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The Effect of Medical Students' Problem-Solving Perceptions and Achievement on Clinical Reasoning Levels

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Abstract

Clinical reasoning is important in medical education in terms of achieving the purpose of clinical practice. 3 cases in which clinical reasoning prepared by relevant experts from 3 different departments were applied to Year-5 students. As an indicator of academic success, the final grade of the internship and the general success average were taken. Problem solving perception scale was applied. This research aimed to examine the relationships between the problem solving, clinical reasoning and academic achievement levels of medical students. It was observed that clinical case evaluations showed a positive correlation with each other, a positive correlation was found between clinical case evaluations and problem solving perception, and the final grade of internship and GPA did not correlate with both clinical case assessment and problem solving perception. It is necessary to determine whether the clinical reasoning processes are used adequately by the students in medical education and the education programs should be reviewed and arranged accordingly.

Introduction

Clinical reasoning refers to repetitive and dynamic thinking processes in which nurses or doctors collect evidence, process information, understand patient problems, plan or apply treatment, evaluate results, and reflect the learning process (Kuiper, 2013). For this reason, it has been described as the main cognitive skill -the backbone- in terms of achieving the purpose of clinical practice, or in other words, the realization of the practice (Higgs et al., 2019; Mattingly, 1991; Young et al., 2020). Higgs (1993) counts clinical reasoning as the central component of clinical competence. Therefore, it is also considered the essential component of being a health professional (Higgs et al., 2019). As the presence of clinical reasoning is at a key point for the education of healthcare professionals, as mentioned, it has been included in certain educational stages and assessment-evaluation frameworks of medical education (Young et al., 2019). When the literature is examined, it is seen that clinical reasoning has many different definitions, terms and defined scopes. Such a situation can make it difficult to establish a common language for both medical learners and educators. According to Groves et al. (2002), clinical reasoning is the integration and synthesis of information obtained from a clinical case with the knowledge and experience of the physician/student, and its use in diagnosing the patient's problem and in the management of the patient. According to some researchers, clinical reasoning has been considered as the cognitive process underlying clinical practice and is generally expressed as problem solving (Maudsley & Strivens, 2000; Round, 2001). The common point that researchers have determined about clinical reasoning is that decision-making processes must be evidence-based in order to see the existence of clinical reasoning (Higgs et al., 2019; Mattingly, 1991; Young et al., 2019; Young et al., 2020). In terms of skill, clinical reasoning is defined as a skill, process, or outcome in which healthcare professionals or clinicians observe, collect, and interpret data to diagnose and treat patients (Gruppen & Frohna, 2002; Gruppen, 2017). According to Daniel et al. (2019), the components of clinical reasoning are information gathering, hypothesis generation, problem representation, differential diagnosis, selecting a leading or working diagnosis, providing diagnostic rationale, and developing a management or treatment plan, can be defined. Novice learners tend to have little and scattered knowledge, while with increasing experience knowledge is organized and placed into more complex structures and schemes. Studies in the field of clinical reasoning show that clinical reasoning is the critical component of clinical competence; structuring medical education in a way that enables specialization in clinical reasoning and creating appropriate learning environments where novices and specialists use different clinical reasoning reveals the necessity of monitoring and evaluating the development of clinical reasoning with appropriate assessment and evaluation tools during the education.

One of the definitions of clinical reasoning is problem solving as stated above. Pesen (2008) defined the problem as a situation where the way to reach a solution is not clear and requires students to use their current knowledge and reasoning skills. According to Krulik and Rudnick (1987), a problem is a situation that is numerical or non-numeric, does not have a specific meaning in reaching the solution as an individual or group, or the solution is not clear and may require resolving. Problem solving is defined as a person's ability to deal with a problem. It is also defined as "the process in which the difference between the desired situation and the current situation must be overcome in a situation affected by previously encountered or unencountered variables" (Huitt, 1992). Considering the daily routines of health professionals, it can be said that they encounter many different problems. So, for healthcare professionals, problem solving may require structuring knowledge to cope with difficulties and using some strategies to eliminate undesirable situations. The problem-solving process includes the re-representation or visualization of the problem in the mind (Mayer, 1992; Mayer & Wittrock, 2006), and this situation constitutes one of the clinical reasoning process skills as stated above. Finally, problem solving is an intellectual process of the brain that searches for an explanation of a particular problem or discovers a technique to understand a given goal (Wang & Chiew, 2010).

Success is seen as an expression of skills or knowledge gained, which is determined by grades, test scores, or both, developed in the lessons taught at school and appreciated by teachers, that is, as academic success. Academic success is "the level of proficiency that the student shows regarding the objectives of the program as a result of a certain program" (Cevizci, 2010; Demirel, 2019; Schunk, 2012). Academic achievement is the level of performance during training (Jarvis, 2004), a level of achievement measured by a knowledge or skill test (Spafford at al., 1998), or grades, degrees, and other certification or public may be reflected in the forms of consent. It is also defined as the attainment of knowledge, competence, and senior status (Collins & O'Brien, 2011). Individuals with high academic success are responsible, disciplined, success-oriented, analytical and independent, and have unusual thinking skills (Sığrı & Gürbüz, 2011). In addition, these individuals know that the behaviors they have learned will not remain constant, they can update to new situations and use self-regulated learning strategies (Zimmerman & Martinez-Pons, 1990). Grade point average (GPA) is generally accepted as an indicator of academic ability, academic performance and academic success (Bean, 2005). McGrath and Braunstein (McGrath & Braunstein, 1997) hypothesize that GPA is one of the most influential variables that show the persistence of behavior. This research aimed to examine the relationships between the problem solving, clinical reasoning and academic achievement levels of medical students.

Method

This research is a correlational study examining the relationships between problem solving perception, achievement and clinical reasoning level.

Participant

This research was conducted with Year 5 students of Çanakkale Onsekiz Mart University. Participation in the research was based on voluntary participation. In this respect, purposive sample was used in the research. When using purposeful sampling, researchers determine the characteristics of the people who will form the research universe and reach people who fit these characteristics. Based on the researcher's knowledge of the universe, it is ensured that the people (subjects) who can give the best information for the purpose of the research are selected (Christensen et al., 2014; McMillan & Schumacher, 2014). There were 112 Year 5 students who voluntarily participated in the research. Of these students, 66 (58.9%) are female and 46 (41.1%) are male.

Data Collection Tools

In this study, data were obtained from three sources. These are: Clinical reasoning form, problem-solving inventory, and achievement.

Clinical Reasoning Form

The form used in the study to obtain information about the clinical reasoning levels of Year 5 students was created by the researchers. The form included three findings, each of which required a conclusion by interpreting the information, signs and symptoms, which were given in two stages. The first of the cases is about

a case that concerns the department of emergency medicine, the second is about a case that is related to the department of cardiology, and the third is about a case that is related to the department of internal medicine (see Appendix 1). A total of 300 points can be obtained from three cases.

While determining the departments (emergency medicine, cardiology and internal diseases) from which the cases were selected, the statistics most frequently seen by a general practitioner who graduated from a six-year medical faculties according to the data of the Ministry of Health were taken into consideration. The cases were created by the researchers with the support of the faculty members of the relevant department. Each case created was presented to the opinion of a group of 7 experts from the relevant field. The consistency of the expert opinions was tested with the Krippendorff Alpha coefficient and a value of 0.84 was obtained (Krippendorff, 2004). As the obtained value showed consistency between raters, necessary corrections were made in the cases in line with expert opinions and their final form was given.

Problem-Solving Inventory (PSI)

In the study, the Problem-Solving Inventory (PSI) was developed by Heppner and Peterson in 1982 and adapted to Turkish Culture by Sahin, Sahin and Heppner (1993). In the adaptation study of the inventory to Turkish culture, the Cronbach alpha consistency coefficient was found to be 0.88. The PSI consists of 35 items and is 6-point Likert-type (“I always act like this”, “I usually act like this”, “I often act like this”, “I sometimes act like this”, “I rarely act like this” and “I never act like this."). Scoring in the inventory is done over 32 items. Items 1, 2, 3, 4, 11, 13, 14, 15, 17, 21, 25, 26, 30 and 34 are reverse scored. The range of points that can be obtained from the inventory is 32-192. Items 9, 22 and 29 are excluded from scoring (Uysal & Manavoğlu, 2019).

Achievement

Researchers thought it would be appropriate to compare medical students' clinical reasoning levels with four types of achievement scores. The first of the cases in the clinical reasoning form was related to emergency medicine, the second to cardiology, and the third to internal medicine. For this reason, the students' general success scores were obtained at the end of their internship in these three departments. In addition, the overall success average of the students as of July of the 2021-2022 academic year was taken. These scores, which give an idea about success, were obtained from the student affairs of the faculty.

Data Analysis

For the purpose of the research, it is necessary to examine the relationships between problem solving perception, academic achievement and clinical reasoning. Again, for the purpose of the research, the effect of problem-solving perception and academic achievement on clinical reasoning should be modeled with regression analysis. In the analysis, the normal distribution of the variables was examined for parametric or nonparametric method preference, and it was determined that the normal distribution was provided. Due to the normal distribution of the data, Pearson was preferred in the relationship analysis and multiple linear regression analysis was preferred in the regression analysis. Multiple linear regression models are in the parametric analysis group. In order to apply multiple linear regression modeling; a) the dependent (result, output) variable in the model should have a normal distribution, b) the independent (explanatory, predictive) variables should not be multicollinearity (variance influence factor-VIF analysis) (Cohen et al., 2002; DeMaris, 2004). In the regression analysis, multicollinearity analysis was performed between predictors. The obtained Variance Inflation Factor (VIF) values were very close to 1. Therefore, it was decided that there was no autocorrelation between predictors (DeMaris, 2004; Pedhazur, 1997).

Ethical Consideration

This research was carried out with the decision of the Clinical Research Ethics Committee of Çanakkale Onsekiz Mart University, dated 09.12.2020 and numbered 14.

Results and Discussion

Pearson correlation analysis was used to test the relationships between the PSI scores of Year 5 medical students, the achievement levels of emergency medicine, cardiology, internal diseases at the end of their internship, the general success average, and the clinical reasoning cases (case). The results are presented in Table 1.

Table 1. Relationships between problem solving perception, achievement, and clinical reasoning

	1	2	3	4	5	6	7	8
1. Case (Cardiology)	1							
2. Case (Internal Diseases)	0.694**	1						
3. Case (Emergency Medicine)	0.454**	0.652**	1					
4. Clinical Reasoning (Total Score)	0.848**	0.946**	0.758**	1				
5. PSI	0.592**	0.675**	0.624**	0.729**	1			
6. Cardiology Achievement	0.022	-0.017	0.076	0.018	-0.090	1		
7. Internal Diseases Achievement	0.070	0.071	0.001	0.064	-0.075	0.169	1	
8. Emergency Medicine Achievement	0.057	0.043	0.031	0.052	-0.116	0.237*	0.504**	1
9. GPA	0.163	0.073	0.107	0.125	0.049	0.209*	0.261**	0.262**

N=112, *p<.05, **p<.01

According to the results of the relationship analysis;

- A positive and significant (p<.05) correlation was found between the clinical reasoning case related to the cardiology department and the scores obtained from the cases belonging to the other two departments (internal medicine and emergency medicine).
- A positive and significant (p<.05) correlation was found between the clinical reasoning case related to the cardiology department and the total score obtained from the clinical reasoning cases.
- A positive and significant (p<.05) correlation was found between the clinical reasoning phenomenon related to the cardiology department and the problem-solving inventory scores.
- No significant correlation was found between the clinical reasoning case related to the cardiology department and the cardiology internship success score and overall success average (p>.05).

The high positive correlation between the scores obtained from the cases prepared by the researchers and used for clinical reasoning can be interpreted as the cases tending to measure the same behavior consistently. It was considered as an interesting situation that the cases were not related to the end-of-internship success scores and general success average of the department they were related to. Success would be expected to correlate with the level of clinical reasoning. It is generally accepted that grade point average is an indicator of academic ability, academic performance and academic success (Bean, 2005). The fact that the scores obtained from the cases used for clinical reasoning were not correlated with the post-practice achievement scores and GPA raised some questions. The training program may have insufficient content to provide clinical reasoning processes. There may be problems in the assessment and evaluation processes. When we saw that the end-of-internship success scores and the overall success grade were positively correlated with each other, it was thought that standardization was achieved in measurement and evaluation. According to these results, students perform clinical reasoning independently of the internship final grade and success grade. In other words, students focus on short-term goals, work towards passing the exam, and the fact-based clinical reasoning processes are not sufficiently developed. According to the view supported by Muller's report (1984) and Nuefeld (1989); In classical curricula, short-term goals such as passing exams are directed instead of deep understanding and learning. According to our findings, it was interpreted that the students were oriented towards short-term goals and therefore there was no correlation between success scores and clinical reasoning levels. On the other hand (Ajjawi & Higgs, 2008) they argued that clinical reasoning is not a skill that can be simply explained, understood and remembered because of its fast-growing, complex and often subconscious natural functioning, and that there are difficulties in reflecting it. In addition, as mentioned above, it can be said that in addition to the content of the program in the faculty where the students of the faculty whose clinical reasoning skills are questioned, educational activities are not used in terms of learning-teaching processes, or there are deficiencies in providing environments where they can reflect these skills. Ryan and Higgs (2008) also suggested that the development or teaching of clinical reasoning is related to the context of the learning environment and the nature of practice settings. For example, although learning-teaching processes have been developed to develop clinical reasoning and to solve cases and clinical problems in the relevant education program, the lack of adequate and appropriate application areas where these skills can be reflected, and the lack of sufficient number

and variety of patients starting from the preclinical period are also the reasons for these results in the Faculty where the study was conducted may be the cause of its occurrence. Some researchers claimed that the development of clinical reasoning skills of medical students depends on their success in basic science courses that mark the preclinical period (Coderre et al., 2009; Smith et al., 2009). Barrows and Feltovich (1987) warned that studies on clinical reasoning conducted with patient problem simulations with low validity in settings different from the clinical context cannot provide sufficient clues about clinical reasoning skills, and this can be counted as one of the limitations of this study.

The fact that the perception of problem solving was related to the level of clinical reasoning was interpreted as that the perception of problem solving could support clinical reasoning. Some other researchers have stated that clinical reasoning is a problem-solving process designed to adapt to the need to obtain more information to resolve an already initially uncertain diagnostic situation and to work towards a gradual increase in knowledge over time (Barrows & Feltovich, 1987). In addition, Elstein et al. (1978) stated that the differences among clinicians are more about understanding the problem and how they visualize the problem (representatively) than the clinical reasoning strategies. However, the lack of a relationship between the perception of problem solving and success was another striking finding. The lack of correlation between the perception of problem solving and success was interpreted as students tending towards short-term goals and working towards passing the exam.

The Effect of Problem-Solving Perception, Cardiology Achievement and GPA on Cardiology Case

The effects of Year 5 medical students' PSI scores, their post-cardiology internship achievements and general success averages, and the clinical reasoning case score related to the cardiology field were modeled with multiple regression. The results are presented in Table 2.

Table 2. The effect of problem-solving perception, cardiology achievement and GPA on cardiology case

Model	B	Std. Error	t	p	VIF	F	p	R^2
PSI	0.466	0.061	7.677	<0.0001	1.013			
Cardiology Achievement	0.120	0.188	0.636	0.526	1.057	21.177	<0.0001	0.370
GPA	0.516	0.326	1.582	0.117	1.051			

The established model is significant ($F=21.177$, $p<.05$). In this case, the interpretation of the model is appropriate. Variance Influence Factor (VIF) statistic is around "1". In this case, it was decided that there was no variance bloat and the estimations were examined. Problem-solving perception is a significant positive predictor ($p<.05$) of the clinical reasoning phenomenon asked about the cardiology field. However, cardiology internship success and overall academic average are not significant predictors for the case asked about cardiology field ($p>.05$). The overall explanatory rate of the model is 37% ($R^2=0.370$). In this case, it can be said that the predictor variables included in the model explain 37% of the variance in the clinical reasoning case related to the field of cardiology.

Problem solving perception can be interpreted as the positive predictor of the scores obtained from the Cardiology phenomenon used for clinical reasoning, as the problem solving perception supports the clinical reasoning processes. It was considered as an interesting situation that the cardiology internship success score and the overall success average were not positive predictors of the scores obtained from the Cardiology clinical reasoning case. The situation that the problem solving perception level is not the predictor of the students' final grade of internship and general success grade; It was interpreted that the students were working towards short-term goals, namely the exam, were not oriented towards deep learning, or that the processes for clinical reasoning and problem solving were insufficiently used while determining the final grade of internship and general success grade.

The Effect of Problem-Solving Perception, Internal Diseases Achievement and GPA on Internal Diseases Case

The effects of Year 5 medical students' PSI scores, their post-internship achievements in internal diseases and their general success averages, and the clinical reasoning case score related to the field of internal medicine were modeled with multiple regression. The results are presented in Table 3.

Table 3. The effect of problem-solving perception, internal diseases achievement and GPA on internal diseases case

Model	B	Std. Error	t	p	VIF	F	p	R^2
PSI	0.779	0.080	9.704	<0.0001	1.011			
Internal Diseases Achievement	0.331	0.201	1.645	0.103	1.082	31.947	<0.0001	0.470
GPA	0.050	0.438	0.114	0.910	1.079			

The established model is significant (F=31.947, p<.05). In this case, the interpretation of the model is appropriate. The VIF statistic is around "1". In this case, it was decided that there was no variance bloat and the estimations were examined. Problem-solving perception is a significant positive predictor (p<.05) of the clinical reasoning phenomenon asked about the field of internal medicine. However, internal diseases internship success and general academic average are not significant predictors for the case asked about internal diseases (p>.05). The overall explanatory rate of the model is 47% (R^2=0.470). In this case, it can be said that the predictor variables included in the model explain 47% of the variance in the clinical reasoning phenomenon related to the field of internal medicine.

The problem solving perception can be interpreted as being a positive predictor of the scores obtained from the internal medicine case used for clinical reasoning and that the problem solving perception supports the clinical reasoning processes. It was considered as an interesting situation that the internal diseases internship success score and the general success average were not positive predictors of the scores obtained from the Internal Diseases clinical reasoning phenomenon. The situation that the problem solving perception level is not the predictor of the students' final grade of internship and general success grade; It was interpreted that the students were working towards short-term goals, namely the exam, were not oriented towards deep learning, or that the processes for clinical reasoning and problem solving were insufficiently used while determining the final grade of internship and general success grade.

The Effect of Problem-Solving Perception, Emergency Achievement and GPA on Emergency Case

The effects of the PSI scores of the Year 5 medical students, their achievements at the end of their emergency medicine internship and general success averages, and the clinical reasoning case score related to the emergency medicine field were modeled with multiple regression. The results are presented in Table 4.

Table 4. The effect of problem-solving perception, emergency achievement and GPA on emergency case

Model	B	Std. Error	t	Sig.	VIF	F	p	R^2
PSI	0.331	0.039	8.411	<0.0001	1.021			
Emergency Achievement	0.127	0.109	1.164	0.247	1.093	24.274	<0.0001	0.403
GPA	0.144	0.214	0.676	0.500	1.081			

The established model is significant (F=24.274, p<.05). In this case, the interpretation of the model is appropriate. The VIF statistic is around "1". In this case, it was decided that there was no variance bloat and the estimations were examined. Problem-solving perception is a significant positive predictor of clinical reasoning asked about emergency medicine (p<.05). However, the success of the emergency medicine internship and the overall academic average are not significant predictors for the case asked about the field of emergency medicine (p>.05). The overall explanatory rate of the model is 40% (R^2=0.403). In this case, it can be said that the predictor variables included in the model explain 40% of the variance in clinical reasoning in the field of emergency medicine.

The problem solving perception being a positive predictor of the scores obtained from the Emergency Medicine case used for clinical reasoning can be interpreted as supporting the clinical reasoning processes of the problem solving perception. It was considered interesting that the Emergency Medicine final success score and the overall success average were not positive predictors of the scores obtained from the Emergency Medicine clinical reasoning case. The situation that the problem solving perception level is not the predictor of the students' final grade of internship and general success grade; It was interpreted that the students were working towards short-term goals, namely the exam, were not oriented towards deep learning, or that the processes for clinical reasoning and problem solving were insufficiently used while determining the final grade of internship and general success grade.

Conclusion

The total scores of Medical Faculty Year-5 students from clinical case evaluations of 3 different departments showed a positive correlation both with each other and with the scores they got from the problem-solving perception scale. That is, the case assessments were consistent. Consistency of problem solving perception and cases was an expected result in Medical Education. However, it was surprising that the students' final grades of internship and general success grades did not show a correlation with both clinical case assessments and problem solving perceptions. Since it is very important to develop clinical reasoning processes in Medical Education, it is necessary to review and develop clinical reasoning-based practices in the education process.

Recommendations

In Medical Education, it is necessary to give importance to clinical reasoning in the process of raising medical doctors (health professionals). Students are required to use clinical reasoning processes. It should be evaluated whether the clinical reasoning processes are used adequately, and the training program should be reviewed and adjusted when necessary. More work is needed to define what influences the development of clinical reasoning. Such research will provide a holistic approach to clinical reasoning, including the basic cognitive processes related to teaching and applying clinical problem solving skills, as well as communication skills that are thought to affect clinical reasoning, and basic social processes that potentially affect the doctor-patient relationship.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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Appendix

Case 1
Part 1 (Duration: 10 minutes)

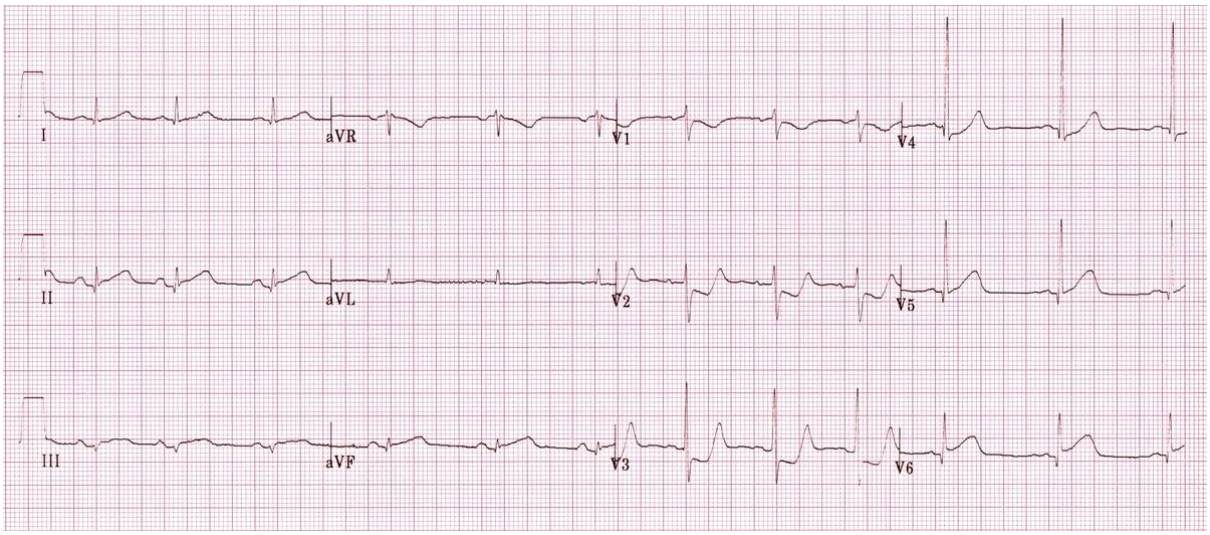
A 40-year-old female patient applied to the emergency department with the complaint of severe chest pain. Retrosternal, pressing, squeezing, burning pain radiated to both arms, forearms, shoulders, neck, jaw, and back. It was learned that the pain started with stomach pain and dyspnea after dinner and spread to the back. The pain did not go away with rest. It was learned from the patient's history that she had been treated for hypertension, did not smoke, did not enter menopause, did not use oral contraceptives, and did not have any other chronic disease. She said in your ongoing anamnesis that she did not have any allergies, she ate the same things with her husband at dinner, and she had not undergone any surgery.

Write down your possible pre-diagnosis for this patient, the reasons that led you to this pre-diagnosis, the anamnesis information that will confirm this pre-diagnosis and distinguish it from other diagnoses in the table below(In this section, 6 pre-diagnoses and reasons should be written, and the highest score that can be obtained is 50.)

Part 2 (Duration: 10 minutes)

Her general appearance is cold, pale, clammy skin, restlessness, irritability, and distress. The lips and nail beds were cyanotic in the patient with orthopnea. On auscultation, you hear rhythmic early beats in heart sounds, you hear S4 distinct heart sounds and wheezing in breathing sounds. T.A: 120/70 mmHg; heart rate: 90/min; Respiration Rate: 24/min; SPO2: 92%; Blood Sugar: 70 g/dl; Body Temperature: 36^{0}C

In the blood test you requested, the patient's white blood cell count is 16.3 mg/dl, hemoglobin 13 mg/dl, platelet count 481.000 ″u/L, Troponin I 0.658 ng/ml (N:0-0.2). The ECG of the patient is as shown in the figure.



In line with these new findings and information, have there been any changes in the preliminary diagnoses you thought for the patient? Which has become a priority? Why is that? Write what you think first in the table with justification (In this section, the conversion of a pre-diagnosis to the main diagnosis, its rationale and treatment recommendation should be presented, and the highest score that can be obtained is 50.).

Case 2
Part 1 (Duration: 10 minutes)

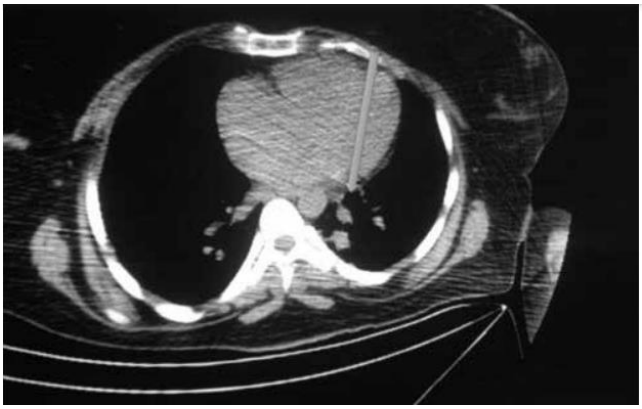
Thirty-year-old patient, who was operated for an ovarian cyst ten days ago, presents to the emergency room with the feeling of faintness and fainting. In the anamnesis, it is stated that she does not have any known ailments, except her body mass index is around 30. In the emergency department, she is conscious, cooperative, hypotensive, and tachycardic (TA: 80/40 mmHg, HR: 150/min). Cardiac and respiratory arrest, cardiopulmonary arrest (CPA) develops during the examination and blood collection procedures, and she is

immediately ortracheal intubated. The procedure could not be completed, as the patient, who responded to three minutes of resuscitation, underwent CPA 3 more times during the imaging procedures.

