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PHYSICAL ACTIVITY

Effects of a Physical Activity and Public Health Course on Exercise Behavior, Perceived Exercise, and Technology Dependence

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Abstract

The purpose of this study was twofold: 1) to examine the effect of physical activity and public health courses on perceived exercise benefits/barriers, stages of exercise behavior change, and technology dependence of undergraduate students, and 2) to explain how the physical activity and public health course supports undergraduate students in terms of physical activity awareness. Data were gathered from 47 university students ($n_{experimental\ group}$=27, $n_{control\ group}$ = 20) in an urban area public university. Participants in the experimental group attended a 13-week classroom-based physical activity and public health course. The control group just participated in their regular courses. Data were collected from three different questionnaires: stages of exercise behav-

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ior change, perceptions of exercise benefits/barriers, and technology dependence of university students at pre-tests and post-tests. Semi-structured interviews were also conducted with 8 participants in the experimental group. Results showed that there was not any statistically significant difference between pre-test and post-test results on technology dependence and perceived exercise benefits/barriers. In terms of stages of exercise behavior change, students in the experimental group were more active than those in the control group in the post-test. Semi-structured interviews revealed that students learn about physical activity and its benefits, as well as the importance of infrastructure in participating in physical activity. They also tend to be more active than they were in the past. Although they did not change their technology usage, they searched for useful content related to nutrition and physical activity plans. In conclusion, according to their expression, they increased their knowledge and awareness of physical activity and its impact on public health. Further studies might integrate the practical sessions into this type of intervention to evaluate its effectiveness on perceived benefits/barriers, physical activity level, and technology dependence of university students.

Introduction

Common chronic diseases, such as obesity and cardiovascular problems, are caused by civilization (Reiner et al., 2013). These diseases are defined as noncommunicable diseases (NCDs), and almost 41 million people passed away due to NCDs (World Health Organization [WHO], 2022), causing 74% of all deaths worldwide (WHO, n.d.). These diseases result from unhealthy lifestyles such as physical inactivity (Reiner et al., 2013). While physical activity (PA) is defined as any bodily movement using energy expenditure produced by muscles, PA is defined as an inadequate PA level or a PA level below the global PA recommendations (Bull et al., 2020). In order to decrease diseases related to inactive lifestyles, the WHO published PA recommendations for children, adults, and older adults. For instance, children should participate in PA for at least 60 minutes daily. The more they engage in PA, the more benefits they have. Adults should engage in 150-300 minutes of moderate to vigorous physical activity (MVPA) per week (Bull et al., 2020). Older adults should participate in multicomponent PA at least three times a week (Bull et al., 2020).

Regular physical activity participation has many health benefits (Coppola et al., 2020; Crozier & Spink, 2017), and it prevents many chronic health problems such as cancer, cardiovascular disease (Crozier & Spink, 2017; Scarapicchia et al., 2017), stroke, hypertension (Irwin, 2004), and diabetes (Guerin et al., 2019). Regular PA has health, physiological, and psychosocial benefits (Bedard et al., 2017) for different groups and socioeconomic statuses (Tremblay et al., 2011). In addition to regular PA, exercising helps to increase cognitive function, improve performance on cognitive tasks, and increase academic achievement (Crozier & Spink, 2017). Moreover, it decreases mental illnesses such as depression (Guerin et al., 2019; Scarapicchia et al., 2017).

Although regular PA has numerous health benefits, participating in PA decreases significantly with age (Irwin, 2004). Research findings revealed that youth and adults did not meet the recommended level of PA (Scarapicchia et al., 2017). For instance, Bull and colleagues (2020) revealed that 81% of adolescents did not meet recommendations for aerobic exercise. Another study showed that more than half of first-year university students are doing PA below the recommended level (Brown et al., 2014). Likewise, another research finding showed that most students in college or university did not engage in PA (Bray & Kwan, 2006), and more than half of Canadian and American university students did not engage in a sufficient level of PA (Irwin, 2004). Similar findings have been reported in the Turkish context (Cengiz, 2009; Ölçücü et al., 2015; Özkan et al., 2015; Vassigh, 2012). Identifying factors associated with physical inactivity plays a critical role in overcoming the barriers to PA participation (Towne et al., 2017). Technology usage may cause university students to engage in less physical activity since it disrupts their daily routines and activities (Alotaibi et al., 2020; Boz, 2020). Knowledge about PA might be another barrier for participation in PA, as stated in previous research (Fredriksson et al., 2018; Martins et al., 2019).

