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ORIGINAL ARTICLE / ARAŞTIRMA YAZISI

Nutrition and Dietetics / Beslenme ve Diyetetik

The Comparison of the Effects of Different Nutrition Education Methods on Nutrition Knowledge Level in High School Students

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ABSTRACT

Purpose: Adolescence is an important life period and has crucial importance for the development of appropriate eating habits and a healthy diet. Nutritional interventions may help improving diet and thus may provide prevention from the development of lifestyle related diseases during both adolescence and in the future. This educational intervention study with a pretest-posttest design aimed to evaluate the effectiveness of different nutrition education methods on nutrition knowledge levels among adolescents.

Methods: A total of 216 students from 3 high schools in Usküdar, Istanbul were randomly assigned to three different educational intervention method groups (video-mediated, peer-directed, and visual aids), each consisting of 36 students to compare the effectiveness with the traditional education method. The nutrition knowledge level of adolescents was evaluated with the Adolescent Nutrition Knowledge Questionnaire (ANKQ) before and after interventions

Results: All of the intervention methods provided significantly increased post-test total scores when compared to pre-test scores ($p<0.05$). Peer-led and visual tools mediated nutrition education were significantly related to increased post-test scores compared to traditional nutrition education ($p<0.05$).

Conclusion: Repetitive interventions, follow-ups regarding sustainability and evaluation of behavioral changes are recommended for future studies.

Keywords: adolescent, healthy diet, dietary habits

Lise Öğrencilerinde Farklı Beslenme Eğitim Yöntemlerinin Beslenme Bilgi Düzeyine Etkisinin Karşılaştırılması

ÖZET

Amaç: Adölesan dönem yaşamın önemli bir dönemidir ve uygun beslenme alışkanlıklarının geliştirilmesi ve sağlıklı bir diyet oluşturulması için büyük önem taşımaktadır. Beslenme müdahalelerinin, diyetin iyileştirilmesine yardımcı olabileceği, böylece hem adölesan dönemde hem de gelecekte yaşam tarzı ilişkili hastalıklarının gelişmesini engelleyebilmektedir. Öntest-sontest tasarımlı bu eğitsel müdahale çalışması, farklı beslenme eğitimi yöntemlerinin lise öğrencilerinin beslenme bilgi düzeylerine olan etkisini değerlendirmeyi amaçlamıştır.

Yöntem: İstanbul ili Üsküdar ilçesinde gönüllü olan 3 liseden toplam 216 öğrenci, her biri 36 kişiden oluşan müdahale gruplarına (video aracılı, akran yönlendirmeli ve görsel araç kullanılan) rastgele atanmış ve her bir yöntemin beslenme bilgi düzeyine etkisi geleneksel eğitim yönteminin etkinliği ile karşılaştırılmıştır. Her bir eğitim öncesi ve sonrası Adolesan Beslenme Bilgi Düzeyi Anketi (ABBID) ile ergenlerin beslenme bilgi düzeyleri değerlendirilmiştir.

Bulgular: Son test puanlarının tüm müdahale yöntemlerinde ön test puanlarına göre anlamlı olarak arttığı saptanmıştır ($p<0.05$). Akran yönlendirmeli ve görsel araç kullanılan beslenme eğitimi, geleneksel beslenme eğitimine kıyasla belirgin olarak artmış test skorları ile sonuçlanmıştır ($p<0.05$).

Sonuç: Gelecekteki çalışmalar için tekrarlayan, uzun vadede kalıcılığı izleyen ve davranış değişikliklerinin de değerlendirildiği müdahaleler önerilmektedir.

