Efficacy of Stage-Matched Intervention Based on the Transtheoretical Model of Change in Enhancing High School Female Students' Processes of Change to Engage in Regular Physical Exercise: A Randomized Controlled Trial.

نجاعة التداخل المطابق لمرحلة التغيير المستند إلى نموذج التغيير عبر النظريات في تحسين عمليات التغيير لطالبات المدارس الاعدادية لممارسة التمارين البدنية المنتظمة: تجربة معشاة منضبطة

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المستخلص

الهدف: اختبار مدى نجاعة التداخل المطابق لمرحلة التغيير المستند إلى نموذج التغيير عبر النظريات في تحسين عمليات التغيير لطالبات المدارس الاعدادية لممارسة التمارين البدنية المنتظمة..

المنهجية: التجربة المعشاة المنضبطة لـ ١٤٤ طالبة من طالبات المدارس الإعدادية اللاتي تتراوح أعمارهن بين ١٥–١٩ سنة اللاتي تم اختيارهن عشوائياً من المدارس الاعدادية في مدينة بغداد (٧٢ مشاركةً في كل من مجموعتي الدراسة والسيطرة).وبعد إنجاز الاختبار الأولي، تم تصنيف المشتركات وفقًا لمرحلة التغيير الخاصة بهن)، وتم تصميم التداخل (استهداف سلوك التمرينات البدنية)، وتقديمه للمشتركات في كل مرحلة من مراحل التغيير خلال ٥ أيام.

النتائج: أظهرت نتائج الدراسة زيادة ملحوظة مع اختلاف معنوي في قيمة إيجابيات مع مرور الوقت لمجموعة الدراسة، وانخفاض ملحوظ مع اختلاف معنوي في قيم سلبيات ممارسة التمارين الرياضية المنتظمة لدى المشاركات لمجموعة الدراسة مع مرور الوقت .

الاستنتاجات: أثر التدخل المطابق للمرحلة التغيير المستند إلى نموذج التغيير عبر النظريات بشكل إيجابي في عمليات التغيير لدى الطالبات.

التوصيات: مزيد من الدراسات التي تستخدم التدخل المطابق للمرحلة التي تسعى إلى تعزيز المشاركة في ممارسة التمارين الرياضية بانتظام يجب أن يتم إجراؤها من قبل باحثين آخرين سواء داخل العراق أو خارجه.

الكلمات المفتاحية: تغيير السلوك الصحي؛ عمليات التغيير للمشاركة في التمارين البدنية المنتظمة والتدخل المطابق لمرحلة التغيير؛ نموذج التغيير عبر النظريات.

Abstract

Study Objectives: to examine Efficacy of Stage-Matched Intervention Based on the Transtheoretical Model of Change in Enhancing High School Female Students' Processes of Change to Engage in Regular Physical Exercise.

Methodology: A randomized controlled trial of 144 female high school students aged 15-19-years who were randomly selected from a high school in Bagdad City)72 participants in each of the study and control groups). After accomplishing the pre-test, participants were classified according to their Stage of Change), the intervention (Targeting physical exercise behavior) was tailored, introduced to participants in each Stage of Change within 5 days.

Results: The study results display a noticeable increase with a significant difference in the value the Pros over time for study group, and a remarkable decrease in the values of Cons of engaging in regular physical exercise for participants for the study group over time with significant difference.

Conclusions: The TTM-based Stage-Matched intervention positively influenced the students' Processes of Change.

Recommendations: Further studies that employ Stage-matched intervention that seek to enhance engaging in regular physical exercise need to be conducted by other researchers either inside or outside Iraq.

Keywords : Health Behavior Change; Processes of Change to Engage in Regular Physical Exercise Stage-Matched Intervention; The Transtheoretical Model of Change.