Write in the table below what your possible preliminary diagnoses are for this patient, the reasons leading you to this preliminary diagnosis, the anamnesis, physical examination and examination information that will confirm this preliminary diagnosis and distinguish it from other diagnoses. (In this section, 5 preliminary diagnoses and justifications should be written, and the highest score that can be obtained is 50.)

Part 2 (Duration: 10 minutes)

BP: 60/40 mmHg, HR: 160/minute, peripheral circulation was impaired and cyanotic. Meanwhile, the ABG values measured: pH: 6.87, pCO2: 61 mmHg, pO2: 28 mmHg, BE: -27.7 mmol/L, HCO3: 5.9 mmol/L, Lactate: 19 mmol/L, coagulation values: PT: 18.39 sec, PT%: 47, INR: 1.59, APTT: 114.4, D-Dimer: >100000. With the preliminary diagnosis of PE and acute renal failure (ARF), anticoagulant treatment enoxaparin (Clexane 0.6 mL twice a day and coraspin 300 mg) and fluid resuscitation were started. When hemodynamics did not improve, norepinephrine infusion was added. However, when metabolic acidosis did not improve, heparinized hemodiafiltration was applied, and sedation was started for brain protection. After hemodynamic stabilization, CT-pulmonary angiography was performed.



Based on the information given in the second part, write down what you think primarily, your diagnosis and your treatment with justification in the table (In this section, the conversion of a pre-diagnosis to the main diagnosis, its rationale and treatment recommendation should be presented, and the highest score that can be obtained is 50.)

Case 3

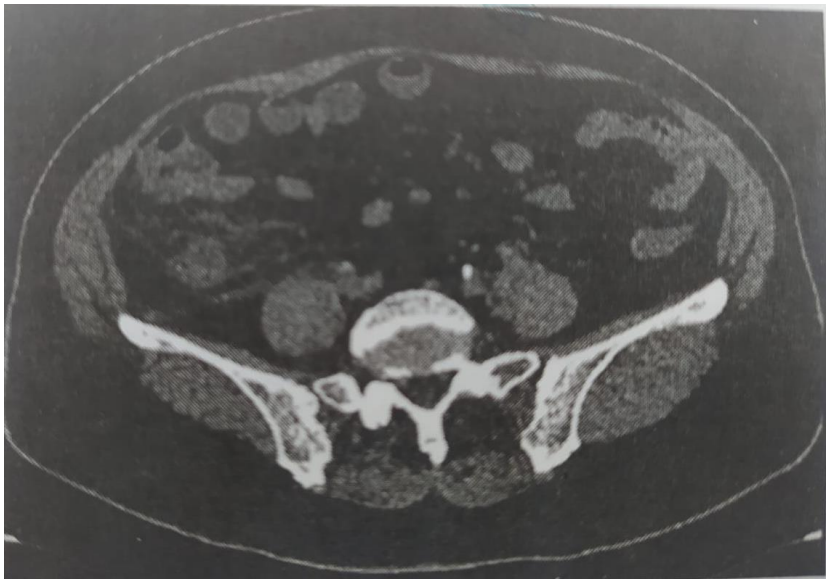
Part 1 (Duration: 10 minutes)

A 40-year-old male patient presented to the emergency department with complaints of loss of appetite and nausea. You detected widespread tenderness in the abdominal examination of the patient whose history was unremarkable. In the routine laboratory examinations of the patient, you saw that the AST, ALT, BUN and creatinine values were within normal limits. Hemogram was Hg: 12.8 mg/dl, plt: 200000 u/L, WBC: 11200 u/L. No pathological finding was found in the standing direct abdominal X-ray.

Write in the table below what your possible preliminary diagnoses are for this patient, the reasons leading you to this preliminary diagnosis, the anamnesis, physical examination and examination information that will confirm this preliminary diagnosis and distinguish it from other diagnoses. (In this section, 5 preliminary diagnoses and justifications should be written, and the highest score that can be obtained is 50.)

Part 2 (Duration: 10 minutes)

In the follow-up of the patient, pain and rebound positivity developed at the Mc Burny point in the right lower quadrant. Abdominal pain has shifted to the right lower quadrant, nausea-vomiting and loss of appetite continue. Abdominal CT without contrast is as follows.



In line with these new findings and information, have there been any changes in the preliminary diagnoses you thought for the patient? Which has become a priority? Why is that? Write what you think first in the table with justification (In this section, the conversion of a pre-diagnosis to the main diagnosis, its rationale and treatment recommendation should be presented, and the highest score that can be obtained is 50.).

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The Effect of Health Anxiety on Subjective Happiness: Does Optimism Play a Protective Role?

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Abstract

In this study, health anxiety and optimism were determined as predictors of subjective happiness. A total of 301 individuals, 168 females (55.8%) and 133 males (44.2%) participated in the study carried out based on the correlational model. The research data were collected online due to the pandemic. In the study, Personal Information Form, Health Anxiety Scale, Optimism Scale and Subjective Happiness Scale were used as data collection tools. According to the findings obtained from the study, statistically significant and negative correlations were found between the health anxiety variable and the variables of subjective happiness and optimism. In addition to these results, statistically significant and positive correlations were determined between the optimism variable and subjective happiness variable. Mediation analyses were conducted in the study, and according to the results, it was revealed that optimism had a mediating role in the relationship between health anxiety and subjective happiness. As a result, the indirect effect of health anxiety on subjective happiness was found to be statistically significant. It is believed that the findings of the research will benefit experts who prepare intervention programs for individuals who experience intense anxiety during the pandemic process and who have low levels of subjective happiness.

Introduction

Positive psychology, which offers an alternative perspective to the solution-oriented approach of psychology, emphasizes the strong and virtuous aspects of human beings (Sheldon & King, 2001). Seligman (2002), who is considered one of the pioneers of the theory, explains the philosophy of the theory as investigating the factors that make life worth living instead of the things that go wrong in life. It can be said that the basic concepts of the theory have been also shaped in the light of this philosophy. Human happiness lies at the center of these concepts. To put it briefly, positive psychology is concerned with happiness, enjoyment, meaningful life, in other words, the well-being of the individuals.

Subjective Well-Being

Well-being is a general concept that may correspond to the happiness and positive functionality of the individuals (Tuzgöl Dost, 2004). The concept of well-being is handled in two different ways in the theory as subjective and psychological well-being. While psychological well-being is used in the meaning of the self-realization and development of the individual (Ryff, 1989); subjective well-being, on the other hand, is used in the meaning that the individuals experience less negative emotions and more positive emotions, and is satisfied with their life (Diener, 1984; Diener, 2000; Diener et al., 2002; Diener et al., 1997; Ryan & Deci, 2001). Looking at the definition of subjective well-being; It is seen that it has a three-component structure as positive emotions, negative emotions and life satisfaction. It is seen that the part of these components related to positive and negative emotions represents the affective dimension of subjective happiness, and the part related to life satisfaction represents the cognitive dimension (Diener et al., 1999; Schimmack, 2008). In the affective dimension, the positive affection is associated with the intensity of emotions such as joy, being full of love, calmness, being fun and the negative affection is associated with the intensity of emotions such as anger, fear, anxiety, shame, guilt, regret (Diener & Tov, 2012). Life satisfaction, which is included in the cognitive dimension, is defined by Diener and Diener (1995) as the state of being satisfied, which includes all positive evaluations of life, and as the satisfaction with the whole of life as a result of these evaluations. In short, the subjective well-being is a concept related to both affectivity and evaluations of life in general. It can be said that

positive emotions being more than negative ones and life satisfaction indicate subjective well-being or, with its use in everyday language, happiness (Carr, 2014).

Studies show that various factors are effective on subjective well-being. Lyubomirsky et al. (2005) have evaluated variables related to subjective well-being in three groups. These are living conditions (education, gender, age, economic status); purposeful life activities (doing good, fulfilling religious obligations, forgiveness) and genetic traits. In the literature, personality traits (Heady & Weaning, 1989); neuroticism and extraversion (Argyle, 2001; Spangler & Polrecha, 2004); genetic factors (Costa & McCrae, 1980); age (Blanchflower & Oswald, 2004; Eryılmaz & Ercan, 2011; Luchman et al., 2012; Ryff, 1989) gender (Dilmaç & Bozgeyikli, 2009; Güler & Gazioğlu, 2008; Inglehart, 2002; Shmotkin, 1990; Tümkaya, 2011) marital status (Diener, 2009) economic status (Carbonell, 2005; Proto & Rustichini, 2013); religion (Argyle & Hills, 2000); hope (Bernardo, 2015; Snyder et al., 2003); optimism (Bailey et al., 2007; Cummins & Nistico, 2002; Gülcan & Bal, 2014; Sapmaz & Doğan, 2012) are some of the variables whose relationship with subjective happiness is examined. Based on this information, it can be said that subjective well-being is affected by and affects many variables in human life. In addition, research findings show that there is a relationship between subjective well-being and feeling healthy (Diener et al., 1999). Based on this relationship, health anxiety was included as a variable in the research and an answer was sought to the question of whether there is a relationship between health anxiety and subjective well-being.

Health Anxiety

Health anxiety is defined as an individual's intense concern about his/her health, constantly dealing with it, and interpreting changes in her body as a sign of an important disease (Reiser et al., 2014). In other words, it can be said that it is the fear of the individual against being sick. American Psychiatric Association (2013) defined disease anxiety with the symptoms in which the individual has repetitive thoughts that he/she has or will have a serious illness, the anxiety he/she feels is not consistent with his current situation, the anxiety he feels about his health is high and he is inclined to be afraid in this situation, and there is an excess of behaviours related to his health.

The research studies conducted has emphasized that the individual's feeling of health is positively related to subjective well-being (Diener et al., 1999) and revealed that subjective well-being is also related to personality traits (Doğan, 2013; Eryılmaz & Ercan, 2011; Reisoğlu & Yazıcı, 2016). There are research findings concluding that optimism, which is accepted as a personality trait with one dimension (Carver & Scheier, 2002), is also positively related to subjective well-being (Seligman, 2002). For this reason, optimism was included as a variable in the study and its intermediary role in the relationship between health anxiety and subjective well-being was investigated.

Optimism

Optimism is defined as a strong expectation that everything will be fine in life despite the difficulties and obstacles encountered (Gillham & Reivich, 2004; Scheier & Carver, 1985). In other words, it can be said that it is focusing on the good side of the events rather than the bad side (Benson, 2007). Carver and Scheier (2002), who conducted the first research study on optimism, one of the important concepts of positive psychology, in the context of psychology, emphasized the continuity and consistency of optimism. Not a situational optimism, but a continuous tendency to see the positive aspects of events in general has been mentioned and optimism has been considered as a personality trait. In addition to this view, there are approaches that deal with optimism as situational, but the optimism discussed in this study was considered as a feature with consistency and continuity.

Subjective well-being is a concept used synonymously with happiness in the literature (Tuzgöl Dost, 2010). Happiness is a common goal that all people have, a point they want to reach throughout their lives. Each information that will contribute to people in achieving this goal and bring them closer to it is of great importance. Research findings have been found in the literature demonstrating that optimism is negatively associated with depression, anxiety and stress (Chang et al., 2003; McIntosh et al., 2004; Scheier et al., 1994); it is positively associated with mental resilience (Nicholls et al., 2008) and physical health (Scheier & Carver, 1985) and subjective well-being is positively associated with physical health (Carr, 2014; Diener, 2012), optimism (Seligman & Csikszentmihalyi, 2014) and psychological well-being (Keyes et al., 2002; Linley et al., 2009). Both health anxiety and optimism are concepts that can be positively changed with interventions to be conducted. Psychotherapy interventions for anxiety are widely used. Studies have demonstrated that optimism is

a feature that can be learned and that the optimism levels of individuals can be increased with interventions (Seligman, 2006). In the light of this information, it is considered that the results of the research can be a guide in the interventions planned to be carried out to protect the mental health of individuals and increase their well-being levels. In the pandemic process, which has affected the whole world, it has been observed that individuals have become more sensitive to signals coming from their bodies due to the anxiety of catching the virus (Yazıcı-Çelebi, 2020). Anxiety or even panic can be experienced by perceiving a simple cough or a slight fever as a sign of Covid 19. Considering the high similarity with the criteria in the diagnosis of health anxiety, it can be considered that the current pandemic process will have a triggering effect on health anxiety. When considered from this point of view, it is believed that the findings of the research will be useful also for the experts who prepare intervention programs for individuals who experience intense anxiety due to the pandemic and who have low levels of subjective well-being. While forming the theoretical basis of the research, the extension and development model put forward by Fredrickson (1998) was taken as basis. The model is based on the principle that positive emotions contribute to the development of individuals' social, psychological and physical resources (Fredrickson et al., 2008), they are useful in coping with the difficulties encountered in life and contribute to permanent well-being (Kiken & Fredrickson, 2017). The aim of the study was to evaluate the mediating role of optimism in the relationship between health anxiety and subjective happiness. In line with this purpose, the following hypotheses were tested:

Hypothesis 1: Health anxiety is a significant predictor of subjective happiness.
Hypothesis 2: Optimism has a mediating role in the relationship between health anxiety and subjective happiness.

Method

Study Group

After the permission of the measurement tools used in the research were received and the ethics committee application was performed, the data of the research was obtained through online forms between 20 July 2020 and 27 July 2020. The data were collected online by the researchers by using the convenient sampling method. This method enables researchers to select participants from groups more accessible in terms of time, money, and availability (Creswell, 2014). All procedures in the research were completed within the framework of the approval numbered E.33572 of the Scientific Research and Publication Ethics Committee of Gümüşhane University. The descriptive information of the individuals constituting the study group of the research is presented in Table 1.

Table 1. Descriptive statistics of the participants

Variable		N	%	HA Score Means and Standard Deviations	O Average Scores and Standard Deviations	SH Average Scores and Standard Deviations
Gender	Female	168	55.8	16.06(5.35)	66.76(6.81)	19.56(4.16)
	Male	133	44.2	13.61(6.47)	67.31(6.95)	20.14(4.16)
Education Level	Associate/Bachelor	253	84.1	15.09(5.89)	66.68(7.04)	19.55(4.30)
	Postgraduate	48	16.0	14.40(6.49)	68.73(5,61)	21.21(3.07)
Social-Economic Level	Medium Level	109	36.2	15.50(5.51)	67.39(7.81)	19.20(4.33)
	Good Level	149	49.5	14.64(6.08)	67.17(6.15)	20.18(4.08)
	Very Good Level	43	14.3	14.84(6.82)	65.47(6.58)	20.09(3.97)
Chronic Discomfort	Yes	42	14.0	14.88(4.96)	66.88(5.65)	20.88(3.51)
	No	259	86.1	14.99(6.14)	67.02(7.05)	19.64(4.24)
The Status of Relatives/Friends	Yes	127	42.2	15.35(6.16)	66.52(6.59)	19.86(3.95)
Being Diagnosed with Covid-19	No	174	57.8	14.70(5.87)	67.36(7.06)	19.78(4.32)
Death due to Covid-19 in the	Yes	17	5.7	16.12(6.18)	68.35(5.86)	21.18(3.68)
immediate surroundings	No	284	94.4	14.91(5.98)	66.92(6.92)	19.73(4.18)

HA: Health Anxiety, *O:* Optimism, *SH:* Subjective Happiness

The study group of this research consisted of a total of 301 individuals, including 168 females (55.8%) and 133 males (44.2%). The ages of the individuals in the study group ranged from 19 to 31 (*Mean*=20.3, *SD*=2.9). It was determined that 253 (84.1%) of the individuals who participated in the research stated that they were at the associate/undergraduate level, and 48 (16.0%) were at the postgraduate level. When the socio-economic levels of the individuals constituting the study group of the research were examined, 109 (36.2%) of them reported that

they were at a medium economic level, 149 (49.5%) of them were at a good economic level, and 43 (14.3%) of them were at a very good economic level. 42 (14.0%) of the participants of the study stated that they had a chronic disease and 259 (86.1%) of them stated that they did not have a chronic disease. In addition to this information, the number of the participants who had people in their immediate circle diagnosed with Covid-19 was determined to be 127 people (42.2%). In addition, the number of the participants who lost their relatives due to Covid-19 was calculated to be 17 people (5.7%).

Data Collection Tools

Health Anxiety Scale

The Health Anxiety Scale is a self-report scale consisting of eighteen items developed by Salkovskis et al. (2002). The first 14 items question the feelings and thoughts of the participants about their health status, while the last four items consist of questions about how the participants will react when they think they have a serious illness (Salkovskis et al., 2002). The internal consistency coefficient of the scale was determined to be 0.89 for the first part (14 items) and 0.84 for the last part (4 items). Scoring of the scale is between 0-3 for each item ('0' is "I don't feel anxious about my health" and '3' is "I always worry about my health") and high score indicates high level of health anxiety. The scale was adapted to Turkish by Aydemir et al. (2013). In reliability analyses, internal consistency coefficient was determined to be 0.92. As a result of the reliability analysis conducted within the scope of this study, the internal consistency coefficient was determined as ($\alpha = 0.86$).

Optimism Scale

Optimism Scale, developed by Balcı and Yılmaz (2002) to measure the optimism levels of individuals, is a four-point Likert-type scale ('1' It is definitely not for me, and '4' Just like me) with twenty-four items. Internal consistency coefficient of the Optimism Scale was found to be 0.96, split-half reliability coefficient was found to be 0.91 and the test-retest correlation coefficient was found to be 0.61. Internal consistency coefficient of the scale was also found to be at a high level within the scope of the study ($\alpha = 0.75$).

Subjective Happiness Scale

Subjective Happiness Scale was developed by Lyubomirsky and Lepper (1999) to determine the happiness levels of individuals. The scale is a four-item 7-point Likert ('1' I am not happy at all and '7' I am very happy) type of measurement tool. The adaptation study of the Scale to Turkish culture was carried out by Akın and Satıcı (2011). Internal consistency coefficient after the studies conducted within the scope of reliability studies of the scale was determined as 0.83, while the test-retest reliability coefficient was calculated as 0.73 (Akın & Satıcı, 2011). Internal consistency coefficient of the scale was also found to be at a high level within the scope of the study ($\alpha = 0.81$).

Personal Information Form

In the form prepared by the researchers, there are questions about gender, education level, socio-economic level, status of getting psychological help, use of a psychiatric medication, and presence of a chronic illness.

Data Analysis

Before performing statistical operations on the data obtained within the scope of the research, missing value, extreme value, normality and linearity analysis were performed (Field, 2013). As a result of the analysis, it was determined that there were no missing values in the data set. In the extreme value analysis, the scores of the obtained variables were converted into standard z scores, and it was observed whether the whole data set was between -3 and 3 (Tabachnick & Fidell, 2014). Then, the skewness and kurtosis values of the variables obtained from the data set were examined. It was understood that the kurtosis and skewness values of the variables were between -2 and 2 and had a normal distribution (George & Mallery, 2019).

The research was planned based on the relational model among quantitative research approaches. Relational screening models are expressed as designs that aim to determine the existence of covariance among more than one variable (Fraenkel et al., 2015). In this study, it was aimed to determine the role of health anxiety and optimism as a mediating variable in predicting subjective happiness. For the purposes of the research, a mediation model based on the mediating role of optimism in the relationship between health anxiety and subjective happiness was developed. Before testing the mediation analysis of the study, its relationship with demographic variables that may have an effect on health anxiety, optimism and subjective happiness variables was also examined. For this purpose, a t-test was conducted for independent samples in order to find out whether one of their relatives was diagnosed with Covid-19, one of their relatives died from Covid-19, whether they have a chronic illness, whether optimism, subjective happiness and health anxiety differed in terms of gender and education level. On the other hand, whether optimism, subjective happiness, and health anxiety differed in terms of socio-economic level was examined with one-way analysis of variance.

During the testing of the hypotheses of the study, regression-based mediation analysis was carried out. The boostrap method was used to test the mediation hypothesis. The fact that the confidence intervals obtained as a result of the analyses did not include zero indicated that the indirect effect was significant. The SPSS Macro Process software was used for the calculation of the Bootstrap method. SPSS 21.00 packaged software was used for analysis of obtained data.

Results

Before proceeding to the correlation analysis of the research, the effects of various demographic characteristics that may have an effect on the optimism, subjective happiness and health anxiety of individuals were examined. Before the analyses were carried out, the conditions of the parametric analyses were examined and it was determined that both normality and homogeneity of variance were provided.

Independent samples t-test was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether they experienced a chronic disease. The results obtained are given in Table 2.

Table 2. Independent samples t-test results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether they experienced a chronic disease

Variable	Chronic Disease	N	Mean	*SD*	*t*	*df*	*p*
Health Anxiety	Yes	42	14.88	4.96			
	No	259	14.99	6.14	-0.112	299	0.911
Optimism	Yes	42	66.88	5.65			
	No	259	67.02	7.05	-0.124	299	0.901
Subjective Happiness	Yes	42	20.88	3.51			
	No	259	19.64	4.24	1.796	299	0.073

As a result of the analysis conducted, it was found in terms of having a chronic disease that the health anxiety levels of the individuals ($t_{(299)}$ = -0.112, p = 0.911), and their optimism levels ($t_{(299)}$ = -0.124, p = 0.901) and their subjective happiness levels ($t_{(299)}$ = 1.796, p = 0.073) were not statistically and significantly different.

Independent samples t-test was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether a relative of theirs was diagnosed with COVID-19. The results obtained are given in Table 3.

Table 3. Independent samples t-test results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether a relative of theirs was diagnosed with COVID-19

Variable	Diagnosed with Covid-19	N	Mean	*SD*	*t*	*df*	*p*
Health Anxiety	Yes	127	15.35	6.16			
	No	174	14.70	5.87	0.935	299	0.351
Optimism	Yes	127	66.52	6.59			
	No	174	67.36	7.05	-1.044	299	0.297
Subjective Happiness	Yes	127	19.86	3.95			
	No	174	19.78	4.32	0.157	299	0.875

As a result of the analysis conducted, it was found in terms of having a relative diagnosed with Covid-19 that the health anxiety levels of the individuals ($t_{(299)} = 0.935$, $p = 0.351$), their optimism levels ($t_{(299)} = -1.044$, $p = 0.297$) and their subjective happiness levels ($t_{(299)} = 0.157$, $p = 0.875$) were not statistically and significantly different. Independent samples t-test was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether a relative of theirs died from COVID-19. The results obtained are given in Table 4.

Table 4. Independent samples t-test results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of whether a relative of theirs died from COVID-19

Variable	Death from Covid-19	N	Mean	*SD*	*t*	*df*	*p*
Health Anxiety	Yes	17	16.12	6.18			
	No	284	14.91	5.98	0.809	299	0.419
Optimism	Yes	17	68.35	5.86			
	No	184	66.92	6.92	0.834	299	0.405
Subjective Happiness	Yes	17	21.18	3.68			
	No	284	19.73	4.18	1.391	299	0.165

The results of the analysis indicated that in terms of having a relative who died of Covid-19, the health anxiety levels of the individuals ($t_{(299)} = 0.809$, $p = 0.419$), their optimism levels ($t_{(299)} = 0.834$, $p = 0.405$) and their subjective happiness levels ($t_{(299)} = 1.391$, $p = 0.165$) were not statistically and significantly different. Independent samples t-test was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their education levels. The results obtained are given in Table 5.

Table 5. Independent samples t-test results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their education levels

Variable	Education Level	N	Mean	*SD*	*t*	*df*	*p*
Health Anxiety	Associate Degree/Bachelor Degree	253	15.09	5.89			
	Postgraduate	48	14.40	6.49	0.733	299	0.464
Optimism	Associate Degree/Bachelor Degree	253	66.68	7.04			
	Postgraduate	48	68.73	5.61	-1.715	299	0.091
Subjective Happiness	Associate Degree/Bachelor Degree	253	19.55	4.30			
	Postgraduate	48	21.21	3.07	-1.923	299	0.061

According to the results of the analysis, it was found in terms of education levels that the health anxiety levels of the individuals ($t_{(299)} = 0.733$, $p = 0.464$), their optimism levels ($t_{(299)} = -1.715$, $p = 0.091$) and their subjective happiness levels ($t_{(299)} = -1.923$, $p = 0.061$) were not statistically and significantly different. Independent samples t-test was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their gender. The results obtained are given in Table 6.

Table 6. Independent samples t-test results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their gender

Variable	Gender	N	Mean	*SD*	*t*	*df*	*p*	*d*
Health Anxiety	Female	168	16.06	5.35				
	Male	133	13.61	6.47	3.597	299	<.001	0.41
Optimism	Female	168	66.76	6.81				
	Male	133	67.31	6.95	-0.685	299	0.494	
Subjective	Female	168	19.56	4.16				
Happiness	Male	133	20.14	4.16	-1.192	299	0.234	

According to the results of the t-test conducted, it was found in terms gender that the health anxiety levels of the individuals ($t_{(299)} = 3.597$, $p < .001$) differed; their optimism levels ($t_{(299)} = -0.685$, $p = 0.494$) and their subjective happiness levels ($t_{(299)} = -1.192$, $p = 0.234$) were not statistically and significantly different. According to this result, it can be said that women's mean score from health anxiety (*Mean* = 16.06, *SD* = 5.35) was higher than that of men (*Mean* = 13.61, *SD* = 6.47). In terms of effect size, it was found that gender had a moderate effect (d= 0.41) on individuals' health anxiety (Cohen, 1992). One-way anova was conducted to determine whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their socio-economic levels. The results obtained are given in Table 7

Table 7. One-way anova results on whether the health anxiety, optimism, and subjective happiness levels of individuals differed in terms of their socio-economic levels

Variable	Source	*Sum of Squares*	*df*	*Mean Square*	*F*	*p*
Health Anxiety	Between groups	47.30	2	23.65		
	Within groups	10701.54	298	35.91	0.659	0.518
	Total	10748.84	300			
Optimism	Between groups	121.68	2	60.84		
	Within groups	14015.32	298	47.03	1.294	0.276
	Total	14137.00	300			
Subjective Happiness	Between groups	64.29	2	32.14		
	Within groups	5141.30	298	17.25	1.863	0.157
	Total	5205.58	300			

Finally, as a result of the one-way anova analysis conducted, it was found in terms of their socio-economic level that the health anxiety levels of the individuals ($F_{(2, 298)} = 0.659$, $p = 0.518$), their optimism levels ($F_{(2, 298)} = 1.294$, $p = 0.276$) and their subjective happiness levels ($F_{(2, 298)} = 1.863$, $p = 0.157$) were not statistically and significantly different according to the one-way analysis of variance results. According to the results obtained, research analyses were carried out differently for both genders, since there was a differentiation between health anxiety levels in terms of genders. The results of the correlation analysis carried out to determine the relationships between health anxiety, optimism and subjective happiness of both female and male participants of the study are presented in Table 8.