Anahtar Kelimeler: adölesan, sağlıklı diyet, diyet alışkanlıkları

Adolescence is a period of transition from childhood to adulthood in which the fastest growth and development in life is seen (1). Along with physical changes and increased nutritional requirements, eating habits and nutritional preferences alter during this period. The level of nutritional knowledge is the major contributor for appropriate nutritional habits and attitudes (2,3). Therefore, appropriate nutrition education programs (NEPs) should be organized. NEPs commonly embrace information about nutrition, nutrients, and healthy eating behaviours (4). Traditional nutrition education (TNE) as well as video-mediated nutrition education (VMNE); nutrition education given with visual tools (NEGVT); and peer-led nutrition education (PLNE) models are among the commonly used interventions to improve the nutritional knowledge level of adolescents (2,5,6).

VMNE programs are suggested to improve students' learning and considered as an innovative way to organize and present information for students (2,7). In addition, studies showed that videos contributed as a valuable tool for supporting learning, thus might be adapted for all learners as well as adolescents (1,5–8).

It has also been suggested that nutrition education with visual tools including photographs/card etc., is one of the best methods for effective education and education given with visual tools may provide increased awareness about healthy nutrition and improvement in eating habits among adolescents (9,10).

Adolescents are mostly under the influence of peer pressure so the peer-led nutrition education method has also been used in recent studies (11–13). It has been demonstrated that peer-led nutrition education among adolescents provides information, education, and resources for healthy nutrition and health promotion (14). In addition, peer-led education for improving health among adolescents directly affects adolescents in such matters as being a positive role model and changing social norms (12,14).

The efficiency of nutrition education also depends on population-associated factors including socioeconomic status, age, gender, and cultural diffreneces. Therefore, it is not precise which educational intervention method is the most effective on nutritional knowledge level in a specific adolescent population compared to traditional nutrition education. This study aims to evaluate the effects of different nutrition education methods on nutritional knowledge levels among Turkish adolescents.

MATERIAL AND METHODS

Study Design and Sampling Process

The sample was collected regarding the results of a study titled "Evaluation of Body Mass Index and Related Lifestyle Factors among 14-17 Year Old Turkish Adolescents" in Üsküdar district with the participation of 1561 vocational high school students (15). The study results showed that vocational high school 9th-grade students (n=417) have a higher risk in terms of body weight status and unhealthy eating habits including meal skipping, snacking, and fast food consumption in previous year. Thus, the sample size was determined as 216 with a 95% confidence interval and a 5% margin of error (16). Three schools volunteered to participate in the study from vocational high schools studied in the previous study (15). From each school 72 of the 10th grager students were enrolled in the study and the first 36 of them identified as the TNE group and the rest of them were included in other education method groups (VMNE, NEGVT, and PLNE) (Table 1).

Voluntary students with a written "Informed Consent" form signed by their parents were included in the study.

Table 1. Study Design and Sampling Process

1. Vocational High School	Traditional Nutrition Education (n=36)	Video Mediated Nutrition Education (n=36)
2. Vocational High School	Traditional Nutrition Education (n=36)	Nutrition Education Given With Visual Tools (n=36)
3. Vocational High School	Traditional Nutrition Education (n=36)	Peer-Led Nutrition Education (n=36)

Measurements and Data Collection

Nutrition knowledge levels of the adolescents were measured by Adolescent Nutrition Knowledge Questionnaire (ANKQ) which was developed by Oz et al. The items in the questionnaire are complete true or false sentences and the questionnaire includes 9 items from adequate and balanced nutrition; 21 items from essential nutrients, and 8 items from malnutrition-related diseases and the maximum score that can be obtained from the ANKQ questionnaire is 38 and the minimum score is 0 (17).

Nutrition Education Methods

In all education methods, the content of education was same. PowerPoint slides were prepared for Traditional Nutrition Education (TNE) including the answers to the questions in the ANKQ without any visual content. Video Mediated Nutrition Education (VMNE) included a video prepared in the departments of a supermarket and explained the general topics following the nutrition education program. For VMNE; in accordance with the education model, the food at the supermarket aisles was shown in the video without showing a label, and the importance of adequate and balanced nutrition was emphasized throughout the video. In addition, the researcher wore the outfit she wore in the video on the TNE education day, thus the participants saw the researcher in the same way. For Nutrition Education Given with Visual Tools (NEGVT), 36 photographs were taken based on the recommendations of the TNE method. Photos were printed on A3 size copy paper as coloured and all photos were elucidated in the same order with traditional education. In Peer-Led Nutrition Education (PLNE) method, 18 out of 36 students were taken to the conference hall and the rest 18 students were kept in any area of the school. Students who were trained by the researcher were asked to teach the other 18 students. Students from both groups filled the ANKQ at the same time. For identifying the groups, narrators were marked on the questionnaire as "A" and the audiences were marked on the questionnaire as "D".

