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Effect of web-based pediatric pain management education on nursing student knowledge levels

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ABSTRACT

Introduction and aim. Pain is a common symptom in children. Studies indicate that nurses and student nurses lack knowledge about pediatric pain. This study was designed to determine the level of knowledge of pediatric pain management for nursing students and to evaluate the effectiveness of the web-based pediatric pain management education (PPME) program.

Material and methods. This study used a pre/post-test quasi-experimental design before/after the test. It was carried out with 84 pediatric nursing internship students (39 control, 45 intervention) in a nursing school. The control group received routine training, and the intervention group received web-based modules. Data were collected using the questionnaire developed by the researchers and evaluated using the paired sample t-test, independent samples t-test, Spearman's correlation and regression analysis. A structural equation model (SEM) was used.

Results. The level of knowledge of the intervention group was significantly higher than that of the control group in terms of the total score and sub-dimension scores of awareness, physiopathology and 'control' ($p<0.05$). A moderate, positive and significant correlation was observed between PPME and knowledge levels. Web-based education accounted for 56.6% of the increase in knowledge level, resulting in an improvement of 11.062 points. A notable positive correlation was observed between PPME and control scores in SEM.

Conclusion. The conclusion drawn is that the web-based PPME effectively increased student knowledge scores.

Keywords. pain management, pediatric nursing, students, web-based education

Introduction

Pain, which is one of the most common symptoms in children, is considered an important public health problem. Evidence-based research on pediatric pain management has increased the knowledge and awareness of health professionals, but pediatric patients still experience pain from illness, surgery, and medical procedures.[1,2] The World Health Organization has emphasized that pediatric pain is often not noticed, may be ignored, or even denied by health care workers in the 2012 report.[3]

8 88% of children and young people experience pain and 37–72% of hospitalized children experience clinically significant pain.[4,5] Pain in the pediatric population is difficult to realize and evaluate correctly. Many studies in the literature show that nurses experience various difficulties in assessing pain in children.[6-8] The most common reasons for this are the verbal and cognitive immaturity of young children to express their pain, the difficulties in recognizing pain symptoms from reactions such as separation from the mother, and the insufficiencies of nurses to control pain such as lack of knowledge and misunderstandings.[2]

Studies show that nurses and student nurses lack knowledge about pediatric pain assessment and management.[6,9] This indicates a lack of structured pain education and emphasizes the need for comprehensive pain management for students before starting their professional nursing careers.[9] Several education programs have been developed to increase pain knowledge for nurses and undergraduate nursing students in the literature. Due to these studies, it was found that nurse pain knowledge, assessment, and management skills increased.[8,10]

Pain education is provided by classical learning techniques in most nursing schools. It is known that student knowledge level increases with classical learning, but the information gained may not lead to a behavioral change or application to practice.[11] As an alternative to conventional learning, web-based teaching methods have become quite popular in recent years. This method can be used to gain nursing skills and facilitate their transfer to the clinical environment.[12] This learning method can allow nursing students to meet with advanced computer technologies that they will use intensively as part of patient monitoring and care in their professional lives.[13] Students have the opportunity to self-learn by reviewing courses where and whenever they want. Students can easily communicate with instructors via messages or messages, combine material in the discussion forums, send homework, and take their exams or quizzes.[14,15]

With the use of web-based education programs, nursing students can practice their skills in a safe environment and learn the information by repeating it as often as they want before working in the clinical environment.[16] Web-based pain management education was found to improve the level of knowledge of nursing students by Keefe and Wharrad.[17] Similarly, the results of studies conducted in other health schools show that web-based pain education has been successful.[1,18] It is believed that well-equipped students with the necessary knowledge and skills in pediatric pain management, as in many other fields that require nursing expertise, will have a positive impact on clinical outcomes. It is predicted that web-based education will play an important role in successful pain management. In our country, the lack of a sufficient number of studies evaluating the effect of web-based pediatric pain management education (PPME) programs on pediatric pain management knowledge (PPMK) of nursing students has been a guiding light on the planning of this study. This study represents a significant contribution to the field of pediatric pain management, as it is one of the first studies to evaluate web-based education in this area in our country. Furthermore, it offers a novel perspective on the nursing curriculum in this field.

Aim

The purpose of this study is to determine the PPMK of the student nurse PPMK and evaluate the effectiveness of the web-based PPME program.

Material and methods

Design

This study was designed as a quasi-experiment with an unmatched group.

Setting and sample

This study was carried out in a university nursing school with the control group in the fall semester of the 2017–2018 (n=39) academic year and the initiative group (n=45) in the fall semester of 2018–2019 academic year, to prevent the sharing of information among the groups. The population of this study consisted of 84 nursing students who pursued internship education in pediatric nursing. The sample size was calculated with the Gpower 3.0 program and was based on type I error 0.05, type II error 0.20 (80% power), using the correct response rate of the study by Keefe et al. The sample size was calculated as 80 students. The study included all the students who had volunteered to participate.