Table 8. Relationships between health anxiety, optimism, and subjective happiness

Variable	Health Anxiety $_{(M)}$	Optimism $_{(M)}$	Subjective Happiness $_{(M)}$
Health Anxiety $_{(F)}$	1	-0.303***	-0.264***
Optimism $_{(F)}$	-0.278***	1	0.564***
Subjective Happiness $_{(F)}$	-0.332***	0.531***	1

*** $p < .001$, *F:* Female Sample, *M:* Male Sample

According to the results of the correlation analysis, a negative and significant relationship was found in women between health anxiety and optimism ($r = -0.278$, $p < .001$), and subjective happiness ($r = -0.332$, $p < .001$). In contrast, a positive and significant relationship was determined between optimism and subjective happiness ($r = 0.531$, $p < .001$). A negative and significant relationship was found in men between health anxiety and optimism ($r = -0.303$, $p < .001$), and subjective happiness ($r = -0.264$, $p < .001$). Besides these results, a positive and significant relationship was determined between optimism and subjective happiness ($r = 0.564$, $p < .001$).

According to the results of the mediation analysis conducted within the scope of the research hypotheses, it can be said that the total effect of health anxiety on subjective happiness in women is significant ($\beta = -0.258$, $t = -4.538$, $p < .001$). Also, it was found that the effect of health anxiety on optimism ($\beta = -0.353$, $t = -3.724$, $p < .001$), and the effect of optimism on subjective happiness ($\beta = 0.290$, $t = 7.099$, $p < .001$) was found significant. As a result of the analyses, that the 95% bias corrected confidence intervals did not include zero (Preacher & Hayes, 2008) demonstrated that optimism had a mediating role in the relationship between health anxiety and subjective happiness (*ab* = -0.102 % 95 CI [-.1832, -.0374]). In addition to this situation, when the effect of optimism was controlled, it was determined that the predictive effect of health anxiety on subjective happiness was significant ($\beta = -0.155$, $t = -2.995$, $p = .003$). This means partial mediation (Preacher & Hayes, 2008). In addition, as a result of the analysis, it was determined in women that health anxiety explained 8% of the variance in optimism, while health anxiety and optimism explained 32% of the variance in subjective happiness.

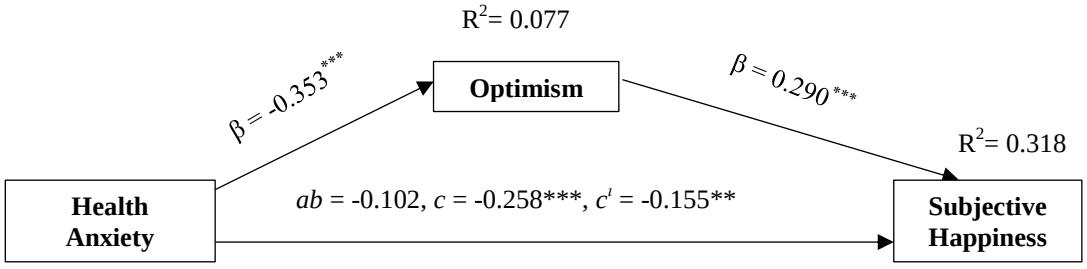

Figure 1. Prediction of subjective happiness by health anxiety through optimism in women
**$p < .01$, ***$p < .001$, *ab*: Indirect Effect, *c*: Total Effect, c': Direct Effect

According to the results of the mediation analysis conducted within the scope of the research hypotheses, it can be said that the total effect of health anxiety on subjective happiness in men is significant (β = -0.169, t = -3.128, p = .002). Also, it was found that the effect of health anxiety on optimism (β = -0.325, t = -3.642, p < .001), and the effect of optimism on subjective happiness (β = 0.319, t = 7.063, p < .001) was found significant. As a result of the analyses, that the 95% bias corrected confidence intervals did not include zero (Preacher & Hayes, 2008) revealed that optimism had a mediating role in the relationship between health anxiety and subjective happiness (*ab* = -0.104 % 95 CI [-.1728, -.0489]). In addition to this situation, when the effect of optimism was controlled, it was determined that the predictive effect of health anxiety on subjective happiness was not significant (β = -0.065, t = -1.351, p = 0.150). This means complete mediation (Preacher & Hayes, 2008). In addition to these findings, as a result of the analysis, it was determined in men that health anxiety explained 9% of the variance in optimism, while health anxiety and optimism explained 33% of the variance in subjective happiness.

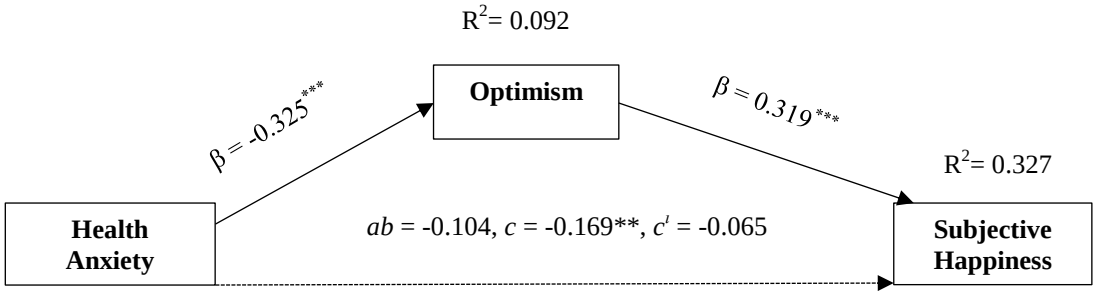

Figure 2. Prediction of subjective happiness by health anxiety through optimism in men
***p* < *.01*, ****p* < *.001*, *ab*: Indirect Effect, *c*: Total Effect, *c'*: Direct Effect

Discussion

The study results revealed that there were significant relationships between subjective happiness, health anxiety and optimism. While health anxiety was negatively related to both optimism and subjective happiness, a positive and significant relationship was found between optimism and subjective happiness. These results are consistent with many research findings in the literature. Similar to this research, it has been observed that there are research results concluded that happiness and optimism were positively related (Bailey et al. 2007; Chang et al., 1997; Cummins & Nistico, 2002; Demir & Murat, 2017; Ho et al., 2010; Lightsey,1996; Lucas et al., 1996; Myers & Diener, 1995; Öztürk & Çetinkaya, 2015) and optimism predicts subjective well-being (Compton, 2000; Eryılmaz & Atak, 2011; Sapmaz & Çetinkaya, 2015). Many research findings on life satisfaction, which is considered as one of the components of subjective well-being, also demonstrate that life satisfaction is related to optimism (Doğan, 2006; Ryan & Deci, 2001; Tuzgöl-Dost, 2007). Optimism, which can be summarized as looking at the events from a positive perspective and focusing on the positive rather than the negative, is a situation that is expected to contribute to the well-being of individuals, that is, their happiness, and the findings support this idea, consistent with the literature.

Another finding of the study is that health anxiety is negatively related to both subjective happiness and optimism. The number of studies examining health anxiety and these variables directly and together is quite limited, but studies on anxiety, as it is a type of anxiety, were also examined and it was seen that the results of the research were consistent with the literature. Similar to the results of this study, it is seen that there are many studies which found that subjective well-being is negatively related to anxiety (Kasser & Ryan, 1993; Öztürk & Çetinkaya, 2015). Studies indicate that individuals with high levels of subjective well-being rarely experience anxiety (Diener et al., 1999). Ho et al. (2010) also concluded in their study with adolescents that life satisfaction, which is a component of subjective well-being, is negatively related to psychological problems. In studies dealing with subjective well-being in terms of physical health, it has been concluded that subjective well-being has been observed to be associated with feeling healthy of the individual (Diener et al., 1999; Diener et al., 2018) and health conditions (Steptoe et al., 2015). To summarize, subjective well-being is negatively related to negative emotions (Diener, 2000; Pavot & Diener, 2008). Considering in this context, it can be said that the negative effects of a situation in which negative emotions such as health anxiety are dominant on happiness is an expected result.

Research results indicate that the relationship between health anxiety and optimism is also negative. These findings are also consistent with the literature. Myers and Reynolds (2000) have concluded that those who use

effective coping strategies in health-related events have high levels of optimism. It can be said that an effective coping mechanism is not used in health anxiety in which a mechanism in which absent or very mild symptoms are exaggerated and transformed into anxiety. It can be interpreted that those who use effective coping strategies will have less risk of experiencing health anxiety, and this can be interpreted as optimism is associated with health anxiety. Reaching a conclusion that confirms this interpretation, Akkuzu (2019) revealed in his research that there is a positive and significant relationship between negative problem orientation, that is, an approach that can be considered the opposite of optimism, and health anxiety. Considering that, in health anxiety, the individual's developing repetitive thoughts that bad things will happen about his health includes a pessimistic viewpoint, it is expected that optimism is negatively related to health anxiety. In terms of general psychological health, it can be said that the situation is similar. Studies have demonstrated that optimists show less depressive symptoms (Lyubomirsky, 2001), that optimism reduces neurotic and psychotic tendencies (Gençoğlu, 2006) and is negatively related to anxiety (McIntosh et al., 2004; Scheier et al., 1994). From the point of view of physical health, it has been observed that there are research findings demonstrating that optimism has positive effects on physical health as well as psychological health (Aydın & Tezer, 1991; Rasmussen et al., 2009; Scheier & Carver, 1985; Scheier et al., 1994), optimists live longer and get better faster (Lyubomirsky, 2001).

The scores obtained from the variables used in the study and the relationships between them were also discussed in terms of the gender variable. While the scores obtained from the health anxiety variable differed in terms of gender, it was seen that there was no significant difference between the scores obtained from the other variables. In terms of the relationships between the variables, health anxiety was negatively correlated with optimism and subjective happiness in both men and women, while optimism and subjective happiness were positively correlated in both groups, and it was determined that the levels by which the variables predicted the dependent variable were very close to each other in women and men. In the mediation analysis, it was found that optimism had a partial mediating effect in the relationship between health anxiety and subjective happiness in women, while it had a full mediation effect in men. The results of this study revealed that women's health anxiety scores were higher than those of men. When the studies in the literature are examined, it is seen that different results have been reached regarding the relationship between health anxiety and gender. The results of the majority of the studies are consistent with the findings of this research. Similar to this study, there are studies showing that women have higher health anxiety levels (Bahadır Yılmaz et al., 2018; Ekiz et al., 2020; MacSwain et al., 2009; Noyes et al., 2003; Özlü et al., 2021) as well as research findings indicating that gender does not make a significant difference (Karapıçak et al., 2012; Şimşekoğlu & Mayda, 2016). In general, it is reported that women are more prone to anxiety disorders than men (Özdemir, 2014). Studies on general anxiety also indicate that women's anxiety levels are higher (Bandelow & Michaelis, 2015; Çırakoğlu, 2011; Janzen, et al., 2014; Leung et al., 2004; Leung et al., 2005; Wang et al., 2020).

The results of the research revealed that subjective happiness did not differ in terms of gender. While this result is consistent with some studies in the literature, it contradicts others. There are many studies that conclude that happiness does not differ in terms of gender, which is consistent with this research (Cihangir-Çankaya, 2009; Eryılmaz & Atak, 2011; Tingaz & Hazar, 2014). In addition to these, there are also studies suggesting that happiness differs in favour of women in terms of gender (Atay, 2012; Şaşmaz, 2016). Akın and Şentürk (2012), on the other hand, found in their research that men were happier than women. Similar to this study, it is seen that the results of the studies on subjective well-being, which is evaluated in the same sense as subjective happiness, do not show a significant difference in terms of gender (Acock & Hurlbert, 1993; Andrews & Withey, 1976; Fujita et al., 1991). In addition, there are studies showing results in favour of women (Lamu & Olsen, 2016; Lee & Browne, 2008; Ozcakir et al., 2014; Steverink et al., 2001; Wood et al., 1989) and in favour of men (Calys-Tagoe et al., 2014; Eryılmaz & Ercan, 2011; Liu et al., 2016). In the studies conducted in the literature, different results were attributed to the characteristics of the groups studied. Cowan et al. (1998) emphasized that gender inequalities could lead to differences in subjective well-being. Nolen-Hoeksema and Rusting (1999), on the other hand, found that marital status rather than gender could produce different results in women and that there was a decrease in the subjective well-being of married women due to the responsibilities they took on. Reflecting on all these findings, it can be said that the gender-based differences or similarities in subjective well-being will be affected by variables such as the culture and gender roles of the individuals in the study group and that it would be useful to examine this with larger-scale studies that include different variables.

As a result of examining the optimism in terms of gender, it was concluded that there was no significant difference. In the literature, there are research findings that reach different results on this subject. Similar to this study, there are research results that conclude gender is not related to optimism (Aydın & Tezer, 1991; Demir & Murat, 2017; Gençoğlu et al., 2014; Gülcan & Nedim-Bal, 2014) as well as results that are in favour of women (Ruthig & Allery, 2008) and men (Puskar et al., 2010; Tusaie & Patterson, 2006). Based on this information, it

can be said that whether or not there is differentiation by gender may depend on other characteristics of the study group and that it would be useful to address these issues in future research.

Looking at the results of the mediation analysis, it is seen that both hypotheses of the study were confirmed, that is, health anxiety is a predictor of subjective happiness, and the mediating role of optimism in this relationship is significant. In the literature, it is seen that there are research studies showing that optimism is a predictor of subjective happiness (Baileyvedi, 2007; Compton, 2000; Cummins & Nistico, 2002; Demir ve Murat, 2017; Gülcan & Nedim-Bal, 2014; Sapmaz & Doğan, 2012). This shows that our research is consistent with the literature. Eken and Ebadi (2019) have concluded that life satisfaction, which is a component of subjective happiness, is negatively related to anxiety and that anxiety is a predictor of life satisfaction. It has been observed that there are many research results concluding that anxiety predicts life satisfaction (Beutel et al., 2010; Deniz et al., 2009; Serin, et al., 2010). In addition, in their study examining the mediating role of optimism, Karacaoğlu and Köktaş (2016) concluded that optimism has a partial mediating role between psychological resilience and psychological well-being. Since psychological well-being is a dimension of subjective well-being, it can be said that the result of this research is consistent with our result.

As a result, it is seen that while health anxiety affects the happiness levels of individuals negatively, optimism has a positive effect on happiness, and it has a partial mediation role in its relationship with health anxiety. Health anxiety is inversely related to optimism and subjective happiness, in other words, optimism and subjective happiness decrease in the individuals with high health anxiety, while subjective happiness levels of individuals with high optimism increase. It can be said that the answer to the question in the title of the study is yes, that is, optimism has a mediating role in the relationship between health anxiety and subjective happiness.

Conclusion

According to the results of the current research, health anxiety levels of individuals differ in terms of gender. In other words, it was observed that women's health anxiety levels were higher than men. In both female and male samples of the study, health anxiety showed negative significant relationships with both subjective happiness and optimism variables. In addition, there was a statistically significant positive correlation between the optimism variable and the subjective happiness variable. According to the mediation analysis results, it was determined that optimism decreased with the increase in the health anxiety variable in both samples, and subjective happiness increased with the increase in optimism. Moreover, it was determined that in the relationship between health anxiety and subjective happiness, optimism had a partial mediating role among women, and a full mediator role among men.

Recommendations

It can be suggested that optimism, one of the variables examined in the research, is a learnable and developable feature, and that psycho-educational studies to be carried out on this subject in the future should be planned considering that it will increase the optimism levels of individuals and indirectly their happiness levels. It has been determined that health anxiety is a condition that negatively affects the well-being of individuals. Based on these results of the research, it is of great importance to provide information that their anxiety levels can reduce their well-being, especially when the pandemic process is considered. It is recommended that those in need be guided for the necessary assistance by conducting informative studies on this issue.

In this study, the relationship between health anxiety, optimism and subjective happiness was tried to be examined. In future studies, it is recommended to carry out larger-scale studies in which different variables (conscious awareness, cognitive flexibility, psychological resilience) that are thought to be related to health anxiety and may have an effect on the subjective happiness of individuals are discussed. This study was conducted based on the cross-sectional method. In this respect, it may be recommended for researchers to conduct longitudinal studies in order to better determine the change in the relationship between health anxiety, subjective happiness and optimism variables.

The use of self-report measurement tools may bring along various errors originating from the participants. This may be considered as one of the limitations of the study. In this respect, in addition to self-report measures, additional evaluation methods (for example, two or more source of information) can contribute to a clearer and more accurate understanding of the variables. For example, parents, spouses, and peers can be included in future research as sources of information about the symptom levels individuals experience.

The study was carried out in accordance with the relational screening model, one of the quantitative research methods. For this reason, the relationships between the variables do not provide an opportunity to examine in depth. The subject can be discussed in depth with possible qualitative studies in the future. This study is limited to the self-report data obtained from 301 individuals reached through online forms between July 20, 2020 and July 27, 2020. It may be suggested that the studies planned to be done in the future examine quantitative results and examine these results with the mixed method, which provides the opportunity to investigate these quantitative results in depth, together with qualitative research.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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Elderly care program
Medical terms

Abstract

The study was attempted to determine the efficiency of the card game named 'MedTerm' upon the students' achievements of the medical terms. The research was one group pre-test and post-test without control group research design and the study group elected by using the convenience sampling method consisted of the first-year students (n=46) elderly care program of the vocational school of health services of a university in northern Turkey. All students who voluntarily participated in the study played the card game named 'MedTerm' in order to learn medical terms. In the research, 'The Medical Terms Achievement Test (MTAT)' consisted of 57 open-ended questions was used as data collection tool. Achievement scores related to medical terms before and after the game were evaluated. At the end of the implementation, the semi-structured interviews were also conducted with randomly selected students.. As a result of the research, a statistically significant difference was found between the pre-test mean scores and the post-test mean scores in favour of the post-test ($t=-17.141$, $p<0.05$). In accordance with the data obtained, it can be said that the 'MedTerm' card game increases elderly care program students' sound and partial understandings of medical terms and their achievements. In addition, it was concluded that all students expressed positive views concerning the functioning of the course.

Introduction

The terms generated and used in medicine and health care are called medical terms and the use of these terms across the world creates a universal language assuring world health (Tekin &Atas, 2018). Medical terms are crucial for accurate, quick, efficient, and quality communication in medicine (Cankur, 2002; Tekin &Atas, 2018). The efficiency of learning and practice in health education depends on the success of learning medical terminology but is equally significant in professional and academic life (Abdulmajed et al. 2015; Akl et al. 2010; Alfarah et al. 2010; Babacan et al. 2016; Meterissian et al. 2007). In this context, medical terminology is taught in health education, as every health worker must use medical terms effectively.

With the aging of the world population, the importance of professions has increased provide professional care services to the elderly (Birinci, 2020). Students who are one of the candidates for this profession in elderly care associate degree program at the department of Health care services prepares and provides medical and psychological environments to provide the care that elderly individuals need. They are individuals who can produce solutions in the implementation of care services, have analytical thinking skills, are prone to teamwork, have a sense of responsibility. These students are health technicians and they are a crucial part of the health team in the production of health care. In this context, they need to implement medical terms effectively and correctly in their professional life. However, students may have difficulty understanding medical terms they have met for the first time in their education life. Since the terms are taught as a dictionary, they frequently think it boring and monotonous (Babacan et al. 2016; Lickiewicz et al. 2020).

In this context, unlike conventional teaching, the use of games in the teaching of medical terms is effective in motivating students to be curious, motivated, organizing their knowledge in the learning process, and helps in terms of their learning responsibilities (Lickiewicz et al. 2020). Game-based learning (GBL) is both fun and educational approach to achieving the determined learning outcomes (Jabbar & Felicia, 2015; Shaffer et al. 2005). The use of GBL in the education process increases learning activities (Partovi & Reza Razavi, 2019; Trajkovik et al. 2018). Games that are played manually and require movement provide the relation of existing information with daily life, the formation of connections between neurons in the brain, and permanent learning (Yazıcıoglu & Cavus-Gungoren, 2019). For this reason, card and board games played in the GBL process include the expression, physical movements, and verbal intonations of individuals who exist in face-to-face

interaction, unlike games performed in digital media. In these games, communication between student-educator and student-student, which cannot be directly provided in audio-visual digital games, can be comfortably provided (Billinghurst & Kato, 2002; Feng Liu & Chen, 2013).

In the relevant literature, there are many studies on various topics in different disciplines that board and card games increase academic achievement (Chen et al. 2020; Rastegarpour &Marashi, 2012; Sadler et al. 2013). Especially in the literature, there are studies using board and card games in the healthcare field at the undergraduate level (Anyanwu, 2014; Giddens, 2010; Ridley, 2004; Lennon & Coombs, 2007). For example, Hill & Nassrallah (2018) developed and implemented a card game in an anatomy course in order to teach the liver and portal venous system in their study. The research showed that the students enjoyed playing the card game and had a higher achievement scores concerning the relevant topic. Burleson and Olimpo (2016) used a word string game named 'ClueConnect' to examine its impact on students' understanding of the terminology in the introduction to anatomy and physiology in the healthcare field course at the undergraduate level. In the game, students tried to define the terms by generating descriptive sequences and positioning them structurally and functionally in the body. As a result, the study revealed the game increases the students' understanding and expresses positive opinions that they have fun. In his study, Boctor (2013) developed a game named 'Nursopardy' in the nursing principles course, and with that game, he attempted to repeat the students' knowledge. It was concluded that the game in the study was effective in repeating the students' knowledge and increased their learning. Gomez-Urquiza et al. (2010) examined the effect of the "Escape Room" game on nursing students' learning. In the game, students were expected to accurately demonstrate both their theoretical and practical knowledge by solving puzzles and escaping the room they were in within 30 minutes. The study showed that the game increases students' learning and that they have opinions that the learning process is fun and motivating.

There have been no studies in the literature using the card and board games in the healthcare field at the associate degree and investigating the impact of these games on their academic achievements. In this context, this research attempted to develop and apply a card game in terms of game-based learning of medical terms for the students of the health care associate degree and to examine the effect of the game on their academic achievement. It is believed that the study could shed light on future research at the associate degree programs in the healthcare field and close the gap in the literature. The problem statement of the research is, *"What is the impact of the 'MedTerm' card game on the academic achievements of the first-year students studying in the Elderly Care Associate Degree Program of the Department of Health Care Services of the Vocational School of Health Services in the course 'Elderly Care Principles and Practices 1' at a university in northern Turkey?*", and its sub-problems are as follows:

- Is there a significant difference between the pre-test and post-test achievement scores of the first year students of the Elderly Care Associate Degree Program?

- What are the opinions of the first year students of the Elderly Care Associate Degree Program about the game?

Method

The Study Group

The research was carried out as one group with a pre-test post-test without control group research pattern (Robson, 2015).The population of the study was composed of first-year students (N=72) studying in the Elderly Care Associate Degree Program of the Department of Health Care Services of the Vocational School of health services of a university located in northern Turkey in the fall semester of 2018-2019 academic year. Convenience sampling method is used in this research. In the cases where not to reach the whole of the sample, researchers can work with appropriate sample groups to represent the study. The study group included students who volunteered to participate in the research from this class and students who did not come out of the health vocational high school (n=46). The researcher gave theoretical information about medical terms to all students in the theoretical part of the 'Elderly Care Principles and Practices I' course. The practice course was taught with the "MedTerm" word game. All students were informed about the implementation process and how to perform it, and the written informed consent forms were obtained from the students (Christensen et al., 2015; Taber, 2014). In addition, each student was given a code in order to keep the identity information of the students confidential (for instance *S-8, S-11, S-46*).The ethics committee's permission for the research was obtained from the local ethics committee with the number protocol no: 679. After the implementation of the post-test and

interviews, the 'MedTerm' game was also applied to the health vocational high school students. In addition, students who did not want to participate in this research previously voluntarily wanted to play the 'MedTerm' game when they saw that their friends had fun after the after the application. In this context, the game was also played to these students after the implementation process.

Data Collection Tools

Medical Terms Achievement Test 'MTAT'

The Medical Terms Achievement Test (MTAT) was developed by taking the opinions of two experts and examining the related literature (Abduvossiyevna, 2020; Ekinci &Hatipoglu 2018; Koprulu, 2017) (See Appendix 1). Medical terms commonly used in the 'Elderly Care Principles and Practices I' course and the terms asked to students in mid-term and final exams in previous years are listed. The 57 medical terms created were both asked as open-ended questions in the MTAT and used in the game 'MedTerm'. The first 27 questions asked in the open-ended questions in the test are related to respiratory system, questions between 28-40 are related to cardiovascular system, questions between 41-52 include body temperature, questions 53 and 54 include blood pressure, and questions between 55-57 include general medical terms.

The test was carried out as a pilot test with the students who were taught the medical terms in previous years (n=100). In order to determine the reliability and validity of the test, the reliability coefficient of the test (Kuder-Richardson 20), the mean discrimination index of the items (r) and the mean difficulty index (p) were analyzed by content analysis according to the responses given by the students to the open-ended questions. Content analysis was carried out in accordance with the concept-evaluation scheme developed in previous studies in the literature (Abraham et al. 1994; Marek, 1986; Nakiboglu, 2003). Originally, this cheme consists of four categories, and some researchers have used different concept-evaluation schemes consisting of three or five categories. The categories, their explanations and scores shown in Table 1 were used in this study:

Table 1. Categories, explanations, scores and some examples

Categories	Explanations	Scores	Some Examples
Sound Understanding (SU)	Responses are scientifically accepted correct and complete answers	3	'Bradycardia is a slow resting heart rate, commonly under 60 beats per minute.'
Partial Understanding (PU)	Responses include the answers that contain a part of the scientifically accepted answer	2	'Bradycardia means heartbeat.'
Misunderstanding (MU)	Responses are scientifically incorrect answers	1	'Bradycardia causes rapid heartbeat.'
Unanswered (UA)	Responses include empty, meaningless, irrelevant, or ambiguous answers	0	'I have no idea.' '.....' (Blank answers)

In the pilot test, the responses given by the students containing SU and/or PU were accepted as the right answers and containing MU and/or UA were accepted as wrong answers. Therefore, right answers were scored as '1' and wrong answers were scored as '0' in the pilot test. The mean item difficulty index and the mean item discrimination index of the test were calculated as 0.41 and 0.53, respectively. The reliability coefficient of the test was found to be 0.960 by using the SPSS package program. In this context, it was concluded that the test has high reliability, medium difficulty and high discrimination power. The reliability and validity of the MTAT are sufficient and it was applied without removing any of the items. The MTAT was carried out before and after the implementation as a pre-and post-test.

Semi-Structured Interviews

The semi-structured interviews in the study were consisting of 1 open-ended question developed by taking the opinions of two experts and were conducted with 19 randomly selected students in 10 minutes periods. The students were asked the question at the end of the implementation process to get their opinions about the functioning of the course. The question was that *'What do you think about the functioning of the course? Please express your positive and/or negative views about the functioning of this course.'* The researcher used a tape recorder during interviews and recorded the obtained data in writing.