Introduction

Over the last two decades, addressing mental health in Iraq has been challenging due to ongoing wars, conflicts, and political instability in the country. [(1)] Additionally, Iraq has encountered significant challenges that have greatly affected the mental health of its people, including issues with healthcare facilities, security concerns, and access to basic necessities like food and water. Currently, more than 20% of Iraqis are affected by mental illnesses, and this percentage is on a steady rise. [(2)] Based on a study conducted in Baghdad, the majority of women (91.1%) in the city have experienced trauma related to war over the past two decades. Additionally, about 44% of

individuals seeking treatment at psychiatric clinics are women. [3] Empirical evidence is mounting to support the connection between insufficient physical activity and measures of mental health. Research indicates that overweight adolescents who are not involved in physical activity are more susceptible to engaging in risky behaviors, such as attempting suicide and developing addiction to both alcohol and illegal drugs. [4]

Engaging in regular physical exercise has been found to alleviate symptoms of depression and anxiety, as well as enhance mood. There is evidence suggesting that regular physical activity might also lower the risk of developing depression, although additional research is needed to fully understand this connection. [5]Physical activity, including structured exercise, has been found to have a significant impact on the brain and mind. It not only affects physical health but also has a role in mental health and overall quality of life. Additionally, exercise has been recognized as a potential treatment for mental disorders. [6] Recent evidence indicates that engaging in physical activity has positive effects on cognitive function. Erickson et al. found that even a small amount of engaging in Physical exercise can help prevent cognitive deterioration in older age. [7]

Globally, schools are recognized as crucial for promoting health among adolescents, regardless of their backgrounds. The World Health Organization (WHO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) have introduced global standards to advance their initiative "Making Every School a Health Promoting School". Central to this initiative are physical education and after-school sports programs, which serve as primary means for schools to promote physical activity. (8) Many studies have utilized theoretical frameworks to investigate the mechanisms underlying significant changes in PA behavior, among these, the Transtheoretical Model of Change has garnered significant attention. [9]

Health behavior change programs in schools encompass educational sessions in classrooms, teacher preparation, and adjustments to

school surroundings that foster healthy habits. [10] To sustain long-term health improvement efforts, dissemination and implementation theories are instrumental in promoting the adoption of various healthy behaviors such as regular physical exercise. [11]

Several studies have investigated various aspects of adolescent behavior, including violence, addiction, smartphone usage, and its impact on academic performance, as well as the utilization of social networking platforms and their influence on mental health within educational settings. Consequently, the integration of regular exercise into the daily lives of adolescents is advocated as a proactive measure to mitigate the detrimental effects associated with these behaviors. [12-15]

There are studies in Iraq used the Transtheoretical Model of Change to change unhealthy behaviors such as (Carbonated Drinks, Performance-Enhancing Substances). [16-21]

A careful review of the literature applicable to using the TTM in exercise states that there was no study in Iraq, Arab countries, or the Middle East region that used stage-matched intervention in enhancing females' readiness to engage in regular physical exercise.

Methodology

Study Design

This study used an experimental randomized controlled trial design. Control is used to minimize the chance of error and raise the likelihood that the study's conclusions accurately represent the state of reality. The researcher can lessen the impact of confounding effects of unrelated variables on the study variables. [22]

The Setting of the Study:

The study was conducted at "Al-Tasamoh" High School for females in Bagdad City, Iraq. A probability simple random sampling method was used for selecting school from female high schools. The names of all female high schools in Rusafa (2nd directorate) Bagdad City were written in identical pieces of paper, these pieces were closed and stirred well in the container, then drawn one piece and "Al-Tasamoh " female high school was chosen. Data collection took place at this location.

The Study Population

The study population included high school female students. The target population for this study was drawn from female high school students in Bagdad City. who met the inclusion criteria mentioned below and were willing to participate in the study.

Inclusion Criteria

The study participants were chosen based on high school, female students, and morning study criteria.

Exclusion Criteria

The researchers excluded participants who are studying at levels less than high school (middle schools), male, and those who are in evening study.

Participants

The study included a simple random sample of high school female students where the names of all students were written in identical pieces of paper. These pieces were folded and stirred well in the container and then one of the colleagues drawn one piece. Random assignments were made to assign participants in the study and control groups. The researchers completed all the measurements without being aware of whether the participants were part of the study or the control group.