Ethics approval

All participants gave their informed consent to be included before participating in the study. The study was carried out according to the Declaration of Helsinki, and the protocol was approved by the Non-Interventional Research Ethics Committee of Dokuz Eylül University (date: 05.05.2017, Number: 10-19) and the directory of Nursing Faculty (Date: 30.03.2017, number: 19396244-108.99/525).

Procedure

Development of the web-based PPME program

Educational content was developed based on the pain management guidelines of various international and national organizations, societies, universities and hospitals as well as from data from evidence-based studies.[1,3,19-28] It is stated in the literature that pain is related to awareness, physiopathology, barriers, diagnosis, evaluation and control dimensions.[29] Therefore, the modules of the educational content were created considering these dimensions (Table 1).

Table 1. Program modules of PPME

Modules	Content of PPME	Transferred time to the website
1.	**Pediatric Pain Awareness** - Definition of pain - Atraumatic care - Pain and empathy - Self-assessment of pain - Pain perceptions of children and factors their pain reaction - Cognitive development and perception of children - Hospitalization and perception of pain	2nd week

	- Children's Pain Reactions - Differences between pediatric pain and adult pain	
2.	**Pediatric pain physiopathology** - Causes of pain - Classification of pain - Physiopathology of pain - Theories of pain - Dimensions of Pain - Consequences of undertreated pain in infants and children	3rd week
3.	**Barriers to effective pediatric pain management** - Conditions preventing pain management in children - Misunderstandings, fears, and realities about pediatric pain	4th week
4.	**Pediatric pain management** - **First section: diagnosis of pain** - Basic Components of Pediatric Pain Diagnosis - **Second section: assessment of pain** - Determining Pain Assessment Scale according to the developmental level of children - Reassessment of pediatric pain - Pain assessment in special children - **Third section: control of pain** - Nonpharmacologic pain control in children - Pharmacological pain control in children - Analgesia ladder method - Non-opioid analgesics - Opioid analgesics - Adjuvant analgesics - Local anesthesia in children - Patient-controlled analgesia in children - Sedation in children - Parental involvement in pain management - Nursing approach to pediatric pain management	The 5th week 6th week

Expert opinion

The module's educational content was contributed by 10 faculty members who are experts in the field of child health and disease nursing. A checklist was created for expert opinion, comprising parameters such as scientific content, comprehensibility, suitability for the student's level, and recommendations. The checklist, along with the

module contents, was sent to experts. The educational content was evaluated by experts to determine whether it included the criteria mentioned above. The experts provided recommendations for each module and provided updated references.

For module 1:

- Explaining the subject of pain and empathy with examples from nature
- Exemplifying the factors that affect children's perception of pain
- Diversifying children's reactions to pain according to their age
- Adding the difference between child pain and adult pain

For module 2:

- Explaining the characteristics of pain according to its types
- Explaining the factors that affect chronic pain in children
- Explaining the nociception process
- Explaining Pain Transmission

For module 3:

- Adding to the topic of misconceptions about pain in children,

For module 4:

- Using local anesthetics in the effective management of procedural pain in children
- Explaining the use of adjuvant drugs among pharmacological agents
- Adding the age group in patient-controlled analgesia in children
- Adding the results of optimal pain management

The recommendations of the experts who provided feedback were collated into a single document for each module. The researchers implemented the necessary corrections and enhancements, thereby producing the final version of the educational content.

Pilot study

A pilot study was conducted with eight third-grade students who represented the sample and were not in the study group. Their feedback was received. As a result of the pilot study, it was decided to divide the fourth module into three sections because its content was quite intense.

Educational intervention

The Web-based PPME is a comprehensive evidence-based program designed for nursing students and consists of four modules focused on pediatric pain management. Modules are scheduled as follows:

1. Module: pediatric pain awareness – 2nd week
2. Module: Pediatric pain physiopathology – 3rd week
3. Module: Barriers to effective pediatric pain management – 4th week
4. Module: pediatric pain management – 5th and 6th week (Fig. 1)

The contents of the web-based pediatric pain management education program were uploaded to the web environment via the University's Distance Education Implementation and Research Center. This system has an advanced infrastructure that enables e-learning content to run in different educational software. In the system created with this infrastructure, courses can be introduced to students and registrations can be made. This system enables students to access educational resources via the Internet whenever and wherever they want. The pediatric pain management course was made available to the intervention group and the students were registered for the course. The system enabled researchers to provide web-based education through live lessons, resource sharing, announcement, and chat room modules (Fig. 2).