Some effective approaches to overcoming physical inactivity problems include informational, school-based, behavioral-social, environmental, and policy approaches (Kohl et al., 2019). One is classroom-based health education programs that are part of informational approaches for promoting PA. In this approach, people are

given information related to PA to encourage and empower them to modify their behavior and sustain that change over time (Kahn et al., 2002). The dissemination of information aims to change one's perceptions of the advantages of PA, increase awareness of specific local opportunities for increasing PA levels, describe ways to avoid barriers, and struggle with unfavorable attitudes and perceptions toward physical activity (Kahn et al., 2002). A recent systematic review indicated that a classroom-based approach is a potentially beneficial strategy for enhancing PA despite the current evidence's mixed views on the effectiveness of this type of intervention in doing so (Lee et al., 2022). It should be emphasized that research studies typically enroll students from elementary school through high school. Class-based PA approaches at the university level are rare in the literature. For this reason, the primary purpose of this study was to examine the effect of physical activity and public health courses on perceived exercise benefits/barriers, stages of exercise behavior change, and technology dependence of undergraduate students. The second purpose of the study was to explain how the physical activity and public health course supports undergraduate students in terms of PA awareness. The following research questions were examined in this study:

- Does the physical activity and public health course significantly affect university students' perceived exercise benefits/barriers, stages of exercise behavior change, and technology dependence?
- How do undergraduate students perceive the physical activity and public health course as supporting their PA behavior?

Materials and Method

Participants and Settings

In the pretests of the study, data were gathered from 61 students ($n_{\text{experimental group}}$= 31, n_{control}=30). In the post-test, however, some participants withdrew from the study or did not complete the questionnaires. As a result, data were gathered from 47 university students ($n_{\text{experimental group}}$=27, $n_{\text{control group}}$=20) at an urban area public university in the post-test. All ethical issues were considered before conducting the study. All participants were involved in the study voluntarily. The experimental group enrolled in an elective physical activity and

public health course offered to undergraduate students. The control group enrolled in another course unrelated to physical activity and public health.

Physical Activity and Public Health Course

The main aim of the course was to enhance university students' knowledge and increase their awareness about the role of PA in public health. It was a 13-week synchronous online course. Each session lasted for approximately 2 hours. The course content was created based on the foundations of PA and public health and the current literature on PA. This course was divided into three major parts. The first part, lasting three weeks, included basic concepts and definitions of PA, public health, global PA guidelines, and physical activity measurement techniques. The second part, lasting five weeks, was composed of the health effects of PA participation, such as obesity, cancer, cardiovascular health, musculoskeletal health, and risk factors of doing physical activity. The third part, lasting three weeks, focused on the effective PA interventions in the literature.

The course instructor was one of the researchers in this study. She has ten years of experience in teaching physical activity and public health. Various teaching methods were applied in the course. For instance, lectures, classroom discussions, video presentations, and class activities were used as the teaching strategies in the course. At the end of each session, three students were responsible for preparing a 15-minute oral presentation about the recent research on physical activity. They shared one research article, news, and video about their topic during the student presentations. In addition, students had one mid-term and one final exam.

Measurement Tools

In this study, the data were collected from three different questionnaires: the stages of exercise behavior change (Marcus & Lewis, 2003), perceptions of exercise benefits/barriers (Sechrist et al., 1987), and technology dependence of university students (Aydın, 2017). These questionnaires are explained in detail below. In addition to these questionnaires, a demographic information form was designed to gather detailed information about the participants regarding their gender, age, perceived health status, screen time, and general physi-

cal activity behaviors. Online face-to-face semi-structured interviews were used as a data source for the qualitative phase.