The sample size was 144, 48 students were randomly recruited from each grade (fourth, fifth, and sixth), there were 72 students in the study group and 72 in the control group.

The Study Instrument

The Exercise Processes of Change Scale (EPOCS)

The Exercise Processes of Change Scale was used to measure the experiences can affect the exercise habits of some people. [145] This scale is a 5-point Likert type scale that is composed of 28 items self-report measure previously validated for use with adolescents. The EPOCS is conceptualized as consisting of two correlated second-order factors which each include five first-order factors. The experiential processes included (1) for Consciousness Raising (3 items), e.g., seeking information; (2) for Dramatic Relief (3 items), e.g., emotional aspects of change; (3) environmental reevaluation (2

items), e.g., assessment of how inactivity affects society; (4) self-reevaluation (3 items), e.g., assessment of personal values; (5) social liberation (3 items), e.g., awareness, availability, and acceptance of active lifestyles in society.

Behavioral processes consisted of (1) counterconditioning (3 items), e.g., substituting physical activity for other leisure choices; (2) helping relationships (2 items), e.g., using social support during change; (3) reinforcement management (3 items), e.g., self-reward for change; (4) self- liberation (3 items), e.g., commitment and efficacy beliefs about change; (5) stimulus control (3 items), e.g., managing situations that prompt inactivity or activity. Items from the processes of change questionnaire were rated by participants using a 5-point Likert-type response format. [23]

These items were measured on a 5-point Likert scale. Responses on this scale range from 1 (Never) to 5 (Repeatedly). Total scores range from 28 to 140, with a higher score indicating greater Processes of Change. [24]

Data Collection Methods

A self-reporting study instrument was provided to participants. and it was also utilized to gather data at three different time points in high school (pre-intervention, The interval between administering the intervention and posttest I, and between posttest I and posttest II is 12-weeks).

Statistical Analyses:

The Statistical Package for Social Science for Windows Version 27 was used to analyze the data. The repeated measures analysis of variance (RMANOVA) was used to examine the differences in the main TTM constructs.

Ethical Considerations

After receiving the approval of the ethical committee at Community Health Nursing Department at The College of Nursing- The University of Bagdad, the researchers obtained the approval of the Ministry of Education/ General Directorate of Education in Baghdad Governorate, Rusafa (2nd directorate) .

The researchers informed the study participants of the aim of the study, how to complete the study instrument, and ensure their understanding that participation is voluntary and that they can withdraw from the study at any time. The researchers assured participants that the confidentiality of their data will be safeguarded and securely maintained during and following study participation. The researchers further assured study participants that their identities will remain anonymous in the presentation, reporting, and/or any eventual publication of the study. The researchers obtained informed consent prior to data collection.

Intervention

After completing the pretest phase, the researchers started intervention where it was a session about (Participating in regular physical exercise) for study group (72 students) and presented five sessions through data-show for students in the "Al-Tasamoh" high school, which was one session for each Stage of Change, first day was for Precontemplation Stage (21 students), second day was for Contemplation Stage (24 students), third day was for Preparation Stage (18 students), fourth day was for Actin Stage (8 students), and last day was for Maintenance Stage (1 student).

Each session lasted for two-hours with 10-minutes brake after the first hour.

The educational materials for each Stage of Change considered the Processes of Change corresponding each Stage of Change, shed the light on topics that help female students how to choose suitable physical exercise for their life and how to maintain regular physical exercise, [17] related to regular physical exercise. The intervention methods considered participants' participants' distribution according to Stages of Change. The intervention methods focused on role playing and discussions with family for those in the Precontemplation Stage; focused on clarifying values and guided imagery for those in the Contemplation Stage; focused on policy interventions and empowerment for those in the Preparation Stage, focused on social support, reinforcing behavior with rewards, substituting healthy behavior for problem behavior for those in the

Action Stage, and focused on avoiding high-risk cues, removal of triggers, restructuring environment, and accountability for those in the Maintenance Stage.