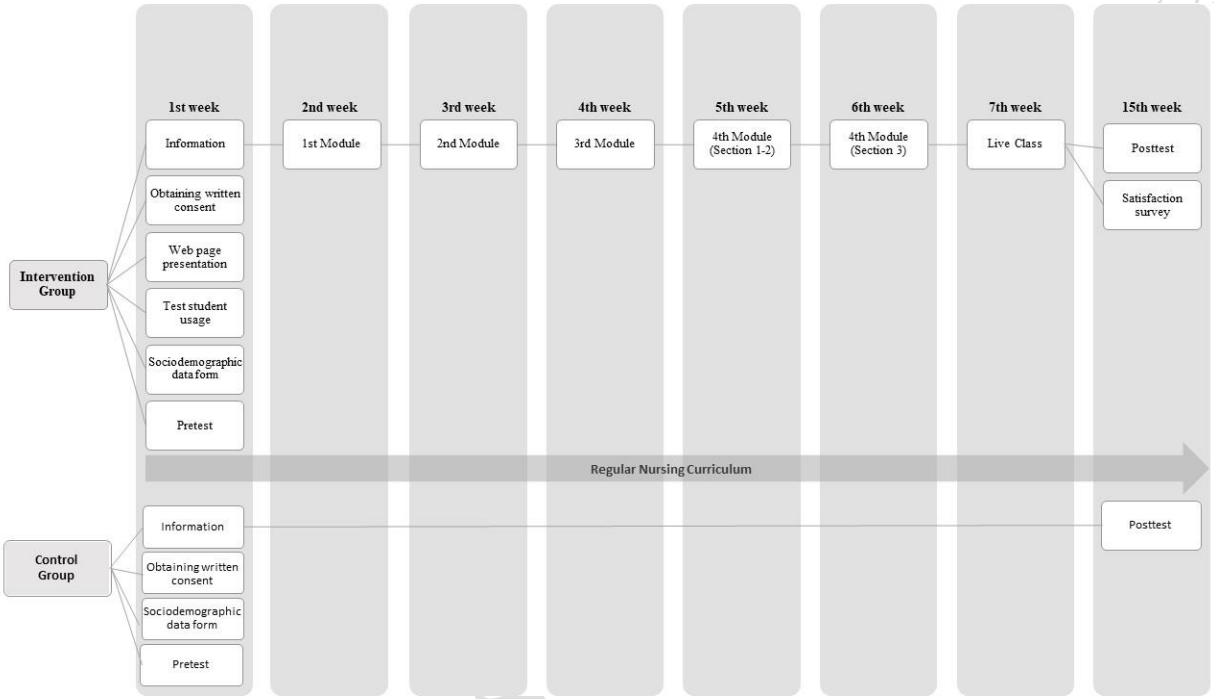

Fig. 1. Flow chart of the study

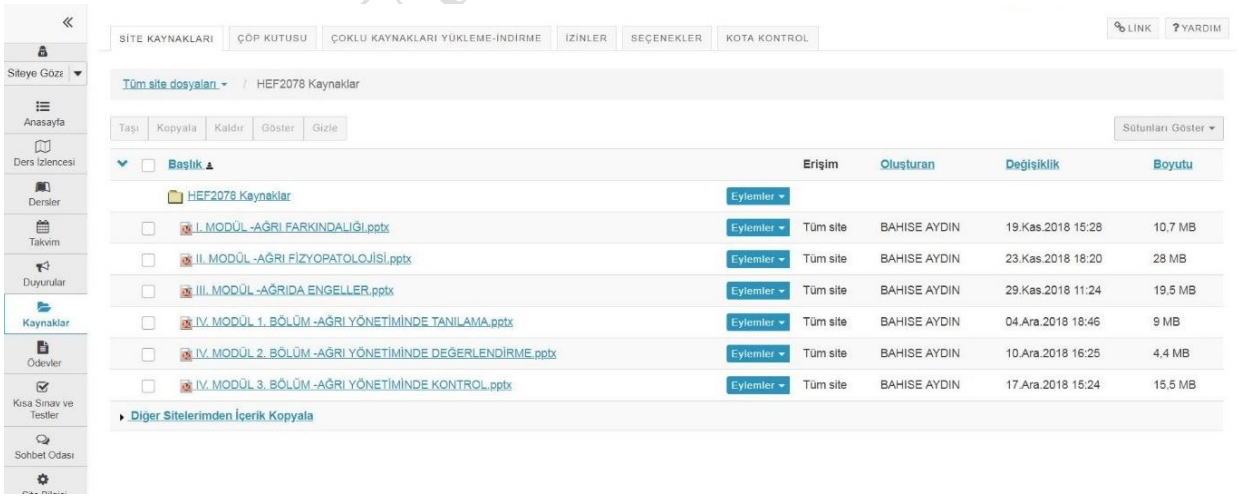

Fig. 2. An image of web-based education

Control Group

The control group underwent standardized training as part of their internship program without additional intervention. At the beginning and end of the semester, the students in this group completed a pre-test and post-test (Fig. 1).

