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Life Happiness of Women through Exercise Intervention

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Departmental Honors Thesis

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Abstract

The American College of Sports Medicine recommends for individuals to exercise for at least 150 minutes of moderate intensity per week. Women in the United States are less likely to engage in the recommended amount of physical activity per week of exercise than men. Supported by past research, there is a positive correlation with amount of exercise and happiness in both men and women. It comes as no surprise with the lack of exercise that individuals partake in the United States, then, that the World Happiness Report ranked United States as only being the 15th happiest country. Considering existing research that has demonstrated that exercise can improve overall well-being, we explored the motivation to exercise, as well as the impact of an exercise intervention on an individuals' happiness. Each participant was randomly assigned to one of 3 conditions that dictated what aspects of exercise to focus on; psychological, physiological, or self-guided. Our results showed that there was a main effect of time with exercise but there was not significant difference between condition in measures of exercise. There was also no significant main effect of time, or condition, or an interaction between any measure of happiness (overall psychological needs and vitality measures). As such, the study has not come to final conclusions that guiding women to focus on a particular aspect of exercise can increase their tendency to exercise to lead to an increase in happiness.

Keywords: Exercise, Life Happiness, Women, Sedentary, Physical Activity, Vitality, Self-

Determination Theory

Introduction

On average, women and men collectively do not engage in the proper amount of aerobic physical activity that is recommended by the American College of Sports Medicine (ACSM).

^{1 2} The ACSM recommends a minimum of 30 minutes of moderate aerobic physical activity five days a week, for a cumulative total of 150 minutes weekly. Men are more likely than women of the same age to meet this recommendation of physical activity suggested by the ACSM, but there is little evidence to explain why this discrepancy occurs between genders.³ Meanwhile, there is ever-mounting evidence suggesting that exercise can increase overall life satisfaction and quality of life.⁴ Life satisfaction, as defined by the *World Happiness Report (WHR)*, is a state of subjective well-being or, in other words, “happiness.”⁵ Research showing that exercise can increase overall life satisfaction and quality of life, suggests the need for further investigation into how exercise can increase happiness more efficiently by focusing either on the psychological or physiological aspects of physical activity.

The benefits of engaging in consistent aerobic exercise are not restricted to increasing life happiness however; benefits can manifest themselves throughout many facets of life. These benefits include but are not limited to: improved psychological health,^{6 7 8} neurocognitive function^{9 10 11} and sleep, increased energy, and improved general cardiovascular function.^{12 13 14} Psychological health benefits include less perceived stress and more energy, fewer symptoms of anxiety and depression, and lower instances of depression.^{6 7 8} Benefits to neurocognitive function include increased brain volume, general neuroprotective function, enhanced attention and processing speed, executive function, and memory.^{9 10 11} Improved cardiovascular function can enhance wound healing rates among healthy older adults and overall bone health, aid in prevention

of chronic diseases (e.g. diabetes, hypertension, cardiovascular disease, and obesity), reduce risk of upper-respiratory tract infection, and improve weight management.^{12 13 14}

In order to reap the benefits of physical activity, individuals must adhere to the recommended guidelines given by the ACSM. However, previous research has suggested that only about 50 percent of individuals who begin a new physical activity program will maintain it for more than 6 months and reap the long term benefits of physical activity.^{15 16} Thus far, research has not revealed an effective motivator for all individuals to continue to engage in exercise past the 6-month mark. In the past, the ACSM has had health campaigns such as the “exercise is medicine” initiative to improve physical activity primarily within middle-aged women; middle age women being the least likely to engage in the recommended amount of physical activity. These health campaigns have not been successful in increasing the number of women exercising or prompting women to maintain exercise habits into the long term. Instead, as determined by Segar et al. (2011), it might be a more successful strategy to focus on the immediate benefits of engaging in physical activity, such as the improvement of life happiness or quality of life instead of weight management or health benefits.¹⁷ Segar et al. (2011) found that women who value physical activity for the weight and health benefits of exercise are less likely to remain physically active than women who value physical activity for the quality of life benefit. It is speculated by Segar et al. (2011) that the lack of continued motivation can be due to an individual reaching a plateau of exercise levels and body weight. By uncovering whether focusing upon psychological or physiological aspects of physical activity while increasing physical activity participation will differentially improve well-being, additional research can further help all people reap the other benefits of maintained physical activity.

Life Happiness

Life happiness can be improved through meaningful relationships, increased physical activity, and positive emotions; and this improved life happiness in turn results in a longer life expectancy, more positive and fulfilling relationships, and more productive work.^{18 19 20 21 22 23} Many of the benefits of life happiness are consistent with aspirations of the American culture. However, the United States of America was only ranked the 15th happiest country in the world by the WHR in 2012-2014.²⁴ The score given by the WHR of the United States has, in fact, decreased from the 2005-2007 period to the 2012-2014 period. This inconsistency between American values and measured life satisfaction of the American population could be due to the large inactivity among the American population, which our study has attempted to address.

In this study, happiness was operationally defined using constructs from two domains. The first is Self-determination theory (SDT) which is defined as an approach to an individual's motivation in day-to-day life, the development of one's goals, and wellness.²⁵ There are three critical psychological needs that must be met according to SDT: autonomy, competence, and relatedness. Autonomy has been defined by the self-determination theory as the freedom of choice for oneself or for an individual to be in agreement with one's unified self. Although many perceive it to be so, autonomy does not refer to being independent of others.²⁶ Competence is defined as being able to seek control of an outcome and experience mastery of a task at hand.²⁷ Relatedness is defined best as the universal need and desire to interact with, experience caring from, and be emotionally connected to other individuals.²⁸

In addition to the basic psychological needs, SDT also highlights the importance of vitality as a key component of happiness. Vitality can be defined as a positive feeling of being full of energy and "feeling alive".²⁹ Vitality has been hypothesized to be linked with overall well-being

and energy that is available for oneself. Therefore, vitality can be used as an additional measure of happiness.

