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Flow for Exercise Adherence: Testing an Intrinsic Model of Health Behavior

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Background: Health behavior theory generally does not include intrinsic motivation as a determinate of health practices. **Purpose:** The purpose of this study was to test the flow theory of exercise adherence. Flow theory posits that exercise can be intrinsically rewarding if the experiences of self/time transcendence and control/mastery are achieved during performance. It was hypothesized that higher levels of flow during exercise would be associated with exercise adherence rates. **Methods:** Expert panel review, test–retest, and factor analysis were used to establish the reliability and validity of a Flow for Exercise Adherence Scale. Free-living exercise among 445 young adults (age range 19–29) was tracked for 4 weeks to test the scale. **Results:** Flow scale scores differentiated between stages of change for exercise as theorized. Flow scale scores were significantly correlated with days of vigorous physical activity for subjects in the maintenance ($r = 0.52$) and action ($r = 0.31$) stages. **Discussion:** The results of this study are consistent with flow theory. Intrinsic motivation can be an important factor in free-living exercise adherence. **Translation to Health Education Practice:** Health educators may enhance program effectiveness by using flow theory to focus on intrinsic motivations for the target health behavior.

BACKGROUND

Many health practices need to be consistently performed over long periods of time to promote health and/or prevent disease. Promoting long-term adherence to health practices is a fundamental challenge for health educators. Models and theories of human behavior have been employed in an attempt to increase adherence to many health practices.[1] In order to promote health behavior adherence, some theories emphasize health-related motivations (disease avoidance) and other theories focus on a broad base of social motivations. A growing trend is to employ comprehensive ecological models that emphasize the individual in an environmental context. Generally overlooked in health behavior theory are motivations intrinsic to the health behavior itself.

Flow is a concept first described by Dr. Csikszentmihalyi.[2] He identified flow as an optimal experience occurring from a deep involvement in a self-chosen activity. The heightened concentration required by the activity results in a reduction in ego awareness and time consciousness. The flow experience is facilitated by being fully immersed in a level of activity that challenges the skill level of the participant. Athletes have often reported flow experiences when placed in challenging, competitive situations. Studies by Dr. Csikszentmihalyi revealed that flow is not limited to athletes; it can be produced by participation in a wide variety of activities. Research has identified individuals who experience flow in artistic, occupational, and recreational settings.[3] Regardless of the setting, there is a tendency for some people to seek out activities that produce flow. The

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mental changes associated with flow are reinforcing, encouraging the individual to want to engage in flow producing activities regularly.

Flow theory has emerged as an effort to explain why individuals consistently engage in practices for their own sake. It is hypothesized that the flow experience creates a foundation for long-term adherence. This foundation is grounded in rewards directly derived from the practice of the target behavior. The strength of intrinsic motivation is proportional to the degree to which the target activity promotes a flow experience. According to Dr. Csikszentmihalyi, flow is a state of mind when consciousness is harmoniously ordered and focused on the execution of an activity.[3] Flow is characterized by deep immersion in the performance of a behavior. During flow, a person's attention is so completely focused on the activity that awareness of self and the environment is reduced, resulting in a reduction self-conscious cognitions. Perception of time is often altered. Time may be transcended or "forgotten," potentially reducing perceptions of boredom. In other cases, time can be perceived as slowing down or passing quickly. During flow experiences, people often report a sense of elevated control or mastery. These perceptions are promoted by activities that provide adequate challenge and produce a sense of accomplishment. Insufficient challenge will produce boredom and loss of interest, whereas overwhelming challenge can often lead to anxiety and frustration. In cases of insufficient or overwhelming challenge, flow theory would hypothesize low intrinsic rewards and poor adherence. Taken together these characteristics create the autotelic experience: an enjoyable event of intrinsic worth. A review of the literature did not reveal studies examining the relationship between flow and adherence to vigorous physical activity.

