute holds a unique partnership between academia and industry to turn the tide of physical inactivity. It co-ordinates and delivers research designed to improve the use of physical activity in everyday life. Established in 2010, the ukactive Research Institute seeks to answer 'how can we get more people, more active, more often'?

The Research Institute aims to bridge the evidence gap between traditional laboratory based 'exercise is medicine' research and real world interventions. This is achieved by conducting research assessing the effectiveness of interventions on directly measured physical activity levels, clinically relevant markers of cardiovascular and metabolic health, and other core variables in real world interventions.

These questions will in time relate as much too economic, social and political factors as to scientific and health factors. Each project undertaken will, when completed, be publishable in a peer-reviewed journal article, constitute the basis of a major policy report/insight document, or produce otherwise strategically relevant data.

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