Statistical Analyses

Data were analyzed using the SPSS software, version 21 (SPSS Inc., Chicago, Illinois, USA). Descriptive quantitative data were expressed as the mean±standard deviation, the qualitative data frequencies, and percentages were used. The suitability of the variables to normality assumption was examined with the Kolmogorov-Smirnov test. As all of the parameters did not satisfy the normality assumption the non-parametric tests were used. P values were tested for comparison of the differences of parameters with two groups the Mann Whitney U test and for parameters with more than two groups the Kruskal Wallis test was used. The differences between the two repeated measures were evaluated via Wilcoxon Signed test. Spearman's rho correlation analysis was used to analyze the correlation between subgroups of questionnaire and questionnaires total score. Statistical significance was defined as $p < 0.05$.

RESULTS

Significant increases were observed among all intervention groups including TNE after educations regarding the total and subgroups scores of ANKQ ($p<0.05$). But the VMNE and the NEGVT methods did not significantly increase the malnutrition-related disease scores of the participants ($p>0.05$) (Figure 1)

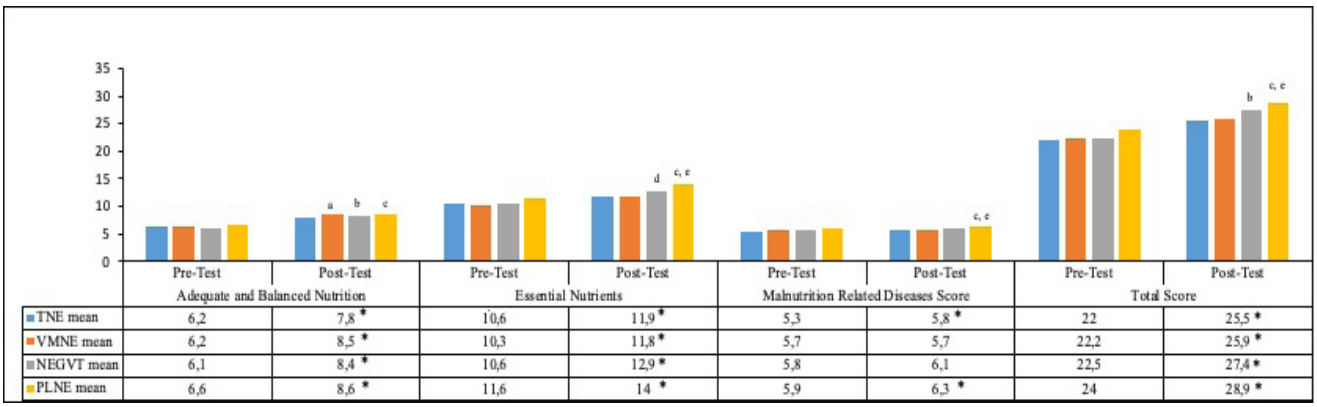
Differences between pre-test and post-test scores of adolescents in all intervention groups are given in Figure 1. There was no statistical significance in pre-test scores between the four groups (Figure 1.) which is analysed for the assessment of the homogeneity between the groups regarding nutritional knowledge levels. On the other hand, after the intervention, there was a significant difference in the subgroup of adequate and balanced nutrition scores of participants from VMNE, NEGVT, and PLNE groups, and the TNE group ($p<0.05$ for all, Figure 1.). The post scores of the subgroup of essential nutrients and malnutrition-related diseases, and total scores in PLNE groups were statistically higher compared to participants of the TNE and VMNE ($p<0.05$). Besides, the essential nutrients score of the NEGVT group significantly increased compared to participants in VMNE ($p<0.05$).

