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Speech and Language Therapy Students' Knowledge and Awareness Levels Regarding Augmentative and Alternative Communication Systems

Dil ve Konuşma Terapisi Öğrencilerinin Alternatif ve Destekleyici İletişim Sistemlerine Yönelik Bilgi ve Farkındalık Düzeyleri

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ABSTRACT

Purpose: Alternative and Augmentative Communication (AAC) Systems refer to various mechanisms that support, complement or replace speech in individuals whose communication skills need to be increased. Speech and language therapists (SLT's) play an active role in the preparation and implementation of AAC Systems. Adequate and efficient training is a prerequisite for effective and successful AAC Systems services. In this study, it is aimed to investigate the level of knowledge and awareness of Speech and Language Therapy (SLT) undergraduate students in Turkey according to their taking AAC Systems course. **Material and Method:** 204 SLT undergraduate students from 10 different universities in Turkey, including 96 participants (47.06%) who took AAC Systems course and 108 participants (52.94%) who did not take AAC Systems course, participated in the study. Data were collected through an online questionnaire created by the researchers. The questionnaire included a total of 41 questions about the sociodemographic information of the participants and the level of AAC knowledge and awareness. Participants were recruited via social media platforms. **Results:** A statistically significant difference was found between those students who have taken AAC Systems course and those who did not ($p<0.05$). Participants who took the course gave an average of 6.16 to the efficiency of the course and 6.36 to the adequacy of the course out of 10. **Conclusion:** It was found that taking a course on AAC Systems increased awareness. However, improvements should be made in the efficiency and adequacy of the course in the undergraduate period.

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Introduction

Speech-based verbal communication is a unique ability of humans. However, this ability can be lost either temporarily or permanently due to developmental disorders or acquired conditions.

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Individuals with developmental disorders such as autism spectrum disorder (Ganz et al., 2013) down syndrome (Babb et al., 2021) cerebral palsy (Clarke and Price, 2012) and intellectual disabilities (Elsahar et al., 2019), and individuals with acquired disorders such as apraxia (Oommen and McCarthy, 2015), dysarthria (Bloch and Wilkinson, 2004) and dementia (Bourgeois et al., 2010) are only some of the disadvantaged groups who have difficulty in verbal communication. Individuals with these conditions have difficulty in conveying their most basic needs and requests to other people. As a result, these individuals experience limitations in daily life activities according to the International Classification of Functioning, Disability and Health proposed by the World Health Organisation (WHO) and social isolation occurs by decreasing participation in life (WHO, 2001). To prevent all these situations, there is a need to increase the communicative skills of individuals. To meet these communication needs, the use of Alternative and Augmentative Communication (AAC) Systems is essential (Beukelman and Mirenda, 2013).

AAC Systems includes methods used to support or replace an individual's verbal communication skills, including verbal and written forms of communication, which identify temporary or permanent impairments, activity limitations, and participation restrictions in speech-language production and/or comprehension, and attempts to compensate when necessary (Johnston et al., 2004). AAC Systems refers to various mechanisms that support, complement, or replace speech in individuals whose communication skills must be increased (Shahbaz et al., 2022). There are many AAC Systems designed differently from each other to increase the communication skills of these individuals. Basically, it is possible to categorize AAC Systems as unaided and aided (Marshall and Goldbart, 2008). Unaided systems do not require any external equipment and technology such as gestures, facial expressions, or body movements (Coyne, 2016). Aided systems, on the other hand, can be classified as either high-tech, such as programs installed on devices such as computers, phones, and tablets, which allow individuals to create words and/or sentences appropriate to their needs, or low-tech, such as communication boards (ASHA, 2024). These different systems are used specific to the needs of the individual after the evaluation of the relevant experts (Buekelman and Mirenda, 1998).