Stages of Exercise Behavior Change Questionnaire

The Stages of the Exercise Behavior Change Questionnaire was developed by Marcus and Lewis (2003) and adapted to the Turkish context (Cengiz et al., 2008). The questionnaire asks four questions about people's current physical activity behaviors. Based on the answer, participants are in the pre-contemplation, contemplation, preparation, action, and maintenance stages. The first three stages (pre-contemplation, contemplation, and preparation) show that participants are inactive, and the last two (action and maintenance) show that participants are active. It takes one minute to fill it out.

Perceptions of Exercise Benefits/Barriers Scale

The Exercise Benefits/Barriers Scale (EBBS) questionnaire was developed by Sechrist et al. (1987), and it was adapted to the Turkish context by Ortabağ and colleagues (2010). External consistency was excellent (Cronbach's $\alpha = 0.87$), and the test-retest reliability was .85 (Ortabağ et al., 2010). The questionnaire includes 43 questions based on a 4-point Likert Scale from "Strongly Disagree" (1) to "Strongly Agree" (4). The score of the questionnaire is from 43 to 172 points. Because an overall score was considered, the barrier items in the questionnaire were reversed.

Technology Dependency of University Students

The Technology Dependence Scale was used to determine university students' technology-dependence behaviors. The scale was developed by Aydın (2017) and consists of 24 questions to measure four different subscales of social network addiction, instant messaging addiction, online gaming addiction, and website addiction. The questions in the scale were answered based on a 5-point Likert type from Never (1) to Always (5). Scale scores range from 24 to 120. The scores are interpreted as not dependent (0-24), low dependent (25-48), moderately dependent (49-72), very dependent (73-96), and entirely dependent (97-120). The scale of internal consistency was .786 for social network addiction, .806 for instant messaging addiction, .897 for online game addiction, and .861 for website addiction.

Procedures

The data was gathered in the fall semester of 2021-2022. The ethical approval form was obtained from the Applied Ethics Research Center, Ethics Committee on Human Researches. Consent forms were also gathered from the university students who participated in the study. All instruments were applied online during the course hour. It took 10 to 15 minutes to fill out the questionnaires. In addition, semi-structured interviews were conducted at the end of the semester with students in the experimental group. Participants were invited to the interviews to collect qualitative data by email voluntarily.

Overall Study Design

This study used an explanatory sequential mixed method as a research method (Creswell & Creswell, 2017). In the exploratory sequential mixed method, the quantitative data is first collected and analyzed; then, the qualitative data is used to understand the quantitative results in depth. In the quantitative part of the study, a quasi-experimental nonequivalent control group design was used (Cambell & Stanley, 1996). A quasi-experimental design is used when random sampling cannot be applied. The non-equivalent control group design is used in cases where both groups cannot achieve sample equality. Pre-test and post-test are applied to both groups. The basic qualitative research design was used in the qualitative part of the study. The basic qualitative research design is carried out without any additional context to understand the participants' thoughts about their experience (Merriam & Tisdell, 2015).

Qualitative Phase of Study

Qualitative research deals with the meanings attributed to their experiences by people and how they interpret their experiences (Merriam & Tisdell, 2015). Qualitative research has many data sources (interviews, field notes, observations, documents, video and voice records, etc.). Interviews were conducted at the end of the semester after getting the quantitative data analysis results.

The semi-structured interview questions were shaped according to the research questions and the quantitative data analysis. Since the interviews were conducted at the end of the semester, on a voluntary basis, eight students could be reached. Yet, data saturation has

been reached, and qualitative results have been used to understand quantitative results more deeply. Examples of the semi-structured interview questions are as follows:

- Is there any change in your opinion about physical activity and public health? If yes, what are these changes?
- What are the reasons that prevent you from exercising?
- How did the physical activity and public health course affect the use of technology in your life?