Pretest and posttest results within each education method are numerically shown in Table 2. (Delta = difference of pretest and posttest). Considering differences between 4 groups, only the difference between subgroup 1 was significant (Table 2.) The difference between the TNE method and the VMNE, NEGVT, and PLNE methods were found significant. However, the differences between VMNE and NEGVT and between VMNE and PLNE were also significant (Figure 1.).

Tablo 2. Comparison of Pre-test and Post-test Differences for Each Group According to the Subgroups

	Changes in mean score				Significance within group
	TNEI	VMNEI	NEGVT	PLNE	p*
Total Score	3.47	3.75	4.90	4.90	0.473
ΔSubgroup 1	1.64	2.30	2.36	2.00	0.041
ΔSubgroup 2	1.27	1.47	2.27	2.44	0.258
ΔSubgroup 3	0.44	0.28	0.25	0.47	0.478

p* values were tested via Kruskal Wallis.
Δ denoted for represent the differences between pretest and posttest scores.
Subgroup 1: Subgroup of Adequate and Balanced Nutrition
Subgroup 2: Subgroup of Essential Nutrients
Subgroup 3: Subgroup of Malnutrition Related Diseases



	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
	Adequate and Balanced Nutrition		Essential Nutrients		Malnutrition Related Diseases Score		Total Score	
TNE mean	6,2	7,8 *	10,6	11,9 *	5,3	5,8 *	22	25,5 *
VMNE mean	6,2	8,5 *	10,3	11,8 *	5,7	5,7	22,2	25,9 *
NEGVT mean	6,1	8,4 *	10,6	12,9 *	5,8	6,1	22,5	27,4 *
PLNE mean	6,6	8,6 *	11,6	14 *	5,9	6,3 *	24	28,9 *

Figure 1. Comparison of total score and subgroups scores of between the different educational methods.
*p<0,05
[a] Indicates statistically significant differences between the post-test scores of VMNEI and TNE.
[b] Indicates statistically significant differences between the post-test scores of NEGVT and TNE.
[c] Indicates statistically significant differences between the post-test scores of PLNEI and TNE.
[d] Indicates statistically significant differences between the post-test scores of NEGVT and VMNE.
[e] Indicates statistically significant differences between the post-test scores of PLNEI and VMNE.

DISCUSSION

The adolescent period has a vital role in the development of healthy eating habits as the acquired nutritional habits have a potential for persistence along adulthood (18).

Our results showed that all of the nutrition education methods provide significantly increased nutritional knowledge scores when compared to pre-test scores in adolescents. Rao et al. (2007) reported similar results in the improvement of nutrition knowledge level (19). This might be explained by the fact that adolescents are open to learning (1,20). Therefore, any education may be effective on the nutrition knowledge level. Oz et. al. carried out an educational intervention study to improve eating habits, increase physical activity, and reduce sedentary behaviours in adolescents and they found a significant increase in the level of knowledge in the internet-based education group compared to the control group (classical education) regarding prevention from excessive body

weight (17). However, our study demonstrated that the TNE group has significantly different post-test scores than the pre-test scores. The contributory factors to the score of the TNE group may be the research year; socioeconomic status; nutrition knowledge levels; awareness; and motivation of the participants.

We found significant difference only between the pre- and post-test scores of malnutrition-related diseases subgroup in VMNE. The reason for that may be explained as the video was taken in a supermarket and there was no visual material about malnutrition-related diseases in the content of the video.

Our results confirmed that the most effective nutrition education method for increasing the knowledge level was NEGVT and PLNE when compared with TNE ($p<0.05$). This might be explained by the fact that when the time is kept constant, people recall 10.0% of what they read, 20.0% of what they hear, 50.0% of what they see and hear, 70.0% of what they say, and make 90.0% of what they say and do. In addition, it is reported that learning will be faster and more permanent when using visual and auditory tools in teaching (21).