Intervention group

The intervention group participated in a web-based PPME program. In the first week of the program, students were informed about the educational content and flow chart of the study, and the researcher introduced the website. In addition, the sociodemographic data form and pretest were applied to the students. PPME modules were uploaded to the university's existing distance education center website. The researcher interacted with students on-line and offline during education sessions following the schedule (in the second, third, fourth, fifth, sixth and seventh weeks). In the 15th week, the final stage of the study was completed by applying the post-test and satisfaction questionnaire to the students (Fig. 1).

Measurements and data collection A total of 84 students were enrolled in the study. The students completed data collection tools. The pre-test and post-test forms were matched with student nicknames according to the form instructions. A sociodemographic questionnaire was used to collect personal data such as age and sex. To assess the PPMK of students, the researchers developed a pediatric pain management knowledge questionnaire was developed by the researchers according to the literature consisting of multiple choice, true/false, open-ended, and matched questions.[7,30-32] The questionnaire consists of 81 questions and six sub-dimensions (pain awareness, the physiopathology of pain, barriers to effective pain management, pain diagnosis, pain assessment, and pain control) coinciding with the content of each module (Table 2). The increase in the scores of the questionnaire indicates that the students had more information about pediatric pain management. Knowledge scores were calculated by summing up the numbers of correct answers.

Table 2. Sub-Dimensions of pediatric pain management knowledge questionnaire

Module Section	Sub-dimensions (short name)	No of questions	Score range	Content of sub-dimesions
1.	Pain awareness (awareness)	10	0–17	The students have questions about the effects of pediatric pain, perception of pain,, children's responses to pain and symptoms of pain.

2.		Pain physiopathology (physiopathology)	9	0–9	The questions include the physiological and pathological response of children to pain and the types of pain.
3.		Barriers to effective pain management (barriers)	17	0–17	There are questions about situations that prevent pediatric pain management in the clinical area and nurses' issues that prevent accurate diagnosis and treatment of pediatric pain.
4.	1	Pain diagnosis (diagnosis)	5	0–5	Questions include the time to diagnose pain and its components.
	2	Pain assessment (assessment)	5	0–8	There are questions about pediatric pain assessment and in special groups.
	3	Pain control (control)	35	0–51	Questions include pharmacological and non-pharmacological techniques.
Total			81	0–107	

Statistical analysis

Data were analyzed with SPSS 24.0 and AMOS 25.0 (IBM, Armonk, NY, USA). The number, average, and percentage values were used in the descriptive data. In comparison of the pre-test and post-test scores of the intervention and control groups, the paired samples t-test was used. The relationship between PPME and student knowledge levels was evaluated using Spearman correlation analysis. Covariance analysis was used to compare the pre/posttest difference scores of sub-dimensions of knowledge levels of the intervention and control groups. Power analysis and effect size were used to determine the effectiveness of the study. Regression analysis was performed to determine the effectiveness of PPME. Multiple correlations were evaluated using variance inflation factor (VIF), tolerance, and condition index. The study used structural equation modeling (SEM) to examine the model illustrating the relationship between pediatric pain questionnaire subdimensions. The significance level was set at 0.05.

Results

The sociodemographic data of the nursing students are shown in Table 3.

Table 3. Sociodemographic data of nursing students (n=84)[a]

Demographic data	Control group (n=39)				Intervention group (n=45)			
	n	%	X	SD	n	%	X	SD
Age								
20-22 yr	23	59	22.44	1.142	34	75.5	21.93	1.156
≥ 23 yr	16	41			11	24.5		
Grade point averages*								
50–79	29	74.4	2.26	0.442	36	80	2.20	0.405
80–100	10	25.6			9	20		
Sex								
Female	36	92.3	–	–	33	73.3	–	–
Male	3	7.7			12	26.7		
Previous education on pain								
Yes	3	7.7	–	–	1	2.2	–	–
No	36	92.3			44	97.8		
Self-sufficiency in PPM (1–10 point)								
1–4	9	23			21	46.6		
5–7	23	59	5.97	1.739	22	49	4.66	1.566
≥ 8	7	18			2	4.4		

[a] X mean, SD – standard deviation, * grade point averages were evaluated according to the 100-point classification system

The total and subdimension scores of PPMK of students are given in Table 4. Statistically significant ($p<0.05$) differences ($p <0.05$) were found between the control and intervention groups in total pre-test values, but not in the post-test values ($p>0.05$). Furthermore, the groups showed a statistically significant difference in the differences in the pre-test and post-test score differences ($p<0.05$). Advanced analysis revealed that the difference originated in the intervention group ($p<0.05$). When comparing the mean scores of the control and intervention groups before and after the intervention, a statistically significant difference was found ($p<0.05$; Table 4).