To investigate the benefits of focusing on different aspects of physical activity we created a randomized controlled study. Participants were randomly assigned to one of three conditions: control (self-directed focus), performance self-monitoring (physiological focus), and affective response to physical activity self-monitoring (psychological focus). During the first visit, the participants met with a research assistant, completed pre-intervention surveys, and were instructed to engage in at least 150 minutes of moderate intensity exercise per week for the next 30 days. The participants' physical activity was recorded and tracked by the use of a heart rate monitor (Polar FT60, USA). After the 30 days, the participants came in again to meet with the research assistant to address how the participant felt that the last 30 days went in regards to exercise, and completed post-intervention surveys. The main hypothesis of this study is that there will be a condition by exercise interaction, such that participants who increase their exercise behavior in the psychological focus condition will experience greater benefits in happiness (autonomy, competence, relatedness, and vitality).

METHODS

Participants:

Participants incorporated in the current analysis were a sample of women recruited to participate in a 12-month long exercise intervention randomized control trial (PIs: Courtney Stevens and Angela Bryan 13-0183) to measure the effects of self-monitoring on physical activity

behavior and effects of self-monitoring content on physical activity behavior at 1, 3, 6, 9 and 12 months. The data used for analyses was taken from the initial visit (Baseline) and 1-month time points.

A total of 80 women between the ages of 21-65 were recruited in Boulder, Colorado. In order to participate, these women had to be staying in, or residents of Boulder for the following month, have internet access daily for one month and they had to be insufficiently active for the last six months. Insufficient activity is measured by the ACSM guideline for cardio respiratory exercise, which defines that all healthy adults should take part in a minimum of 150 minutes per week of moderate intensity exercise or 75 minutes of per week of high-intensity exercise or a combination of the two. Participants also had to be physically capable of engaging in moderate-intensity physical activity, and willing to be randomly assigned to a condition. Individuals were not eligible to participate if they reported any of the following; diabetic or receiving treatments for a metabolic disorder, currently pregnant, undergoing treatments for cancer of any type, currently taking antipsychotic medications or receiving behavioral psychotherapy treatments for any psychiatric and/or neurological disorder, receiving treatment for alcohol or drug abuse, have a history of cardiac respiratory disease, receiving treatment for a heart condition or high blood pressure, experience chest pains during and/or not during physical activity, or have a muscle, bone, or joint problem or injury that limits movement, makes exercise painful or could become worse by exercising.

The mean participant age was 39, and the median age was 39. Demographics (race, household income, relationship status, education level and employment status) are listed in Table 1.

Experimental Design:

Exercise intervention-training conditions. There were three different conditions that each participant can be randomly assigned to before the start of the baseline visit. The three conditions are performance self-monitoring in which participant received “standard exercise recommendation education” (EDUC), affective response to physical activity self-monitoring in which participants got training in “mindful awareness and values clarity skills building” (MAVC) and “self-directed exercise” (Control).

The participants within the EDUC condition was given a pre-intervention workshop focused on exercise, health and performance and were asked to record, in daily surveys, information that is physiological in nature and related to the health and weight control benefits of engaging in physical activity surveys during the 30-day physical intervention. The participants within this condition were told during the baseline session, *“the research team is interested in testing the effectiveness of an approach that emphasizes the relationship of several areas of health and wellness at helping you start an exercise program and enhance your ability to stay committed to your exercise routine over time. One of the ways we think you might learn to be more committed to exercise is by increasing your awareness of performance-based outcomes of your workouts,”* to open a discussion with the research assistant regarding what the participant is expected to focus on during the 30-day physical intervention. The manual that was used for this workshop session was comprised of educational information from publications and national agencies such as, the Trust for America’s Health, ACSM, CDC, and USDHHS. Topics also included in the workshop sessions were healthy cooking to support an active lifestyle, exercise as stress management and

mood regulation, guidelines for sun protection when exercising outdoors, and the bidirectional relationship between quality sleep and maintaining an active lifestyle.

The MAVC condition was given a pre-intervention workshop grounded in “mindful awareness and values clarity skills building”.³⁰ Participants were asked to record, in daily surveys, information that is psychological in nature and relevant to aspects of quality of life that is impacted by engaging physical activity during the 30-day physical intervention. The participants within this condition were told during the baseline session, “*The research team is interested in testing an approach that will teach you skills you can use to help you overcome common barriers associated with starting an exercise program and enhance your ability to stay committed to your exercise routine over time. One of the ways we think you might learn to be more committed to exercise is by increasing your awareness of how exercise influences your mood,*” to open a discussion with the research assistant regarding what the participant is expected to focus on during the 30-day physical intervention. The manual that was used for each workshop session was adapted from (1) Burtryn and Forman’s PACT Workshop Manual for an Acceptance Based Behavioral Intervention to Promote Physical Activity and (2) Burtryn & Forman’s IMPACT Treatment Manual for an Acceptance Based Behavioral Intervention to Promote Physical Activity During Weight Loss Maintenance.⁴⁰ These two manuals were used to help the participant develop psychological acceptance of exercise related thoughts and feeling states, become more mindful and aware of their exercise and related experiences, and strengthen their commitment to exercise-related values.

The control condition participants did not receive any pre-intervention workshop during the baseline session and were only asked to record, in daily surveys, the types and duration of physical activity during the 30-day physical intervention.

The participants within all conditions were also told, “*prior research shows that when people keep track of how often they exercise, they tend to exercise more frequently,*” to open a discussion with the research assistant regarding the expectations of completing the daily surveys and to be more aware of their difference in activity is from the days they exercise to their rest days.