The promotion of exercise adherence remains an important and difficult challenge for health educators. Regular physical activity (PA) reduces the risk of premature death and disability. In the United States, estimates of the annual cost of sedentary behavior on lives lost range from 200 000 to 300 000 per year.[4] Medical care costs due to inactivity are estimated at 76 billion dollars annually.[5] In contrast, a physically activity lifestyle can enhance fitness, vigor, and productivity.[6] Despite this evidence, PA rates of Americans are in decline.[7] Transportation, occupational, and home-related PA demands have all declined in the past 50 years. Only about 25% of adults report adequate leisure time PA.[8] The only increase identified in the past 50 years was in time spent in sedentary activities. There is a clear need for coordinated health promotion efforts to increase planned exercise to counterbalance increasingly inactive lifestyles. The low rates of PA have sparked the need to identify determinants to facilitate the development of effective interventions. Lack of time, poor weather, self-consciousness, and boredom are often cited as barriers to PA adherence.[9-11] Though many potential determinants of exercise have been examined, little attention has been given to potential intrinsic reinforcements of exercise.

PURPOSE

The flow experience is a positive state of mind produced by engagement in an activity that is self-reinforcing. Flow may be a factor in adherence to regular exercise participation. The purpose of this study was to test the flow theory of exercise adherence. The first step was to develop an instrument to measure flow for exercise adherence. Instrument development procedures will be used to establish the validity and reliability of the instrument. The flow instrument will be tested as a determinant of exercise adherence measured prospectively over a period of 4 weeks. The relationship between flow scores and exercise bouts will be examined by exercise stage of change.

METHODS

Item development began by establishing operational definitions for each of the 2 dimensions of flow believed to be most consistent with exercise adherence. *Focus* was defined as "high level concentration on the exercise task characterized by perceptions of power, control, accomplishment and reduced concern for factors outside the exercise experience." *Self-transcendence* was defined as "a reduction of thoughts about self during exercise characterized by reduced awareness of time and effort." These definitions were then used to construct a pool of 14 items. The items were reviewed by an expert panel of judges for both content and face validity. The panel consisted of 3 judges who were all familiar with the original work of Dr. Csikszentmihalyi and the exercise adherence literature. Items were rated for their goodness-of-fit to the 2 defined dimensions of focus and self-transcendence. At stages 1 and 2, reviewers would propose item word changes that were accepted or rejected by the other judges. Three rounds of panel review were needed to establish consensus for face and content validity. The items were pilot tested on 120 subjects from general health classes at a large Midwestern university. Students were able to give written feedback on any question they did not understand or wording that was unclear. Again the panel of experts reviewed the few wording changes proposed by the students.

The 7-day recall instrument developed by Petosa et al.[12] was used to measure exercise adherence. This scale was chosen for this study because it produces more detailed, valid results than most self-report scales of exercise. It is designed to measure bouts of vigorous exercise in terms of mode, duration, and day of the week. The American College of Sports Medicine policy on exercise to promote

cardiorespiratory fitness and body composition serves as the definition of vigorous exercise.[13] The scale defines *vigorous exercise* as planned physical activity done to enhance health/fitness that is continuous for 20 min or longer, during which the heart beats rapidly, breathing is rapid and deep, and a conversation is challenging. Examples provided on the scale include running, swimming laps, aerobic classes, and cycling over 10 mph. Subjects record duration and mode of each bout of exercise for each of the previous 7 days. A 3-round expert panel review process established the face and content validity. The correlation between daily diaries and the 7-day recall was 0.72. Test–retest reliability over a week was $r = 0.58$ for free living and $r = 0.72$ for supervised physical activity.

Exercise stage of change was measured using a 5-item instrument designed by Marcus and Simkin.[13] This instrument categorizes participants into one of 5 stages based on the stage of change model, which include precontemplation, contemplation, preparation, action, and maintenance. Validity and reliability have been previously established for this instrument. Again, this instrument produces more valid results than competing instruments that assess stage of change.

Students age 19 to 28 ($N = 445$) enrolled in general studies courses at a large Midwestern University served as subjects for the study. Fifty-four percent of the subjects were female and 88% reported being white. Participation in the study was voluntary and no course credit was provided. The courses were lecture based and did not require any form of physical activity. During the first week of the study participants completed consent forms, the Flow of Exercise Assessment Scale, and the Stage of Change for Exercise Scale. One week later the subjects again completed the flow scale and a 7-day recall of exercise. For 3 additional weeks students completed the 7-day recall of physical exercise. This procedure enabled tests of one-week test–retest stability of the flow instrument as well as the ability of the flow instrument to explain variance in 4 weeks of exercise data. Research procedures were reviewed and approved by The Ohio State University institutional review board.