Data Analysis

Quantitative Data Analysis

In this study, descriptive and inferential statistics were used by using SPSS 28. The mean value of students' exercise benefits and barriers and the technology dependence scale were presented for descriptive statistics. For the inferential statistics, one-way MANOVA was run to determine the group difference. In addition, paired t-tests were used to understand the pre and post-test differences. Before running a one-way MANOVA, researchers must consider some requirements. These requirements include sample size, normality histogram, skewness, and kurtosis values. For the absence of multivariate outliers, Cook's distance and Leverage value were used; for the absence of multicollinearity among dependent variables, Pearson correlation (*r*) was used; for homogeneity of variance, Levene's test was used. The Box M test was used for the homogeneity of the variance-covariance matrix. For sample size requirements, each group's recommended minimum sample size was 20 observations (Hair et al., 2014). These requirements were tested, and assumptions were not violated. Then, a one-way MANOVA was run. Alpha level was set at .05.

Qualitative Data Analysis

One of the researchers transcribed and organized voice records. Moreover, another researcher checked the transcripts by comparing them with the voice recordings. Thematic analysis was used to analyze the qualitative data. In thematic analysis, patterns in qualitative data are identified and analyzed (Kiger & Varpio, 2020). Preliminary codes were assigned when reviewing the transcripts. Themes and patterns were searched within the codes. The themes created from

the codes were examined, named, and defined. The themes created were examined by another researcher who was not involved in the qualitative phase of the process for trustworthiness. The MAXQDA 2022 software was used for the analysis of qualitative data.

Results

Baseline information of students

First, Box M was considered for homogeneity of the variance-covariance matrix. The results showed that it was not violated, F (3, 649994.24) = .047, $p > .05$. Thus, Wilks' Lambda was interpreted for the multivariate test. The results showed that there was no significant effect of groups on dependent variables Wilks' $\lambda = .98$, F (2, 58) = .585, $p > .05$. There were two dependent variables in the main test; thus, the alpha level had to be divided in two, so a new alpha level of.025 was set. The results of one-way MANOVA revealed that there was no significant effect of the group on exercise benefits and barriers F (1, 59) = .487, $p > .025$, and there was no significant effect of groups on technology dependence F (1, 59) = .587, $p > .025$.

The Main Result

The total number of participants was 47 students (experimental group=27, control group= 20) in the post-test. Their age was 23 (*SD* = 5.09), height was 170.63 (*SD* = 10.74), and weight was 67.04 (*SD* = 14.64). In terms of groups, the experimental groups' age (*M* = 24.48, *SD*=6.12) and the control groups' age (*M* = 21, SD=2.05) are almost similar.

According to the exercise stage of change results, students were generally in contemplation (*n*=20), preparation (*n*=13), and maintenance stage (*n*=19) in the pre-test and contemplation (*n*= 20), preparation (*n*=10), and maintenance stage (*n*=13) in the post-test. In terms of groups, the control group was more inactive (*n*=14) than the experimental group (*n*=9) in the pre-test. Students in experimental groups showed that they were more active (*n*=12) than control groups (*n*=4) in the post-test (Table 1). Thus, students' motivation toward physical activity decreased in the control group but remained the same for students in the experimental group during the study.

Table 1
Exercise Stage of Change

	Experimental group		Control group	
	Pre-test	Post-test	Pre-test	Post-test
Pre-contemplation	1	1	2	0
Contemplation	8	9	12	11
Preparation	7	5	6	5
Action	3	3	3	0
Maintenance	12	9	7	4
Total	31	27	30	20

Students indicated that they seem themselves moderate (n=7), good (n=22), and very good (n=12) in health condition. In terms of groups, both groups of students indicated that their health condition was good (experimental group=15, control group=7). In addition, they stated that 17 of them participated in physical activity regularly. In terms of groups, more students in the experimental group participated in an activity regularly (n= 12) than students in the control group (n=5).

In the post-test, one-way MANOVA was run to determine group differences in exercise benefits, barriers, and technology dependence. First of all, Levene's test of equality of Error variances was considered, and the assumption of homogeneity of variance was violated for the technology dependence tool. Thus, the new alpha value was set at .04. Then, the Box M test was considered for the homogeneity of the variance-covariance matrix. The results showed that it was not violated, F (3, 168801.41) = 1.81, $p > .05$. Thus, Wilks' Lambda was interpreted for the multivariate test. The results showed that there was no significant effect of groups on dependent variables Wilks' $\lambda = .96$, F (2, 44) = .839, $p > .05$. In the main test, because there were two dependent variables, the alpha level had to be divided into two, a new alpha level was set .025 for exercise benefits and barriers tool, .020 for technology dependence tool. The results showed that there was no significant effect of the group experiment (M = 142.96, SD = 16.06) and control group (M = 142.30, SD = 16.90) on exercise benefits and barriers F (1, 45) = .019, $p > .025$. There was no significant

effect of the group's experiment (M = 57.51, SD = 21.59) and control group (M = 50.45, SD = 13.06) on technology dependence F (1, 45) = 1.68, $p > .020$.