Exercise Training Prescription. The physical activity prescription is based on national guidelines (i.e., ACSM) and is determined individually based on on percentage of heart rate reserve (HRR), $HR_{max} - HR_{at\ rest}$.^{15 31 32 33 34 35} Heart rate max was estimated for each participant using an established formula $206 - (.88 \times age)$.³⁶ Moderate intensity was considered within the range of 40-59% HRR and high intensity was considered 60-89%. Once the different levels of intensity of exercise were explained, the participants were told that their goal during the 30-day exercise intervention period was to reach at least 150 minutes of moderate intensity exercise per week by the end of the intervention, as recommended by the ACSM.

Procedures:

After participants were deemed eligible to participate in the study, the first session that they attended was the baseline session. The baseline session was run by a research assistant and included informed consent, baseline survey on a computer, interview regarding current physical activity, measure of resting heart rate, how to use the study-issued heart rate monitor along with the online daily exercise surveys to be completed during the 30-day exercise intervention, and an explanation of the 30-day exercise intervention and their physical activity prescription.

Within the pre-intervention workshop in the MAVC and EDUC conditions the participants met one-on-one with a workshop leader, a graduate student studying clinical psychology. The

workshop was recorded entirely to ensure the workshop content is being delivered consistently among all workshop leaders, and that the content matches the assigned experimental condition.

After the baseline session the participants were expected to complete their exercise prescriptions on their own for the next 30 days. By telling participants to wear the heart rate monitor while they were engaging in any type of exercise of the participant's choosing, we were able to collect objective data on exercise performed during the 30-day period (Polar FT60, USA). Participants were also expected to fill out daily surveys pertinent to their physical activity that day. The control condition participants were asked, "Did you exercise today?" and if answered "yes" it would lead to the question, "What type of exercise did you do and for how long?". The EDUC condition participants were asked the same questions as the control condition as well as questions concerning numbers of calories burned, % effort, and distance traveled. The MAVC condition participants were asked the same questions as the control condition as well as the extent to which they were feeling pride, guilt, and commitment. These surveys were filled out everyday and the research team made sure that the participants were filling the surveys out regularly. If they were not, the participants were emailed to remind them how important it was to fill out surveys.

After the 30-day period of exercise the participant returned the heart rate monitor and either met with a research assistant in the control condition, or a work-shop leader in the MAVC and EDUC conditions, to complete an intervention-exit meeting (1 Month). All participants completed a post-intervention survey that is similar to the survey from the pre-invention but included questions how the participants felt about the program overall. Only the participants within the MAVC and EDUC received an additional workshop that briefly reviewed the ideas that were presented in the pre-intervention workshop.

Once the post-intervention workshop was completed the participants were no longer asked to complete surveys daily and not given any specific prescription for exercise behavior for the remainder of their participation in the study.

Measures:

The Basic Psychological Needs Scale assessed the concepts of the self-determination theory. The scale addresses psychological needs and satisfaction in an individual's life. Three subscales were used as follows; competence, autonomy, and relatedness.³⁷ Basic Psychological Needs Scale (Needs)^{38 39 40} is a twenty-one item scale with the autonomy subscale being a seven item scale, the competence subscale being a six item scale and the relatedness subscale being a nine item scale. A sample item from the autonomy subscale is "I feel like I am free to decide for myself how to live my life", a sample item from the competence subscale is "People I know tell me I am good at what I do", a sample item from the relatedness subscale is "I really like the people I interact with" which the participant can respond to each question from a range of "Not true at all", "Somewhat true", and "Very true". The mean of these 21 items was the measure of overall psychological needs being met within the participant. The coefficient alpha for the full basic psychological needs scale at Baseline is .884 for the autonomy subscale the coefficient alpha at Baseline is .718, , for the competence subscale the coefficient alpha at Baseline is .773, and for the relatedness subscale the coefficient alpha at Baseline is .766.

The Subjective Vitality Scale (Vitality)^{41 42 43} was used as to measure the energy that is available for one self, which is considered to be a large aspect of what it means to be fully

functioning and psychologically well.¹ Subjective Vitality Scales is a seven item scale. A sample item is “I have energy and spirit” which the participant can respond from a range of “Not true at all”, “Somewhat true”, and “Very true”. The mean of these seven items was the measure of vitality. But as supported by past research, if question two is removed from analysis, the coefficient alpha will increase. This is thought to be due to where question two is the only item that is in a negative form, it is stated as, “I don’t feel very energetic”. The coefficient alpha for the scale at Baseline is .905.

Exercise behavior was measure with the Aerobic Exercise Questionnaire (AEQ), a 3-item measure that specifically asks about voluntary aerobic activity of moderate or vigorous intensity.⁴⁴ Before answering questions, participants were reminded that the definition of aerobic activity in the current context was “any activity that uses large muscle groups, is done for at least 20 minutes each time, and is done at a level that causes your breathing to be heavy and your heart to beat faster. Examples are running, swimming, bicycling, basketball.” Participants then indicated how often they had engaged in aerobic activity in the past three months (on a 1=never to 7=often scale), the average number of days per week they engaged in aerobic exercise in the past three months (0 days to 7 days), and the number of days they engaged in aerobic exercise in the past week (0 days to 7 days). The mean of these three items was the measure of exercise behavior, coefficient alpha was .877

Compensation was given for the first visit of \$15. At the second visit, after completion of the 30-day program, compensation ranged from \$15 to \$45 (\$15 plus \$1 for every day of completion of an online survey during the 30-day program). At the 3-month follow-up participants received a \$10 Amazon gift card.

Results

Analysis Overview

The main hypothesis was that there would be a condition by exercise interaction, such that participants who increase their exercise behavior in the MAVC condition will experience greater benefits in happiness (autonomy, competence, relatedness, and vitality) than participants who increase their exercise in the EDUC or control conditions. For descriptive purposes, the first analysis was a 3 X 2 mixed design ANOVA, where condition (MAVC, EDUC or control) is the between subjects variable, and exercise over time (baseline, 30 days) is the within subjects variable. This analysis presents the change in exercise over time by condition.