The difference in pre-test and post-test score was statistically significant between the control and intervention groups for the subdimensions of 'awareness', 'physiopathology', and 'control' ($p<0.05$). Advanced analysis revealed that the difference originated in the intervention group ($p<0.05$). When comparing the mean scores of the groups internally, there was a statistically significant difference between the pre-test and post-test mean scores in both groups for the subdimensions of 'awareness' and 'barriers' ($p<0.05$). The intervention group showed a

statistically significant difference in the mean scores for the subdimensions of 'physiopathology', 'diagnosis', 'assessment', and control between the pre-test and post-test ($p<0.05$; Table 4).

Table 4. Comparison of pretest and post-test knowledge scores of subdimensions of pediatric pain management of the intervention and control group[a]

Sub-dimensions	Group	Pre-test score		Post-test score		Pre/post-test difference		t**
		X	SD	X	SD	X	SD	p
Awareness	**Control**	12.56	1.789	13.92	1.676	1.36	1.856	-4.571 <0.0001
	Intervention	11.84	1.965	14.71	2.361	2.87	2.492	-7.717 <0.0001
	t*	1.745		-1.738		-3.169		
	p	0.085		0.086		0.002		
Physiopathology	**Control**	5.77	1.224	6.02	1.224	0.26	1.044	-1.533 0.133
	Intervention	5.24	1.433	6.20	1.307	0.96	1.348	-4.756 <0.0001
	t*	1.790		-0.628		-2.627		
	p	0.077		0.532		0.010		
Barriers	**Control**	9.87	2.745	11.51	2.533	1.64	2.560	-4.004 0.000
	Intervention	9.76	2.488	11.62	2.338	1.87	1.502	-8.340 <0.0001
	t*	0.204		-0.206		-0.483		
	p	0.839		0.837		0.631		
Diagnosis	**Control**	3.26	1.117	3.61	0.990	0.36	1.181	-1.899 0.065

	Intervention	3.18	1.154	3.71	1.058	0.53	1.290	-2.774 0.008
	t*	0.316		-0.426		-0.642		
	p	0.753		0.671		0.522		
Assessment	**Control**	5.79	1.542	6.15	1.309	0.36	1.678	-1.336 0.189
	Intervention	5.62	1.435	6.36	1.209	0.73	1.814	-2.712 0.010
	t*	0.531		-0.734		-0.977		
	p	0.597		0.465		0.332		
Control	**Control**	34.13	4.549	35.36	5.513	1.23	4.049	-1.898 0.065
	Intervention	27.84	6.296	37.16	5.291	9.31	4.567	-13.677 <0.0001
	t*	5.171		-1.522		-8.521		F***: 36.323
	p	0.000		0.132		0.000		<0.0001
Total	**Control**	71.38	8.993	76.59	9.284	5.21	4.372	-7.435 <0.0001
	Intervention	63.48	9.231	79.76	9.386	16.27	5.302	-20.582 <0.0001
	t*	3.957		-1.549		-10.333		F***: 77.960
	p	0.000		0.125		0.000		<0.0001

[a] * independent samples t-test, ** – paired samples t-test, *** – ANCOVA $p<0.05$ significance

Web-based PPME was found to significantly predict student PPMK levels (F=106.779, p<0.0001). The web-based PPME explained 56.6% of the change in the PPMK level (R^2=0.566) and increased it by 11.062 points (B=11.062; Table 5). The power and effect size of the study were calculated on regression analysis. The power was 0.99 and the effect size (f2) was 0.75 of the study. A significant, positive, and advanced relationship was found between the Web-based PPME and the total knowledge score (PPMK) (p<0.01).

Table 5. The prediction level in the study on the change of PPMK of nursing students[a]

ariables	**PPMK**				
	B	**SH**	**β**	**t**	**p**
onstant	5.205	0.783		6.643	<0.0001
roup[†]	11.062	1.070	0.752	10.333	<0.0001
			0.752		
²			0.566		
			106.779		
			0.000		
W[‡] **(1.5–2.5)**			1.856		

[a] The intervention group was coded as "1" and the control group was coded as "0", DW Durbin Watson p<0.05 significance

There was a positive low-level correlation between Web-based PPME and awareness (0.32), physiopathology (r=0.28), barriers (r=0.06), diagnosis (r=0.05) and assessment (r = 0.10) subdimension knowledge scores of nursing students. Otherwise, there was a strong positive correlation between the web-based PPME and the control (r=0.71) knowledge score. In the difference in the model, we found that the PPMK score between the groups of nursing students significantly affected the difference in control knowledge levels (Fig. 3). The suitability of the model was evaluated with the fit indexes and it was determined as RMSEA=0.068, chi-square/degree of freedom = 1.375, CFI = 0.95, IFI = 0.95, GFI = 0.96, NFI = 0.85 and TLI=0.88. The results demonstrated that the theoretical model exhibited statistical significance. Additionally, the results were corroborated.