Data Analysis

The researchers analyzed the responses of open-ended questions of MTAT test in accordance with the categories and scores in Table 1.The highest score in the MTAT test is 171 and the lowest score is 0. The responses of the each questions were categorized and scored by two separate experts. Average agreement percentage was calculated by the formula $P = N_a.100 / N_a + N_d$ (N_a = Number of agreements, N_d = Number of disagreements, P = Agreement percentage) (Cavanagh, 1997) and was found to be 90%. The data obtained were used in statistical calculations to determine whether there was a significant difference between students' pre- and post-test scores. The statistical analysis of the study was made using the SPSS 19.0 package program. To determine which statistics to be used in the research, it was examined whether the achievement scores displayed a normal distribution or not. Skewness and Kurtosis values, Kolmogrov-Smirnov Test and Shapiro-Wilk Test of these scores were examined (Table 2):

Table 2. The normality distribution results of the MTAT pre-test and post-test

	Kurtosis		Skewness			
Variables	Coefficient Score	Standard Error	Coefficient Score	Standard Error	K-S Test	S-W
Pre-test	1.042	.688	.846	.350	.200	.026
Post-test	-.012	.688	.081	.350	.200	.987

When the skewness and kurtosis coefficients and the normal distribution graphs were examined, the results showed that the values were close to normal (Tabachnick & Fidell, 2007). Since the data show the normal distribution, a paired-samples t-test, one of the parametric tests, was used to determine whether there was a significant difference between the MTAT pre- and post-test scores. In addition, the data from semi-structured interviews were also categorized and scored by two separate experts and the average agreement percentage was calculated as 95%.

Development and Implementation of the Game: 'MedTerm'

The 'MedTerm' card game was inspired by the Taboo (Hasbro Inc., Pawtucket, RI) game and developed by reviewing the literature (Sallo 2020; Olimpo et al. 2010). In the classic Taboo game, one of the players is given a series of cards with a keyword and several taboo words. The goal of the game is for the player to explain as many keywords as possible to their team mates within the given time without using the taboo words. The team that knows the most words correctly wins the game. In this study, 57 medical terms used in MTAT test were also used in MedTerm based on the classic taboo game. There is a MedTerm game board, dice, and colored cards at the game. There are 30 cards in the game that contain forbidden words and keywords. It is aimed to explain the keyword on these cards without using the forbidden words. The keywords in the other 13 cards include words that need to be explained using 10 words. The words on the other 14 cards are the words that should be explained by drawing (see Table 3). Four forbidden words have been created for each keyword on cards with banned words (see Figure 1). Cards with forbidden words, cards containing the words to be explained by drawing, and cards containing the words to be explained by using 10 words were prepared in three different colors. These colors are the same color as the boxes on the MedTerm game board. The game progresses by randomly selecting cards of the same color according to which color the box on the MedTerm game board is moving. MedTerm is played with a total of 8 people consisting of two separate teams of 4 people. A total of 6 groups were randomly formed for the MedTerm game in the classroom for this study. 5 groups consist of two separate teams of 4 people, a total of 8 people, and 1 group consists of two separate teams of 3 people. Each group tells their teammates the word they chose randomly within one minute:

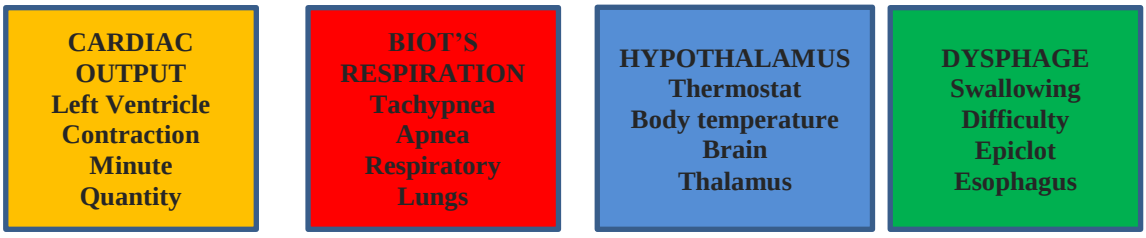

Figure 1.Keyword cards containing forbidden words

Table 3.List of forbidden words, words to be drawn and words to be described in 10 words

List of Keywords Containing Forbidden Words			
Keywords	Forbidden Words	Keywords	Forbidden Words
Cardiac output	Left ventricle, contraction, minute, quantity	Piloerection	Hair, body temperature, hypothermia, movement
Alveoli	Carbon dioxide, single-layer epithelium, diffusion, extreme ventricle	Constant fever	Continuous, high body temperature, fluctuation
Medulla oblongata	Center, respiratory, spinal cord, regulator	Vasodilatation	Vasoconstriction, dilatation, constriction, pregnancy
Hypothalamus	Thermostat, body temperature, brain, thalamus	Hyperventilation	Depth, speed, lung, movement
Diastolic blood pressure	Contraction, vascular, systolic, diastolic	Ventilation	Dilatation, constriction, oxygen, carbon dioxide
Tachycardia	Bradycardia, pulse, minutes, heartbeat	Biot's respiration	Tachypnea, apnea, respiratory, lungs
Apnea	Permanent, temporary, pause, respiration	Vasoconstriction	Vasodilation, vascular, constriction, hypertension
Stroke volume	Left ventricle, contraction,, blood, heart	Intermittent fever	Body temperature, morning, evening, irregular
Dysphagia	Swallowing, difficulty, epiclot, esophagus	Remittent fever	Fluctuating, high fever, 24 hours, change
Vital signs	Respiration, body temperature, systolic blood pressure, diastolic blood pressure	Hypoxia	Oxygen, cell depletion, respiration
Systolic blood pressure	Aorta, vascular resistance, first beat, systolic	Cheyne- Stokes respiration	Heart disease, brain hemorrhage, respiratory rate, apnea
Tachypnea	Sport, ladder, fast, minute	Bradypnea	Sleep, sedation, minute, slow
Hypertrophy	Muscle, overuse, atrophy, growth	Kussmaul respiration	Metabolic acidosis, abnormal, deep, breathing
Atrophy	Muscle, disuse, hypertrophy, shrinkage	Anoxia	Oxygen, tissue, deprivation, lung
Bradycardia	Tachycardia, pulse, minute, heartbeat	Recurrent fever	Recurrent, high, body temperature, 24 hours
List of Words to be Drawn		List of Words to be Expressed in 10 Words	
Cyanosis	Oral cavity	Rhythmic pulse	Trachea
Arteria brachialis	Axillary path	Uvula	Hypothermia
Arteria temporalis	Visceral pleura	Intercostal muscle	Hyperpnoea
Tympanic	Nasal cavity	Expiration	Dyspnea
Arteriafemoralis	Arteriaradialis	Inspiration	Eupnoea
Arteriacarotis	Pulse	Hyperthermia	Thready pulse
Parietal pleura	Arteriapoplitealis	Hypopnea	

We can sample the game on the MedTerm board shown in Figure 2 with the following items:

- One of the 4 student teams rolls the dice. The team that rolls the highest starts the game first. The people on the team who started the game first determine the order in which they tell among themselves. The person who starts first randomly selects cards of the same color as the box on the game board. The first three boxes shown in Figure 2 are yellow and yellow boxes indicate yellow-forbidden word cards. The team player who starts the game first randomly selects one of the forbidden word cards that are yellow. They try to explain their chosen keyword to their teammates within one minute without using the forbidden words written on the cards. If his teammates know that word correctly, the same team moves through a box. Each known word goes one more box than the boxes on the game board, and the word card they know is placed in the 'memory card' field on the game board.

- The fourth box on the game board represents the word card to be explained by the drawing. When the team arrives in this box, the purple cards are randomly selected and the players try to draw the word to their teammates within one minute without speaking or making hand gestures. If the teammates know this word correctly, the correct known card is placed in the memory card area and continued.
- Green boxes on the game board represent words to be described using 10 words. When the team comes to the boxes in the green area, the player randomly selects the cards in green. The players try explaining the word to their teammates in one minute using 10 words. If the teammates know this word correctly, the correct known card is placed in the memory card area and continued.
- Red-colored boxes on the game board are marked as 'M'. These boxes show that previously known cards placed in the memory card area will be drawn randomly. The player randomly selects the types of words in the memory card area (cards to be explained by drawing, word cards to be explained using 10 words, cards containing forbidden words) and explains them to their teammates.
- Misrepresented, unanswered, or expired word cards are unplaced in the memory card area. It is placed next to other cards to be selected randomly again.
- In case of misunderstanding and exceeding the time, the game line moves to the other team of 4. They also start the game by determining the explaining order among themselves.
- During the entire game, teams have the right to choose another card by passing only four times.
- In this way, the game continues until the team reaches the end point.

The implementation process of the game lasted a total of 120 minutes. At the end of the game, chocolate was given as a reward to the winning teams:

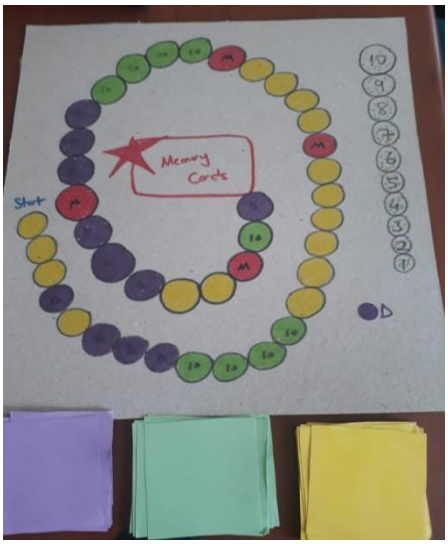

Figure 2. MedTerm game board and color cards

Results and Discussion

Results Concerning the Content Analysis of MTAT Pre- and Post-test

When the MTAT pre-test content analysis result was examined, the response frequencies of the majority of the students in the UA category (f: 2152, 82.1%) were higher than those in other categories (f: 352, 13.4% for SU; f: 79, 3% for PU; f: 40, 1.5% for MU) (see Table 4). This finding shows that most of the students did not know medical terms. In the results of post-test content analysis, although it was seen that most of the students had high response frequencies in the UA category (f: 1226, 46.4%), the response frequencies of the students in the SU (f: 948, 35.9%) and PU (f: 306, 11.6%) categories were higher than those in other categories (f: 162, 6.1% for MU). In addition, it was observed that the response frequencies of the students in the MU category increased in the post-test. This finding indicated that students have had misunderstandings. In general, it was concluded that the students' sound and partial understandings increased in the post-test, and their frequency in the UA category decreased. According to the data obtained, it can be said that the MedTerm card game has increased students' sound and partial understandings:

Table 4. The Results of Content Analysis of MTAT Pre- and Post-test

Q*	Pre-test Categories								Post-test Categories							
	SU		PU		MU		UA		SU		PU		MU		UA	
	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
1	3	*6.5*	0	*0*	8	*17.4*	35	*76.1*	14	*30.4*	13	*28.3*	1	*2.2*	18	*39.1*
2	21	*45.7*	7	*15.2*	1	*2.2*	17	*37*	37	*80.4*	4	*8.7*	1	*2.2*	4	*8.7*
3	22	*47.8*	7	*15.2*	3	*6.5*	14	*30.4*	37	*80.4*	4	*8.7*	1	*2.2*	4	*8.7*
4	15	*32.6*	4	*8.7*	3	*6.5*	24	*52.2*	32	*69.6*	4	*8.7*	3	*6.5*	7	*15.2*
5	9	*19.6*	0	*0*	1	*2.2*	36	*78.3*	16	*34.8*	3	*6.5*	2	*4.3*	25	*54.3*
6	0	*0*	2	*4.3*	0	*0*	44	*95.7*	6	*13*	9	*19.6*	1	*2.2*	30	*65.2*
7	0	*0*	2	*4.3*	0	*0*	44	*95.7*	4	*8.7*	9	*19.6*	1	*2.2*	32	*69.6*
8	8	*17.4*	1	*2.2*	0	*0*	37	*80.4*	12	*26.1*	6	*13*	3	*6.5*	25	*54.3*
9	1	*2.2*	0	*0*	0	*0*	45	*97.8*	3	*6.5*	5	*10.9*	0	*0*	38	*82.6*
10	20	*43.5*	1	*2.2*	0	*0*	25	*54.3*	23	*50*	3	*6.5*	2	*4.3*	18	*39.1*
11	25	*54.3*	2	*4.3*	0	*0*	19	*41.3*	40	*87*	1	*2.2*	2	*4.3*	3	*6.5*
12	25	*54.3*	0	*0*	1	*2.2*	20	*43.5*	38	*82.6*	2	*4.3*	1	*2.2*	5	*10.9*
13	0	*0*	0	*0*	1	*2.2*	45	*97.8*	14	*30.4*	7	*15.2*	5	*10.9*	20	*43.5*
14	8	*17.4*	0	*0*	1	*2.2*	37	*80.4*	37	*80.4*	1	*2.2*	4	*8.7*	4	*8.7*
15	12	*26.1*	4	*8.7*	2	*4.3*	28	*60.9*	33	*71.7*	9	*19.6*	1	*2.2*	3	*6.5*
16	7	*15.2*	5	*10.9*	1	*2.2*	33	*71.7*	31	*67.4*	10	*21.7*	1	*2.2*	4	*8.7*
17	5	*10.9*	4	*8.7*	1	*2.2*	38	*78.3*	27	*58.7*	10	*21.7*	1	*2.2*	8	*17.4*
18	3	*6.5*	1	*2.2*	1	*2.2*	41	*89.1*	31	*67.4*	3	*6.5*	3	*6.5*	9	*19.6*
19	0	*0*	2	*4.3*	0	*0*	44	*95.7*	23	*50*	4	*8.7*	2	*4.3*	17	*37*
20	3	*6.5*	2	*4.3*	0	*0*	41	*89.1*	24	*52.2*	5	*10.9*	4	*8.7*	13	*28.3*
21	0	*0*	2	*4.3*	0	*0*	44	*95.7*	0	*0*	4	*8.7*	16	*34.8*	26	*56.5*
22	0	*0*	1	*2.2*	0	*0*	45	*97.8*	1	*2.2*	1	*2.2*	15	*32.6*	29	*63*
23	15	*32.6*	0	*0*	1	*2.2*	30	*65.2*	33	*71.7*	1	*2.2*	2	*4.3*	10	*21.7*
24	1	*2.2*	0	*0*	0	*0*	45	*97.8*	1	*2.2*	4	*8.7*	16	*34.8*	25	*54.3*
25	1	*2.2*	1	*2.2*	0	*0*	44	*95.7*	22	*47.8*	7	*15.2*	1	*2.2*	16	*34.8*
26	2	*4.3*	1	*2.2*	0	*0*	43	*93.5*	17	*37*	7	*15.2*	3	*6.5*	19	*41.3*
27	16	*34.8*	1	*2.2*	1	*2.2*	28	*60.9*	29	*63*	3	*6.5*	2	*4.3*	12	*26.1*
28	14	*30.4*	2	*4.3*	1	*2.2*	29	*63*	27	*58.7*	1	*2.2*	5	*10.9*	13	*28.3*
29	1	*2.2*	0	*0*	0	*0*	45	*97.8*	9	*19.6*	4	*8.7*	2	*4.3*	31	*67.4*
30	2	*4.3*	1	*2.2*	0	*0*	43	*93.5*	13	*28.3*	3	*6.5*	3	*6.5*	27	*58.7*
31	10	*21.7*	6	*13*	4	*8.7*	26	*56.5*	29	*63*	9	*19.6*	3	*6.5*	5	*10.9*
32	8	*17.4*	1	*2.2*	1	*2.2*	35	*76.1*	27	*58.7*	5	*10.9*	5	*10.9*	9	*19.6*
33	2	*4.3*	0	*0*	1	*2.2*	43	*93.5*	13	*28.3*	6	*13*	2	*4.3*	25	*54.3*
34	2	*4.3*	**1**	*2.2*	**0**	*0*	43	*93.5*	26	*56.5*	3	*6.5*	1	*2.2*	16	*34.8*
35	0	*0*	2	*4.3*	0	*0*	44	*95.7*	7	*15.2*	16	*34.8*	2	*4.3*	21	*45.7*
36	0	*0*	2	*4.2*	1	*2.2*	43	*93.5*	5	*10.9*	18	*39.1*	0	*0*	23	*50*
37	1	*2.2*	3	*6.5*	0	*0*	42	*91.3*	5	*10.9*	19	*41.3*	3	*6.5*	19	*41.3*
38	0	*0*	3	*6.5*	0	*0*	43	*93.5*	4	*8.7*	21	*45.7*	0	*0*	21	*45.7*
39	0	*0*	2	*4.3*	0	*0*	44	*95.7*	4	*8.7*	15	*32.6*	6	*13*	21	*45.7*
40	0	*0*	2	*4.3*	0	*0*	44	*95.7*	5	*10.9*	15	*32.6*	2	*4.3*	24	*52.2*
41	0	*0*	0	*0*	0	*0*	46	*100*	4	*8.7*	13	*28.3*	2	*4.3*	27	*58.7*
42	2	*4.3*	0	*0*	0	*0*	44	*95.7*	11	*23.9*	0	*0*	4	*8.7*	31	*67.4*
43	2	*4.3*	0	*0*	0	*0*	44	*95.7*	8	*17.4*	0	*0*	4	*8.7*	34	*73.9*
44	0	*0*	0	*0*	0	*0*	46	*100*	4	*8.7*	0	*0*	2	*4.3*	40	*87*
45	7	*15.2*	0	*0*	0	*0*	39	*84.9*	17	*37*	3	*6.5*	4	*8.7*	22	*47.8*
46	0	*0*	1	*2.2*	1	*2.2*	44	*95.7*	8	*17.4*	4	*8.7*	6	*13*	28	*60.9*
47	18	*39.1*	1	*2.2*	1	*2.2*	26	*56.5*	36	*78.3*	1	*2.2*	1	*2.2*	8	*17.4*
48	2	*4.3*	0	*0*	0	*0*	44	*95.7*	2	*4.3*	2	*4.3*	3	*6.5*	39	*84.8*
49	0	*0*	0	*0*	0	*0*	46	*100*	2	*4.3*	1	*2.2*	1	*2.2*	42	*91.3*
50	0	*0*	0	*0*	0	*0*	46	*100*	1	*2.2*	1	*2.2*	0	*0*	44	*95.7*
51	0	*0*	0	*0*	0	*0*	46	*100*	5	*10.9*	1	*2.2*	0	*0*	40	*87*
52	19	*41.3*	0	*0*	1	*2.2*	26	*56.5*	34	*73.9*	0	*0*	1	*2.2*	11	*23.9*
53	10	*21.7*	1	*2.2*	1	*2.2*	34	*73.9*	18	*39.1*	3	*6.5*	2	*4.3*	23	*50*
54	9	*19.6*	1	*2.2*	1	*2.2*	35	*76.1*	17	*37*	3	*6.5*	2	*4.3*	24	*52.2*
55	4	*8.7*	0	*0*	1	*2.2*	41	*89.1*	1	*2.2*	0	*0*	1	*2.2*	44	*95.7*
56	0	*0*	0	*0*	0	*0*	46	*100*	2	*4.3*	0	*0*	1	*2.2*	43	*93.5*
57	17	*37*	0	*0*	0	*0*	29	*63*	19	*41.3*	0	*0*	0	*0*	27	*58.7*
T*	352	*13.4*	79	*3.0*	40	*1.5*	2152	*82.1*	948	*35.9*	306	*11.6*	162	*6.1*	1226	*46.4*

*Q: Questions, T: Total

If we give an example of the classification of students' responses to a particular question by categories in MTAT pre- and post-test content analysis, we can consider the 14th question. In the pre-test content analysis of the 14th question, in which the Turkish meaning of the medical term ' Eupnoea ' was asked, most of the students did not answer the question (f: 37, 80.4%). In the post-test content analysis, it is seen that the majority of students answered this question (f:37, 80.4%) in the category of SU. In addition, in the post-test, it was determined that one student answered in the PU category, four students in the MU category, and four students left the question blank (see Figure 3).

The students' sound, partial and misunderstanding answers to the medical term 'Eupnoea' for question 14 in the final test are as follows:

"It is Normal Respiration." ***(SU) (S-8, S-11, S-46)***
"It is Standard Respiration." ***(PU) (S-37)***
"It is Dyspnea." ***(MU) (S-14)***
"It's a Respiratory Retardation." ***(MU) (S-18)***
"It's the Respiratory Acceleration." ***(MU) (S-25)***
"It's a Respiratory Standstill." ***(MU) (S-44)***

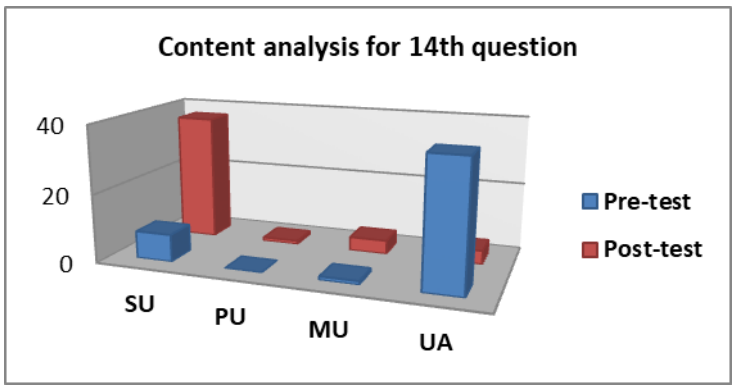

Figure 3.MTAT pre- and post-test content analysis for the 14th question

Results Concerning the Statistical Analysis of MTAT Pre- and Post-test

The results of the paired-samples t-test analysis regarding the MTAT pre and post-test scores of the students are shown in Table 5:

Table 5.Paired-Samples t-Test results for MTAT pretest-posttest scores

	N	$\overline{X}$	*SD*	*t*	*p*
Pre-test	46	28.978	13.851	-17.141	0.001
Post-test	46	78.652	22.648		

p<0.05

When Table 5 is examined, it is seen that there is a significant difference in favor of the post-test (t = -17.141; p <0.05) between the MTAT pre-test mean scores ($\overline{X}$ = 28.978) and the post-test mean scores ($\overline{X}$ = 78.652). This finding revealed that there was a statistically significant difference between the students' pre-and post-test scores in favor of the post-test. In addition, eta square value (η^2) and Cohen d value calculated for the size of statistical significance were found to be high (η^2=0 .747, d=2.65). Accordingly, it can be said that the MedTerm game is efficient in increasing students' achievements on medical terms.

Results Concerning the Semi-Structured Interviews

The content analysis result of the semi-structured interview performed at the end of the application is shown in Table 6. As seen in Table 6, all students expressed positive views about the functioning of the course (f: 48, 100.0%). None of the students expressed a negative view concerning the course. Their positive views include that the course is understandable/instructive, useful, catchy, visually enriched, fun, improving communication skills, and facilitating pronunciation:

Table 6. Content Analysis of the Semi-Structured Interviews and Some Student Statements

Positive Views			Negative Views		
Main Theme: Functioning of the course	f	%	Main Theme: Functioning of the course	f	%
Sub-themes:	48	100.0	Sub-themes:	0	0.00
Understandable / instructive	15	31.25	None	0	0.00
Catchy / intensifier	10	20.83	Some student statements		
Useful / fertile	10	20.83	‘It was intensifier. So we learned the medical terms better. Our communication with friends has increased. "**(S-1)** ‘‘It was a lesson that progressed without getting bored. The MedTerm game made us understand the lesson better. "**(S-3)** ‘‘It was very efficient. The tutorial was catchy. It was very catchy that we tried to explain the words to our friends, and they tried to explain it to us. ”**(S-6)** ‘My pronunciation also improved while communicating with my friends in the game. I now know what many medical terms mean. ”**(S-12)** ‘‘The course process was fun as well as being instructive. In addition, the content of the lesson enriched with this visual activity became catchier. "**(S-15)** ‘‘It happened in a useful way. It's understandable. "**(S-18)**		
Fun	6	12.50			
Visually enriched	3	6.25			
Improving communication skills	3	6.25			
Facilitating pronunciation	1	2.09			

Discussion

In this study, the efficiency of the 'MedTerm' card game, which was developed in the health field 'Elderly Care Principles and Practices I' course, on the achievements of first-year students studying in the Elderly Care associate degree program in medical terms was examined. In this context, the results of the MTAT pre-and post-test content analysis and the statistical analysis of the scores revealed that the MedTerm card game increased students' sound and partial understanding and their achievement in medical terms. In the literature, studies are showing that the Taboo form word game is effective in students' learning terms and increasing their achievement scores in different disciplines and at different grade levels. For example, Sallo (2020) stated in his thesis that 8th-grade students had difficulty speaking English in the classroom and got low grades in speaking skills. In this context, he applied the taboo word game as action research in his study. The result of the study showed that the students' speaking skills test scores were high and the students were confident in speaking in the classroom environment. Olimpo et al. (2010) developed and implemented a Taboo game consisting of 78 words and a dictionary named 'wiktionary' for each word to better understand the terminology in the topics of a biology course. The result of the study showed that the student's understanding and recall with the game were high.

In addition, it was determined that the students especially misunderstood the terms "cheyne-stokes respiration" (question number 21), "biot's respiration" (question number 22) and "kussmaul respiration" (question number 24) related to medical terms in the post-test. However, these words are basic terms that should be known professionally in the evaluation of the respiratory system.

In addition, the results of the semi-structured interview conducted at the end of the implementation in the study expressed positive opinions of all students about the process of the lesson, that it is understandable, catchy, entertaining, and includes visuality. One student stated that he/she could pronounce medical terms more efficiently with the game "MedTerm". In the literature, there are studies in which health field students express positive opinions that teaching the lessons with the GBL method card games is fun, enhancing, and beneficial (Boctor, 2013; Burleson & Olimpo, 2016).

Conclusion and Recommendations

Since there are no studies in the literature that use cards and board games on 'medical terms' at the associate degree level of the healthcare field and investigate the impact on their academic achievements, it is thought that this study may close the gap in the field and shed light on future research. In this context, our study is also a pilot study. In addition, it is considered to make applications that can correct the misunderstandings determined, to plan the study group by separating it into an experimental-control group, to implement the research by increasing the number of study group and the medical terms in the game 'MedTerm', in the future.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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Appendix-1. MTAT

Name-Surname:
Graduation High School:
Other (…….) Medical Vocational (……)

Please write the meanings of the Latin words below in Turkish.
1. Vital signs:……
2. Nasal cavity:……
3. Oral cavity:……...
4. Trachea:……
5. Uvula:……...
6. Parietal pleura:……
7. Visceral pleura:……
8. Alveoli:……..
9. Intercostal muscle:……
10. Ventilation:……
11. Expiration:……..
12. Inspiration:……
13. Medulla Oblongata:……
14. Eupnoea:……..
15. Apnea:……..
16. Tachypnea:……
17. Bradypnea:……
18. Hyperpnoea:……
19. Hyperventilation:……
20. Hypopnea:……
21. Cheyne- Stokes Respiration:……
22. Biot's respiration:……
23. Dyspnea:……
24. Kussmaul respiration:……
25. Anoxia:……
26. Hypoxia:……
27. Cyanosis:……
28. Pulse:……
29. Stroke volume:……
30. Cardiac Output:……
31. Tachycardia:……..
32. Bradycardia:……
33. Thready pulse:……
34. Rhythmic Pulse:……
35. Arteria temporalis:……
36. Arteriacarotis:……
37. Arteria brachialis: ……
38. Arteriaradialis:……
39. Arteriafemoralis:……
40. Arteriapoplitealis:……
41. Hypothalamus:……
42. Vasodilatation:……
43. Vasoconstriction:……

44. Piloerection:……
45. Axillary path:……
46. Tympanic:……
47. Hyperthermia:……
48. Intermittent fever:……
49. Remittent fever:……
50. Constant fever:……
51. Recurrent fever:……
52. Hypothermia:……
53. Systolic blood pressure:……
54. Diastolic blood pressure:……
55. Atrophy:……
56. Hypertrophy:……
57. Dysphagia:…….