The second analysis was a 3 X 2 mixed design ANOVA, where condition (MAVC, EDUC or control) is the between subjects variable, and happiness measures over time (baseline, 30 days) is the within subjects variable. This analysis presents the change in happiness over time by condition.

The third and last analysis is a series of correlations where differences of exercise amount reported from Baseline to 1 month were compared to the differences of happiness measures reported from Baseline to 1 month. This analysis was used to examine the relationship between changes exercise amount and changes in happiness reported.

Changes in Exercise by Condition

There was no main effect of condition ($F(2, 68) = .551, p > .05$). The main effect time was significant ($F(1, 68) = 98.26, p < .001$), indicating that participants increased their exercise from baseline to 30 days. The interaction of time and condition was also significant ($F(2, 68) = 1.49, p < .005$). As can be seen in Figure 1, participants in the control condition increased their exercise more than those in the other two conditions.

Changes in Happiness by Time

Overall needs satisfaction

There was no effect of condition on overall needs satisfaction ($F(2, 67) = .244, p > .05$). There was no significant main effect of time ($F(1, 67) = .408, p > .05$) indicating that participants showed no change their needs satisfaction from baseline to 30 days. The interaction of time and condition was not significant ($F(2, 67) = .852, p > .05$); see Figure 2

Autonomy

As with overall needs satisfaction, there was no effect of condition on autonomy ($F(2, 67) = .260, p > .05$). There was also no main effect of time ($F(1, 67) = .768, p > .05$) and no interaction of time and condition ($F(2, 67) = .149, p > .05$); see Figure 3

Competence

There was no main effect of condition ($F(2, 67) = .056, p > .05$), no main effect of time ($F(1, 67) = .941, p > .05$), and no interaction of time and condition ($F(2, 67) = .887, p > .05$); see Figure 4.

Relatedness

There was no main effect of condition ($F(2, 67) = .079, p > .05$) and no main effect of time ($F(1, 67) = .525, p > .05$) on relatedness. There was also no significant time by condition interaction ($F(2, 67) = .567, p > .05$); see Figure 5.

Vitality

There was no main effect of condition ($F(2, 67) = 1.009, p > .05$) or of time ($F(1, 67) = 2.472, p > .05$) on vitality. The interaction of vitality and condition was approaching significance, ($F(2, 67) = 2.498, p = .09$) such that the control and MAVC condition increased in vitality while the EDUC participants decreased; see Figure 6.

Relationships between Change in Exercise and Change in Happiness

Correlations between change in exercise and change in happiness measures can be seen Table 2. Though none of the correlations reached traditional levels of statistical significance, there

was a small to moderate size correlation between change in exercise and change in vitality, such that increases in exercise were related to increases in vitality. This correlation of change in exercise and vitality is approaching statistical significance, $r(70) = .206, p = .01$.

Discussion

The findings from this investigation did not support our hypothesis that there will be a condition by exercise interaction, such that participants who increase their exercise behavior in the psychological focus condition will experience greater benefits in happiness (autonomy, competence, relatedness, and vitality). Instead it was found that there was an increase in exercise amount in all conditions. There was no significant correlation of changes in exercise to changes in any measure of happiness.

There are still other trends to note, such as there being a moderate to small positive correlation between the change in exercise and change in vitality scores. The correlation between the change in exercise and change in vitality scores can be because the participant began to reap the benefits of engaging in physical activity and therefore felt they have more energy to devoted to other aspects, as supported by past research.⁴⁵ However, this first assessment of exercise and vitality and correlation between change in exercise and change in vitality scores was only over the course of 30 days. We still do not know whether this can be increased even more as the participants begin to exercise more.

Another trend to note, the autonomy scores were decreased over the course of the 30 days. This could be from a participant coming into the study and being told how much they have to exercise and how much commitment is expected while participating in the study instead of having

the freedom to make the choice of how much exercise to complete and level of commitment to engaging in physical activity.

An important idea to remember is this data is only 30 days of exercise reporting and 30 days after participants began a new life change of beginning exercise. Because of the data only showing the first 30 days of starting a new exercise regime we are only able to see the short term effects. With further data collection and more participants collected we will be able to see a larger change of how happiness can change over time from increased exercise. We will also be able to see if this increase in amount of exercise is sustained within the participants' life and truly if there is a difference between the conditions.

Instead our data points to the idea that by having participants come in to make exercise goals as well as record day-to-day exercise activity will improve their exercise habits for the better within the first month after the initial appointment. Time is largest main effect of our study representative that taking the initiative to begin to start exercise can in turn allow you increase your exercise amount as well as other factors such as the overall psychological needs also being significantly increased over time. But as our data suggests there was no benefit or advantage for a participant to focus on a specific aspect of exercise as shown in our data to increase exercise habits or increase happiness levels.

Limitations and Future Directions

The entire study will run for over one year to obtain all the planned data. The timing of this thesis is such that the data at hand includes all data taken up to approximately halfway through the study. Because the data were analyzed prior to the completion of the project, the entire sample size

has not been evaluated, nor is the recruitment of participants finished. Analyzing the data before all of the participants completed the study invariably led to the small sample size and associated problems with power. If the sample size was larger and the data was analyzed at the end of the project, there could more conclusive results.

One of the most significant limitations observed was the control group responded to the condition by having increased their exercise amount from Baseline to Time 2. The control group responding to the condition and increasing their exercise amount could be due to the recruiting mechanisms that we used to obtain the participants. The most common form of recruitment was through Craigslist. The ad that was posted had a title of, “The GET ACTIVE! Research Study at CU Boulder.” This title could have created a sample bias of only recruiting individuals who were already motivated to start exercising and just wanted some guidance. With this potential sample bias in mind, regardless of whatever condition a participant was randomly assigned, the individual was willing to start exercising.