In addition to group difference results, paired t-test results of exercise benefits and barriers revealed a statistically significant difference between the experimental group's pre-test (M = 127.11, SD = 13.84) and post-test (M = 142.96, SD = 16.06); t (26) = 6.68, $p < .05$; and the control group's pre-test (M = 121.70, SD = 11.84) and post-test (M = 142.30, SD = 16.90); t (19) = 5.43, $p < .05$. However, the result of pre and post-test of technology dependence showed that there was not any statistically significant difference between the pre-test (M = 56, SD = 16.60) and post-test (M = 57.52, SD = 21.59) of the experimental group; t (26) = .684, $p > .05$, no significant difference between the pre-test (M =52.80, SD = 13.55) and post-test (M = 50.45, SD = 13.06) of the control group; t (19) = 1.12, $p > .05$.

Table 2
Themes and Sub-themes

Themes	Sub-themes
Reason for Selection of class	Personal interest
	Necessity of an elective course
Knowledge of PA and Public Health	Health effects of PA
	Chronic diseases
Barriers to physical activity participation	Physical fatigue
	Mental fatigue
	Classes
Technology	Content of technology
	Technology usage for PA

Qualitative Results

This section presents the key findings from semi-structured interviews with the participants who attended the course in this study. The interviews aimed to understand the participants' perceptions of the course and the underlying structure of the quantitative results. Four main themes were revealed as a result of the thematic analysis. Table 2 shows the themes and sub-themes determined through thematic analysis.

Reasons for the Course Selection

Students' interviews revealed two main reasons for selecting the course. One was "personal interest in physical activity," and the second was "necessity of selecting an elective course." Interviewers with a personal interest in courses have various reasons. Most of them stated that they are already doing sports or physical activities. One of the participants stated that he was a coach at certain periods of his life, so he was interested in the course. Another participant mentioned that she was already a physical education teacher, and she explained the reasons for the selection of the course as follows:

> When I looked at it as a teacher, I already noticed that the students in the classes I entered had eating disorders. I've taken classes on these before. I was noticing that the sports they did were often wrong and that the perception of sports especially among students was wrong lately. I was thinking about what information I could gain so that maybe I could use it in my field.

According to the university's curriculum, in which the study was conducted, students have to choose an elective course from another faculty member. Some participants mentioned that as a reason for choosing the Public Health and Physical Activity course.

Knowledge of Physical Activity and Public Health

Regarding the knowledge of physical activity and public health, interviews also indicated that the effect of overdose physical activity on the body and the role of physical activity in preventing disorders attracted participants' attention. Some participants stated they already knew the importance of physical activity in health. However, they stated that they realized that the information they had previously obtained was insufficient or that it was hearsay. Participant 2 explained her thoughts on the effect of physical activity on health before the course as follows:

> I always thought that physical activity had nothing to do with cancer. Honestly, it didn't seem relevant to me. If I had seen it somewhere, I would probably have thought it wouldn't be very accurate. I saw that this thought was the complete opposite.

Some students who chose this course from different faculties as a requirement of the curriculum stated that they discovered how physical activity could be related to their field. An undergraduate student from civil engineering (Participant 5) mentioned how he noticed the connection between physical activity and civil engineering:

> Before I researched these recreation areas, in particular, I thought that these areas were chosen randomly, that is, an empty area was used there, but it wasn't. In other words, I learned from the course that the recreation areas should be in a place where people can reach, especially that they should be used by all people.

Some of the participants were already paying attention to being more active during the day. Participants who stated that they had previous knowledge about physical activity were found to have connections with sports in their interviews. Their connections with sports are as follows: those who regularly do sports before class, study at the faculty of physical education and sports, do professional sports before, and do bodybuilding.