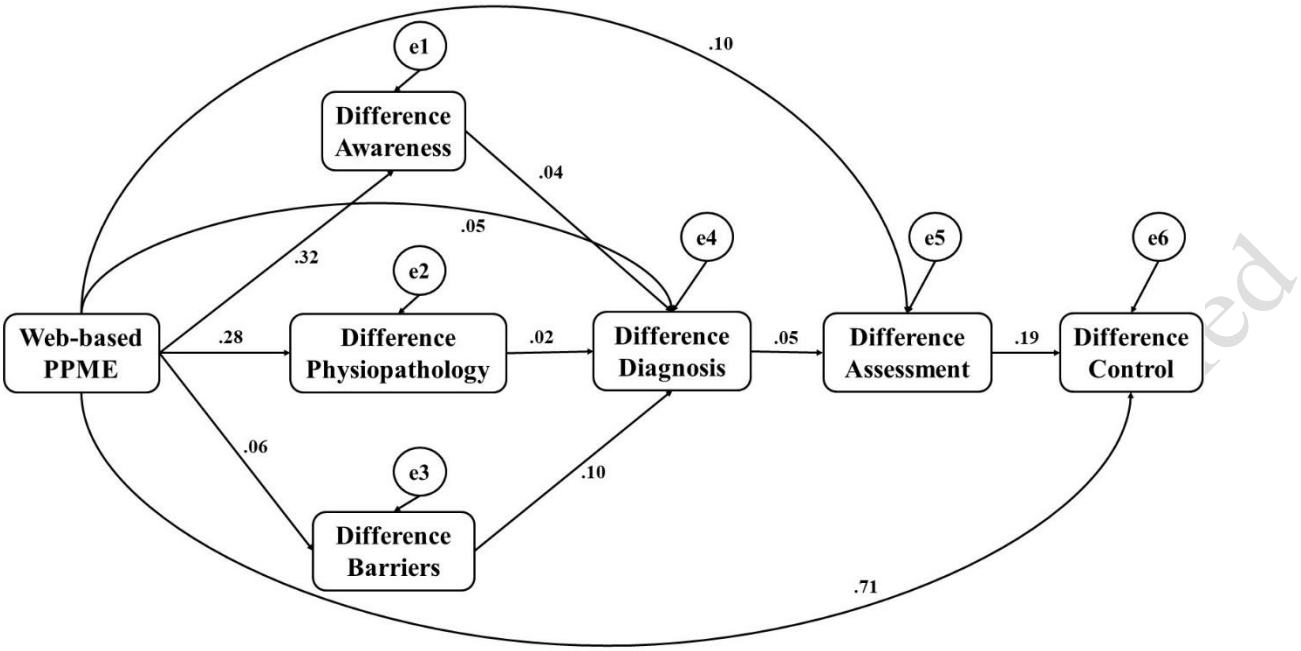

Fig. 3. Path analysis between pediatric pain management knowledge variables of nursing students

Most of the students in the intervention group were satisfied with the Web-based PPME and the average satisfaction score was 7.36±1.686 (1 – low, 10 – high). Student feedback on the educational content, method, and use was positive. However, some of the students had difficulties accessing the internet, mobile devices and accessing the website.

Discussion

Covariance analysis was performed to prevent the results from being affected by the pre-tests, since there was a significant difference between the pre-test scores of the intervention and control groups in the present study. This study determined that web-based pediatric pain management education significantly increased PPMK of nursing students. Similar studies in the literature have shown that Web-based PPME has increased knowledge after education, both nursing students [17,33] and other undergraduate health department students.[1] It is thought that the increase in the knowledge scores of the students who receive web-based education may be because the students can easily access the PPME content when they need, they can repeat it as often as they want, the web-based education has more detailed content, the accessibility of the educator, and the possibility of getting online support. In addition, most of the students in both the intervention and control groups evaluated their pain knowledge levels before and after education at low and moderate levels, and this could be a motivating factor for studying by recognizing their shortcomings.