AAC Systems requires multiple disciplines to work together due to the multiple needs of individuals who use it. Speech and language therapists (SLT's), occupational therapists, and special education teachers are among the professional groups that can be found in AAC Systems services (Beukelman & Light, 2020). SLT's, who graduated from the undergraduate department of speech and language therapy (SLT), play an important role in the evaluation and intervention process of individuals in need of AAC Systems (Kovacs, 2021). SLT's working in this field are expected to have a good level of knowledge in areas such as situations requiring the use of AAC Systems, types of AAC Systems, methods of deciding the suitability of AAC Systems for the individual, and evaluating their effectiveness (Zarifian et al., 2021). It is very important to have adequate and effective training to provide AAC services correctly and effectively (Murray et al., 2020; Subihi, 2013). Despite this, many SLT's have shared information in different studies that their undergraduate education is insufficient, they feel inadequate in practices in this field, their knowledge level is incomplete, and they need more education in the postgraduate period to overcome these deficiencies (Flores and Dada, 2024; Kemp and Hayes, 2005; Koçak et al., 2023; Marvin et al., 2003; Wormnæs and Abdel Malek, 2004).

The foundation of AAC Systems courses in the field of SLT is laid during the undergraduate period and the competencies in this field are initiated with the AAC Systems course taken in this period. In Turkey, the courses to be included in the SLT undergraduate program and their contents are determined according to the National Core Education Program for Speech and Language Therapy (NCEP-SLT) (Council of Higher Education, n.d.). Courses on AAC Systems usually start in the 3rd and 4th year of SLT undergraduate education. In these courses, it is aimed to establish basic

competencies for AAC Systems. The AAC Systems course taken during the undergraduate period affects the services to be provided during clinical practice and the clinical research to be conducted in this field. For this reason, the course is expected to increase the level of knowledge and awareness of the students. However, it is very important that the course taken is adequate and efficient for the students. While these courses aim to build foundational AAC competencies, there is limited evidence on their actual effectiveness in improving student awareness and knowledge. Identifying and eliminating the deficiencies in this area during the undergraduate period will ensure the development of clinical research and services in the future. Many other international and national awareness and knowledge level studies in the field of AAC Systems have been conducted with different populations such as SLT's (Koçak et al., 2023; Wormnæs & Abdel Malek, 2004; Yaşa & Tokalak, 2023; Zarifian et al., 2021), special education teachers (İnce et al., 2023; Servi and Baştuğ, 2021; Subihi, 2013) who provide clinical services after completing their undergraduate education rather than undergraduate students. As in this study, there are few studies conducted with SLT undergraduate students (Shahbaz et al., 2022). As far as we know, there is no study examining the effect of taking AAC Systems course during the undergraduate period on awareness levels. This study addresses a critical gap in the literature by examining how exposure to AAC Systems courses affects the knowledge and awareness levels of SLT undergraduate students in Turkey. Unlike previous research, which mostly focuses on clinical professionals, this study uniquely targets students still in training. By doing so, it offers early insights into the potential strengths and shortcomings of AAC education at the undergraduate level.

In light of the above, this study aims to examine the awareness and knowledge levels of the students studying in different universities in Turkey according to the status of taking AAC Systems courses in SLT undergraduate departments. In addition, with this study, the adequacy and efficiency of the AAC Systems course taken during the undergraduate period will be evaluated in terms of students and the relationship between the level of knowledge and awareness will be determined. Determining the effect of the AAC Systems course at an early stage will help to identify and overcome the deficiencies of this course, if any, and will help to develop research and applications in this field. In this context, answers to the following questions will be sought:

1. What are the knowledge and awareness levels of SLT undergraduate students regarding AAC Systems?
2. What are students' perceptions of the adequacy and efficiency of the AAC Systems course?
3. What is the impact of taking an AAC Systems course on SLT students' levels of knowledge and awareness, as well as their understanding of target users, the implementation process, and perceived professional implications?

Materials and Methods

Research Design

This study is a descriptive survey study aiming to examine the awareness levels of SLT undergraduate students in Turkey according to their AAC Systems course-taking status.