Statistical analyses consisted of confirmatory factor analysis and correlation and linear regression using SPSS. Confirmatory factor analysis was used to examine a priori item–scale structure. If the solution is well defined and matches the targeted theory constructs, the scale is judged to have construct validity. Pearson product moment correlation analysis was used to examine the relationships between FEAS scores and days of vigorous exercise over 4 weeks by stage of change for exercise.

RESULTS

Confirmatory factor analysis using principal components analysis extraction was run to verify the factors in the instrument. Only items that loaded with eigenvalues greater than 2 were retained. The analysis revealed a 2-factor solution. The factor focus had an eigenvalue of 4.93 and accounted for 49.3% of the variance in FEAS scores. The factor self-transcendence had an eigenvalue of 2.49 and accounted for 24.9% of the variability in FEAS scores. Together the cumulative explained variability was 74.2%. Table 1 presents the 2-factor solution for the instrument; all item factor loadings were greater than 0.7. It is important to note that all items correlated positively with items within the factor and negatively with items in the other factor, lending credibility to the uniqueness of the 2 separate factors.

Internal reliability of the instrument was explored using coefficient alpha. The removal of any item decreased the overall reliability of the instrument as a whole, thus confirming the contribution of each item to overall reliability. The Focus subscale produced a coefficient alpha of .91. The Self-Transcendence subscale yielded a coefficient alpha of .96. The coefficient alpha of the total 10-item instrument was .80. One week test–retest stability for each subscale produced Pearson correlation coefficients of $r = .81$ for Focus and $r = .78$ for Self-Transcendence.

Table 2 presents scores on the FEAS, mean days of exercise, and FEAS correlations with exercise across the 5 stages of change for exercise. As predicted by flow theory, the FEAS scores increased with each stage from precontemplation to maintenance. The mean days of vigorous exercise across the 4-week measurement period were consistent with the stage of change model. The mean of 0.4 days would be expected in the precontemplation group. Exercise in this group was generally opportunistic and inconsistent, prompted by forces outside the individual's intention. As hypothesized, these subjects reported lower FEAS scores. Consistent with the stage of change model, mean days of exercise increased across all of the stages to a mean of 4.28 for the maintenance stage. It is important to note that the mean of 4.28 days of exercise was over 4 weeks. Had subjects at the maintenance stage met

TABLE 1
Confirmatory Factor Analysis for the Flow for Exercise Adherence Scale Item Loading for 2-Factor Solution[a]

FEAS Items	*Factors*	
During exercise I ...	1	2
feel a sense of accomplishment.	0.722	−0.286
am able to concentrate better than normal.	0.795	−0.277
tend to forget daily worries and frustrations.	0.766	−0.270
feel a sense of power.	0.741	−0.203
feel a sense of control.	0.799	−0.266
am able to concentrate well.	0.754	−0.242
feel my consciousness is altered.	−0.184	0.746
tend to lose track of time	−0.345	0.747
feel a sense of "flow" or being in "the zone."	−0.303	0.854
feel a sense of effortlessness.	−0.258	0.878

[a] Extraction method: principal component analysis.

TABLE 2
Mean for Days of Exercise, FEAS Scores, FEAS Correlations With Days of Vigorous Exercise by Exercise Stage of Change

	Stages of Change for Exercise				
	Precontemplation	*Contemplation*	*Preparation*	*Action*	*Maintenance*
Mean days exercise over 28 days	0.40	1.12	1.82	2.84	4.28
Focus subscale	10.1	18.8	22.6	25.6	25.3
Transcendence subscale	6.7	10.9	12.9	15.6	19.3
FEAS score	16.8	28.7	35.6	41.2	44.6
FEAS correlation with days/exercise	0.08	0.12	0.19	0.31*	0.52*

Abbreviation: FEAS, Flow of Exercise Assessment Scale.
*$P < .001$.

