

The effect of intensity of recommendations on adherence to a healthy diet and exercise and subsequent effects on working memory and well-being

Imogen Tijou, Carolyn Mair & Sophie McKensie
Southampton Solent University



Abstract

Adhering to exercise regimes benefits health, subjective well-being (SWB) and academic achievement, but evidence suggests that recommending high, rather than moderate, intensity exercise can have a detrimental effect on adherence in specific populations. The effect of different intensity recommendations of consuming fruit and vegetables (F&V) is less well documented. Evidence on aging and child populations support the positive correlation between activity and cognition, however research on this relationship in young populations is sparse. The project aimed to determine the optimal intensity of recommendations in health behaviours in a student population and the effect of these on WM and SWB. A between-subjects design tested adherence to recommendations, WM and SWB measured before and after the 6-week intervention. Student participants were randomly allocated to (i) Moderate F&V (4 portions/day), (ii) High F&V (7 portions/day), (iii) Moderate-intensity exercise (30 minutes 5 times/week), or (iv) High-intensity exercise (30 minutes 5 times/week) groups. All participants completed the International Physical Activity Questionnaire (IPAQ), an assessment of F&V consumption, the Positive Affect and Negative Affect Scale (PANAS) and a WM task. Groups 1 and 2 recorded F&V portions eaten daily. Groups 3 and 4 recorded weekly exercise. After the intervention, participants completed a second WM task and the PANAS. The results are currently being analysed, but preliminary findings suggest the hypotheses were supported. We conclude that participants are more likely to adhere to moderate programmes and moreover to diet rather than exercise behaviour. Furthermore, increased engagement in health behaviours improves WM and SWB.

Introduction

Investigating ways to tackle the global problem of obesity is timely and critical. The link between diet, exercise, student attainment and satisfaction is also important especially as demands on universities and global economies increase. Thus an environment that promotes healthy eating among students and staff improves the capacity to learn, physical and mental fitness and reduces absenteeism. (Arlington, 2001).

Behaviour has a critical role in the causes of health and ill-health (e.g. Gruman & Follick, 1998) and health behaviour in young people is particularly important because poor exercise and diet during these years can predispose to the development health problems later in life (Douglas & Collins, 1997). The World Health Organisation (2011) recommends that in order to have a positive effect on physical and psychological health, adults should eat 400g (around 5 portions) of fruit and vegetables (F&V) and take 30 minutes of moderate exercise daily.

An emerging body of multidisciplinary literature supports the beneficial influence of physical activity on brain function (e.g., Hillman, Erickson and Kramer, 2008). However, that intensity of exercise might have an effect on how aversive the exercise is perceived (Brewer *et al.* 2000) and recommending high, rather than medium, intensity exercise has been found to have a detrimental effect on adherence in a specific population (Perri *et al.*, 2002). Higher intensity exercise demands higher physical exertion which can be associated with pain during and after exercise. Additionally, the usually positive effect of exercise on affective state might be reversed in high intensity exercise (Hall *et al.*, 2002). This is counter-productive as cognitive ability and therefore, working memory, as well as creativity, can be enhanced by sustained positive emotion (Fredrickson, 2001). Moreover, regular physical exercise can improve subjective well-being (SWB) and have many other psychological benefits including reduced depression, anxiety and anger (Hassmen, Koivula & Uutela, 2000). Thus we also measure the effects on SWB of high and low intensity healthy behaviour.

From a neuroscience perspective, Kane and Engle (2002) argue that the capability to maintain a memory representation in an active state (working memory) despite distractions and interference is critical to predicting general success across higher order cognitive domains. Because cognitive ability is largely affected by working memory, we are interested in the affect of healthy behaviours on working memory.