Future research would be better benefited by using other measures of life satisfaction and basic psychological needs. Examples of measures that could be added include but are not limited to “The Basic Psychological Needs in Exercise Scale”, “Quality of Life Enjoyment and Satisfaction Questionnaire”, and measures that also pertain to a participants’ work and relationship needs being met.^{46 47} Each of these measures can give a better explanation of why the results occurred and to give better insight into interacting variables of an individual’s life while taking part of the study.

Implications

We cannot come to any conclusive results that any particular condition differentially improves happiness or exercise habits in the long term. There is evidence to suggest that the workshops bring a short term improvement to exercise, but this could be attributed to the fact that the participants are the most involved within the research study during the first month. The initial increase in participants' exercise has been shown in many studies but following this initial increase there is usually a steady decrease after the initial spike in participation.⁴⁸ Once more data have been collected we will be able to draw larger conclusions to whether or not the workshops give a long term impact on amount of exercise that an individual does.

Conclusion

Our data closely supports past literature stating that exercise can be increased by having an exercise goal in mind and by recording the daily amount of exercise that was completed each day.⁴⁷ By having an individual fill out daily surveys and set a goal, this may help individuals begin to form a habit of continuously thinking about obtaining the goal in mind, and being more successful at maintaining exercise. After the participants begin to maintain a regular exercise regime the participants will then experience more benefits of exercise such as improved psychological health (eg. happiness), neurocognitive function and sleep, increased energy, and improved general cardiovascular function, as supported in past literature, in the longer term.

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Tables and Figures
Table 1 Demographics of Participants

	Percent of Sample (N=80)
Relationship Status	
Never Married	35.8
Divorced	6.2
Widowed	1.2
Engaged	3.7
Domestic Partner	12.3
Married	38.3
Living together	2.5
Education Level	
High School/GED	8.6
Some College	11
Associates Degree or Technical Certification	6.2
Bachelor's Degree	44.4
Master's Degree	23.5
Doctoral Degree	6.2
Employment Status	
Full-time (>30 hours a week)	48.1
Part-time (<30 hours a week)	27.2

Unemployed/disabled/retired/other	11.1
Full-time Student	7.4
Homemaker/stay-at-home mom	6.2
Household Income	
\$0-\$9,999	16.5
\$10,000-\$19,999	8.9
\$20,000-\$29,999	6.3
\$30,000-\$39,999	13.9
\$40,000-\$49,999	10.1
\$50,000-\$59,999	6.3
\$60,000-\$69,999	5.1
\$70,000-\$79,999	7.6
\$80,000-\$89,999	6.3
\$90,000-\$99,999	5.1
\$100,000 or more	13.9
Race	
American Indian or Alaska Native	1.2
Asian	3.6
Black or African American	1.2
Native Hawaiian or other Pacific Islander	0
White	89.2
Identify with Multiple Race Categories	6

Table 2 Correlation between Difference in Amount of Exercise reported to Difference in Happiness Measures from Baseline to 1 Month (N=71)

	Exercise Amount (r)	p-value
Overall Psychological Needs	.025	.835
Autonomy	-.094	.438
Competence	.122	.316
Relatedness	.022	.854
Vitality	.206	.088