Participants

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (25.03.2024, 42). Subjects were informed about the aims and procedures of the study, and informed consent was obtained after they agreed to participate.

The number of participants in this study was determined according to the rule that the number of participants should be 5 times the number of questions adopted in survey studies (Taherdoost, 2007). In this context, since there were 41 questions in the study, it was aimed to reach 205

participants. To participate in the study, it one was required to be a 3rd or 4th-year SLT student. As a result, 204 students studying in SLT undergraduate program at different universities in Turkey participated in this study. 1 student was excluded from the study because she answered the questionnaire even though she was a 2nd-year SLT undergraduate.

Materials

An online questionnaire created by the researchers was used to collect the quantitative data for this study. Two types of research were conducted to create these questionnaire items. As the first source, a literature review was conducted and studies investigating the level of awareness and knowledge about AAC Systems were examined by the researchers (Koçak et al., 2023; Shahbaz et al., 2022; Zarifian et al., 2021; Wormnæs & Abdel Malek, 2004). As the second source, the NCEP-SLT prepared for the SLT undergraduate departments in Turkey and AAC Systems course contents from different university curricula were examined (Council of Higher Education, n.d.). After these analyses, the questionnaire items were created by the researchers. Then, 2 expert SLT's working in the field of AAC Systems evaluated the survey questions and expert opinion was taken and it was revealed that the questions were aimed at the information to be measured. To reach the participants more easily, the questionnaire was converted into an online format.

The content of the questionnaire prepared by the researchers for this study is as follows: 6 open-ended questions about the sociodemographic information of the participants, including age, gender, the university where the undergraduate education continues, whether they have studied other departments before, in which year they are studying in the undergraduate department, whether they have done a practical internship before; 8 open-ended and optional questions about AAC and the course taken about AAC and whether they have heard of AAC before, whether they have knowledge of the abbreviations AAC, whether they have taken AAC course, in which class, how many semesters and how many hours per week, and whether this course time is sufficient; If the course was taken, there are 2 questions in which they rate the efficiency and adequacy of this AAC Systems course according to Likert-type scoring between 1 (minimum) and 10 (maximum) and 2 questions in which they rate their level of knowledge about AAC Systems and their recommendation of AAC Systems according to Likert-type scoring between 1 (minimum) and 10 (maximum). There are also 23 information questions about AAC systems, which are asked to answer by marking one of the options '*Yes*', '*No*', and '*I don't know*'. In other words, there are 41 questions in total. Table 1 presents the content-item number information regarding the content of the information questions about AAC Systems (see Table 1, question content-item number information).

Table 1 Content and item number of the knowledge questions on AAC Systems.

Content	Item Number
Information about individuals using AAC Systems	1,2, 3, 4,6,7,8,9,13, 14, 15
Information about the impact of AAC Systems on speech and language skills	5, 22, 23
Information about the assessment of individuals using AAC Systems	11, 12
Information on the use of AAC Systems	10, 19, 20
Information about SLT's practicing AAC Systems	16, 17, 18, 21

Data Collection

Participants in this study were 3rd- and 4th-year SLT undergraduate students recruited via social media platforms (WhatsApp, Instagram, Twitter, Facebook) using a Google Forms survey link. Before starting the questionnaire, participants were informed about the study and asked to provide

informed consent.

To minimize bias, the survey was anonymous and did not collect personal information. Neutral language was used, and demographic questions were kept general to avoid social desirability bias. Participants were instructed to complete the survey independently in one session. Sharing the survey across various platforms and university student communities aimed to reach a more diverse and representative sample.

Data Analyses

The SPSS v.23 (IBM, NY, USA) package program was used for data analysis. We evaluated categorical variables as numbers and percentage for descriptive analyses, normally distributed numerical variables as mean and standard deviation, and non-normally distributed numerical variables as median (minimum-maximum). As a result of the normal distributions of the obtained data, the Student t-test, or Mann-Whitney U test, was used for two-group comparisons. Chi-Square Test of Independence was used for two-group comparisons of categorical data. The significance level was accepted as $p<0.05$.

