

DOCTORAL THESIS

Application of the social cognitive theory to an electronic activity monitor system-based Physical Activity Intervention for working adults

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Date of Award:
2020

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ABSTRACT

Adults in Hong Kong show relatively low participation in physical activity. In the wake of technological advancements, it has become necessary to promote physical activity in an innovative approach. To that end, this study aimed to investigate the effect of an application of Social Cognitive Theory (SCT) under an eight-week electronic activity monitor system (EAMS)-based intervention on changes in physical activity (PA) as well as its associated SCT constructs of self-efficacy, social support and self-regulation for working adults in Hong Kong. A series of studies were performed:

Study 1: In order to assess the validity of the step count output of two popular electronic activity monitor system (EAMS) model, Fitbit Charge HR and Xiaomi Mi Band 2, healthy adult ($N=30$) worn both EAMS and walked at five predetermined speeds on a treadmill. Two-factor (step x speed) repeated measures ANOVAs was performed to compare the output of devices with manual step count. Result: there was no significant mean difference ($p > 0.05$) in step count among the Fitbit Charge HR and Mi Band 2 activity monitors and the criterion in all treadmill speeds. Both of them are valid devices for step count in the laboratory setting.

Study 2: As to assess the validity of step measurement of Mi Band 2 in the free-living environment, 31 healthy adults were invited for wearing both Mi Band 2 and ActiGraph GT9X Link on their dominant hand's wrist for 7 consecutive days. Paired sample t-tests and Pearson correlation were conducted to compare the average steps per day between Mi Band 2 and ActiGraph GT9X Link. Result: there was no significant mean difference ($p > 0.05$) and high positive correlation in step count between the Mi Band 2 and Actigraph. The Mi Band 2 is a valid device for step count in the free-living environment.

Study 3: To examine the validity and reliability of the Chinese version of PA related self-efficacy, self-regulation and social support in Hong Kong Chinese adults. There were 230 healthy adults aged 19-63 years recruited. The factorial validity of the scales was assessed by the Confirmatory Factor Analyses (CFA) while criterion validity was assessed by correlating measured constructs with self-reported PA. The internal consistency and scales test-retest reliability were evaluated by Cronbach's alpha and

intraclass correlation coefficient, respectively. Result: indicators of CFA supported the one-factor structure while all PA correlates were significant ($p < 0.01$) associated with self-reported PA. All scales demonstrated acceptable internal consistency and test-retest reliability. The results provided psychometric support for using the Chinese version of the scales to measure PA correlates among Hong Kong adults.

Main Study: A two-armed randomised controlled trial took place to investigate the effect of an EAMS-SCT intervention on changes in PA and its associated SCT constructs for working adults in Hong Kong.

Sixty-four (26 males, 38 females, mean age = 39.98, SD =7.06) participants were stratified based on their job nature and randomly assigned to the control, EAMS only group ($n = 33$) and the treatment, EAMS-SCT group ($n =31$) after data screening. Both groups received an EAMS, whereas the EAMS-SCT group received SCT elements in the eight-week intervention, which comprised of one physical activity advisory session conducted by a certified personal trainer and four WhatsApp delivered sessions conducted by the researcher.

Outcome measures: Measures of PA (by IPAQ MET score) and SCTs constructs (by the scale of Exercise Self-efficacy, Social Support for Exercise and Physical Activity Self-regulation) of two groups at three times of measurement. 2 x 3 (Group x Time of Measurement) mixed ANOVA and mixed MANOVA were conducted respectively for PA and SCTs constructs for detecting group difference.

Results: The interaction effect between different groups (EAMS only and EAMS-SCT) on the participants' score on IPAQ, across three times of measurement (pre-intervention, post-intervention and 4-week follow-up) was significant. The mean IPAQ MET scores of participants in both groups (EAMS only, from 957.64 to 1235.82, EAMS-SCT group from 883.49 to 1420.86) increased and statistically significant difference from its scores than that of the pre-intervention. However, there was no statistically significant difference in IPAQ MET scores between the groups.

There was a statistically significant multivariate effect of SCT constructs across the interaction between the groups and time of measurement: $F(6, 57) = 7.267, p = .000$, with large effect size. Post-hoc analysis revealed that the score of exercise self-efficacy,

social support for exercise and physical activity self-regulation from pre-intervention to post-intervention were significantly higher in the EAMS-SCT group. There was no significant difference in the score of physical activity self-regulation between the EAMS only group and the EAMS-SCT group. Meanwhile, there was a significant mean difference in exercise self-efficacy and social support for exercise at Week 8 and social support for exercise at Week 12 between EAMS only and EAMS-SCT group.