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A Study to Develop a Health Self-Efficacy Scale

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Abstract

Health self-efficacy (HS), defined as the belief of being able to take actions necessary to be healthy, is crucial for improving individuals' health-related behaviors. That is why there is a need for a valid and reliable scale to measure people's level of HS. This study aims to develop a scale that enables the measurement of HS of individuals. This is a study for developing a scale that uses the survey methodology. Data obtained from two different sample groups have been evaluated through exploratory and confirmatory factor analyses. Through the factor analysis carried out to put forward the framework of the scale, we determined that the HS comes under nine categories, and that 81.4% of HS is explored. We have examined the 9-factor framework of the "Health Self-Efficacy Scale" (HSS) that was developed through confirmatory factor analysis, observing that its fit indices are acceptable and the HS framework is confirmed. The Cronbach's alpha value of the scale is .93 and its sub-dimensions are between .85 - .96. The HSS, consisting of 36 items and providing data regarding the beliefs of individuals that they can manage to fulfill health-related practices, is a valid and reliable tool of measurement.

Introduction

At a time when the pandemic has impacted our world as never before, in order for societies to remain healthy, it is necessary, along with the reduction of social and environmental risks, to maximize the effort shown to protect individual health. That way it will be possible to more quickly ameliorate the health practices and increase the quality of life of individuals, and accordingly, of societies. Led by the World Health Organization (WHO), the Bangkok Charter was signed, which defines the notions of encouragement and improvement of health as the process of people increasing their control over their health and its determining factors, and providing an opportunity to ameliorate their health (Bangkok Charter, 2005). The individual's health-related actions, their beliefs, behaviors, and experiences contribute to the health and the perception of the individualistic aspects of health (Ağaçdiken Alkan, Özdelikara & Mumcu Boğa, 2017). In this context, in order to protect and ameliorate health, it is indispensable that the studies on health self-efficacy increase.

It is shown that self-efficacy is measured for a variety of health-related behaviors such as in traditional clinical fields, intellectual development, health-related activities, and performance in sports. Moreover, it is a prominent and reintegrative theoretical framework that can explain and forecast psychological changes obtained through different treatment methods (Elshatarat et al., 2016). To add, self-efficacy that is health-related is accepted as a significant component of programs and models for improving health due to its support for a healthy lifestyle (Gandoy-Creco et al., 2016). Health self-efficacy is also defined as a person believing in their abilities to organize and realize the actions needed to overcome health-related situations (Von Ah et al., 2004), or that a person has an optimistic self-faith concerning resistance to unhealthy temptations and embracement of a healthy lifestyle (Schwarzer & Renner, 2000). It is clear that a society consisting of individuals with a higher level or health self-efficacy will cope with diseases more successfully, stay away from risky actions, and be better at protecting their health.

The results obtained from previous scientific research show the importance of the examination of self-efficacy's effects on individuals' health-related behavior. According to these results, it is known that self-efficacy considerably predicts the patterns of smoking and drinking, and the increasing belief of self-efficacy is an important determinant of quitting smoking at ages 18-29 (Von Ah et al., 2004); that the relationship between the perceived self-efficacy and the capacity of exercise should be used in improving health conditions (Selzler, Moore et al., 2020); and that it was tackled in studies with regards to nutrition, obesity, and weight control (Bas & Donmez, 2009). Other studies show that a high level of self-efficacy could be a protective factor against sleep problems and is crucial against the prevention and treatment of sleeping disorders (Schlarb et al., 2012); that it

explains protective behaviors against breast cancer by 67% (Umeh & Chadwick, 2016); and that it is in correlation with the increase in self-efficacy of getting an HPV vaccination and protection from the disease through vaccination (Stout et al., 2020). It is also stated that a high level of self-efficacy could support an individual with low spiritual intelligence to display proper health behavior (Omar Dev et al., 2018); and that people with higher self-belief are more resilient to stress in their careers (Lu et al., 2005).

The goal should be first to use the scales developed for measuring health self-efficacy to determine the self-efficacy of the individuals constituting the society, regarding whether they fulfill the necessary health-related behavior, and later on to improve this behavior through the application of public health and health education. This could strengthen the beliefs and perceptions of being healthy among individuals who make up the society, supporting the creation of a healthier society. The purpose of this study is to develop a valid and reliable health self-efficacy tool that measures the individuals' health self-efficacy levels.

Methods

This is a study of scale development using the principal survey model.

Sample

This study has used two different groups. The first group from which the exploratory factor analysis (EFA) data was obtained consists of 170 people, and the second one from which the confirmatory data was obtained consists of 429 people. A total of 599 participants attended the study, and the data on gender and age is given below, in Table 1.

Table 1. Gender and age distribution of participants

Variable		Frequency (f)	Percent (%)
Gender	Male	141	23.5
	Female	458	76.5
	Total	599	100
Age	12-15	17	2.8
	16-19	11	1.8
	20-24	62	10.4
	25-40	316	52.8
	41-55	169	28.2
	56-65	22	3.7
	66 and above	2	0.3
	Total	599	100

As written on Table 1, among the participants 23.5% are male and 76.5% are female. There are 17 participants (2.8%) in 12-15 age group, 11 (1.8%) in 16-19 age group, 62 (10.4%) in 20-24 age group, 316 (52.8%) in 25-40 age group, 169 (28.2%) in 41-55 age group, 22 (3.7%) in 56-65 age group, and finally, 2 participants (0.3%) at the age of 66 and above.

Data Collection

The study for the validity and reliability of the Health Self-Efficacy Scale has been carried out from March to July in 2020, during the COVID-19 pandemic. During the first stage of research, data from 170 participants were used in exploratory factor analysis (EFA), and data from the remaining 429 participants were used in confirmatory factor analysis (CFA). To enhance the impact of the study and to increase the reliability and validity, data collection was made from different provinces in all seven regions of Turkey and from individuals aged 12 and above. Convenience sampling method was used to reach the participants.

In the study data collection was conducted online. During the preparation, printed survey form and electronic web survey interface (Google Forms) were devised to collect data; communication methods such as face-to-face, e-mail, phone message, and/or web-based applications, etc. were used to reach the participants electronically. Necessary clarifications were made to the participants within the printed form and electronic data collection tools; the participants were informed that the study was being conducted on a voluntary basis and

they gave their approval. Only the results from the participants who completed the study were taken; those who did not wish to complete were allowed to leave the system without having completed/saved the study.

Tools for Data Collection

In the tool used for collecting quantitative data, the first part had information-gathering questions asking for personal information (gender, age) from the participants; the second part had the items for the draft health self-efficacy scale.

The Health Self-Efficacy Scale

During the preparation stage for the development of the Health Self-Efficacy Scale, we have delved into literature on self-efficacy and health-related behavior. Moreover, we have asked 21 people to state their opinions on what they consider as the most important health-related fields when it comes to protecting health. Also taking the qualitative evaluations into account, we determined 10 areas of protecting health (nutrition, physical activity, weight increase, harmful habits, adequate sleep, infectious diseases, immunity, protective health services that provide early diagnosis, stress, and spiritual relaxation). Upon inspection of literature on the field, despite the presence of scales that tackle self-efficacy and health separately (Gandoy-Crego et al., 2016; Renner, Knoll & Schwarzer, 2000), we have seen that there are no measurement tools that deal with "health self-efficacy" taking into account health to such an extent and as a whole. That is why there was no direct use of resources during the development of factors; however, we have taken into consideration the findings of Schmitz and Schwarzer (2000) that self-efficacy could be better measured with items concerning overcoming hardships and obstacles. On top of that, the four notions that the belief of self-efficacy is based on and can change/affect self-efficacy, namely mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states (Bandura 1977), were used for creating four items for every field of health. As a result, we developed a total of 40 items, consisting of 4 items from each of the 10 fields we had determined that are important for protecting health. During the pilot study phase; four pedagogues of the field, two experts on assessment and evaluation, and two experts on the Turkish language examined the items. In accordance with expert opinions, four items related to immunity were removed due to the lack of direct relevance to health, but more relevance to after the loss of health. In the end, the draft of the scale was finalized with 36 items. On the scale, the participants stated to what extent they agree or disagree with the items on the Health Self-Efficacy Scale by choosing among the following responses: "I completely agree (5), I mostly agree (4), I partly agree (3), I hardly agree (2), I disagree (1)".

Data Analysis

While developing the scale, we first examined the normality of distribution and the outliers to determine that the necessities for the factor analysis are met. After that, exploratory factor (maximum likehood) analysis was used for setting forth the data structure and decreasing the factor; confirmatory factor analysis was used for testing the structure obtained. The proof of validity was tested with the total item test correlation and the correlation coefficient obtained from the highest and lowest 27% of the group. Reliability was confirmed with Cronbach's alpha values of both the scale in general and of each factor. This study used IBM SPSS Statistics 28.0 and LISREL 8.80 softwares.

Results

This part includes findings related to the validity (exploratory factor analysis and confirmatory factor analysis) and reliability (internal consistency) of the measurements obtained from the Health Self-Efficacy Scale (HSS).

Findings Related to the Exploratory Factor Analysis

Kaiser Meyer Olkin (KMO) value and Bartlett Test of Sphericity were used to making sure the data set was consistent with the factor analysis. The KMO value was observed as .836 and the Bartlett Test of Sphericity was significant (X^2 = 5776,051; p=,000). This value gives information about whether the factor analysis is good or not.

Maximum likehood analysis was conducted in order to set forth the structural validity of the scale and to determine the magnitude of factor loads of the items. During the maximum likehood analysis, factors with an Eigenvalue over 1 were considered and the scale was grouped under 9 factors. These were chosen to ensure each item has a factor load to a factor of at least .32 (Tabachnick & Fidell, 2013). The total variance calculated as a result of the scale was 75.52%. Eigenvalues and the variance explored by each factor are given in Table 2.

Table 2. Scale-related eigenvalues and explored variances

Factor	Eigenvalue	% Variance	% Total Variance
1	11.11	10.10	10.10
2	3.43	9.27	19.37
3	3.23	9.08	28.45
4	2.71	9.01	37.45
5	2.22	8.09	45.55
6	2.01	7.89	53.44
7	1.80	7.41	60.86
8	1.56	7.36	68.22
9	1.22	7.30	75.52

Table 2 shows that the first factor explores 10.10% of the variance, and the others play a smaller part in percentage variance. A line chart based on the Eigenvalues, which is another way of determining the number of factors, is given below (Figure 1).

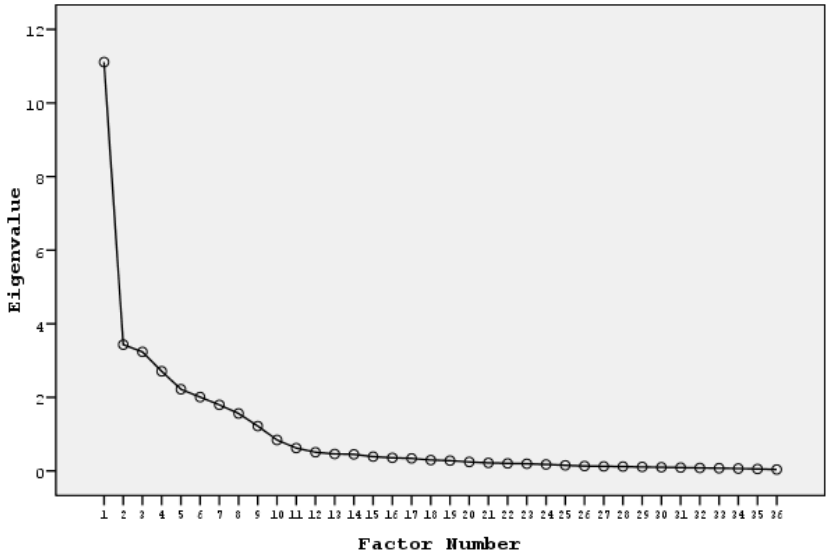

Figure 1. Scree plot

When we look at the change of Eigenvalues with respect to components, we can observe that there is a significant decrease in the trend of Eigenvalue line, and that the breaking point after which Eigenvalues become stable is 9. Due to the lack of any expectation of a high degree of correlation between the factors which were obtained during the maximum likehood analysis, we preferred Varimax as the method of rotation. Table 3 contains the 9 factors which were obtained, the items under the factors, and their common variances.

As seen in Table 3, there are 4 items under each factor. The item referred to as M25 is a part of both the 7th and the 9th factors. However, due to M25's load in the 7th factor being larger than in the 9th, and because of the content of the item, M25 should be placed under the 7th factor. The factors are named according to the content of the items. As such, the nine factors are named: Keeping Away from Harmful Habits Self-Efficacy (Items 1-4), Spiritual Relaxation Self-Efficacy (Items 5-8), Protection from Infectious Diseases Self-Efficacy (Items 9-12), Protection from Stress Self-Efficacy (Items 13-16), Physical Activities Self-Efficacy (Items 17-20), Access to Preventive Health Services Self-Efficacy (Items 21-24), Sleep Self-Efficacy (Items 25-28), Weight Control Self-Efficacy (Items 29-32) and Nutrition Self-Efficacy (Items 33-36). The factor load values of the items in the scale vary between .526 and .930.

Table 3. Items' factor load values

No of Item	1th Factor	2th Factor	3th Factor	4th Factor	5th Factor	6th Factor	7th Factor	8th Factor	9th Factor
1	.884								
2	.922								
3	.930								
4	.883								
5		.833							
6		.873							
7		.881							
8		.774							
9			.895						
10			.862						
11			.795						
12			.754						
13				.757					
14				.868					
15				.882					
16				.841					
17					.644				
18					.693				
19					.873				
20					.856				
21						.557			
22						.704			
23						.897			
24						.884			
25							.529		.318
26							.712		
27							.842		
28							.839		
29								.813	
30								.833	
31								.526	
32								.735	
33									.660
34									.785
35									.601
36									.717

Findings Related to the Reliability of the Scale

We looked at the item discrimination for the lowest and highest 27% of the group and the item-total test correlation coefficient in order to determine the level of item discrimination. Internal consistency or in other words, Cronbach's alpha value which determines how closely-related the items are, was examined for the total scale and the sub-dimensions. The results of the scale's reliability are given in Table 4.

Table 4. Results of the scale's reliability

Factors	Item	Item Total Correlation (n=170)	t Lowest %27-Highest %27 (n=46)	Cronbach's Alpha	McDonald's ω
Keeping Away from Harmful Habits Self-Efficacy	1- Even if I am feeling nervous, I can stay away from habits that are harmful to health (tobacco products, alcohol, etc.).	.890	-28.34*	.96	.96
	2- Even if people around me consume them, I can stay away from habits that are harmful to health (tobacco products, alcohol, etc.).	.921	-29.09*		
	3- Even if I cannot get information from an expert (doctors, psychologists, teachers, etc.) on their harmful effects, I can stay away from habits that are harmful to health (tobacco products, alcohol, etc.).	.939	-24.41*		
	4- Even if I need to remind myself of the incidents where I had to resistant, I can stay away from habits that are harmful to health (tobacco products, alcohol, etc.).	.890	-23.76*		
Spiritual Relaxation Self-Efficacy	5- Even if I cannot get information from an expert (psychologists, teachers, etc.) on spiritual relaxation, I can do activities that make me feel better (various hobbies, yoga, religious activities, etc.).	.840	-19.73*	.94	.94
	6- Even if I have never tried relaxing activities, I can do activities that make me feel better (various hobbies, yoga, religious activities, etc.).	.898	-24.46*		
	7- Even if my friends see them as a waste of time, I can do activities that make me feel better (various hobbies, yoga, religious activities, etc.).	.875	-22.52*		
	8- Even if I do not want to bother with them, I can do activities that make me feel better (various hobbies, yoga, religious activities, etc.).	.797	-19.37*		
Protection from Infectious Diseases Self-Efficacy	9- Even if I need take to care more about hygiene, I can take precautions against infectious diseases (due to viruses, bacteria, etc.).	.870	-16.83*	.93	.93
	10- Even if I am feeling anxious, I can take precautions against infectious diseases (due to viruses, bacteria, etc.).	.843	-17.77*		
	11- Even if I cannot get information from an expert (doctors, healthcare workers, teachers, etc.) to protect myself against them, I can take precautions against infectious diseases (due to viruses, bacteria, etc.).	.837	-18.57*		
	12- Even if my friends act differently than I do, I can take precautions against infectious diseases (due to viruses, bacteria, etc.).	.805	-16.51*		
Protection from Stress Self-Efficacy	13- Even if I cannot getting support for stress from an expert (psychologists, teachers, etc.), I can cope with stress.	.818	-17.53*	.94	.94
	14- Even if I am feeling anxious, I can cope with stress.	.880	-15.75*		
	15- Even if there is nobody around me who has succeeded in coping with stressful situations, I can cope with stress.	.889	-17.40*		
	16- Even if I have not been through a major stress issue, I can cope with stress.	.827	-16.24*		
Physical Activities Self-Efficacy	17- Even if I cannot get information about exercises from an expert (sports trainers, doctors, teachers, etc.), I can do physical exercise (walking, jogging/running, exercises with/without sports equipment, etc.).	.734	-17.54*	.91	.90
	18- Even if I am feeling tired, I can do physical exercise (walking, jogging/running, exercises with/without	.764	-18.16*		

	sports equipment, etc.).				
	19- Even if I have to try until I get accustomed to it, I can do physical exercise (walking, jogging/running, exercises with/without sports equipment, etc.).	.837	-18.22*		
	20- Even if the people close to me do not, I can do physical exercise (walking, jogging/running, exercises with/without sports equipment, etc.).	.818	-20.17*		
Access to Preventive Health Services Self-Efficacy	21- Even if I cannot get information on protective health services from an expert (doctors, teachers, etc.), I can make use of protective health services (early diagnosis, vaccination, etc.).	.679	-20.04*	.89	.89
	22- Even if people around me have never used protective health services, I can make use of protective health services (early diagnosis, vaccination, etc.).	.783	-17.42*		
	23- Even if I think I do not get sick very often, I can make use of protective health services (early diagnosis, vaccination, etc.).	.807	-20.63*		
	24- Even if I do not like going to the doctor's, I can make use of protective health services (early diagnosis, vaccination, etc.).	.787	-18.93*		
Weight Control Self-Efficacy	25- Even if I cannot get support on nutrition from an expert (dieticians, doctors, teachers, etc.), I can control my weight.	.814	-15.47*	.89	.89
	26- Even if I love so eating, I can control my weight.	.808	-15.05*		
	27- Even if I have tried and failed to lose weight in the past, I can control my weight.	.624	-15.00*		
	28- Even if my friends do not pay attention to their weight, I can control my weight.	.803	-17.14*		
Sleep Self-Efficacy	29- Even if I enjoy staying up late, I am sure I could get enough sleep.	.567	-16.12*	.88	.89
	30- Even if I cannot get information on the importance of good sleep from an expert (doctors, teachers, etc.), I am sure I could get enough sleep.	.788	-16.80*		
	31- Even if I have to rearrange my sleep schedule, I am sure I could get enough sleep.	.829	-14.37*		
	32- Even if people around me do not pay attention to their sleep schedule, I am sure I could get enough sleep.	.825	-17.06*		
Nutrition Self-Efficacy	33- Even if I cannot get information on a balanced diet from an expert (dieticians, teachers, etc.), I can have a balanced diet (by eating enough of each of the groups: meat, dairy, grains, fruit, vegetables, and oil).	.677	-13.98*	.85	.85
	34- Even if people around me do not pay attention to having a balanced diet, I can have a balanced diet (by eating enough of each of the groups: meat, dairy, grains, fruit, vegetables, and oil).	.751	-13.70*		
	35- Even if I have to reduce my junk food (cookies, chocolate, chips, etc.) intake, I can have a balanced diet (by eating enough of each of the groups: meat, dairy, grains, fruit, vegetables, and oil).	.613	-11.57*		
	36- Even if preparing my meals out of different food groups takes time, I can have a balanced diet (by eating enough of each of the groups: meat, dairy, grains, fruit, vegetables, and oil).	.722	-14.78*		

The item-total test correlation values vary between .567 and .939 for the Health Self-Efficacy Scale consisting of 36 items with 9 factors. Items with item-total test correlation value greater than and equal to .30 are known to discriminate between the individuals well (Büyüköztürk, 2014). Moreover, when we look at the difference in average item points of the highest and lowest 27%, the difference seems significant ($p<0.001$). The mentioned values imply that the items in the scale have high validity.

The reliability values (Cronbach's alpha and McDonald's ω) for the Health Self-Efficacy Scale were calculated as .93. This value is known to be highly reliable (Can, 2014). Cronbach's alpha and McDonald's ω values of the factors vary between .85 and .96 (Table 4). Based on these values it can be said that the scale in total and its nine factors are quite reliable (Özdamar, 2002; George & Mallery, 2003).

Findings Related to the Confirmatory Factor Analysis

In order to obtain proof related to the Health Self-Efficacy Scale's structural validity and to see to what extent it is consistent with the data of the nine-factor scale, we used confirmatory factor analysis (CFA). To show that the model tested with the CFA is sufficient, the Chi-squared fit test was conducted (Table 5). For the fit index criteria, for $\chi 2/fd$, values smaller than 3 generally show perfect fit; values between 3 and 5 show acceptable fit (Schumacker Lomax, 1996; Schermelleh-Engel, Moosbrugger & Müller 2003). The path diagram obtained through the CFA is given (Figure 2).

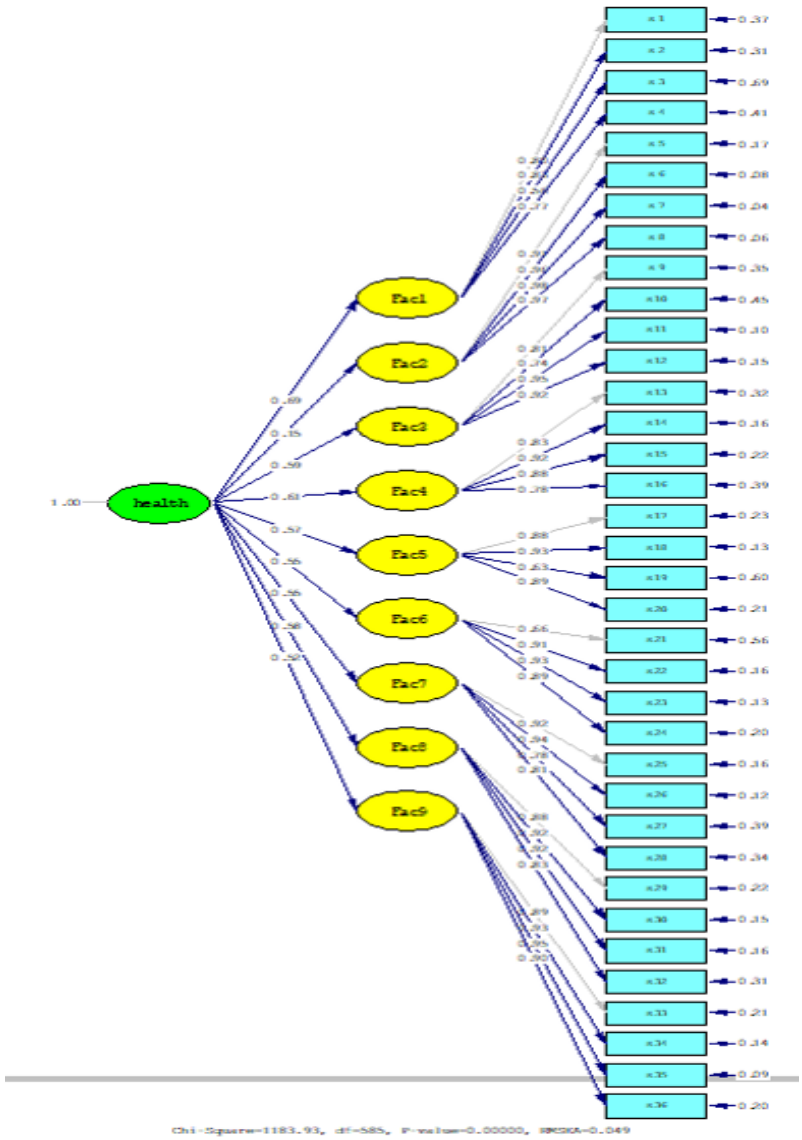

Figure 2. Confirmatory factor analysis path diagram: Standardized values

Table 5. Fit indices obtained as a result of CFA

Examined Fit Indices	Perfect Fit Criteria	Acceptable Fit Criteria	Obtained Fit Indices	Result
$\chi 2/sd$	$0 \leq \chi 2/sd \leq 2$	$2 \leq \chi 2/sd \leq 3$	2.02	Acceptable Fit
AGFI	$.90 \leq AGFI \leq 1.00$	$.85 \leq AGFI \leq .90$	.85	Acceptable Fit
CFI	$.95 \leq CFI \leq 1.00$	$.90 \leq CFI \leq .95$	.97	Perfect Fit
NFI	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI \leq .95$	.95	Perfect Fit
NNFI	$.95 \leq NNFI \leq 1.00$	$.90 \leq NNFI \leq .95$	.97	Perfect Fit
IFI	$.95 \leq IFI \leq 1.00$	$.90 \leq IFI \leq .95$	.97	Perfect Fit
RMSEA	$.00 \leq RMSEA \leq .05$	$.05 \leq RMSEA \leq .08$	.05	Perfect Fit
SRMR	$.00 \leq SRMR \leq .05$	$.05 \leq SRMR \leq .10$	.05	Perfect Fit
PNFI	$.95 \leq PNFI \leq 1.00$	$.50 \leq PNFI \leq .95$	.88	Acceptable Fit
PGFI	$.95 \leq PGFI \leq 1.00$	$.50 \leq PGFI \leq .95$	.76	Acceptable Fit

$\chi 2$=1183.93 (fd=585) which was calculated through CFA is significant ($p<.01$) and $\chi 2/fd$ =2.02 was obtained. The results show that in the model, Comparative Fit Index (CFI), Normed Fit Index (NFI), Non-Normed Fit Index (NNFI(TLI)), Incremental Fit Index (IFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) values show perfect fit (CFI=.97; NFI=.95, NNFI= .97, IFI=.97, RMSEA=.05; SRMR=.05). Adjustment Goodness of Fit Index (AGFI), Parsimony Goodness of Fit Index (PGFI), and Parsimony Normed Fit Index (PNFI) values show acceptable fit (AGFI=.85, PGFI=.76, PNFI=.88). For all the items, t values are significant at the level of .01. Fit indices that were obtained remark that the model has a good fit.