On the other hand, some of them mentioned that during the course, they changed their daily behaviors to be more active after realizing that even small changes can make a difference. Such as "using stairs instead of elevators," "getting off the bus one stop earlier," "doing sports outdoors instead of indoors," and "preferring to walk short distances." As an example of this theme participant 1 mentioned the changes in her behavior:

> I reduced the use of elevators at school and in the institution where I work. You know, I'm on vacation right now, it's like walking for half an hour today, and swimming tomorrow. I choose to engage in slightly different activities and this prevents me from getting bored. Frankly, I planned this as an "experience" based on the topics we talked about in the lesson.

Barriers

In the interview on the reasons that prevent them from doing physical activity, the most mentioned barrier to physical activity

was mental and physical fatigue. The intensity of the lectures and the excess of time spent studying for exams and homework were the reasons for the participant's mental and physical fatigue. Other reasons were weather, motivation, exhaustion, time, work, and courses. Participant 1 mentioned mental fatigue as follows:

> There may be mental fatigue in general. In other words, I may be doing something like this because I like to sit down and do something else at that moment, or I'm already very tired today, and I'm even more tired if I do this right now. I can wake up more tired tomorrow etc. I have thoughts like that.

According to participant 5, the reason for the change between measurements is as follows:

> The difference between the two surveys for me was that I was able to do sports regularly at the time of the first survey, but now I've been working for about two months and the study impressed me a lot. Frankly, in that situation, time and fatigue prevent me from doing sports. That's why my two surveys were very different.

Some of the interviewees mentioned that the things that they learned in course have helped them overcome the barriers. Some quotes from the interviews on the subject are below. Participant 3 mentioned, "After the course, I realized the thing that I said to my friend, 'Let's go for a walk. Let's not drive to our destination.' For example, I was always doing things like this. If nothing else, this was a relief for me, at least it helped me in such a way."

Additionally, Participant 7 explained the change as follows: "… In that stressful period, I used to stop doing activities, in fact, I realized that when I do not do activities, I do not spare more time for myself and my productivity drops a lot. After this lesson, I started not to quit activities anymore. I mean, I went for a walk or something during the exam period."

One participant became more knowledgeable about factors directly affecting physical activity and participation. Participant 4 said, "I learned that physical activity is affected by many variables, such as environmental policy."

Technology

As indicated by the analysis of interviews, most of the participants in the experimental group were already conscious of the use of social media before the course. Five out of eight participants mentioned that they already use technology when it is necessary before the class. Therefore, they stated that there was little change in the time spent using technology due to physical activity and public health courses. Participant 4 emphasizes her usage of technology as follows:

> I already use the computer in mandatory situations, that is, when I do work or homework. I didn't have a lot of technology dependence anyway. I usually use the phone as a computer in places where there is no computer. Other than that, I didn't have a lot of technology before. I wasn't the type of person who wouldn't let go of her phone.

One of the participants stated that he questioned whether his use of social media was in line with the information they had learned during the course. However, he mentioned that there was no change in her behavior.

On the other hand, most of the participants stated that the content they were interested in or researched on social media changed in line with what they learned in the course. Participant 7 emphasized the change in the content of the usage of social media:

> I saw that there are many branches of this subject that I do not know. That's why it has been added to my research. In a way, I started researching new areas that I did not know. Even though the course is over, I'm still trying to read. There has definitely been a change in that respect as much as possible

Participant 4 shared:

> You know, in addition to this physical activity, I searched for meal plans that could help with the sports I did a little more so that I could fix some eating disorders at least during this 2-week vacation. I also looked at the thing, how can I diversify the sport I do, that is, if I walk for half an hour or if I walk for half an hour and then cycle for 15 minutes? For

example, I looked at these plans to see what examples are available. I looked yesterday too.

Some participants froze their Instagram accounts during the course. For instance, Participant 2 said that "time consumed in websites or social media were not increased. In fact, these were decreased. I did close my social media account," while Participant 8 said, "After the discussion in the public health and physical activity course, I had an opportunity to think about it and I did freeze my social media account."