Results

Results Related to Participant Characteristics

Participants from 10 different universities in different regions of Turkey participated in this study. 204 SLT undergraduate students, 182 female (89.22%) and 22 male (10.78%), participated in the study. The average age of the participants was 21.9±1.05 years. 103 (50.49%) of the participants were 3rd grade students and 101 (49.51%) were 4th grade SLT undergraduate students. The mean ages of the participants according to gender and grade are presented in Table 2 (see Tablo 2, number and mean age of participants by gender and class).

Table 2 Number and mean age of participants by gender and class.

	n	**Age Mean ± *SD***
Female	182	22.0 ± 1.04
Male	22	21.8 ± 1.18
Class 3	103	22.04 ± 0.946
Class 4	101	22.04 ± 0.943

In this study, 96 participants (47.06%) had taken AAC Systems course; 108 participants (52.94%) had never taken AAC Systems course before. Of the participants who took AAC Systems course, 32 (33,33%) took AAC Systems course in the 2nd grade, 34 (35,42%) in the 3rd grade, and 68 (70,83%) in the 4th grade. The participants who took AAC Systems course stated that the course they took lasted 1 half term. 18 participants (18,75%) took AAC Systems course for 1 hour per week, 63 participants (65,63%) for 2 hours per week, 14 participants (14,58%) for 3 hours per week, and 1 participant (1,04%) for 4 hours per week. 15 participants (15,63%) who took the course wanted the course hours to be increased. 9 of the participants (9.31%) stated that they had not done an internship with a speech and language therapist before. In the comparison of the sociodemographic characteristics, including age and gender, internship status, and grade levels of the participants who took and did not take the AAC Systems course, no significant difference was found between age, and internship status, while statistically significant differences were found between gender and grade levels *($p<0.05$)* (see Table 3, Comparison of participants' age, gender, internship status and class level according to taking AAC Systems course). In addition, it was determined that 70.83% of the participants who took the AAC Systems course and 30.56% of the participants who did not take the course were enrolled in the 4th grade.

Table 3 Comparison of participants' age, gender, internship status and class level according to taking AAC Systems course.

	Course Takers (n:96)	**No Course Takers (n:108)**	***p***
Age	22.3 ± 0.995	21.7 ± 1.03	-
Internshıp Status	YES 84 NO 12	YES 101 NO 7	*p=0.134 (2.1796)*
Gender	MALE 6 FEMALE 90	MALE 16 FEMALE 92	***p=0.049 (3.875)***
Class Level	CLASS 3 28 CLASS 4 68	CLASS 3 75 CLASS 4 33	***p<0.001(32.9836)***

Results Related to Participants' Knowledge and Awareness Levels of AAC Systems

23 participants (11.27%) stated that they had never heard of AAC Systems before. 178 participants (87.25%) stated that they did not know that AAC Systems was called 'ADIY' in Turkey before (see Table 4, Comparison of the participants' hearing about AAC Systems and knowing that it is called (ADİY), their level of knowledge according to their own opinions, and their recommendation of AAC Systems according to whether they have taken the course or not). 27 participants (13.24%) stated that they did not know the definition of AAC Systems, while 9 participants (4.41%) gave incomplete or incorrect answers, although they stated that they knew. There were 168 participants (82.35%) who gave complete and correct answers. 3 participants made the definition of AAC Systems wrong even though they took the course.

Table 4 Comparison of the participants' hearing about AAC Systems and knowing that it is called (ADİY), their level of knowledge according to their own opinions, and their recommendation of AAC Systems according to whether they have taken the course or not.