Conclusion: The participants in the EAMS-SCT group show a significant increase in physical activity level and all three related SCT constructs. Both the EAMS only and the EAMS-SCT groups have an increase in the IPAQ MET score and the score of the scale of physical activity self-regulation after the 8-week intervention. Participants in the EAMS-SCT group exhibit higher scores in the scales of exercise self-efficacy and social support for exercise than participants in the EAMS only group after the 8-week intervention.

TABLE OF CONTENTS

DECLARATION	i
ABSTRACT.....	ii
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES	xi
LIST OF FIGURES	xv
LIST OF SYMBOLS	xvii
LIST OF ABBREVIATION	xviii
CHAPTER ONE	1
INTRODUCTION	1
Background of Study.....	1
Statement of Problem.....	3
Purpose of the Study	4
Research Questions	6
Definitions of Terms	7
Delimitations	9
Limitations	10
Significance of the Study	11
CHAPTER 2	12
LITERATURE REVIEW	12
Benefits of Physical Activity	12

Physical Activity Recommendations	13
Physical Activity Level of Hong Kong Adult.....	14
Relationship between Step Count and Physical Activity Level.....	14
Physical activity measurement.....	16
Workplace Physical Activity Promotion.....	21
Promotion of Physical Activity through Technology	22
Electronic Activity Monitor System (EAMS) and Its Persuasive Interfaces...	24
EAMS for Promoting Physical Activity	27
Social Cognitive Theory	41
Component of Social Cognitive Theory	44
Personal Factors	44
Environmental Factors	47
Behaviour	48
CHAPTER 3	50
METHODOLOGY	50
Study 1: Validation of Electronic Activity Monitor Devices during Treadmill Walking	51
Introduction	51
Methods	52
Results	54
Discussion.....	62
Study 2: Validation of Electronic Activity Monitor Tracker as Step Measurement in Free-living Conditions	64
Introduction	64

Methods	65
Results	68
Discussion.....	73
Study 3: Validation of the Chinese version of physical activity related to self-efficacy, self-regulation, social support questionnaire for adults	75
Introduction	75
Method.....	79
Results	83
Discussion.....	86
Summary of Chapter 3	89
CHAPTER 4	90
Main Study: An Application of the Social Cognitive Theory to An Electronic Activity Monitor System-based Physical Activity Intervention for Working Adults in Hong Kong	90
Introduction	90
Hypotheses	92
Procedures	93
Design.....	97
Goal-Setting.....	99
Process measure.....	100
Intervention fidelity	101
Physical Activity adherence	101

Intervention content and process	102
Outcome measures.....	109
Assessment of intervention effects	111
Data analysis.....	112
Parametric statistical test assumptions	112
Level of significance	115
Results	116
Characteristics of the Participants	116
Statistical Findings of IPAQ MET Score.....	121
Assumptions of mixed ANOVA	122
Hypothesis	123
Testing assumption for IPAQ MET score	123
Interaction effect (groups x time of Measurement).....	124
Simple effect of time of measurement (within-subjects).....	127
Simple effect of group (between-subjects).....	130
Summary for the primary outcome measure	132
Statistical Findings of Social Cognitive Theory Constructs	134
Assumptions of mixed MANOVA	135
Hypothesis	136
Testing assumption	136
Multivariate outcome.....	138
Simple effect on exercise self-efficacy.....	142

Simple effect on social support for exercise.....	148
Simple effect on physical activity self-regulation	154
Summary for the Secondary Outcome.....	160
Intervention Fidelity.....	161
Physical Activity Adherence after Intervention.....	163
CHAPTER 5	164
DISCUSSION AND CONCLUSIONS	164
Intervention Effects on Physical Activity Levels and their Implications	165
Change of SCT Constructs and Implications	168
Strength and Significance of the Study.....	173
Limitations	175
Recommendations.....	176
Conclusion.....	178
REFERENCES	179
APPENDIX 1 Consent Letter	216
APPENDIX 2 Questionnaire of Exercise Self-efficacy.....	219
APPENDIX 3 Questionnaire of Physical Activity Self-regulation	220
APPENDIX 4 Questionnaire of Social Support for Exercise Scale	222
APPENDIX 5 International Physical Activity Questionnaire – short-form, Chinese Version.....	224
APPENDIX 6 Physical Activity Readiness Questionnaire	226
CURRICULUM VITAE.....	227