Discussion

In this study which aims to develop a valid and reliable data collection tool to be used for determining the health self-efficacy of individuals, the exploratory factor analysis aiming to determine the structure of the scale found out that health self-efficacy is grouped under nine factors. The factors were named as such: Keeping Away from Harmful Habits Self-Efficacy, Spiritual Relaxation Self-Efficacy, Protection from Infectious Diseases Self-Efficacy, Protection from Stress Self-Efficacy, Physical Activities Self-Efficacy, Access to Preventive Health Services Self-Efficacy, Weight Control Self-Efficacy, Sleep Self-Efficacy, and Nutrition Self-Efficacy. The factor load values of items on the scale are expected to be greater than or equal to .30 (Ho, 2006; 207). The factor load values of the items in the Health Self-Efficacy Scale are between .526 and .930. The calculated variance should be 30% or more in single-factor scales, and higher in multi-factor scales (Büyüköztürk, 2014). The mentioned nine factors explore 75.5% of the variable.

The reliability values (Cronbach's alpha and McDonald's ω) for the Health Self-Efficacy Scale in general are .93. Cronbach's alpha and McDonald's ω values for the sub-dimensions vary between .85 and .96. Internal consistency coefficients have a high level of reliability both for the scale in general and for the sub-dimensions. Indeed, .80-1.00 is regarded as a high-value interval by the literature on the field (Özdamar, 2002). The item-total test correlations of the scale vary between .567 and .939 and all items have a discrimination t value that is significant at $p<.001$. These results imply that the validity of the items in the Health Self-Efficacy Scale is high and that they discriminate the participants with regards to health-related self-efficacy.

Confirmatory factor analysis was applied to the 36-item and 9-factor structure of the Health Self-Efficacy Scale that was put forth by the exploratory factor (principal components) analysis. When the fit indices obtained by the confirmatory factor analysis are examined; Comparative Fit Index (CFI=.97), Normed Fit Index (NFI=.95), Non-Normed Fit Index (NNFI= .97), Incremental Fit Index (IFI=.97), Root Mean Square Error of Approximation (RMSEA=.05), and Standardized Root Mean Square Residual (SRMR=.05) values show perfect fit (25, 26). Adjustment Goodness of Fit Index (AGFI=.85), Parsimony Goodness of Fit Index (PGFI=.76), and Parsimony Normed Fit Index (PNFI=.88) values show acceptable fit (Schumacker & Lomax, 1996). Thus, the aforementioned structure is confirmed.

The health self-efficacy scale consists of 36 items and shows individuals' perceptions of self-efficacy on health in general and different dimensions of it. The health self-efficacy scale that was developed is related to the people's belief of being successfully involved in behaviors related to health; this is in line with Bandura's (1977) definition of the belief of self-efficacy in specific cases (16). Points received from the entirety of the

scale as well as its sub-parts show individuals' level of perception regarding their health self-efficacy. Designed as a 5-Point Likert Scale, the minimum attainable score for every sub-dimension on the Health Self-Efficacy Scale is 4 points, and the maximum is 20 points. The minimum possible score in total is 36 points, and the maximum is 180 points.

Conclusion

The "Health Self-Efficacy Scale" that was developed is specific to the individuals' belief that they can fulfill health-related behaviors and it could fill an important gap in the literature thanks to its tackling of health from such a broad scope. Health self-efficacy is a valid and reliable tool, which can be used for measuring both their general health self-efficacy as well as their self-efficacy on smaller dimensions, by providing data regarding people's beliefs on whether they can successfully fulfill the health-related acts and behaviors, starting from the age of 12.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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A Pilot Study for Developing Water Literacy of Preschool Children

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Abstract

In order to ensure the use, protection and sustainability of water, which is becoming more and more important for life, individuals need to develop their water literacy starting from the pre-school period. In this direction, it was aimed to improve the water literacy of 60-72 month old children who were in pre-school education with online education. In the study, action research design, one of the qualitative research methods, was used. The study group was determined by criterion sampling method and consists of 36 children aged 60-72 months. A semi-structured interview form was used as a data collection tool. In the study, Water Literacy Online Training was prepared and implemented in order to improve children's water literacy. Interviews were conducted with the children before and after the training. Content analysis was used in the analysis of the findings. As a result of the study, there had been improvement in the practical, living and social water literacy of the children. The results of the study showed that Water Literacy Online Training is effective in pre-school children's ability to recognize the importance of water, which is among the basic concepts for water literacy, for life, its limitations and the importance of its protection.

Introduction

Water has a key role in the survival of all creatures. However, the amount of water that can be used on earth is not evenly distributed (Moreno-Guerrero et al., 2020). In addition, changes in precipitation due to climate change and global warming cause a change in the distribution of usable water (Yu et al., 2021). Climate change, global warming and the state of the available water on earth are expressed as a global public health problem (Su et al., 2011). Although water resources do not increase, water use is constantly increasing due to population growth and the amount of usable water is decreasing due to pollution. In order to overcome the problems experienced, the use of water in our daily lives must be sustainable. However, environmental and social problems arise due to the unsustainable use of water (López-Alcarria et al., 2021). In order to eliminate these problems, improve the current situation and develop water in a sustainable way, new paradigms need to be considered. It is argued that the concept of water literacy is at the center of these paradigms (Otaki et al., 2015).

Being water literate means knowing how the water used in daily life is supplied, purified, safe and the amount of water we use daily (He, 2018). Water literacy is examined in three categories: practical, living and social water literacy. Practical water literacy; is to know to drink safe, clean water and not to drink unhealthy water. Living water literacy means the ability to use water wisely at home and in the garden. Social water literacy is acting responsibly for the society as a whole in terms of water use (Otaki et al., 2015). For the development of water literacy in individuals, interventions should be made for practical, living and social water literacy.

The most powerful intervention we have today for the development of water literacy is education (Åkerblom et al., 2019). The education on water literacy provides the opportunity to take sustainable measures related to water, to analyse the water problem well, and to produce effective and permanent solutions for the water problem in the education curriculum of children at all educational levels, starting from the pre-school period (Alicea-Planas et al., 2020; Lobato & Davis, 2019). The education curriculum should include the issues of economical use of water, water scarcity, the effect of water quality on human health, awareness of natural water resources that store water (Muntz & Kopp, 2019; Su et al., 2011).

The basis of the educational process is pre-school education. Preschool education is the educational process in which 0-6 year old children are included, covering the process before traditional education. In pre-school education, important foundations that shape the lives of individuals are laid. During this period, children's cognitive, social, emotional and language developments mature rapidly (İnan, 2012). In Turkey, 36-72 months old children are included in pre-school education. The Ministry of National Education Pre-School Education Program (MEB, 2013) in Turkey aims to ensure that children attending pre-school education institutions grow

up healthy through rich learning experiences, have the highest level of development in motor, social and emotional, language and cognitive development, develop self-care skills and enabling school readiness. While the education of children in the pre-school period is planned in line with the stated purpose, it is also important to raise individuals who are sensitive to the environment (Kaya Aydın, 2021). The inclusion of water literacy education in the curriculum from the pre-school period enables children to meet water-related problems early and acquire skills to prevent this problem early (Meehan, 2021). The knowledge, skills and attitudes taught in the pre-school period are more easily adopted and permanent than those taught at later ages (Bhise, 2020). For this reason, the education given in the pre-school period allows the development of water awareness in the society from an earlier age and water literacy settles in the society. Studies have shown that the education given to pre-school children on water conservation (Samaltani & Christidou, 2013), water literacy and awareness (Ursavaş & Aytar, 2018), fisheries awareness (Kılınç et al., 2016) and water cycle (Ahi, 2017) has been effective. Although important issues related to water were mentioned in these studies, no planning was made for the development of all categories of practical, living and social water literacy of children in the content of the education they provided. In addition, giving education in a formal environment can make it difficult to control whether the acquired knowledge, skills and behaviours are transferred to the home environment where children interact with water the most. Based on these identified situations, the trainings on water literacy should include all categories of practical, living and social water literacy. In addition, the fact that children receive this education in the home environment makes it easier for them to act. In this direction, it was aimed to improve the water literacy of 60-72 month old children who were in pre-school education with online education.

For this purpose, answers to the following questions were sought:

- What were the views of the children in the study group about water literacy before online education?
- Was there a change in the views of the children in the study group about water literacy after the online training?

Method

Research Design

In the research, action research design, one of the qualitative research methods, was used. It is a pattern that includes practices such as creating changes in the behaviors, attitudes, perceptions or value systems of the participants. Technical/scientific/collaborative action research is one of the types of action research. In technical/scientific/collaborative action research, a new approach is applied and analyzed, application-oriented evaluation is made and the implementation process is defined. (Yıldırım & Şimşek, 2013). This study was thought to be suitable for action research in terms of the implementation of Water Literacy Online Training, interviewing and evaluation before and after the application.

Study Group

The study group consisted of 36 children aged 60-72 months who were receiving pre-school education. Criterion sampling, one of the purposive sampling methods, was used in the selection of the study group. The basic criteria were that children are attending pre-school education, they were 60-72 months old, they had internet access at home, they had a computer or tablet where they could participate in online education, and they could be accompanied by an adult to support the child during online education.

When the demographic characteristics of the children in the study group were examined, it was seen that 47.3% were girls and 52.7% were boys. 22.2% of the children's mothers were secondary school graduates, 52.8% high school graduates, and 25.0% university graduates. 5.6% of their fathers were secondary school graduates, 47.2% were high school graduates, and 47.2% were university graduates. 13.39% of mothers were civil servants, 2.8% were workers, 2.8% were self-employed and 80.5% were housewives. 27.8% of fathers were civil servants, 27.8% were workers and 44.4% were self-employed. 38.8% of the families had a high income and 61.2% have a medium income.

Data Collection Tools

Personal Information Form and Interview Form were used as data collection tools.

Personal Information Form

The form was created by the researchers and filled out by parents. In the form, there were questions about the gender of the children, the educational status of the parents and their occupation and income.

Interview Form

A semi-structured interview form prepared by the researchers was used in the study. Before creating the data collection tool, the relevant literature was searched. A data collection tool consisting of six open-ended questions was created. The questions in the interview form were grouped under three themes: practical, living and social water literacy. These three themes cover the following: knowing the concept of water, its source, drinking safe and clean water and not drinking unhealthy water, using water sparingly in daily life, acting as a community for water use, finding a solution to the water problem. The interview form was examined by three field experts. Adjustments were made in line with the recommendations of the experts. The interview form was applied to two children who were not in the study group. Afterwards, the interview form was given its final form. The interview form was applied both before and after the Water Literacy Online Training.

Water Literacy Online Training

The Water Literacy Online Training (WLOT) was created by researchers in order to improve the water literacy of 60-72 months old children. Before the WLOT was created, the relevant literature was scanned. In order to develop water literacy, it was thought that it was necessary for children to acquire the knowledge and skills of knowledge about water and water resources, the amount of water use in daily life, and the awareness of finding solutions to the water problem. In this direction, WLOT was planned by the researchers to include activities for practical, living and social water literacy categories. The activities were prepared by using the acquisitions, indicators, concepts, activity types and formats in the Preschool Education Program of the Ministry of National Education (MoNE, 2013). Turkish-language, science, drama, play, music and art activities were included in WLOT. Five activities were prepared for practical water literacy, six activities for living water literacy and five activities for social water literacy. WLOT was presented to the opinion of three field experts, and WLOT was given its final form in line with the suggestions received. One activity from each category of WLOT was selected and a preliminary application was made to the children who were not included in the study group. After the pre-application, the activities were rearranged and the WLOT was given its final shape.

Implementation of WLOT

WLOT was administered to children twice a week for eight weeks. The activities were implemented online by connecting the children with the Zoom application. The application was made by dividing the children into seven groups of five and six each in order to better interact with the children. The groups did not change throughout the training program. All groups were treated for eight weeks, two sessions per week. Each session lasted approximately 40 minutes.

Data Collection

Data were collected through interviews before and after the WLOT was applied. Interviews were carried out with one-on-one video calls over the zoom application when the children were available. During the interviews, the parents were told that there should not be an environment that would distract the children's attention. With the support of the parents, a suitable environment was created for the interviews. Interview questions were carried out before and after the implementation of WLOT. Interviews lasted approximately twenty minutes with each child.

Ethical Approval

Ethical Approval was obtained from Afyon Kocatepe University Social and Human Sciences Ethics Committee (2021/281).

Data analysis

The data were analyzed by content analysis technique. In this technique, concepts related to the collected interview results are formed, similar concepts are brought together and themes are formed (Yıldırım & Şimşek, 2016). In the analysis of the data, the steps of organizing and preparing the data, making general sense of the information, coding, defining, representing and interpreting were used respectively (Creswell, 2013). The interviews were converted into written text. The obtained data were read and coded by the researcher. The data were evaluated and coded by another expert in the field. The different encodings were again negotiated and changed. The data were organized according to codes and themes. The findings that emerged as a result of examining the themes were reported by quoting directly from the views of the participants (Yıldırım & Şimşek, 2016). Theme and category tables for the coding were created. The obtained data are also presented in the text as frequency values. In the study, children were selected as C1, C2, C3, C4 etc. and analyses were presented with these codes.

Validity and Reliability

In order to ensure the internal validity of the obtained data, diversification, expert review, participant confirmation and long-term interaction methods were used. In order to ensure external validity, the data obtained were analysed without adding comments and without disturbing the nature of the data. For reliability, coding reliability was calculated. The obtained data were analysed by two independent researchers and the agreement between encoders was calculated as .88 using the consensus-disagreement formula (Miles & Huberman, 1994). Since the agreement percentage was higher than .70, it was decided that the results obtained were reliable.

Results

The data obtained from the study were gathered under the main headings of practical, living and social water literacy and presented in tables below.

Practical Water Literacy

Table 1. Themes and sub-themes related to the concept of water

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
drink	drink (f=15) drinking water (f=5)	20	48,78	life	Source of life for people (f=15) Source of life for animals (f=3) Source of life for plants (f=2)	20	45,45
life	Life source (f=4) life (f=2)	6	14,63				
cleaning	cleaning (f=4) bath (f=1) handwash (f=1)	6	14,63				
nature	nature (f=2) rain (f=1)	3	7,33	health	health (f=2) useful (f=4)	6	13,64
other	water (f=2) surname (f=1) beautiful (f=1) health (f=1) Everything (f=1)	6	14,63	need	people's need (f=12) plant's need (f=1)	13	29,55
total		41	100,0	conservation	keeping water clean (f=2) water conservation (f=1)	3	6,81
				important	Everything (f=1) important (f=1)	2	4,55
				total		44	100,0

In order to evaluate practical water literacy, the children were asked "What is water/What comes to mind when you think of water?", "What is the source of water/Where does the water come from/Where does it go?", "How

is/what is clean water?" questions were posed. When Table 1 was examined, it was seen that the answers given by the children regarding the concept of water in the pre-interviews were grouped under the categories of "drink, life, cleanliness, nature and other". In the post interviews, it was seen that they were gathered under the themes of "life, health, need, important". It was noteworthy that the children gave more detailed answers to the concept of water in the last interviews. While most of the children expressed their opinion that water was a drink in the pre-interviews, it is noteworthy that in the post interviews they emphasized that water was the source of life for all living things, that it met the needs of living things and expressed its importance in terms of health. Examples from children answers in the pre and post interviews regarding the concept of water were as follows:

C2. It is the drink that is our source of life. (Pre-interview)
C18. It is our source of life. (Pre-interview)
C7. Water is very useful. It protects people from diseases. It is the source of life for animals and plants. (Post interview)
C24. It is necessary for the survival of plants. It is our source of life. It keeps us clean. (Post interview)

Table 2. Themes and sub-themes related to the source of water

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
natural source	rain (f=4) underground (f=3) cloud (f=1) river (f=1) runnel (f=1)	10	27,80	natural source	rain (f=6) cloud (f=4) underground (f=4) sky (f=2) nature (f=1) sea (f=1)	18	45,0
fountain	faucet (f=5) fountain (f=4) washbasin (f=1)	10	27,80	artificial source	barrage (f=11) waterworks (f=11)	22	55,0
artificial source	barrage (f=4) conduit (f=2) sewage (f=2)	8	22,20	total		40	100,0
no answer	no answer (f=8)	8	22,20				
total		36	100,0				

When Table 2 was examined, it was seen that the answers given by the children in the pre-interviews about where the water came from were gathered under the themes of "natural source, fountain, artificial source" and eight children did not answer. In the post interviews, it was seen that they were gathered under the themes of "natural source and artificial source". When the answers given by the children in the pre-interviews were examined, it was seen that they referred to the elements they saw in their physical environment regarding where the water came from. However, when the results obtained from the post interview were examined, it was seen that the children expressed their opinions about the water cycle, the place where the water is purified and the place where it is stored. Examples from children answers in the pre and post interviews about where the water comes from were as follows:

C3. It's coming from the faucet. (Pre-interview)
C17. It's coming from the pipes. (Pre-interview)
C18. Underground water evaporates and comes as rain. (Post interview)
C27. The water is cleaned in water treatment plants and comes back. (Post interview)

When Table 3 was examined, it was seen that the answers given by the children in the pre-interviews about how clean water was, were gathered under the themes of "clean water, clean appearance, potable water, nature". It was noteworthy that 15 of the children did not respond in the preliminary interviews. In the post interviews, it was seen that they were gathered under the themes of "health, beneficial content, potable water". In the pre-interviews, the children mostly made statements about the physical characteristics of clean water. In the post interviews, the children gave answers about the benefits of clean water for health, not containing microbes, containing beneficial minerals and being drinkable. Examples from children answers in the pre- and post-interviews about how clean water was:

C7. It is bright, visible water. (Pre-interview)
C20. It is water without garbage and mud. (Pre-interview)
C2. It is purified water with beneficial minerals in it. (Post interview)
C8. There are no microbes. It doesn't make you sick. It is drinkable. (Post interview)

Table 3. Themes and sub-themes related to the concept of clean water

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
clean water	clean (f=4) sterile (f=2) Handwash water (f=1)	7	19,44	health	sterile (f=18) beneficial (f=5) healthy (f=13) not sick (f=12) clean (f=2)	50	58,82
clean appearance	waste-free water (f=2) bright water (f=2) sludge-free water (f=2) visible water (f=2)	6	16,67	beneficial content	water with beneficial minerals (f=12) chemical-free water (f=10)	20	23,53
potable water	potable water (f=4) bottled water (f=1)	5	13,89	potable water	potable water (f=7) purchased water (f=1)	15	17,65
nature	Nature water (f=1) sea water (f=1) water where fish live (f=1)	3	8,33	total		85	100,0
no answer		15	41,67				
total		36	100,0				

Living Water Literacy

In order to evaluate living water literacy, the children were asked, “What is water saving/What comes to mind when you say water saving? What do you do at home to save water?” questions were posed.

Table 4. Themes and sub-themes related to water saving

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
not waste water	not waste water (f=4) not leaving the water on (f=3) close the tap (f=3) urning off the water while washing hands (f=2)	12	33,33	not waste water	not waste water (f=11) not leaving the water on (f=4) close the tap (f=4) not using unnecessary water (f=2)	21	58,33
small amount of water use	don't use too much water (f=2) don't turn on the water too much (f=1)	3	8,33	small amount of water use	use less water (f=5) use water carefully (f=3) watering flowers with used water (f=3) watering the garden with little water (f=2) Not turn off the water while brushing teeth (f=2)	15	41,67
saving	not waste (f=1) saving (f=1)	2	5,56				
no answer	No answer (f=19)	19	52,78				
total		36	100,0	total		36	100,0

When Table 4 was examined, it was seen that the answers given by the children to what/how to save water in the pre-interviews were gathered under the themes of "not wasting water, using a small amount of water, saving", and in the post interviews "not wasting water, using a small amount of water". Although the themes were the same, 16 children stated that they did not know how to save water in the pre interview, and that there was no child who did not know in the post interviews. In addition, it was noteworthy that in the post interviews, children gave detailed information about water saving. Examples from children answers in the pre and post interviews on water saving were as follows:

C1. Don't waste water. (Pre-interview)
C16. Turning off the water while washing our hands. (Pre-interview)
C17. Watering the flowers with the water we use in our garden. (Post interview)
C20. Do not use unnecessary water. Do not leave the water on. (Post interview)

Table 5. Themes and sub-themes related to what they do to save water

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
not waste water	use less water don't leave the taps open turn off water	9	25,0	not waste water	brushing teeth while washing hands (f=6) not to waste water (f=5) using the washing machine less (f=3) turn off water (f=4) not waste water (f=3) closing the taps (f=3) Not washing the dishes before putting them in the machine (f=3) turn on the water less (f=2)	29	59,18
no answer	no answer	27	75,0				
total		36	100,0	water conservation	rainwater storage (f=8) watering flowers with little or used water (f=6) water used in the sink for garden irrigation, balcony washing (f=6)	20	40,82
				total		49	100,0

When Table 5 was examined, the answers given by the children in the pre-interviews about what they and their families do to save water were gathered in the category of "not wasting water". 27 children said that they did not know what they did at home to save water. In the post interview, the answers were gathered under the themes of "not wasting water and water conservation ". In the pre-interviews, it was seen that most of the children did not know how to save water, and the respondents only focused on the amount of water use. In the post interviews, it was seen that answers were given about the amount of water use and wasting water, as well as the evaluation of used water. Examples from children answers in the pre and post interviews about what they do to save water were as follows:

C3. We never leave the taps open. (Pre-interview)
C32. We use less water. (Pre-interview)
C36. We collect the water with which we wash the vegetables and wash the balcony. (Post interview)
C26. We do not wash the dishes with water before putting them in the machine. (Post interview)

Social Water Literacy

In order to evaluate social water literacy, the children were asked, “What do you do to protect water?” question was posed. When Table 6 was examined, the answers given by the children about what they can do to conserve water in the pre-interviews were gathered under the themes of " water conservation, protecting water, water storage". In the last meeting, the themes of "Using less water, making new inventions, informing the public" were gathered. In the pre-interviews, children's views on using water sparingly, protecting clean water and accumulating rainwater. However, in the pre-interviews, 22 children could not answer this question by saying that they did not know. In the post interview, it was thought that all children answered the questions and thought about innovations for water saving as well as using less water and making plans to inform the public, which is an indicator of the development of social water literacy in children. Examples from children answers in the pre and post interviews about what they can do to conserve water were as follows:

C8. If everyone left the waters on, I would turn off all the waters. (Pre interview)

C14. I wouldn't waste taps and water. (Pre interview)
C29. I used to install alarms on faucets. The alarm would sound when the water flowed too much or dripped. (Post interview)
C34. I used to distribute pictures to all the children that the water was running out, that they had to turn off the water. (Post interview)

Table 6. Themes and sub-themes related to conserve water

Pre-Interview				Post Interview			
Theme	Subtheme	f	%	Theme	Subtheme	f	%
water conservation	not to waste water (f=6) not turning on the water (f=3)	9	25,0	use less water	inventing machines that use less water (f=9) drip irrigation (f=9)	18	30,51
protecting water	keeping water clean (f=3) protecting water (f=1)	4	11,11	Innovation to save water	making automatic taps (f=4) installing alarms on taps (f=4)	15	25,42
water storage	rain accumulation (f=1)	1	2,78		automatic accumulation system of water in the sink (f=4) rain collection system for houses (f=3)		
no answer	no answer	22	61,11				
total		36	100,0	informing the public	make and distribute pictures to all children (f=10) making and distributing pictures to people, telling (f=10) sticking a closing picture on the taps (f=6)	26	44,07
				total		59	100,0

Discussion and Conclusion

Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. Add results and findings here. The study was carried out with the aim of improving the 60-72 month old children who were in pre-school education with Water Literacy Online Training (WLOT). Children's water literacy has been prepared by considering the categories of practical, living and social water literacy. As a result of the study, it was determined that there was an improvement in children's practical, living and social water literacy.

Practical water literacy is knowing the importance of water for living things, reaching clean and safe water, and knowing where the water we use comes from (Otaki et al., 2015). Having this information about water, which has an important place in the life of living things, is at the center of water literacy (Hui-Shuang, 2018). With the WLOT that was applied in the study, the practical water literacy of the children was determined by the questions "What is water/what comes to mind when you say water, what is clean water/how is it, what is the source of water/where does the water come from?" It was evaluated in line with the questions and it was seen that it improved. As a result of the pre-interviews carried out before the WLOT was implemented, it is noteworthy that children's knowledge of practical water literacy is limited and at a low level. It was concluded that children's awareness of practical water literacy improved after the implementation of WLOT. In the study, there was an increase in children's knowledge about water source, water source and clean water. Similarly, in the studies aimed at raising the awareness of pre-school children on water conservation, it was stated that children's basic knowledge about water improved. In addition, it has been emphasized that children should be developed through education programs, since even their knowledge of the concept of water, safe water and the water cycle will enable them to act consciously about water saving (Papadopoulou & Christidou, 2004; Samaltani & Christidou, 2013). As a result of the study conducted to support the water literacy of preschool children with a project-based research, it was concluded that children's knowledge of the concept of water increased (Ursavaş & Aytar, 2018). It has been stated that the education given to pre-school children on the water cycle increases the

knowledge of children on this subject (Ahi, 2017). It is seen that the results of the studies given above overlap with the results obtained from this study regarding practical water literacy. Since practical water literacy includes the information that children encounter in their daily lives, it is thought that children's knowledge develops easily after the education given. It is considered that children's basic knowledge about water, which is in danger today, will be effective in developing policies for water conservation and water protection.

Living water literacy is the ability of children to consume water wisely in daily life without wasting it (Otaki et al., 2015). Since the amount of water we can use in the world is limited, the importance of using water carefully should be explained to children starting from the pre-school period (OECD, 2015; UNESCO, 1994). In order to evaluate the living water literacy level of children, questions and activities were prepared about their knowledge about water saving and what can be done for water saving. In the post interview, there were no children who could not answer about the living water literacy, and the answers of the children about the living water literacy varied. It had been observed that the knowledge and awareness of the children after the application of WLOT was higher than before the application. This result showed that WLOT was effective in developing children's living water literacy. No studies had been found in the literature that directly examine living water literacy. For this reason, studies on water saving that support the results of the study are included. Wagner and Pramling Samuelsson (2019) emphasized that water, water conservation and sanitation education given to preschool children is necessary to have a more sustainable environment. Children who had knowledge about water saving and water cycle in the pre-school period acted more responsibly in later life (Bhise, 2020; Lake & Adinolfi, 2017). Water awareness training for pre-school children expands children's knowledge of water conservation and increases water conservation practices (Miller et al., 2014).