	Course Takers (N:96)	**No Course Takers (N:108)**	***p***
Hearing About AAC Systems	YES 96 NO 0	YES 85 NO 23	-
Knowing That It Is Called (ADİY)	YES 19 NO 77	YES 7 NO 101	***p<0.01 (8.0965)***
Level Of Knowledge	5.47 ± 1.69	2.67 ± 2.14	***p<0.01***
Recommendation Of AAC Systems	5.47 ± 1.95	2.31 ± 2.34	***p<0.01***

The knowledge level of the participants, according to their own opinions, was 5.47 ± 1.69 out of 10 points for the participants who took the course and 2.67 ± 2.14 points for the participants who did not take the course. In terms of recommending AAC Systems, the participants who took the course gave an average score of 5.47 ± 1.95 out of 10 points, and the participants who did not take the course gave an average score of 2.31 ± 2.34 (see Table 4, Comparison of the participants' hearing about AAC Systems and knowing that it is called (ADİY), their level of knowledge according to their own opinions, and their recommendation of AAC Systems according to whether they have taken the course or not). According to the participants' own opinions, when the knowledge levels and AAC Systems recommendation status were compared according to the status of taking and not taking

the course, it was found that there were significant differences between the two groups *(p<0.05)* (see Table 4, Comparison of the participants' hearing about AAC Systems and knowing that it is called (ADİY), their level of knowledge according to their own opinions, and their recommendation of AAC Systems according to whether they have taken the course or not).

The participants who took the course gave an average of 6.16 ± 2.58 for the efficiency of the course and 6.36 ± 2.58 for the adequacy of the course out of 10 points. The efficiency and adequacy responses of the course takers are shown in Figure 1 and Figure 2. (see Figure 1, course efficiency; see Figure 2, course adequacy)

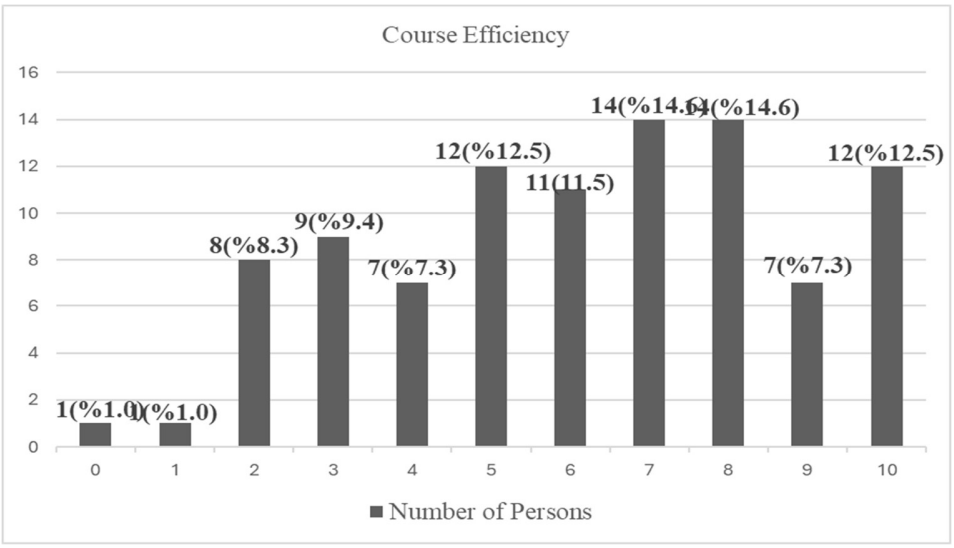

Figure 1: Participants' course efficiency scores.