Study Results

Table 1. *Descriptive statistics of Processes of Change over time*

Processes of Change	Mean	Std. Deviation	N
Study Pretest	63.84	20.71	72
Study Posttest I	107.19	14.78	72
Study Posttest II	120.84	17.89	72
Control Pretest	71.22	19.59	72
Control Posttest I	54.81	11.52	72
Control Posttest II	53.62	10.98	72

N: Number, Std. Deviation: Standard Deviation

The study results display that there is a remarkable, consistent increase in the values of the Processes of Change for participants in the study group (Pretest = 63.84, Posttest II = 107.19, Posttest II = 120.84) respectively. While for participants in the control group, there was a fluctuation in these values over time (Pretest = 195.98, Posttest II = 180.16, Posttest II = 195.93) respectively.

Table 2. *Multivariate Tests of the Within-subjects for the Processes of Change*

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
POC Study	Pillai's Trace	.873	240.517[b]	2.000	70.000	.000	.873
	Wilks' Lambda	.127	240.517[b]	2.000	70.000	.000	.873
	Hotelling's Trace	6.872	240.517[b]	2.000	70.000	.000	.873
	Roy's Largest Root	6.872	240.517[b]	2.000	70.000	.000	.873
Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
POC Control	Pillai's Trace	.472	31.309[b]	2.000	70.000	.000	.472
	Wilks' Lambda	.528	31.309[b]	2.000	70.000	.000	.472
	Hotelling's Trace	.895	31.309[b]	2.000	70.000	.000	.472
	Roy's Largest Root	.895	31.309[b]	2.000	70.000	.000	.472

a. Design: Intercept
Within Subjects Design: Processes of Change
b. Exact statistic

c. Computed using alpha = .05

There are significant differences in the values of the Processes of Change over time for participants both in the study and control groups (F = 240.517, df = 2, p < .05 vs. F = 31.309, df = 2, p < .05).

Table 3. *Tests of within-subjects effects for the Processes of Change*

Measure: MEASURE_1							
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
POC Study	Sphericity Assumed	127545.120	2	63772.560	361.878	.000	.836
	Greenhouse-Geisser	127545.120	1.377	92609.262	361.878	.000	.836
	Huynh-Feldt	127545.120	1.396	91394.922	361.878	.000	.836
	Lower-bound	127545.120	1.000	127545.120	361.878	.000	.836
Error (POC Study)	Sphericity Assumed	25024.213	142	176.227			
	Greenhouse-Geisser	25024.213	97.784	255.913			
	Huynh-Feldt	25024.213	99.083	252.558			
	Lower-bound	25024.213	71.000	352.454			
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
POC Control	Sphericity Assumed	13923.361	2	6961.681	99.687	.000	.584
	Greenhouse-Geisser	13923.361	1.111	12533.484	99.687	.000	.584
	Huynh-Feldt	13923.361	1.116	12478.040	99.687	.000	.584
	Lower-bound	13923.361	1.000	13923.361	99.687	.000	.584
Error (POC Control)	Sphericity Assumed	9916.639	142	69.835			
	Greenhouse-Geisser	9916.639	78.873	125.729			
	Huynh-Feldt	9916.639	79.224	125.172			
	Lower-bound	9916.639	71.000	139.671			

a. Computed using alpha = .05

There was a (a priori p = 0.01) significant difference (F (1.377, 97.784) = 361.878, p = 0.01) in the Processes of Change over time for participants in the study group. The omnibus effect (measure of association) for this analysis is .836, which indicates that approximately 83% of the total variance in the Processes of Change values is accounted for by the variance in the administered intervention.

For the control group, there was a (a priori p = 0.01) significant difference (F (1.111, 78.873) = 99.687, p = 0.01) in the Processes of Change over time. The omnibus effect (measure of association) for this analysis is .584, which indicates that approximately 58% of the total variance in the Processes of Change values is accounted for by the chance.