Figure 1 Change in AEQ scores by condition from Baseline to 1 Month

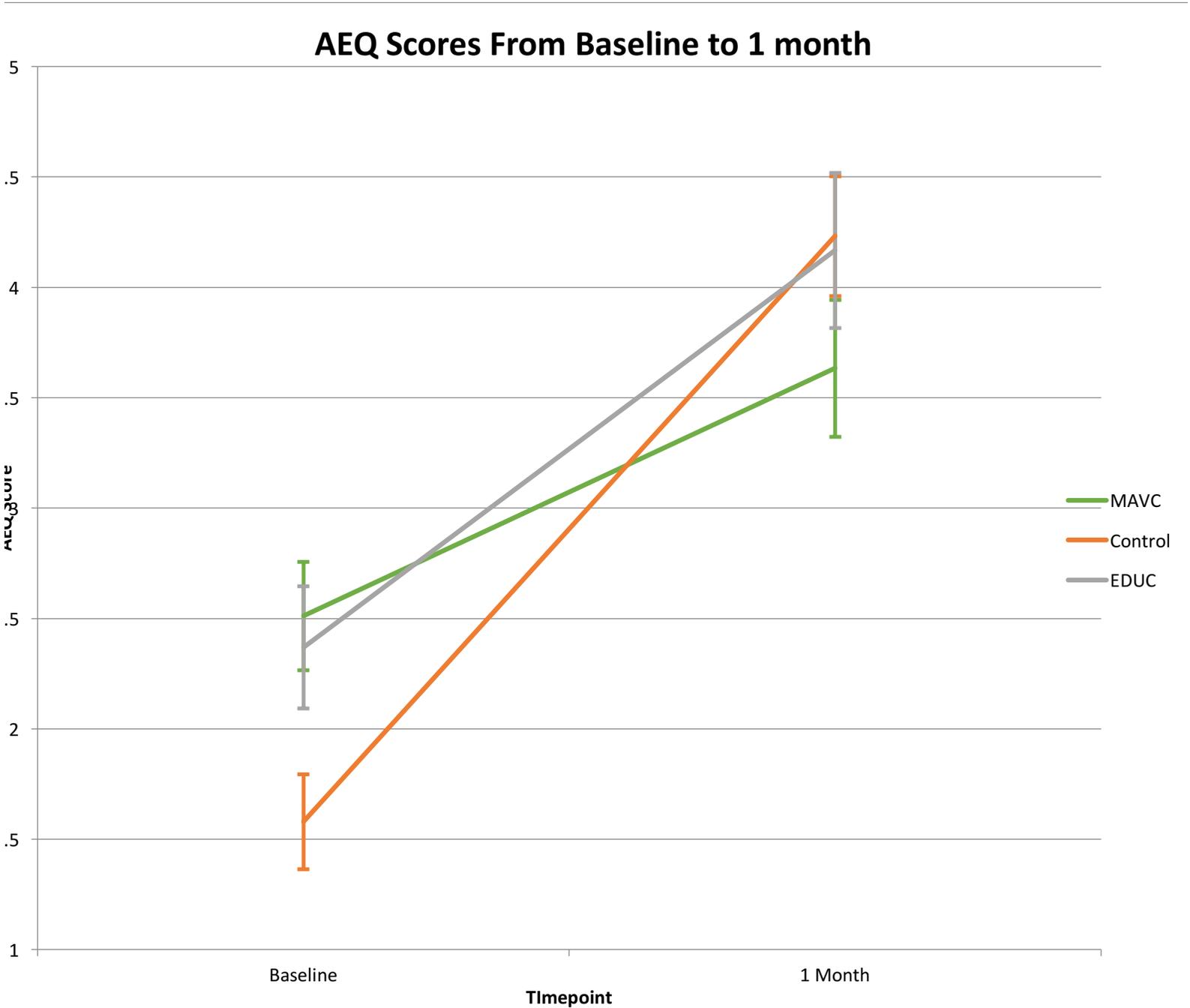


Figure 2 Change in overall psychological needs scores by condition from Baseline to 1 Month.