Overall, even though the duration of internet usage was not changed, participants used technology and spent more time on the internet after they took the public health and physical activity course. Some participants became more aware of what they do in daily life regarding technology.

Discussion

This study's primary purpose was to examine the effect of physical activity and public health courses on perceived exercise benefits/barriers, exercise stages of behavior change, and technology dependence of undergraduate students in a public university in Turkey. Furthermore, the study was to investigate how the physical activity and public health course supports undergraduate students in terms of physical activity awareness. Findings showed that students in both groups were moderately dependent on technology. Statistical results also showed no statistically significant difference between pre-test and post-test results on the technology dependence in both groups.

In national and international literature, a body of research investigated the technology dependency of students of various ages. Karadağ and Kılıç (2019), for example, found that students in primary, secondary, and high school were heavily reliant on technology, particularly social media, online games, and text messages. Another research revealed that senior university students were moderately addicted to technology, and they did not find a negative relationship between technology addiction and sports participation among university students (Yaman, 2021). In the international literature, almost all participants in one study used technological tools in one form or another (Amudhan et al., 2022), and technology addiction decreases while age increases (Sharma et al., 2017) and the most

common internet addiction is social media that is used for communication (Brooks et al., 2016). Technology dependence might become a common problem worldwide. It is known that technology dependence was significantly associated with risk factors including, anxiety, depression, and loneliness (Amudhan et al., 2022; Sigerson et al., 2017), and academic success was negatively correlated with internet addiction (Sert et al., 2019) and study-related use of the internet has a positive impact on academic performance (Abbasi et al., 2021). In addition, studies in the literature concluded that there is a negative relationship between technology addiction and the physical activity of participants (Abbasi et al., 2021; Ercan et al., 2021; Yaman, 2021) technology addiction and health outcomes (Eliaçık et al., 2016), social media addiction and perceived health (Chen et al., 2022) and positive relationship between physical inactivity and smartphone use (Pereira et al., 2020).

University students in our study were moderately addicted to technology, and the intervention had neither a negative nor positive effect on their perceived exercise benefits and barriers. The reason might be that (a) the public health and physical activity course was done online, (b) the course did not include practical parts, (c) the course was done in pandemic situations. In addition, most of the intervention group participants mentioned that they already used technology consciously before the course. However, qualitative results indicated that although they did not change the time they spent on technology usage, they gained knowledge about PA while using technology more than before they took the course. Some participants expressed that they have been watching informative videos on the internet. Furthermore, many stated that they did freeze social media accounts during this process. In conclusion, there was no difference in technology usage in both groups regarding quantitative results. The experimental group changed their behavior with technology and its usage.

This study considered exercise benefits and barriers scores as overall scores but not divided. Findings of perceived exercise benefits/barriers indicated no statistically significant difference between students who received PA and public health courses and those who did not. The results showed that university students had high perceived exercise benefits/barriers in the post-test and they increased

their perceived score from the pre-test to the post-test. However, it seemed that the intervention did not affect their perceived score. Based on Turkish literature, some studies about perceived exercise/ barriers exist. For instance, participants over 18 had a 99.79 mean score from total instruments in the university hospital. There is a relationship between participation in exercise and perceived exercise benefits/ barriers (Ersin et al., 2022). Another study was done with sixty-nine mothers with children with different motor functional statuses. The researcher evaluated the mother's exercise benefits/ barriers scale item by item. They reported most frequently that "exercise takes too much time from family relationships" as a barrier and "Exercising will keep me from having high blood pressure" as a benefit. The range was from 45 to 133 for participants (Özkan & Numanoğlu-Akbaş, 2021). In the literature, perceived exercise benefits/barriers were applied to different contexts, such as medical students (Blake et al., 2016; Chung-Yan Chan, 2014), nurses (Bakır & Macit Hisar, 2016), patients in hospitals (Karataş & Polat, 2021), physicians and nurses (Gabal et al., 2020). Ransdell and colleagues (2004) conducted a 12-week home-based and university-based physical activity intervention with mother-daughter pairs. They found similar results as we did. Participants' perceptions about exercise benefits and barriers did not change after the intervention, although they had practice sessions during the intervention period (Ransdell et al., 2004).