Social water literacy, on the other hand, includes acting responsibly for the society in paying attention to water use and producing solutions to the water problem. Although the acquisition of social water literacy is a long process, its foundations should be laid starting from the pre-school period (Otaki et al., 2015). For this reason, the concept of water conservation within the scope of social water literacy was discussed in the study. Training and interview questions on water conservation were prepared for children to evaluate this issue. In the pre-interviews, most of the children left the questions unanswered. It is noteworthy that in the post interviews, children planned innovations related to water conservation and water saving, and emphasized the need for studies to inform the public. Our results are in line with the results of the Papadopoulou and Christidou (2004) study to raise awareness of water conservation in preschool children. It also overlaps with the results of Bourotzoglou et al. (2016) studies in which children develop their knowledge of water sustainability. Ursavaş and Aytar (2018) concluded that after the training they gave, the ideas of children's water conservation developed.

As a result of the study carried out with the aim of improving the of 60-72 month-old children receiving pre-school education with Water Literacy Online Training (WLOT), it had been determined that there was improvement in children's practical, living and social water literacy. The results of the study showed that WLOT was effective in pre-school children's ability to recognize the importance of water, which was among the basic concepts for water literacy, for life, its limitations and the importance of its protection. In line with this result, it may be necessary to develop the water literacy of individuals starting from the pre-school period in order to ensure the use, protection and sustainability of water, which is becoming increasingly important for the life of living things. can be said.

Recommendations

- In the study, WLOT was applied online and it was found to be effective. It may be suggested to prepare intervention programs using different methods.
- In the study, the application was applied twice a week for eight weeks. The effectiveness of the study can be increased by extending the application period.
- A semi-structured interview form was used as a data collection tool in the study. The results obtained from the study can be varied by using different data sources and data collection tools.
- Children's water literacy should be followed in the following years and supported with high-level achievements.
- Although positive results were obtained by applying the study online to small groups, the generalizability of the results should be ensured by applying a large sample.
- Reliable measurement tools should be developed to evaluate the water literacy of preschool children.
- All individuals in the society should be informed about water literacy.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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Investigation the Effectiveness of Storytelling on Fifth Grade Turkish Students' Environmental Problems

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Abstract

Even though there are numerous studies on environmental education in the literature, they are limited to investigate the effects of stories. In this context, this research aimed to investigate the views of fifth grade Turkish students concerning environmental problems through storytelling. In accordance with this aim, action research has carried out. The study was conducted with 35 students enrolled in a middle school. Four stories related to different environmental topics were told participants during four weeks. Qualitative data were obtained through focus group interviews supported by data analysis of word association test (WAT). WAT included six key words was applied as pre- and post-WAT. The frequency tables and concept networks were constructed based on WAT results. Participants discussed the effects of environmental problems, the consequences of environmental problems, and environmental protection through focus group interviews. According to the WAT results, students mostly associated "human" with "environmental problem" and "environmental pollution". They also used of ecological terms increased at the end of intervention.

Introduction

Environmental issues are at the alarming rate for all around the world in recent years. These problems refer to any action which has the harmful effects on living things such as pollution, global warming, and species extinction (e.g., Almahasheer & Duarte, 2020; Ebadi et al., 2020; Erten, 2004; Gregory et al, 2021; Hasnat et al., 2018). According to The Living Planet Report by World Wildlife Fund (WWF, 2018), consumption of natural resources (ecological footprint) has shown an increase about 190% in the last 50 years (WWF, 2018). In Turkey, 144 ton plastic waste has polluted the seas every day (TEMA, 2021). On the other hand, Turkish Government has imposed new regulations such as paid plastic bags and zero-waste project in order to protect environment (Bilgili, 2021; TEMA, 2021). In fact, eradication of environmental problems could be possible only when each individual in each society feels a responsibility and takes the action. Therefore, environmental education has been a vital component of environmental protection. Environmental education doesn't only imply taught of basic concepts, but also aims at active participation in environmental problems to generate effective solutions. One of the general objectives of current Turkish science curriculum is to enhance students' interest towards environment and to develop positive attitudes (MoNE, 2018). Many studies on environmental education showed that students' environmental knowledge, attitudes and behaviors are not at the desired level in Turkey (e.g., Akkuzu-Guven & Uyulgan, 2021; Aydın, 2014; Erten, 2004). One reason for this problem is stated as those parents and educators are not competent on environmental issues (e.g., Amardini et al., 2021). Another reason is that environmental education in teacher training programs is ineffective (Demir & Yalçın, 2014; Hastürk, 2021). Turkey is a transcontinental country located mainly on the peninsula of Anatolia in Western Asia, with a smaller portion on East Thrace in Southeast Europe. The country, which is surrounded by seas on three sides, the Black Sea in the north, the Mediterranean Sea in the south, and the Aegean Sea in the west. In addition to this, there is also the Marmara Sea, which is described as the inland sea. Not a day goes by that an environmental disaster or issue does not trouble her. In the recent past, mucilage in the Marmara Sea has occupied the country's agenda and continues to do so (Acar et al., 2021). A huge attempt conducted to examine the marine mucilage, which invaded the Marmara Sea recently, has revealed that though the sea's surface is now clean thanks to the ongoing efforts, the threat is not over yet. It is a very important issue for the people living in this country, regarding the mentioned environment issue of Turkey, to gain awareness about such environmental problems and to take the necessary measures to prevent them.

Environmental education promotes students' knowledge base, skillset and capacity to work individually and collectively at a range of scales to care for the natural world through developing an action orientation (Clark et al. 2020). In order to develop the quality of environmental education, activity- based learning in natural

environment is mainly suggested (e.g., Demir & Yalçın, 2014; Erten, 2004; Geçit & Şeyihoğlu, 2012). Although this kind of activities offer students an opportunity to experience about natural world, there are challenges addressed on both national and international studies. One of the activity-based learning is stories and storytelling. Stories and storytelling would be an effective method for environmental education. Related studies in literature show that stories are practical, applicable, and not time-consuming (e.g., Demircioğlu et al.,2006; Jonassen & Hernandez-Serrano, 2002; Şimşek, 2004). Storytelling does not require high skills or special equipment as much as alternative options does. Besides, it could be easily adapted to different lessons including literature and foreign language. Therefore, stories and storytelling were used in the present study in order to teach environmental issues.

Theoretical underpinnings

Story and Storytelling

Story refers to "a narrative is designed to interest, amuse, or instruct the hearer or reader, either true or fictional" (Dictionary, n.d.). Accordingly, the story is related to interest and instruction from its definition. Stories make contributions to language skills of individuals beginning from early childhood period. Many children get familiarize the stories thanks to bedtime storytelling by their parents. Children who are four years old can be able to tell stories based on their real experience or imagination. When they grow up, their capacity to produce stories increases and they construct their own stories. Children who grow up in storyteller families have a potential to assume a role of personal narrator (National Research Council, NRC, 2000).

Even though storytelling means both telling and writing of stories, this research has focused on the telling of stories by single researcher as author. Several advantages of using stories could be listed as below:

- Facilitates negotiation (Jonassen & Hernandez-Serrano, 2002)
- Helps to memorize knowledge or experience (Jonassen & Hernandez-Serrano, 2002)
- Effective way to construct persuasive arguments (Jonassen & Hernandez-Serrano, 2002)
- Kind of a role-modeling by offering a chance to independently choice good or bad attitude (Jonassen & Hernandez-Serrano, 2002)
- Powerful way to present real events at past (Şimşek, 2004)
- Develops linguistic skills (Şimşek, 2004)

Because of these variety of benefits, stories are used as instruction strategy in many disciplines such as medicine, economy, and education. Moreover, some educators including Bruner (1990) advocate that stories are considered as an important component of culture (Jonassen & Hernandez-Serrano, 2002). Bruner (1990) claims that stories are appropriate tools for social constructionism and social negotiation. He believes that telling stories is a humanly action to make something meaningful. In the book of Acts of Meaning, several features of narrative are explained, in the following, under the discussion of Folk Psychology as an Instrument of Culture:

- Inherent sequentiality means constituents of the story such as events or characters have unique sequence. In other words, they do not have a meaning on alone apart from as they are given in the stories.
- Factual indifference refers that the power of the story is independent from whether it is real or fictional.
- Unique way of managing departures from the canonical means that stories could be used in order to explain the exceptional situation in ordinary patterns.
- Dramatic quality implies that stories should include moral commitment.
- Dual landscape refers that events in stories simultaneously occur both in general scene and in mental world of the main character.

As mentioned above, since stories and storytelling offered students an alternative way of learning especially difficult and boring lessons, there are numerous studies in the education literature (e.g., Demircioğlu, 2008; Dewan, 2005; Özdemir, 2012; Solak, 2006; Yılmaz, 2015). The relevant research about stories usually comprised in two main categories. The first category utilized historical events in stories e.g., famous scientist' personal life and their contribution to the scientific world. Such this type of stories prompted to inspire children's scientific motivation and engagement in the science learning activities (Hadzigeorgiou, 2006; Hadzigeorgiou et al., 2012; Jiangbo et. al., 2021). The latter category utilized stories to illustrate the sequence of events to address the scientific knowledge directly for enhancing students' understanding (e.g., Avraamidou & Osborne, 2009; Jiangbo et. al., 2021; Kokkotas et al., 2010; Simmons, 2006). Checking related literature, the

number of international studies that investigate the effectiveness of stories and storytelling on teaching environmental issues is also very limited while it is not found any research on this topic in national literature. In fact, stories are effective for children to understand the differences and others (Demircioğlu, 2008; Yılmaz, 2015; Jiangbo et. al., 2021). For this reason, stories should be used to enhance awareness about any living things and any environmental problem even they have never been experienced or met by children (Fanini & Fahd, 2009; TESS-India, 2014). Moreover, it was found that stories are useful method for socio-scientific issues (Hwang, 2011).

As science educators, one of our responsibilities is to enhance students' interest towards environment and to develop positive attitudes (MoNE, 2018). Unfortunately, many students find that environmental topics are too boring in comparison to other subjects in science education. In addition, environmental education is not given enough importance by science teachers due to some limitations such as insufficient background knowledge of teachers, time constraints, and inappropriate conditions for nature education (e.g., Şimşekli, 2004). Another point to take into account in environmental education is about students' emotions. Educators need to encourage hope for future rather than to remark destructive effects of environmental problems. Using storytelling should be a practical way to teach environmental issues because it increases students' interest and motivation (Demircioğlu, 2008; Kütük, 2007; Özer; 2004; Solak, 2006).

In the related literature, it was observed that majority of studies using stories was conducted on English teaching and these studies produced favorable outcomes (e.g., Armie, 2020; Nicholas et al., 2011). One advantage of this method is that using stories provides contextual learning (Özdemir, 2012; Yardım, 2011; Yılmaz, 2015). Since environmental issues contain contextual property in their nature, storytelling would be a fruitful method for environmental education. Another advantage of using stories is that students defined this method as enjoyable (Demircioğlu, 2008; Solak, 2006; Yılmaz, 2015). This is important for environmental protection because Erten (2004) claims that people protect what they love. Erten (2004) advocates that endearing animals and plants to children should become one of the main objectives of environmental education. For this purpose, storytelling could be considered as a suitable method. Moreover, Şimşekli (2004) suggested that educators in environmental education should prefer the methods which can be applied on all lessons. In related literature, the studies exampled to utilized stories for environmental issue. For example, Derman and Aslan (2016) stated that Dede Korkut stories (in Turkish literature) are good sources for studies dealing with on environmental education. Similarly, other countries' literature there are many examples for environmental issue, i.e., as said Denkova (2011), Macedonian literature there are also many story examples for environmental issue.

In conclusion, environmental problems such as global warming, loss of biodiversity, and pollution have a significant role for all humanity. Environmental education concerning environmental awareness, environmental activism, and environmental knowledge has a crucial role on dealing with these issues. Nevertheless, there are several issues that restrict the quality of environmental education in our country similar to many other countries such as teachers' ability, students' attitudes or time constraints (Demir & Yalçın 2014; Rahman et al., 2018; Şimşekli, 2004). Although there are many studies conducted on environmental issues, there are few studies focused on qualitative approaches, younger participants, and alternative instrument such as word association or focus group interview (e.g., Dasdemir, 2018; Kahyağolu, 2016).

Stories and Science Education

Stories and scientific inquiry have similar patterns. For instance, setting a scene, presenting a problem, and resolving the problem are respectively followed in many stories while presenting a context, giving a problem, and producing a solution are main parts of scientific inquiry (TESS-India, 2014). Furthermore, Dahlstrom (2014) advocates that storytelling has a significant role for science communicator. Especially for non-expert audiences, using storytelling contributes to comprehension, interest, and engagement. Also, it was pointed that people tend to believe in narrative statements rather than logical or scientific arguments (e.g., Dahlstrom, 2014). Stories are strongly related to the scientific practices such as modeling. Fuchs (2015) posed a question to identify relationship between formal science and folk science (stories) in modern macroscopic physics. For this purpose, he compared the simulation of formal models with storytelling. In his study, it was found that stories facilitate to understand and to build scientific models. Therefore, stories could be considered as an agent of theory as well as a method for conceptual change model.

Another benefit of stories is that they are effective manner for case-based reasoning. It facilitates the problem solving by storing and identifying experiential knowledge. It was proposed that stories are fundamental methods in order to teach how to apply knowledge learned in schools on problems in informal settings. In addition,

likewise to the simulations stories should enable people to substitute themselves in experience which they have never had (Jonassen & Hernandez-Serrano, 2002).

Klassen (2006) defined five domains of context by examining several theories such as constructivism and social constructionism and these are theoretical, practical, social, historical, and affective. Then, he developed the Story–Driven Contextual Approach (SDCA) which is a method for contextual science teaching based on these contexts. According to this approach, contextualization is an effective and useful way in order to minimize the complexity of laboratory works and to comprehend theoretical background of scientific phenomena. Furthermore, scientific discourse is suggested in classrooms by emphasizing the importance of linguistics. Thus, students would act as novice scientists instead of passive observers whereas teachers are responsible for monitoring the process.

Stories are assumed as a way to enhance students' emotions and emotions are strongly related to the motivation, attention, memorization and finally learning. Therefore, using stories is one of the basic elements of SDCA (Klassen, 2006). Stories provide teachers to engage active engagement of students in the five domains which are theoretical, practical, social, historical, and affective. The schema of SDCA is given in the Figure1.

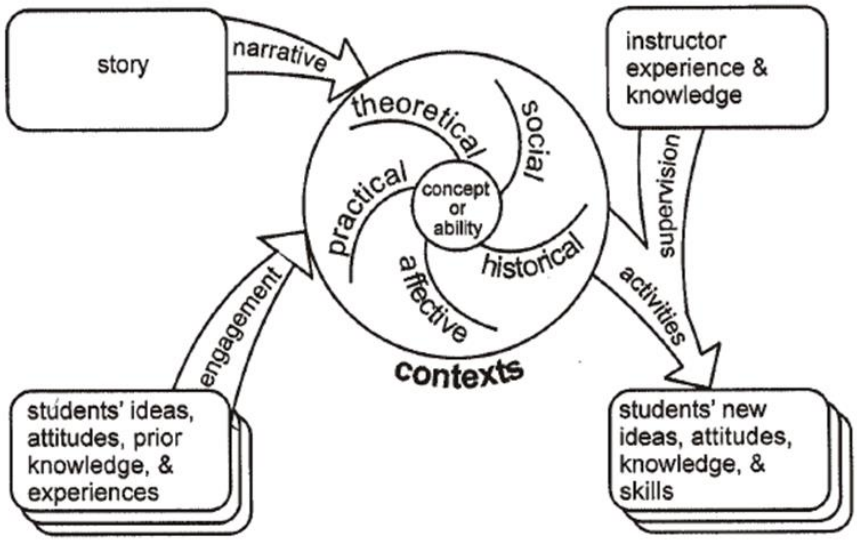

Figure 1. A schema for the story-driven contextual approach

Klassen and Klassen (2014) addressed an important problem that a significant number of students show low interest to science lessons. As a result, their intellectual involvements are insufficient and efforts to teach science would be useless. Nevertheless, they supported that use of science stories is a useful way to increase interest of students both in class and out-of-school. Moreover, it was suggested to combine the science stories, hands-on activities, and social interaction within the contextual manner.

Mutonyi (2016) has conducted a longitudinal study with secondary school students in Uganda throughout four years. Even though some researchers agree African–American, African, and similar cultures have limited connections to modern science (Mutonyi, 2016), she used cultural manners like stories, proverbs, and anecdotes on teaching scientific concepts. In Mutonyi's study, researchers used the stories to initiate discussions about health issues. The analysis of data showed that stories contribute to emotional engagement, motivation, and knowledge level of learners.

Even though the most of studies related to stories or storytelling in our country (i.e., Turkey; Bayraktar, 2014; Hava, 2021) and other countries (e.g., Armie, 2020; Nicholas et al., 2011; Hemmati et al, 2015; Hwang et al, 2016) has focused on English language teaching, there are several research on science education. One of them advocated that stories enhance students' willingness to learn chemistry (Demircioğlu et al., 2006). According to the research, stories would be useful to relate scientific concepts with daily lives, to increase students' motivation, and to provide active participation of students. Furthermore, stories should be used to eliminate alternative frameworks and to replace them by scientific ones. It was suggested to use visual materials for promoting effectiveness of stories.

Another research was carried out in order to investigate the effect of scientific stories on learners' creativity and affective properties (Gölcük, 2017). In accordance with this purpose, the study was designed as the convergent parallel mixed method research. The participants consisted of elementary students and data were collected through semi-structured interview, open-ended questions, Torrance Test of Creative Thinking Test, and Attitude toward Science Questionnaire. As a result of the study, quantitative data found no significant difference in terms of students' creativity and attitudes toward science.

In contrary to quantitative data analysis, qualitative findings have shown that students find scientific stories as enjoyable and interesting (Gölcük, 2017). Additionally, students expressed that scientific stories facilitate to make scientific connections in real-life experiences. Finally, some of the students explained that stories should be used in other lessons, particularly in difficult subjects because they claimed that stories are helpful for comprehension. Consequently, it was asserted that stories are effective to create affirmative learning environment.

Environmental Issues and Stories

Stories give a chance to empathize, so they are suggested as a way to understand animals and plants in environmental issues (TESS-India, 2014). Increasing tourism in northwestern Morocco raises concerns for possible environmental consequences (Fanini & Fahd, 2009). For this reason, a story book related to different aspects of ecosystem was prepared and distributed to students. As a result of survey completed by 74 students from rural and urban areas, it was found that stories are effective to increase the awareness to local environmental issues. Moreover, students who live in urban could define certain species despite of the fact that they have never seen them similar to description of their peers in rural areas.

By taking into consideration of socio-scientific issues, Hwang (2011) argued that environmental education should be given through discourse instead of teaching environmental concepts at knowledge level. However, he concluded that many teachers have insufficient ability on environmental instruction because of various reasons. As a result of the study with teachers, Hwang claimed that integration of stories to the curriculum helps teachers to develop their instructions on different environmental topics. For instance, it was reported that alternative energy teaching with whom a teacher 15-year experiences cannot be fully understood without stories.

Folktales as cultural tools might have a significant role on the acquisition of environmental knowledge. 15 stories were collected from different cultures: America, North American Indians, Australian aborigines, Tahiti, Japan, Africa, England, Ireland and Malaysia (Ahi et al., 2014). The content analysis of these stories showed that they have a wide range of subjects consisting of nature-human interaction, pollution, and natural life. Nevertheless, it was found that some stories include negative behavior such as destroying trees and it was remarked that these stories might serve as bad role model for children. In the light of this line, the present study aimed to investigate the views of fifth grade Turkish students concerning environmental problems through storytelling.

Research questions

There were two research questions of the study as follows:

1. How does affect storytelling on fifth grade students' cognitive structures concerning environmental problems?
2. How does affect storytelling on fifth grade students' views concerning environmental problems?

Method

We utilized transformative action research in this study. The action research aimed to produce solution based on participants' thoughts and reflections throughout certain practices (Savin-Baden & Major, 2013). Transformative action research can be used synonym with social constructionist action research and promotes high participation with interpretation to investigate different thoughts (Savin-Baden & Major, 2013). In this study since we aimed to reveal the development of students' views concerning environmental issues, the second author give the students storytelling training before applying the storytelling sessions.

Sample

The participants of this study consisted of 35 fifth grade Turkish students enrolled in one middle school (12 males, 23 females). The school is located one of the low socio-economic parts of Istanbul the biggest metropolitan in our country. Data were gathered at students' own classroom because they would feel more comfortable in their familiar environment. All participants were at the same class and the class was heterogeneous in terms of academic achievement. The instructor (second author of the paper) was at the same time science teacher of that class. Students were between the ages of 10 (n=12), 11 (n=19), and 12 (n=2). Ethnic breakdown of students are ranging between Turkish (31), Syrian (n= 3), and Kurdish (n=1). Students who have a foreign language came to Turkey about two years ago and participated in educational activities in a formal learning environment. Therefore, it could be assumed that they are actively participated in the activities in the educational content. The students had difficulty with speaking in Turkish; however, they good at understanding and writing. Their families were informed the research purpose and the importance of the study via parents' meeting. Participation was provided teachers' encouragement and there was no other inducement. Pre- and post-WAT were simultaneously assigned to all participants. However, one student did not complete the post- WAT since she was absent on the day of post- application. On the other hand, focus group interview conducted with 35 participants at first three weeks while the class consisted of 33 students at the last week of focus group interview.

Data collection tools and analysis

Word association test (WAT)

To collect data, pre- and post- WAT and focus group interview were utilized. Firstly, WAT was used as pre- and post- with the purpose of investigation of participants' cognitive structures concerning environmental issues. WAT was a practical instrument which enable researchers to obtain a wealth of data in various fields (Govender, 2002). Semantic linkages in word association test (WAT) were assumed to cover mental associations, therefore it should be used in examination of cognitive structures, investigation of conceptual frameworks, or determination of conceptual change and retention (Coştu et al., 2021; Derman & Eilks, 2016; Polat, 2013). In this study, the six key concepts were used in the WAT; these are "environment", "environmental protection", "environmental pollution", "environmental problem", "natural life" and "biodiversity". These concepts determined based on the science curriculum in Turkey (MoNE, 2018) and based on the stories used here (see Figure 2).

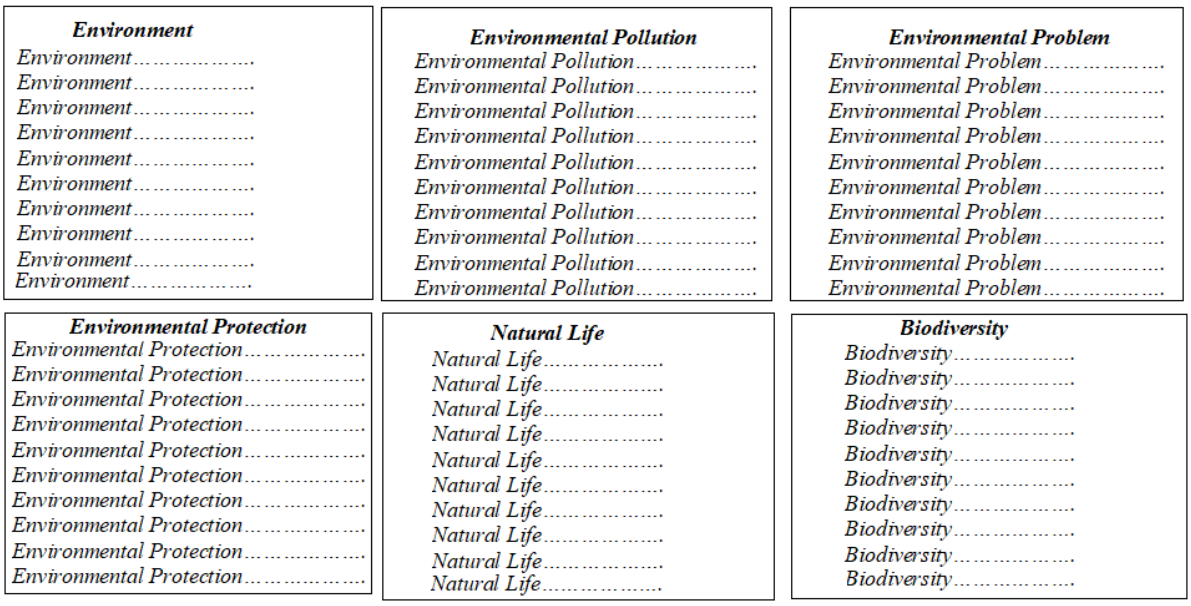

Figure 2. Key words used in the WAT

Moreover, the approval of a science educator out of the authors was received on the determination of these key concepts. The WAT was arranged in a separate page for each key concept by cutting A4 paper to six equal pieces (as seen in Figure 2). Personal information was not taken from the students in order to feel comfortable

and express freely their opinions. Only school numbers of students were asked as personal information not to feel them excited. In literature, 30 seconds were determined as suitable length of time to complete word association test (e.g., Bahar et al., 1999; Coştu et al., 2021; Polat, 2013). Nevertheless, pilot testing was conducted in order to determine the amount of time because sample of this study were younger and had lower language skills compared to their peers. Thus, the WAT was applied on another fifth-grade class in the same school and it was seen that one minute was appropriate for each key word for fifth grade students.

As a result of the pilot test, it was not observed any problem with understanding of key concepts which might threat the feasibility in order to promote content validity. Pre- and post-WAT data were documented for each student. Frequency tables were constituted to examine how many answers had been produced for each key concept and how many of these answers repeated. Data obtained from these frequency tables and cut-off point technique were used to develop concept networks. In the cut – off point technique, the point of 3 or 5 less than the highest frequency of answers was defined as the first cut-off point. Other cut-off points were determined by dropping frequencies at regular intervals until all key concepts came up in the concept network (Bahar et al., 1999; Coştu et al., 2021; Waern, 1972). The cut-off point interval in this study was determined as "5".

Focus group interview

Since the primary purpose is to gain deep knowledge rather than intended answers or majority of evidence, focus group interview was used to examine how storytelling influence on fifth grade students' views concerning environmental issues. Despite similarities with individual interview, interview with focus group has its own characteristics. One of them is that focus group interview mostly aims to release opinions of particular group about a particular issue rather than understanding individual differences (Savin-Baden & Major, 2013). Another difference is that social interaction was promoted in focus group interview since social environment is one of the agents that constructs the individual's beliefs, thoughts, and knowledge from the view of Vygotsky (1978). The researcher (the second author) moderated focus group interviews after each storytelling session. In order to construct a natural environment as much as possible, interviews were conducted in classroom at usual science lessons. Semi-structured manner was designed because younger students might have a difficulty to give proper answers to closed questions, need open-ended items and it is needed prompts to clarify their thoughts. Main themes of interview questions were mostly determined based on the discussion questions of "The Story of Mr. Fox" which were available on open educational platform TESS–India (Teacher Education through School Based Support in India). In the mentioned story, there comprised a wide variety of environmental problems, hence it was selected. The common questions on four focus group interview sessions were as follows: (1) What are the reasons for environmental problems?, (2) What are the consequences of environmental problems?, (3) What do you suggest to prevent environmental problems?