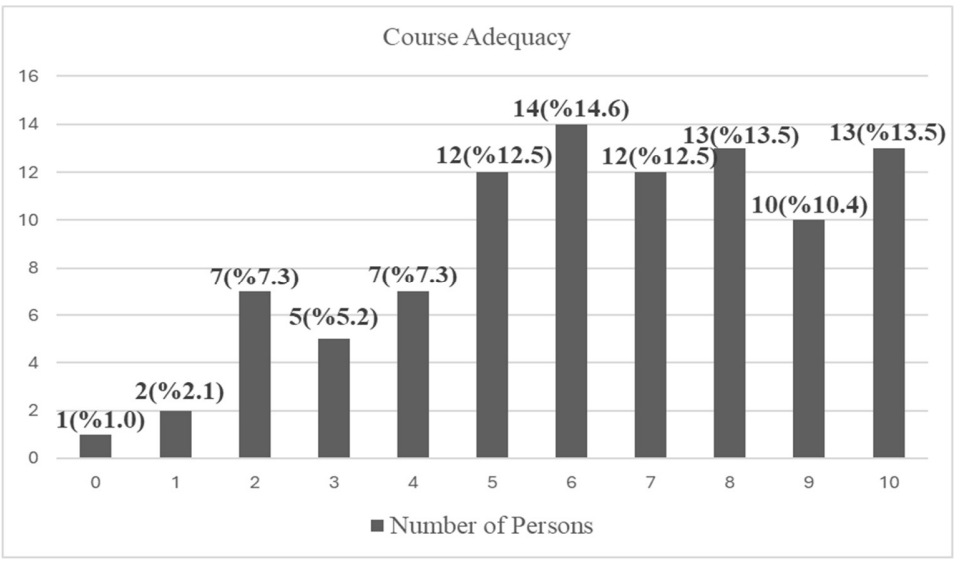

Figure 2: Participants' course adequacy scores

All participants considered their overall knowledge level to be 3.99 ± 2.39 on average (see Figure 3, knowledge level) and stated that they would recommend AAC Systems with an average of 3.79 ± 2.68 (see Figure 4, recommend AAC Systems).

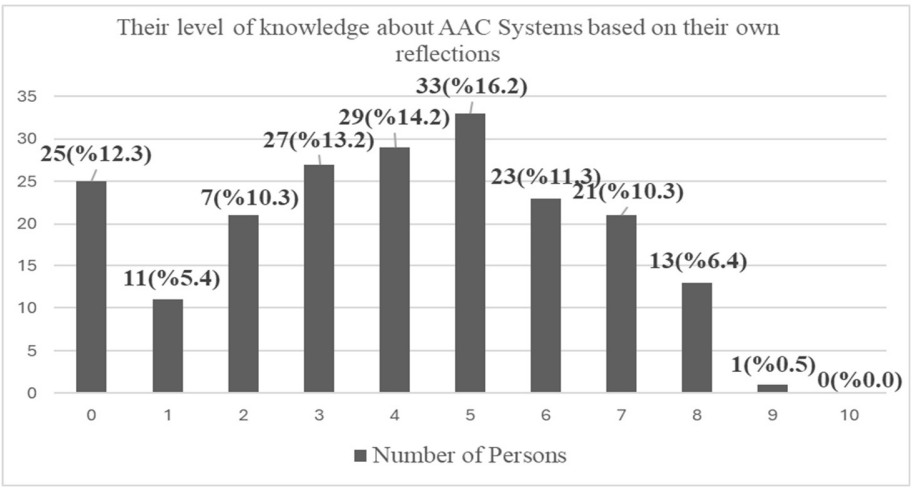

Figure 3: Participants' knowledge level scores based on their own views about AAC Systems