Overall Psychological Needs Scores from Baseline to 1 Month

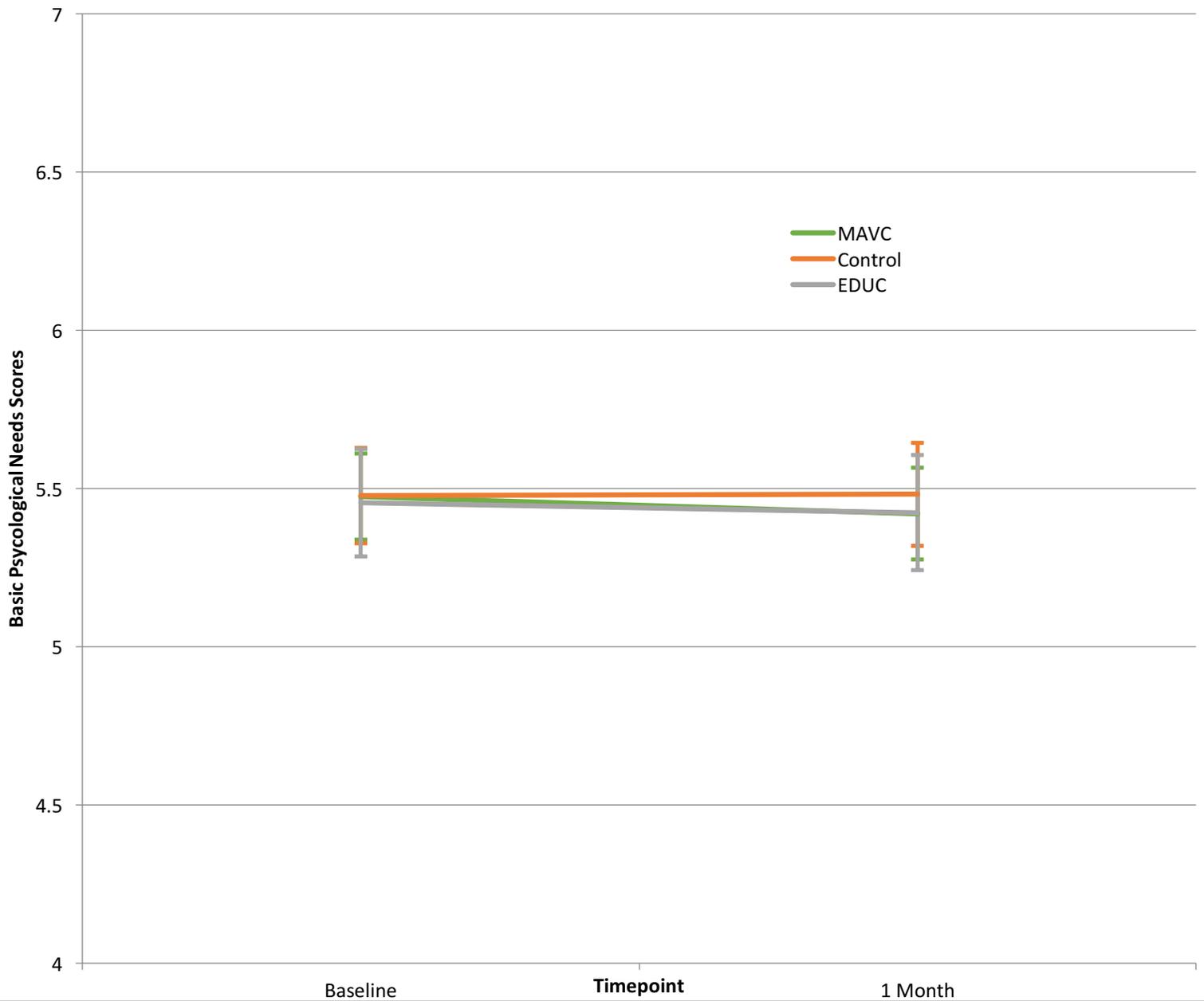


Figure 3 Change in Autonomy scores by condition from Baseline to 1 Month

Autonomy Scores From Baseline to 1 Month

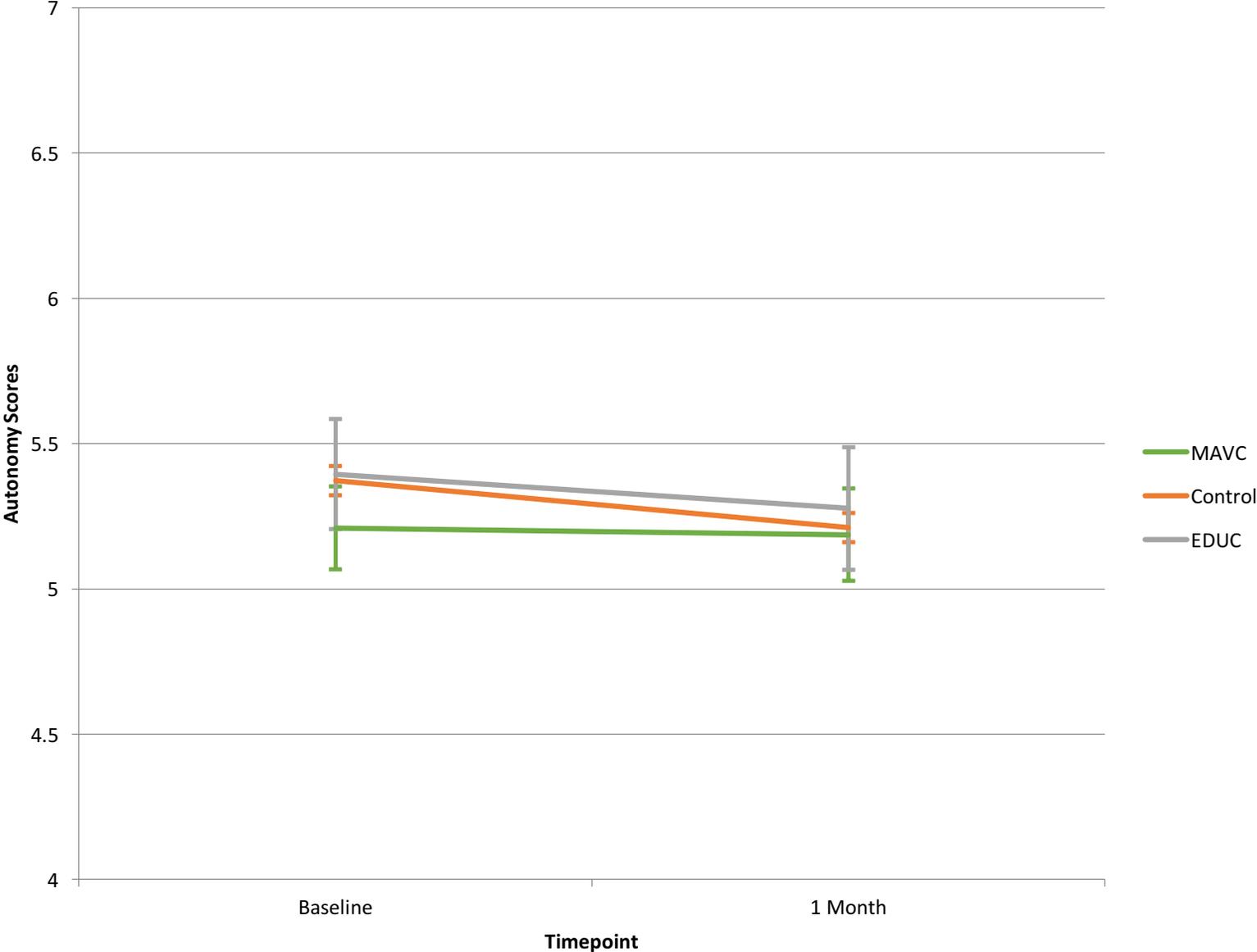


Figure 4 Change in Competence scores by condition from Baseline to 1 Month