The purpose of these questions was to investigate fifth grade students' views via focus group interview concerning environmental issues. For this reason, they were analyzed and coded as defined in data analysis process. Moreover, there were several questions asked in order to elaborate discussion and to engage participants in the stories. Qualitative method was used in order to assess the views of students throughout the procedure. Focus group interview was the central method at this study for collection of qualitative data. The researcher used abridged transcript that avoids to type excessive data such as introduction type, irrelevant responses, or moderator directions (Krueger & Casey, 2015). The classic analysis strategy was preferred since the researcher was novice about qualitative approach. This strategy includes basic elements such as several reading, cutting, and sorting for determination of thematic codes (Krueger & Casey, 2015).

Intervention

Firstly, pre-WAT was assigned to 35 fifth grade students. One week before the intervention of pre-WAT, the sample were acquired a familiarity to WAT technique with simple key words such as "sun" and "tree". They were warned not to look at the other papers by reminding that there were no single correct answers, and all answers were valuable. The students were assumed to produce ten response words by associating the relevant key concept in one minute. The same procedure was repeated until the completing of all key concepts by all the participants. At following four weeks, one story was told by instructor each week. After storytelling session, focus group interview was conducted and recorded on audiotape each week. Finally, the post-WAT was given by following the same procedure in the pre-WAT. Overall procedure lasted for six weeks (see Table 1).

Table 1. Intervention procedure of the study

1st Week	Pre-WAT (40 min.)
2nd Week	Storytelling Session (7 min) + Focus Group Interview (21 min)
3rd Week	Storytelling Session (6 min) + Focus Group Interview (26 min)
4th Week	Storytelling Session (12 min) + Focus Group Interview (22 min)
5th Week	Storytelling Session (3 min) + Focus Group Interview (28 min)
6th Week	Post-WAT (40 min.)

The pilot study of focus group interview was done to minimize possible limitation at three months ago conducting the study. Firstly, the Story of Mr. Fox and its discussion questions were chosen and translated to Turkish by the authors. The pilot story was about "a fox who found himself in buildings instead of his forest and family when it emerged from its hibernation". At the end of the pilot study, it was observed that Turkish version of the story wasn't effective as much as the original one and the researcher wasn't competent in storytelling. Consequently, four stories which were written in Turkish or has already translated to Turkish by experts were chosen for intervention. The names of the stories were "Crumpled Piece of Paper", "The Boat That Wonders Under The Sea", "The Bear That Wasn't" and "Human and Environment" and they were ranged based on science curriculum objectives (see Figure 3).

Story 1
Title: Crumpled Piece of Paper
Writer: Aytül Akal
Related Objective: Students will be able to express the importance of interaction between human and environment and negative effects of environmental pollution on human health.
Emphasized Environmental Issue: Pollution
Short Summary: One day a piece of crumpled paper falls to the ground from the garbage truck. Although a lot of people pass by, no one pick it up for a variety of reasons. A crumpled paper keeps waiting worriedly until two children comes there...

Story 2
Title: The Boat That Wonders Under the Sea
Writer: Aytül Akal
Related Objective: Students will be able to make suggestions for resolving an environmental problem in its immediate surroundings or in our country.
Emphasized Environmental Issue: Water Pollution, Natural Habitat
Short Summary: Always dreaming of being a submarine, the ferry's dream came true. But the bottom of the sea is not what it would have expected. He decided to return to be the ferry with the children who accompany him in this adventure.

Story 3
Title: The Bear That Wasn't
Writer: Frank Tashlin
Related Objective: Students will be able to inference about future environmental problems as a result of human activities.
Emphasized Environmental Issue: Species Extinction, Natural Habitat
Short Summary: A bear in the winter hibernation wakes up to find himself in the middle of a factory. He see working machines and stone pile buildings instead of trees, grass, flowers…Also, everyone keeps telling her it's not a bear!

Story 4
Title: Human and Environment
Writer: Official Course Book
Related Objective: Students will be able to discuss examples of benefits and harm situations in human-environment interaction.
Emphasized Environmental Issues: Human-Nature Interaction, Deforestation
Short Summary: Mustafa and his family moved to a big city 5 years ago. He saw factory established in his village when they went to for the summer vacation. A large part of the forest has been destroyed, many of the animals did not appear. On the other hand, many villagers had found work at the factory. Mustafa thought about what to do...

Figure 3. The stories utilized in the intervention

As seen in the Figure 3, stories were about different themes to ensure representativeness of general context such as "species extinction", "pollution", and "human-nature interaction".

Results and Discussion

WAT results

The first research question of this study was: How does affect using storytelling on fifth grade students' cognitive structures based on pre-posttest of Word Association Test (WAT) concerning environmental issues? According to the results of WAT, the number of answers for each key concept was presented in Table 2.

Table 2. Total number of different response words for each key concept

	Total number of words	
Key concepts	Pre-WAT	Post-WAT
Environment	200	232
Environmental protection	167	169
Environmental pollution	190	197
Environmental problem	165	194
Natural life	186	200
Biodiversity	132	177
Total Number	*1040*	*1169*

It was seen that words associated by the students increased for each key concept. The highest rise occurred in "biodiversity" whereas the lowest one occurred in "environmental protection". The frequencies of different response words for each key concept were determined through examination of all students' pre- and post-WAT result. The words which are synonyms or have close meanings were presented in the same category at the frequency tables (For example, the students associated "environment" key word in the WAT as "street", "village" "city" coded as "street" because of similar meanings). As a result of obtained data, Table 3 and Table 4 indicate respectively response words which have high frequencies in pre-WAT or post-WAT.

Table 3. The frequency of response words in pre-WAT

	Key Words					
Response Words	Environment	Environmental Protection	Environmental Pollution	Environmental Problem	Natural Life	Biodiversity
Cleaning	12	14	2	2	9	1
Pollution	12	---	9	10	---	---
Tree	10	---	1	3	6	---
Beauty	9	6	1	1	9	6
Human	7	6	5	3	7	1
Life	6	3	6	3	7	3
Green	6	1	---	---	1	1
Animal	5	1	3	---	4	1
Flower	5	1	1	---	6	1
Street	5	---	2	---	3	---
Protection	5	9	1	1	2	---
Not to Pollute	5	6	1	---	---	---
Safety	1	6	1	1	---	---
Not to Litter	---	5	---	---	---	---
Garbage	---	1	17	1	---	---
Harmful	1	---	5	4	---	5
Malignity	---	---	5	8	1	3
Fight	---	---	---	7	---	---
Problem	---	1	---	11	---	---
Health	2	4	2	---	5	---
Diversity	---	---	---	---	---	9
Illness	---	---	2	2	---	8
Difficulty	---	---	3	1	---	5
Redundancy	---	---	---	---	---	5

According to the Table 3, some of the high frequencies belong to the last words of key concepts such as pollution, protection, and problem. Additionally, there are some notable response words that seems to be irrelevant to the associated key word such as fight with "environmental problem" or difficulty and illness with "biodiversity". Students thought that environmental problem refers to something like having problem with their friends because the word "environment" are also used to define social sphere in Turkish language. On the other hand, garbage has the highest frequency because of association with "environmental pollution". Moreover,

cleaning, beauty, human and life are response words of students that were associated with all key concepts. Thus, these response words could be defined as "mutual recurrent words".

As seen in Table 4, frequency of the last word of key concepts such as "environmental protection" and "environmental problem" remarkably decreased compared to the pre-test results, whereas students used more different response words with high frequencies. Similarly, another decrease is observed in frequencies of fight, illness, and difficulty which were associated with irrelevant key words on pre-test. Furthermore, animal which was associated with "biodiversity" has the highest frequency. Lastly, tree, flower, and animal replaced by cleaning and beauty as mutual recurrent words.

Table 4 The frequency of response words in post-WAT

	Key Words					
Response Words	Environment	Environmental Protection	Environmental Pollution	Environmental Problem	Natural Life	Biodiversity
Cleaning	17	15	---	1	14	---
Pollution	14	---	14	19	1	1
Tree	15	2	3	2	10	2
Beauty	3	1	---	1	7	2
Human	7	8	12	9	8	5
Life	10	4	3	2	5	6
Green	5	1	---	1	1	---
Animal	8	5	5	7	10	21
Flower	7	2	1	1	8	3
Grass	7	3	---	---	3	---
Protection	---	2	---	---	4	---
Environment	---	2	2	1	5	2
Safety	---	5	---	1	---	---
Insect	6	1	---	---	2	2
Garbage	1	4	15	16	---	---
Forest	5	---	1	---	4	1
Malignity	---	---	5	4	---	---
Fight	---	---	1	4	---	---
Problem	---	---	5	2	---	---
Health	1	1	---	---	6	---
Diversity	---	---	---	---	---	8
Illness	---	---	4	2	---	---
Difficulty	---	---	2	3	---	2
Redundancy	---	---	---	---	---	5
Nature	8	4	2	---	7	4
Plant	2	5	---	2	4	10
Exhaust	---	---	5	3	---	---
Natural Disaster	1	---	5	4	---	---
Living Things	2	---	2	---	---	8
Generation	---	---	---	---	---	5

According to the frequency analysis, the concept networks based on the pre – WAT results are presented in Figure 4. As seen the Figure 4, there was only one key concept emerged within the range for the cut-off point 16 and above. It was determined that 17 students associated "environmental pollution" with garbage. For the cut-off point 11 to 15, both "environment" and "environmental protection" were associated with cleaning. Also, students associated "environment" with pollution which is a negative term while "environmental problem" was associated with its last word. For the cut-off point 6 to 10, all key concepts appeared and associated words slightly increased. However, there were several issues. Firstly, there was no direct association among key concepts. Secondly, "biodiversity" which was a new term for students was associated with illness. Finally, to associate "environmental problem" with fight points the misunderstanding of this concept because the word "environment" is also used in order to define social-behavioral problems in daily life. According to the frequency analysis, the concept networks based on the post –WAT results are presented in Figure 5.

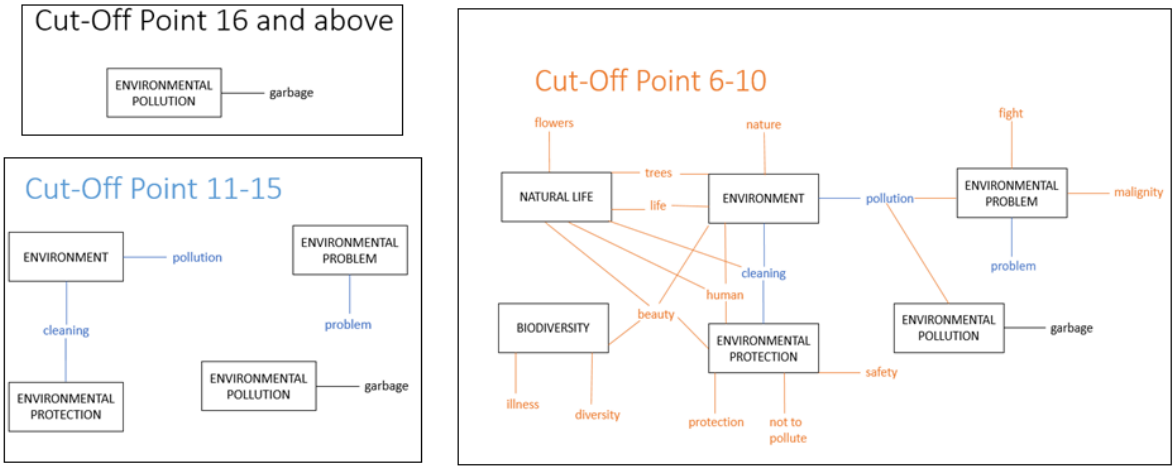

Figure 4. Concept networks formed based on pre-WAT

As seen the Figure 5, it was observed that associations of key concepts increased in comparison to pre-WAT for the cut-off point 16 and above. In this range, "environment", "environmental problem", and "biodiversity" were associated with different response words instead of "environmental pollution". For the cut-off point 11 to 15, it was determined that all key concepts were associated with different words. Nevertheless, there was no direct association of key concepts between each other similar to pre-test. For the cut-off point 6 to 10, it was observed that students made more meaningful associations. For instance, "environment" was associated with natural concepts such as bugs, flowers, and grass. Moreover, animals and human were amongst the most frequently used response words. In brief, participants produced more response word for each key concept in the post-test than the pre-test. The number of associated words for "environmental protection" has risen to 169 from 167. Despite the fact that this raise seemed to be insignificant as quantitative data, there were several important points on qualitative analysis of response words. Nine students associated "environmental protection" with police, soldier, and headman in pre-WAT whereas these words were not used in post-test. Instead of these words, students produced response words which could be considered as suggestion for environmental protection. For instance, competition, recycling, project, poster, story and TEMA were among associated words in post-test.

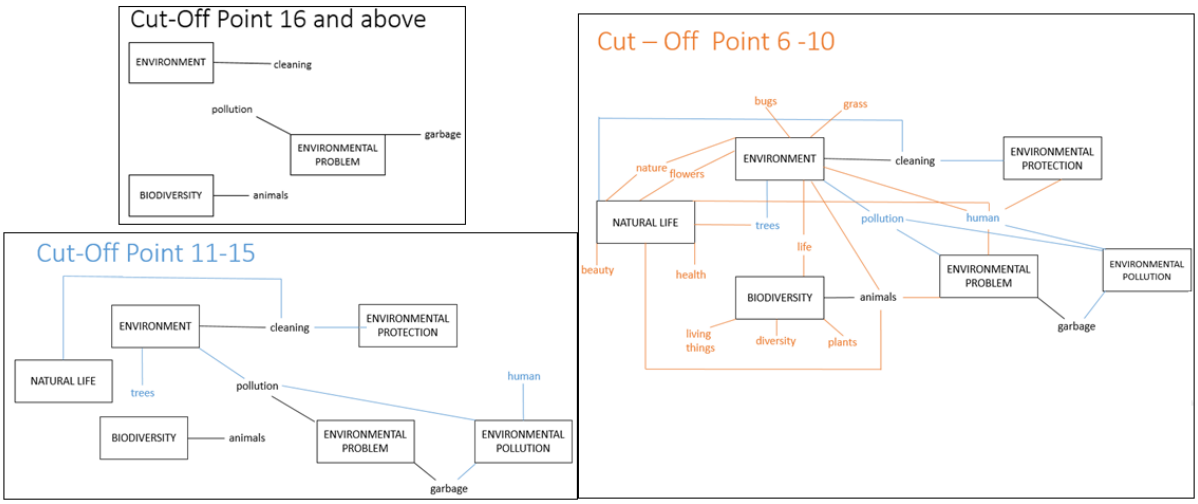

Figure 5. Concept networks formed based on post-WAT

On the other hand, inter-connections between key concepts were not observed in both pre- and post-WAT. This situation could have resulted from that majority of key concepts consisted of two words such as "environmental pollution". For instance, participants may have responded quickly as "pollution" by thinking that pollution and environmental pollution had the same meaning. As a result of the comparisons of frequency tables pre- and post–WAT, it is observed that the associations of ecological terms such as trees, flowers and animals were developed for each key concept with high frequencies. The first key concept of WAT is "environment" and pollution, and cleaning were equally used as response words to it in pre-WAT. In post-WAT, cleaning has acquired highest frequency for "environment" whereas pollution was ranked as the second, together with tree.

Moreover, frequency of ecological terms such as flowers, bugs, grass, and animals has increased as seen in concept network of post-WAT. These finding showed that students have started to link "environment" with primarily positive meanings and ecological terms at the end of the storytelling sessions. In addition, the story which is told at second week about water pollution focuses on a boat as a main character. Although boat and water pollution were not used as response words in pre-WAT, it is observed that both were associated with "environmental pollution" as a result of post-WAT. Similarly, the story at the third week is about a bear threatened with extinction and it is shown that bear was associated with "biodiversity" in post-WAT.

Focus group interview results

The second research question of this study was: How does affect using storytelling on fifth grade students' views via focus group interview concerning environmental issues? Participants discussed the same three questions regarding four different stories for four weeks. Focus group interviews' findings of were analyzed in major themes in the following sections. Also, it was given some students' explanations as example. In the example, the students numbered as S1, S2…etc.

Reasons for Environmental Problems

One of the questions which were asked to students in four focus group interviews was: What are the reasons for environmental problems? Responses to this question were resulted in those codes: "human", "animals", and "disasters". Most students reported that people result in environmental pollution. Some students directly indicated to human such as "people, insensitivity" while some of them clarified in unstraightforward way such as:

S2: "throwing litter",
S5: "factories",
S7: "exhaust fumes",
S16: "People waste their food and throw away",
S26: "cutting trees"

Many students pointed that disasters or weather events cause the environmental pollution. For example:

S8: "earthquakes",
S14: "natural disasters",
S20: "hurricanes",
S27: "fires"

Significant number of students expressed that animals leaded to environmental pollution as following:

S4: "Animals throw shells at the things they eat",
S7: "Things that were not eaten by animals cause the pollution",
S23: "feces of animals"

Some students claimed that natural disasters, fires, and weather events bring on environmental problems. However, they did not explain in detail when the researcher asked them to give justification. Moreover, one student "S21" indicated "sound" as a reason for environmental problems without further explanation. In the same focus group session, another student "S24" explained, "Loud sounds results in broken glasses, so environmental pollution happens"

Outcomes of Environmental Problems

Second question of focus group interview was: What are the consequences of environmental problems? Responses of participants were categorized in to "human", "plants", "animals", "all living things", and "the earth". Majority of students reported effects of environmental problems in terms of human life. For example;

S20: "Life becomes harder …… diseases…"
S7: "Air contaminated by exhaust fumes can cause diseases like difficulty in breathing"

S24: “Prices would increase, life becomes expensive”
S4: “… could lead to the cancer”
S22: “Manufactured gases can prevent the vision of a pilot”

Many students pointed the effects of environmental problems to the earth as following:

S18: “Icebergs could melt”
S19: “Atmosphere could be damaged”
S26: “Clouds would be harmed, and dirty rain could occur”
S8: “Water pollution”

Some participants reported outcomes of environmental problems only regarding animals whereas some of them defined with respect to plants. However, the number of responses that were coded as plants were slightly higher than the number of responses regarding animals. Several examples of both cases were presented respectively in the following:

S28: “Fishes could die”
S14: “Deaths of animals increase”
S15: “I watched at news: the sea is polluting; fishes are washing up onto a shore”
S5: “Plants which are grow in the soil could be damaged”
S22: “Plants weathering”
S24: “Factory fumes could prevent trees to photosynthesize”

Moreover, many students expressed outcomes of environmental problems in terms of all living things or multiple agents such as human and animals as following:

S19: “Living thing could die because of mass poisoning”
S22: “People and animals could die”
S7: “Air pollution……losing lives of fishes and other living things”
S6: “All living things, fishes would die”

Prevention of Environmental Problems

The last question which was analyzed in focus group interview was: What do you suggest to prevent environmental problems? Participants addressed various solutions to environmental problems throughout the discussions. These responses were evaluated and almost equally distributed to three main categories at the end of several rounds of reading transcripts. Firstly, students addressed that simple actions taken by themselves or local administrations such as increasing of garbage cans. In this context, many students claimed that warning people not to throw litter would be important for prevention of environmental problems.

S16: “by warning people”
S17: “Caution signs could be hanged everywhere”
S2: “It could be solved if people do not throw litter”
S4: “It should be increased the number of garbage cans”
S8: “It must be used something to prevent car exhaust”

Secondly, students considered that punishment and reward system would be effective in order to solve environmental problems. Some of them suggested legal sanctions including penalty fine and prison sentence whereas some students addressed the prize competitions. For instance;

S19: “It could be sentenced to imprisonment”
S22: “fine for people who are throwing litter”
S23: “……competitions at all countries…. tablets to minors and iPhone to adults”
S24: “By putting cameras in the trash cans, the people who put the garbage in the garbage bin will be rewarded, and the ones who do not throw it will be punished”
S21: “to put the people who are polluting the environment to work in the field”

Thirdly, many participants made suggestions on educating people via posters, projects and commercials about environmental protection. Some of them shared their opinions concerning simple inventions specially to collect the garbage.

S13: "Booklets can be distributed to people"
S1: "People should be trained"
S20: "Cleaning robots can be made"
S6: "Waste collecting boxes such as basketball hoops can be made, it becomes fun"
S9: "Posters can be prepared"
S18: "Recycling projects"

To sum up, many students had different views of the same issue and advocated their views with various arguments although focus group design has a disadvantage to affect to each other among participants. In contrary to the prepossession, participants shared their opinions and produced various solutions to environmental issues through social interactions. It is reported certain changes in the view of some students, but these changes seemed to be related in the effects of stories (see in Table 5).

Table 5 Change in students' expression throughout storytelling sessions

Students	Related Question	Students' Responses
S8	What are the reasons for environmental problems?	✓ Earthquakes (1st week) ✓ Fabric fumes, weather events (2nd week) ✓ Deforestation (3rd week) ✓ No response reported (4th week)
S2	What are the consequences of environmental problems?	✓ Sick people get worse (1st week) ✓ Animals loses their lives (2nd week) ✓ Plants are affected (3rd week) ✓ No response reported (4th week)
S23	What are the consequences of environmental problems?	✓ People poisoning (1st week) ✓ No response reported (2nd week) ✓ Death risk of living things (3rd week) ✓ No response reported (4th week)
S19	What do you suggest to prevent environmental problems?	✓ It could be sentenced to imprisonment (1st week) ✓ Awareness of people (2nd week) ✓ People should be conscious (3rd week) ✓ All people get the right to be warned 3 times, then they are fined. (4th week)

It was claimed that these students showed the positive development on environmental conscious throughout implementation based on their expressions. For example, S8 stated earthquakes as the reasons for environmental problems at the first week, then he remarked man-made factors such as fabrics and deforestation. At the discussion on consequences of environmental problem, both S2 and S23 reported the effects on human life. However, they started to consider other living thing at following weeks. At that point, it should be noted that deforestation, animals, and natural habitat were frequently emphasized themes at the stories. Lastly, S19 suggested a radical solution that is taken by government at first, she slightly changed their expressions and produced a practical suggestion.

Conclusion

The study presented here aimed at examination of the views of fifth grade Turkish students related environmental issues through storytelling. As noted before, action research carried out with 35 fifth grade students with the purpose of investigation their views related environmental issues based on the Story-Driven Contextual Approach (Klassen, 2006). The researcher posed two research questions as: "How does affect storytelling on fifth grade students' cognitive structures?" and "How does affect storytelling on fifth grade students' views?" The data were collected with regard to these questions during six-week period. As a result of the WAT, the number of response words for each key concept in post-WAT were higher than in pre-WAT and it was as a clue of better understanding of these environmental concepts (e.g., Ercan, Taşdere, & Ercan, 2010). For instance; the number of response words for "environmental problem" has risen to 194 from 165. The increase in the number of related and correctly respond words could be explained by the change in students' conceptual frameworks (e.g. Kiryak & Calik, 2018). At the end of implementation, students mostly preferred ecological

terms to associate key concepts instead of words used in daily life because stories provided meaningful context to students (Özdemir, 2012; Yılmaz, 2015). In pre-WAT, students mostly associated beauty with "environment" while bugs, flowers, and grass were used as associated words for the same concept in post-WAT. Another finding is that number of students who associated human with "environmental problem" and "environmental pollution" increased in post-WAT. Similarly, most of the students considered the human as a reason for environmental problems through focus group interviews.

In addition to the reasons for environmental problems, students also discussed the environmental protection and the effects of environmental problems in focus group interviews. Most students stated that environmental problems have an effect on the human life when discussing the consequences of environmental issues. However, the results also showed that significant number of students were aware of the effects of environmental problems on other living things and the earth. Some students expressed their thoughts with a holistic view at the end of the implementation whereas they considered the problems from only humans' aspect at the beginning. In the manner of environmental protection, students focused on suggestions for creative inventions, legal sanctions as well as the simple actions could be taken by themselves, focus group interviews concluded that student developed various opinions in order to prevent environmental problems.

In focus group interview, students mostly addressed the themes emphasized in the stories during implementation such as dropping litter, deforestation, fabric fumes and water pollution while students used the characters of stories as associated words in post-WAT even though they had low frequencies. Additionally, positive changes in the views of some students were reported throughout the discussions.

On the other hand, some participants discussed the environmental issues independently from the stories and preserved their opinions throughout four weeks. For instance, they claimed that natural disasters and animals leads to environmental problems. Additionally, it was noted that seven students did not want to participate in any focus group interview even though they carefully followed the storytelling sessions. Three of them were Syrian children who had difficulty with speaking in Turkish (but good at understanding and writing) while others were also uninterested to usual science lessons.

In related literature, the studies found that stories are motivating and interesting for students (Ayra & Maul, 2012; Erten et al., 2013; Hadzigeorgiou, 2006; 2016; Jiangbo et. al., 2021; Özer, 2004; Yılmaz, 2015), it was confirmed based on the participants' reflections in this study. Moreover, it was observed that students showed less distractive behavior and maintained their attention longer in the implementation process. According to Solak (2006), story-based lessons are effective to increase the participation of low achievers who was afraid of failure. In this study, it was observed that majority of class had higher participation in lessons including some students who had low academic performance.

Consequently, this research is important due to the lack of studies about storytelling concerning environmental issues and it is needed to consider in the light of its limitations. Both WAT and focus group interviews concluded corresponding results in terms of the views of students concerning environmental knowledge. According to the results, storytelling contributed to environmental knowledge of many participants whereas it is not found a significant effect on some of them. When the research is evaluated from a holistic perspective, it is concluded that storytelling is an effective and practical way to environmental education. Similary, recent decade in the literature researches showed that science teaching with stories and storytelling enhance student's understanding as well as providing their positive attitudes toward science (Ayra & Maul, 2012; Erten et al., 2013; Hadzigeorgiou, 2006; 2016; Jiangbo et. al., 2021).

Recommendations

The study presented here does not imply that storytelling is the best way for environmental education and not attempt to prove any theory. The authors aimed to suggest that storytelling was an effective method to teach environmental topics by emphasizing its utility and efficacy. The study concluded favorable outcomes despite of the several limitations as noted before.

In the literature, only storytelling was not effective to students' understanding about science concepts. Therefore, it should be used with other strategies such as free drawing and hands-on activities (e.g., Jiangbo et al., 2021). These strategies were utilized in similar relevant studies (e.g., Hong & Diamond, 2012; Siew et al., 2017; Walan, 2017), and they showed to be effective to support storytelling. Hence, empowering strategies should be used to promote storytelling.

To develop the quality of method and to gain more insights in academics aspects, pedagogical implications and recommendations for future research were presented as follow:

- Science teachers may give more emphasize stories on their lessons, particularly on environmental science topics.
- It is essential to make rehearsal for storytelling and to choose an appropriate story for learners.
- Cross-sectional cross-cultures studies should be carried out in order to obtain a more holistic insight.
- Longitudinal studies should be conducted to investigate long-term effects of stories and storytelling.
- Further research on stories for environmental issues would be designed as narrative approaches. Students would be able to share their own stories based on their experiences and observations. In that case, results would be more efficient and valuable in educational aspects.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors.

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