Table 4. *Pairwise comparison of the Processes of Change Values between Study and Control Groups*

Pairwise Comparisons						
Measure: MEASURE_1						
(I) POC Study	(J) POC Study	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	-43.347*	1.986	.000	-48.216	-38.478
	3	-57.000*	2.846	.000	-63.979	-50.021
2	1	43.347*	1.986	.000	38.478	48.216
	3	-13.653*	1.626	.000	-17.639	-9.667
3	1	57.000*	2.846	.000	50.021	63.979
	2	13.653*	1.626	.000	9.667	17.639
Measure: MEASURE_1						
(I) POC Control	(J) POC Control	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	16.403*	1.593	.000	12.496	20.309
	3	17.597*	1.747	.000	13.314	21.881
2	1	-16.403*	1.593	.000	-20.309	-12.496
	3	1.194*	.479	.045	.019	2.370
3	1	-17.597*	1.747	.000	-21.881	-13.314
	2	-1.194*	.479	.045	-2.370	-.019

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Participants' Processes of Change in the study group in the pretest time statistically differ from such POC in the posttest I (p = .001) and posttest II (p = .000). Such POC in the posttest I statistically differ from these in the pretest time (p = .001) and posttest II (p = .000). Such POC in the posttest II statistically differ from these in the pretest time and these in the posttest I (p = .000) and (p = .000).

For the control group, the POC in the pretest time statistically differ from such POC in the posttest I (p = .011) and these in the posttest II (p = 0.000). Such POC in the posttest statistically differ from these in the pretest time (p = .000) and posttest II (p = .045). Ultimately, such POC in the posttest II statistically differ from these in the pretest time (p = 0.000) and these in the posttest I (p = .045).

Discussion of the Study Results

There was a noticeable increase with a significant difference in the value the Processes of Change over time for study group, with. The omnibus effect was .836, meaning that the administered intervention made 83% differences of the overall variance in the Processes of Change. The TTM-based Stage-matched intervention had an invariant, consistent effect across time. These findings are supported by Pirzadeh et al. (2015) who found that the processes of change exhibited a significant increase at 3 months and 6 months post-intervention compared to the pre-intervention period (P < 0.001). [25] These findings are supported by Baysal et al. (2017) who reported that the Processes of Change mean scores were low at pre-test for experimental group, showed significant improvement over repeated assessments. These scores increased notably from the precontemplation stage to the maintenance stage, with statistically significant differences observed between measurements. [26] These findings are supported by Masoudy et al. (2022)who found that after intervention participants in the experimental group exhibited a significant increase in mean scores for both cognitive and behavioral processes of change compared to those in the control group. [27]

There were significant differences the values Processes of Change of physical exercise for the control group. The omnibus effect was .584, which reflects that around 58% of the variance in the Processes of Change values is attributed to by the chance in that this difference originated from the fluctuation occurred in this value

over time. This result goes in line with that of Pirzadeh et al. (2015) who found that the values of the Processes of Change of physical exercise for the control group significant difference that this difference originated from the fluctuation occurred in this value over time. [25] This result goes in line with that of Motlagh et al. (2017) who reported that there was Significant differences in the processes of change over time were observed in the control group, with a notable increase at 6 months post-intervention compared to 3 months post-intervention. [28] This result goes in line with that of Jeihooni et al.2018 who found that the mean score of change processes significant difference in the control group. [29] This finding is inconsistent with that obtained by Baysal et al. (2017) who found that the Processes of Change mean scores were low at pre-test for control group, it significantly increases at the posttest. [26]

Conclusions

Participants were effectively moved from lower to higher Stages of Change using the TTM Stage-matched intervention. Using more POC, the TTM Stage-matched intervention improved students' progress to higher SOC. It is advised that graduate programs in Iraq include Stage-Matched Intervention Based on the TTM in their curricula, that graduate students be encouraged to use theory-based studies in their future proposed research, and that community health nurses in Iraq undertake comparable studies in a variety of settings.

Implications

The current study came up with some implications for public health including the following: This Stage-matched interventional study significantly improved students' readiness to engage in regular physical exercise compared to non-stage-matched interventional studies.

Recommendations

Further studies that employ Stage-matched intervention that seek to enhance engaging in regular physical exercise need to be conducted by other researchers either inside or outside Iraq.

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