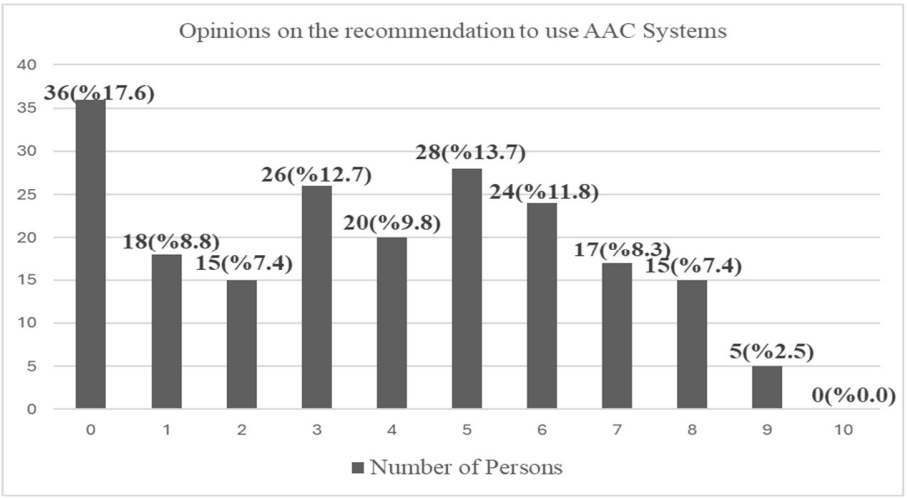

Figure 4: Respondents' scores for recommending the use of AAC Systems

It was found that there was a statistically significant difference between the participants who took the course and those who did not take the course in terms of the answers given as 'Yes', 'No', and 'I don't know' for the 23 information questions asked *($p<0.05$).* It was observed that the percentage of ''I don't know'' answers given by the participants who did not take the course was high. Table 5 shows the information questions and the answers given by the participants. Correct answers are also marked in bold and italicised (see Table 5, questionnaire items, participant answers and correct answers).

Table 5 Participants' responses to the questions according to whether or not they have taken AAC Systems course and statistical significance levels and correct answers).

Question	**All Answers n (%)**	**Course Takers n(%)**	**No Course Takers n(%)**	X^2, p

AAC Systems can be applied to all age groups.	***Yes*** 137(67.2) No 27(13.2) I don't know 40(19.6)	***Yes*** 75 (78.1) No 20 (20.8) I don't know 1 (1.0)	***Yes*** 62 (57.4) No 7 (6.5) I don't know 39 (36.1)	43.036, *p<0.00001*
AAC Systems must be used for life.	Yes 30(14.7) ***No*** 103(50.5) I don't know 71(34.8)	Yes 14(14.6) ***No*** 68(70.8) I don't know 14 (14.6)	Yes 16 (14.8) ***No*** 35 (32.4) I don't know 57 (52.8)	36.168, *p<0.00001*
Individuals with at least some verbal output are not eligible to use AAC Systems.	Yes 13 (6.4) ***No*** 143(70.1) I don't know 48(23.5)	Yes 7 (7.3) ***No*** 84(87.5) I don't know 5 (5.2)	Yes 6 (5.6) ***No*** 59(54.6) I don't know 43 (39.8)	33.943, *p<0.00001*
An individual with a cognitive disability cannot use AAC Systems.	Yes 17 (8.3) ***No*** 127 (62.3) I don't know 60(29.4)	Yes 14 (14.6) ***No*** 71 (74.0) I don't know 11 (11.5)	Yes 3 (2.8) ***No*** 56(51.9) I don't know 49(45.4)	32.362, *p<0.00001*
A person using AAC Systems stops developing speech.	Yes 2 (1.0) ***No*** 163 (79.9) I don't know 39(19.1)	Yes 2 (2.1) ***No*** 91 (94.8) I don't know 3 (3.1)	Yes 0 (0.0) ***No*** 72 (66.7) I don't know 36 (33.3)	-
AAC Systems can also be used as a support for those whose speech is not understood by unfamiliar people and who want to improve their communication.	***Yes*** 159 (77.9) No 7 (3.4) I don't know 38(18.6)	***Yes*** 90 (93.8) No 4 (4.2) I don't know 2 (2.1)	***Yes*** 69 (63.9) No 3 (2.8) I don't know 36 (33.3	32.745, *p<0.00001*
AAC Systems cannot be used in infancy.	Yes 39 (19.1) ***No*** 85 (41.7) I don't know 80(39.2)	Yes 26 (27.1) ***No*** 48 (50.0) I don't know 22 (22.9)	Yes 13 (12.0) ***No*** 37 (34.3) I don't know 58 (53.7)	21.325, *p<0.00002 3*
AAC Systems is only used in adults.	Yes 4 (2.0) ***No*** 159 (77.9) I don't know 41(20.1)	Yes 1 (1.0) ***No*** 89 (92.7) I don't know 6 (6.2)	Yes 3 (2.8) ***No*** 70 (64.8) I don't know 35 (32.4)	23.157, *p<0.00001*