In addition to quantitative analysis, interview results about perceived barriers to exercise showed that the intensity of the lectures in their curriculum and the excess of time spent studying for exams and homework are the main reasons that prevent them from exercising. However, some participants expressed the idea differently than the quantitative results. After taking the course, one participant realized that PA should be planned; another stated that any movement or action, such as walking, jumping, or basic movement, could contribute to his/her daily PA level. Furthermore, one participant realized that PA and public health do not just depend on one variable, but policy, environment, and infrastructure of the neighborhood play a significant role in physical activity participation and level. For instance, some studies showed that environmental variables might play an important role in PA in different settings (De Greef et

al., 2011; Dong & Liu, 2022; Gou et al., 2021; Halali et al., 2016; Xu et al., 2010). Thus, participants became more knowledgeable about physical activity and public health. In conclusion, students' perceived benefits, barrier scores, physical activity knowledge, and awareness were increased after the intervention. Awareness of the positive outcome (Alkerwi et al., 2015) and lack of education about the benefits of physical activity (Kolt et al., 2006) might play an important role in participation in physical activity.

Based on the results of the exercise stage of behavior change, university students in both groups were mainly in the contemplation and preparation stages. In terms of the group, students in the control group were more inactive than students in the experimental group. The experimental group had more participants in the action and maintenance stages than the control group. Previous studies indicated that boys and girls (Cengiz, 2009) and more than half of university students (Miçooğulları et al., 2010; Oral & Aktop, 2014) and most female students in a faculty of sports science (İmamoğlu, 2020) were in pre-contemplation, contemplation and preparation stage. Thus, participants were mainly inactive; however, after the intervention, students stayed active compared to the control group. It may be why students become more aware of their behaviors and are more active than in previous times. Additionally, considering the reasons for choosing the course, most of the experimental group participants who took part in the semi-structured interviews stated that they had a background in PA and sports or that they were currently paying attention to participating in PA, which probably explains the fact that participants from the experimental group are more in the action stage.

Limitations

This study has strengths and some limitations. The main strength of this study was that data were gathered from qualitative and quantitative approaches. It gives a holistic approach to deeply analyzing the current situation in research settings. Although participants in the experimental group did not change their perception toward exercise, they changed their habits toward PA. For instance, one participant stated that s/he used to use elevators at school, but after the class, s/he tends to use stairs or can change their physical activities when s/he gets bored because s/he knows how to plan activities.

Another participant realized that s/he said to friends, "*Let's go for a walk, not drive to our destination*." The study's main limitation was that the number of participants decreased from the pre-test to the post-test. This might limit the conclusions of the quantitative results of the study. Another limitation is that the intervention course was theoretical. Due to the structure of the elective course, the rules have been determined by the curriculum. Taking only one course might not change participants' perceptions of PA and exercise. Further studies should consider the role of both theoretical and practical sessions of PA courses on university students' attitudes, beliefs, perceptions, and PA behaviors. It should also be noted that the course was taught as an online course due to the COVID-19 pandemic reasons. Moreover, there were certain restrictions on going outdoors and to the gym during the pandemic. These factors may affect the results of the study.

Conclusion

This intervention study aimed to examine the effect of physical activity and public health courses on perceived exercise benefits/barriers, exercise stages of behavior change, and technology dependence of undergraduate students. Although the statistical analysis did not show any improvement in perceived exercise benefits/barriers and technology dependence, semi-structured interviews showed that university students increased their awareness and knowledge about PA, and they became more knowledgeable about how to do physical activities or doing any bodily movement may contribute to their PA level. In addition, they used technology to improve their knowledge about PA. In their daily life, they stated that they prefer a more active life than taking PA and public health courses such as using stairs instead of elevators. It should be noted that further research is needed to provide evidence of the effectiveness of other types of approaches in university-based PA courses. Thus, future researchers might add a practical session to the PA and public health course to evaluate students' general perceptions of PA and their PA level. In addition, objective measurement tools such as accelerometers and pedometers are needed to determine university students' PA levels before and after taking this course. The number of university-based PA courses might be increased to support community public health.

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