Competence Scores from Baseline to 1 month

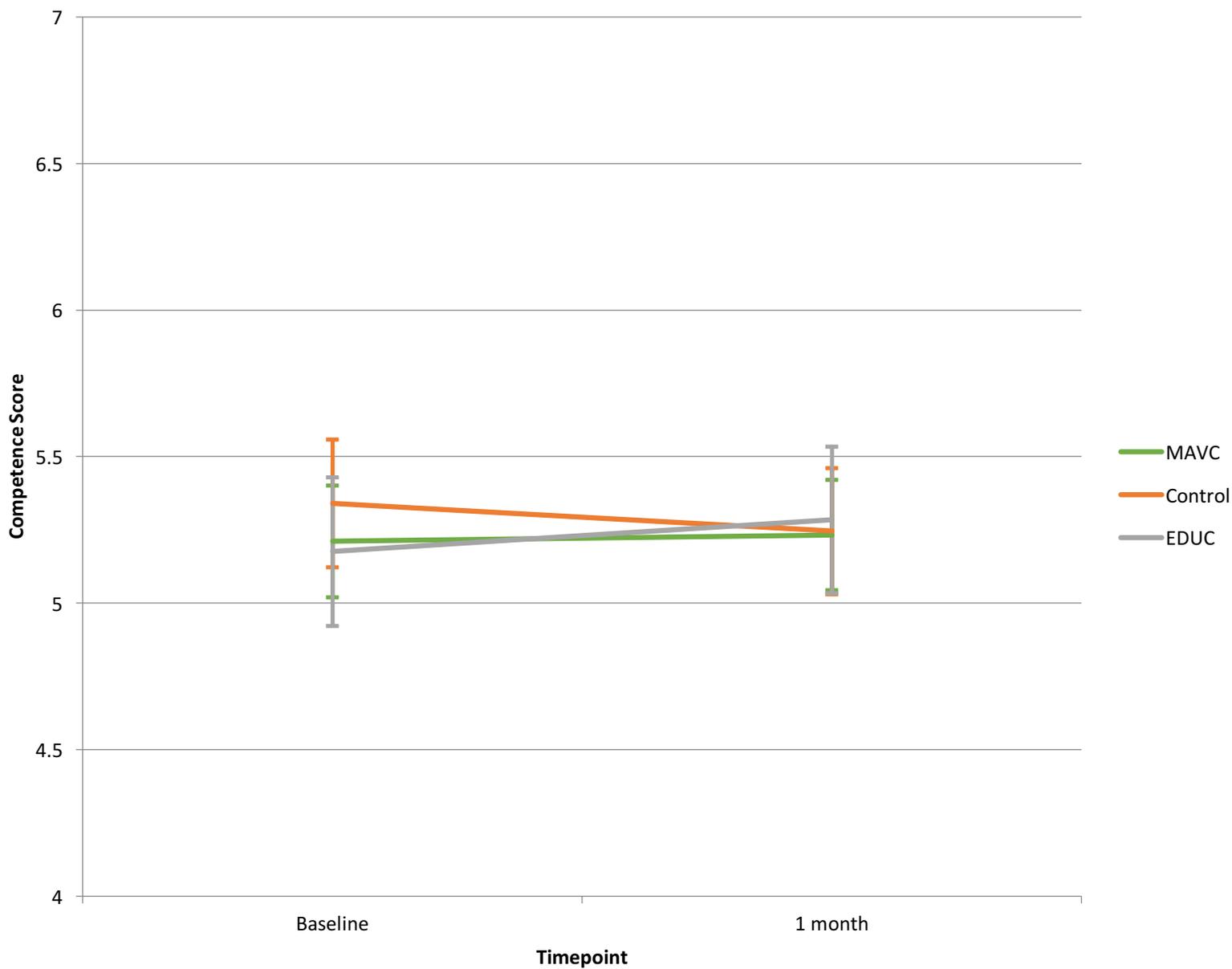


Figure 5 Change in Relatedness scores by condition from Baseline to 1 Month

Relatedness Scores from Baseline to 1 Month

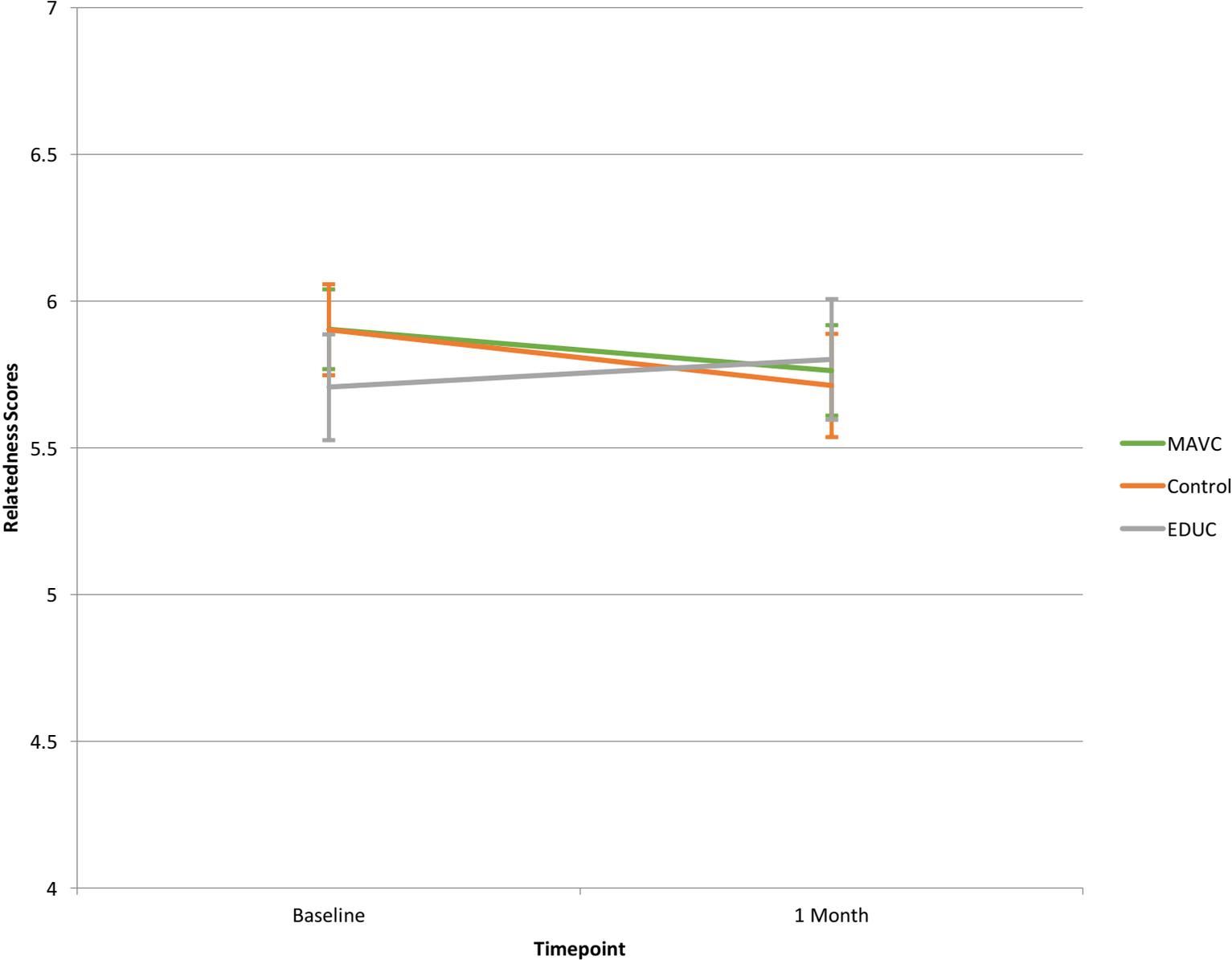


Figure 6 Change in Vitality scores by condition from Baseline to 1 Month

Vitality Scores from Baseline to 1 Month