In a study participants had two consecutive teaching experiences as video-based and traditional text-based and then were asked about their perceptions of learning in terms of comprehension, retention, and motivation (i.e. attention, relevance, satisfaction, and confidence). Video-based instruction was found more motivating and memorable than traditional text-based instruction. (22). In contrast, we found no significant difference in ANKQ scores of participants of TNE and VMNE groups which may be associated with the content of the video, awareness, motivation, and knowledge levels of the participants.

Awareness in NEGVT was created by using various photographic materials and it might be assumed that the use of photographic material attracted the attention of the students and thus NEGVT was more effective than TNE. In another study, 461 adolescents were divided as the intervention group and the control group. Only the intervention group was educated using pictorial representation and its effect on healthy nutrition was investigated. Pictorial representations included food drawings, food models, and food package models. It was found that the responses of the intervention group to the questions were more accurate than the control group.

PLNE model was another successful education model in our study. In this model, information from a friend at the same age is more effective than an adult, and "peer pressure" may have a positive impact among the peers (12). Similar to our findings, it is reported that PLNE has superiority over other models in terms of providing knowledge and self-confidence to adolescents (23). For instance, Ghasemi et al. found peer education more effective than traditional methods such as booklets, lecture notes, and teacher explanations also they found that only the expression of health personnel was more effective than peer education (24). Parents Action on Drugs (PAD) site has reviewed and complied articles about peer methods on substance use, and as a result, the peer method has been more successful than traditional methods (25).

In many peer-led nutrition education studies, a separate education was given to the group that is the narrator in the peer studies, and the narrators were determined in advance whereas long education was given to the narrators (26–28) In our study, all students were educated on the same day, and the education was carried out on the randomly selected students. Akkuş et al. found peer education to strengthen the friendship relations of adolescents, improve self-confidence, and increase the level of knowledge (28). They stated that the narrator group was more advantageous as they learn the principle of helping first, increase the desire to participate in the study, and they can use this acquired skill for the rest of their lives. In addition, they mentioned that the quality of education is important, but even if the quality of education is low, it can make a difference (28).

Some limitations should be considered when evaluating the results of our study. Firstly, this study was carried out with a limited specified population who have been educated in one district of Istanbul. Secondly, this research has only investigated the short-term effects of various education methods on nutrition knowledge. However, the main aim of nutrition education programs should be developing healthy eating habits. Therefore, further interventional studies are recommended to evaluate the development of permanent nutrition knowledge and improved eating behaviors among adolescents. Lastly, the food environment (availability, prices, variety, quality, etc.) is a very strong determinant of dietary habits. Thus, it can be a constraint for nutrition education programs' success.

CONCLUSION

Our results supported that nutritional education with interactive and innovative intervention components can be useful for future programs for adolescents. In this context, studies with a combination of VMNE and PLNE methods can be recommended for larger samples for improvement in the knowledge level of adolescents. This design of the study provides improved efficacy in the evaluation of the success of nutrition education methods. However, further educational and interventional studies are required for the determination of the long-term effects of education on nutrition knowledge levels, habits, and behaviors of adolescents.

DECLARATIONS

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Conflicts of Interest/Competing Interests

All authors have no conflicts of interest to disclose.

Ethics Approval

This project was approved by the Marmara University Ethics Committee for Human Research with 03.01.2019 date and 07 number. According to this protocol, which is adjusted to the Declaration of Helsinki, adolescents and their parents were informed about the research objectives and procedures.

Availability of Data and Material

We can provide all the original data.

Authors' Contributions

S.A., H.Ö., and E.Ö. conceived and coordinated the study, performed nutrition educations, and wrote the paper. İ.K.C. performed statistical analyses, wrote and revised the manuscript. E.G. and B.O.B contributed to designing and coordinating the study and wrote the manuscript.

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