The present proposal aims to ascertain which intensity of dietary intake and physical exercise best predicts adherence, working memory and SWB. To assess working memory we take baseline and post study measures using *Explore Your Memory test* (Logie, 2007;) available at <http://www.bbc.co.uk/science/humanbody/mind/surveys/memory/flash/test.shtml>). We also measure SWB using the Positive and Negative Affect Schedule (PANAS; Watson *et al.*, 1988); to quantify the past week's exercise participation and time spent sitting, we use the *International Physical Activity Questionnaire* (IPAQ); the *Exercise Related Pain Scale* (ERPS) is used to assess pain during and after exercise; and the *Fruit & Vegetable Measure* (F&VM) quantifies the past week's consumption.

Acknowledgement: This work was supported by a grant from SSU.

Method

Materials

Positive and Negative Affect Scale (PANAS) (Watson, Clark & Tellegen, 1988) to measure subjective well-being (SWB); *International Physical Activity Questionnaire* (IPAQ) to quantify the past week's exercise participation and time spent sitting; *Exercise Related Pain Scale* (ERPS) to assess pain during and after exercise; *Fruit & Vegetable Measure* (F&VM) to quantify consumption in past week; *Explore your Memory test* (EYM; Logie, 2007;).

Procedure

Baseline measures were taken using the questionnaires and online memory test before random allocation to one of the 4 conditions. Participants were instructed to adhere to the group's instructions and complete the appropriate questionnaires each week for 6 weeks.. The memory test was taken again at the end of the study.

Independent variables		Dependent variables	
Activity	Intensity	Subjective well being	PANAS
Exercise	Moderate	Exercise behaviour	IPAQ
F&V	High	Pain during exercise	ERPS
		F&V consumption	F&VM
		Memory	EYM

	Group 1 Moderate exercise	Group 2 High exercise	Group 3 Moderate F&V	Group 4 High F&V
Baseline	X	X	X	X
PANAS	X	X	X	X
IPAQ	X	X		
ERPS	X	X		
F&VM			X	X
EYM	X	X	X	X

Participants

N=42 (27 female; mean age = 21.67; SD, 4.183);
Group 1: n=8; Group 2: n=8; Group 3: n=14; Group 4: n=12

Results

Groups 1 and 3 (moderate intensity exercise and F&V) returned more questionnaires. Group 3 returned the most. The dropout was similar across all groups, but lowest in Groups 3 and 4 (moderate and high F&V).

Conclusions

References

- Allington, J. (2001) Eating for health and academic achievement, *Wisconsin School News*, March 2001.
- Douglas, K. A. Collins, J. L. Warren, C. Kann, L. Gold, R. Clayton, S. Ross, J. G. Kolbe, L. J. (1997). Results from the 1995 National College Health Risk Behavior Survey, *Journal of American College Health*, 46(2), 55-68.
- Fredrickson, B.L. (2001). The Role of Positive Emotions in Positive Psychology: The Broaden-and-Build Theory of Positive Emotions, *American Psychologist*, 56(3), 218-226.
- Gruman, J. & Follick, M. (Eds.) (1998). *Putting evidence into practice: The OBSSR report of the working group on the integration of effective behavioural treatments into clinical care*. Bethesda, MD: Office of Behavioural and Social Sciences Research, NIH.
- Hassmen, P., Koivula, N. & Uutela, A. (2000). Physical Exercise and Psychological Well-Being: A Population Study in Finland, *Preventative Medicine*, 30(1), 17-25.
- Hillman, C.H., Erickson, K.I. & Kramer, A.F. (2008). Science and society: Be smart, exercise your heart: exercise effects on brain and cognition, *Nature Reviews Neuroscience* 9, 58-65.
- Kane, M.J. & Engle, R.W. (2002). The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective, *Psychonomic Bulletin & Review*, 9(4), 637-671.
- Logie
- Perri, M.G., Anton, S.D., Durning, P.E., Ketterson, T.U., Sydeaman, S.J., Berlant, N.E., Kanadky, W.F., Newton, R.L., Limacher, M.C. & Martin, D. (2002) Adherence to exercise prescriptions: Effects of prescribing moderate versus higher levels of intensity and frequency. *Health Psychology*, 21(5), 452-458.
- Watson, D., Clark, L. A., & Tellegen, A. (1988b). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology*, 47, 1063-1070.