American College of Sports Medicine recommendations of a minimum of 3 days a week the mean would have been 12 days. The correlations between the FEAS scores and days of exercise were consistent with flow theory. The correlations erre very low at the precomtemplation and contemplation stages, increased across stages, and were statistically significant at the action stage ($r = 0.31$) and the maintenance stage ($r = 0.52$).

DISCUSSION

The results need to be considered in the context of the limitations of this study. A nonrandom, convenience sample was used. Although the large cross-sectional sample used in this study is generally representative of students taking a general studies lecture course, caution should be used in generalizing the results to other college student populations. This study also relied upon a self-report instrument of exercise. Currently there is no gold standard for the measurement of exercise. Though the 7-day recall has established validity and reliability, caution should be taken in interpretation of results. In the context of these limitations, this study produced preliminary evidence that the FEAS instrument is a valid and reliable measure of flow for exercise adherence. A multistage expert panel review established the face and content validity of the scale. The confirmatory factor analysis verified the 2-factor structure of the instrument after dropping 4 items with factor loadings less than 0.7. As predicted by flow theory, FEAS scores were significantly correlated with reported days of exercise over 4 weeks. For subjects at the maintenance stage of change, the correlation was higher ($r = 0.52$) than at the action stage ($r = 0.31$). These results are preliminary evidence that the FEAS possesses predictive validity for exercise adherence among young adults. This study should be replicated using designs that allow researchers to track subjects over longer periods of time to determine whether FEAS scores are associated with exercise adherence for 6 to 12 months.

Future research is needed to assess the FEAS instrument's usefulness and sensitivity for detecting changes in flow during exercise produced by interventions. Flow theory suggests that participants can be trained to experience flow during physical activity. Further, such skill would establish a base of intrinsic motivation for exercise that would support long-term adherence. Though this hypothesis is intriguing, it remains to be tested. First intervention studies would need to establish that flow for exercise is a skill that can be systematically taught to a large portion of program participants and thus is a modifiable factor. Conversely, it is possible that only a percentage of the population is prone to flow states during exercise. If this is the case, flow may be a useful approach to promoting exercise adherence for a segment of the population, but only as one part of a more comprehensive approach. Second, intervention studies would need to establish that FEAS scores can be increased in educational settings. The critical question is "Can flow experience be taught?" If it can be taught, do increased FEAS scores produced through instruction predict increased levels of adherence? FEAS score increases mediating improvements in exercise adherence would be a clear advance in the exercise promotion literature.[14] This evidence is needed to support the hypothesis that flow is a causal determinant of exercise adherence.

TRANSLATION TO HEALTH EDUCATION PRACTICE

Physical activity adherence is a challenge; it requires a substantial investment of time and physical effort on the part of individuals. People consistently report significant barriers, including lack of time, boredom, and self-consciousness. This study presented preliminary evidence that flow theory may be useful in the promotion of physical activity adherence in young adults. Flow theory posits that there are identifiable attributes of the flow experience that promote the autotelic experience: an enjoyable physical activity experience producing intrinsic rewards. Rewards inherent in the activity can be an important foundation for adherence.

Based on flow theory, health educators would pay particular attention to the personal tailoring of the personal

physical activity experience. Instructional interventions would be designed to help participants identify activities that enhance perceptions of flow. Students would be encouraged to be mindful of the attributes of flow: challenge, engagement, focus when exercising. Exercise experiences should be designed to provide challenge and a personal sense of accomplishment. Exercise activities should focus on the experience of exercise and less on fitness results. Concepts of mastery and progression should be employed to avoid overwhelming a person's skill or fitness level. Efforts should be made to reduce self-conscious thought during exercise bouts. Students should be trained to be mindful of the experience of flow and how to shape the exercise experience to increase the likelihood of flow. Process evaluation methods could use the FEAS to track participant progress in experiencing flow during exercise. Impact evaluations could then test whether progress in FEAS scores during the intervention supports increased exercise adherence after the intervention. Other studies may want to examine the importance of flow theory to other health-related practices. How many health practices can be tailored to become autotelic experiences: enjoyable, self-reinforcing behaviors of intrinsic worth?

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