In the present study, both education methods contributed to student knowledge of pain awareness, we found that the increase in web-based education group was higher. There have been no studies in the literature

involving all subdimensions of web-based PPME with nursing students. Therefore, the results of this study were discussed with the results related to the subdimension of the studies in which the general pain knowledge levels of nursing students, other healthcare students, and nurses receiving web-based education were evaluated. In a study using the web-based education method to increase the in pain knowledge levels of medical students, the post-test knowledge scores of "empathy and pain" were found to be significantly higher than the pre-test scores.[18] The results of Puljak and Sapunar's research with similar module content are similar to those of this study. When the questions of pain studies about the awareness in children were examined, it was found that the knowledge level of most nurses and nursing students was poor.[34,35] In a study conducted by Aydn and Bektaş it was found that intern nursing students had a moderate level of pain awareness in children.[29] A wide range of content was prepared for students in the pain awareness module of the web-based education that was created to eliminate this deficiency. It is thought to be effective in increasing awareness knowledge of students, taking noticeable scenarios in the web-based module, giving examples that increase awareness level by educators and students during live class, and making reminders by making online communication with students. In addition to all these, the fact that the current study only focuses on measuring student pain awareness knowledge levels and the fact that student awareness of children's pain in their clinical practices cannot be determined should be considered as an important limitation of this research.

In the present study, we found that Web-based education increased student knowledge of pain pathophysiology. Similarly to this result, in studies conducted with medical students, it was reported that the correct response rate of the students to the questions related to pain physiopathology increased significantly after online education.[1,18] After the studies showing that physiopathology knowledge of pediatric nurses and nursing students is not sufficient, an increase in physiopathology knowledge levels of students with online education in this study is an important result.[6,7,29] The extensive content of information content about physiopathology of online education in this study has contributed to the development of student knowledge levels. With the help of web-based education, the opportunity of students to repeat and access the educational content from anywhere and at any time, to receive online support of the instructor and to reinforce their knowledge with clinical practice makes learning easier.

In the present study, we found that the knowledge scores of the intervention and control groups for the 'barriers' subdimension increased but no significant differences in the scores between the groups. Both methods of education increased the knowledge of the students. In a study conducted with medical students, it was determined that the correct response rate of students to questions about barriers such as "children cannot report pain correctly" increased significantly after the education.[1] In a study conducted using the conventional education method, it was determined that the proportion of nursing students who think that "children overstate their pain" decreases after education, but this decrease has been reported to not at the desired level.[36] Similar to the examples in the literature, both education methods increased student knowledge levels in this study. The reason why web-based education does not make a significant difference between the student group knowledge

scores that the students do not have sufficient time and experience in clinics. Therefore, students may not have encountered any barriers of misunderstandings and fears about pain management. Furthermore, when it was examined that the nurses have misconceptions, knowledge, and attitudes about pediatric pain in the literature, it was thought that the insufficient level of development could be related to not finding a sufficient role model in the clinic.[6,37,38] Furthermore, as stated in the limitations, we would like to emphasize that as a result of the data obtained from this study based on quantitative evaluation, the clinical performance of the students was not measured and these findings may be insufficient to reflect the entire obstacle faced by the students in pediatric pain management.

In the present study, we found that web-based education increased student pain diagnosis knowledge. In a study conducted by Ameringer, Fisher, Sreedhar, Ketchum and Yanni [1] it was determined that the rate of correct answers of the questions toward the diagnosis of pain was moderate before the web-based education, but increased significantly after the education. The result of this study is similar to that of Ameringer et al. It was thought that the reason why there were no difference between the knowledge scores of the control and intervention groups was that the diagnosis of pain was the most common part of the daily nursing routine and that the mentors guided the students in clinical practice. Furthermore, the fact that web-based education has a wide content in diagnosis, that students can easily access the content and that the educator's online support of the educator can explain the level of increase in the knowledge of the initiative group itself.

In the present study, we found that web-based education increased student pain assessment knowledge. In the literature, there are studies showing that Web-based pain assessment education increases the level of both nursing and medical students.[1,17,33] Although there are no significant difference between the groups in this study, similar to the results of these studies, it is an important indicator that the students in the knowledge score of the intervention group increased significantly after the education. Pain assessment is one of the most common daily nursing routines. The involvement of students in these practices when working with nurses and mentors in clinics may have reinforced them. Furthermore, it was thought that the extensive content of the web-based module on valid and reliable pediatric pain assessment scales and the opportunity for students to access these scales during clinical practice supported the development of their knowledge. The reason why there is no difference between the groups may be that, as the students stated in the satisfaction questionnaire, the web-based system does not have a mobile interface and that the clinic computers are not always available for use due to the workload. Furthermore, as a limitation of the study, the underlying reasons for the difference between groups may not have been thoroughly determined because the students' clinical pain assessment of the students was not evaluated and was not used qualitative evaluation methods were not used.

In the present study, we determined that students who received web-based education had significantly higher knowledge scores related to the 'control' subdimension than those who did not ($p<0.05$). In a study, it was determined that after the web-based education given to medical students on pharmacological control of pain, the scores of the students increased significantly. In the same study, it was detected that the correct response

rate of students to the question about the use of nonpharmacological treatment was low before and after the education.[1] In a study by Keefe and Wharrad, it was determined that the knowledge level of the students participating in the online pain treatment education increased significantly after the education.[17] In contrast, a study using conventional education methods found that the level of knowledge of pediatric pain pharmacology knowledge of the student nurses did not increase after the education.[36] The results of this study are similar to those in the literature. Intern nursing students mostly observe the nurses during the preparation of the drugs because they are not competent enough. However, it has been shown in the literature that nurses do not have sufficient knowledge about pharmacological pain control.[7,39] Therefore, nurses may not be sufficient role models for students in the clinical setting. Consequently, it is believed that pain control, which is extensively discussed in the content of web-based modules, plays an important role in increasing of student knowledge scores. In addition, the students increased their knowledge because of the opportunity of accessing and repeating the tables, visuals, and reminders given in the web-based module content. It is crucial to note that the presented data do not reflect the clinical performance of the students, as the research was confined to measuring their level of knowledge.

The present study used an SEM to examine the relationship between the subdimensions of the pain management questionnaire. The model, developed in accordance with the literature, revealed a strong positive correlation between web-based education and the 'pain control' subdimension scores. Web-based education has a low level of relationship with other subdimensions. The theoretically generated model was confirmed by fit indices that were statistically appropriate, and the results obtained were supported. Upon examination of the fit indexes, we found that RMSEA was below 0.08 and other fit indexes were above 0.90. The results demonstrated that the theoretical model, which had previously been established, was indeed compatible with real-life observations. The findings of this study suggest that students should be educated about the pathophysiology to pain, the barriers of pain management, pain awareness, pain diagnosis and evaluation in order to develop pain control skills. The model and subdimensions of the study were developed with input from several sources, including the Pain Guideline of the World Health Organization, the guidelines of the Royal College of Nursing, the American Academy of Pediatrics, the Cancer Care Ontario, the pain management modules from the British Pain Society, the pain management guidelines of various international hospitals and the data from evidence-based studies.[3,20-24,26] It is stated in the literature that pain can be conceptualized along a number of dimensions, including awareness, physiopathology, barriers, diagnosis, evaluation, and control. Although some studies have evaluated a subset of these subdimensions collectively, and only one study has examined all of them in unison.[29] In a study conducted by Aydn and Bektaş with pediatric intern nursing students, they examined the relationship between the structural equation model and the sub-dimensions of pain.[29] In contrast to this study, they found a moderate positive relationship between barriers and physiopathology, physiopathology and awareness, barriers, and diagnosis knowledge scores.

Study limitations

There are some limitations in our study. First, in this study, the knowledge level of the students was measured and their clinical performance was not evaluated. It is important to conduct interventional studies with both students and nurses in the clinical setting to assess the efficacy of the educational program. Second, the findings of the study are limited to the sample group and cannot be generalized to the general population. Third, the results of this study were evaluated quantitatively. This situation creates a limitation in the evaluation of the results. It is recommended that future research include quantitative and qualitative evaluations. Therefore, further studies are required to substantiate the findings of the present study and to elucidate the underlying reasons for the subdimensions that did not demonstrate a difference between the control and intervention groups.

Conclusion

The study found that web-based education in pediatric pain management was effective in increasing nursing student knowledge levels. The scores of nursing students who received web-based PPME were higher than those of noneducated students. A moderate and positive statistically significant correlation was detected between the web-based PPME program and the PPMK scores. The results of this study showed that web-based education is effective. The findings of this study may contribute to the delivery of pediatric pain management education in the nursing curriculum as an alternative method and guide future pain management processes.

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Declarations

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Authors' contributions

Conceptualization, M.B. and B.A.; Methodology, M.B.; Software, M.B. and B.A.; Validation, B.A. and M.B.; Formal Analysis, M.B.; Investigation, B.A. and M.B.; Resources, B.A. and M.B.; Data Curation, B.A.; Writing – Original Draft Preparation, B.A. and M.B.; Writing – Review & Editing, B.A. and M.B.; Visualization, B.A. and M.B.; Supervision, M.B.; Project Administration, B.A. and M.B.; Funding Acquisition, B.A. and M.B.

Conflicts of interest

The authors declare that they have no competing interests.

Data availability

Data sets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval

The study protocol was approved by the Non-Interventional Research Ethics Committee of Dokuz Eylül University (Date: 05.05.2017, Number: 10-19) and the Nursing Faculty (Date: 30.03.2017, Number: 19396244-108.99/525).

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