AAC Systems can be used by healthy individuals.	***Yes*** (56.4) No (11.8) I don't know 65(31.9)	115 24	***Yes*** No I don't know	68 (70.8) 13 (13.5) 15 (15.6)	***Yes*** No I don't know	47 (43.5) 11 (10.2) 50 (46.3)	22.219, *p<0.00015*
When using AAC Systems, the individual needs to use the same system without changing it all the time.	Yes (4.4) ***No*** (60.8) I don't know 71(34.8)	9 124	Yes ***No*** I don't know	5 (5.2) 80 (83.3) 11 (11.5)	Yes ***No*** I don't know	4 (3.7) 44 (40.7) 60 (55.6)	43.825, *p<0.0001*
Talent profiling should be done in the AAC Systems.	**Yes** (68.6) No (2.5) I don't know 59(28.9)	140 5	**Yes** no I don't know	81 (84.4) 4 (4.2) 11 (11.5)	**Yes** No I don't know	59 (54.6) 1 (0.9) 48 (44.4)	27.851, *p<0.0001*
The communication profile is not required for every individual in the AAC Systems assessment.	Yes (5.4) **No** (60.3) I don't know 70(34.3)	11 123	Yes **No** I don't know	8 (8.3) 72 (75.0) 16 (16.7)	Yes **No** I don't know	3 (2.8) 51 (47.2) 54 (50.0)	25.870, *p<0.0001*
AAC Systems can only be offered to individuals who have not benefited from therapy.	Yes (6.9) **No** 142 (69.6) I don't know 48(23.5)	14	Yes **No** I don't know	5 (5.2) 89 (92.7) 2 (2.1)	Yes **No** I don't know	9 (8.3) 53 (49.1) 46 (42.6)	50.070, *p<0.0001*
AAC Systems may be recommended for speech intelligibility in individuals with apraxia and dysarthria.	**Yes** (63.2) No (6.9) I don't know 61(29.9)	129 14	**Yes** No I don't know	73 (76.0) 10 (10.4) 13 (13.5)	**Yes** No I don't know	56 (51.9) 4 (3.7) 48 (44.4)	24.279, *p<0.0001*
Individuals with dementia cannot use AAC Systems due to cognitive impairment.	Yes (8.3) ***No*** 89(43.6) I don't know 98(48.0)	17	Yes ***No*** I don't know	14 (14.6) 50 (52.1) 32 (33.3)	Yes ***No*** I don't know	3 (2.8) 39 (36.1) 66 (61.1)	19.635, *p<0.00054*
All SLT's	***Yes***	154	***Yes***	92 (95.8)	***Yes***	62 (57.4)	41.45

should know AAC Systems.	(75.5) No 9 (4.4) I don't know 41(20.1)		No 2 (2.1) I don't know 2 (2.1)		No 7 (6.5) I don't know 39 (36.1)		0, *p<0.0 0001*
Training is required to use AAC Systems.	***Yes*** 128 (62.7) No 30 (14.7) I don't know 46(22.5)		***Yes*** 65 (67.7) No 24 (25.0) I don't know 7 (7.3)		***Yes*** 63 (58.3) No 6 (5.6) I don't know 39(36.1)		32.49 9, *p<0.0 0001*
Only people trained in this field can recommend AAC Systems.	***Yes*** 96 (47.1) No 53 (26.0) I don't know 55(27.0)		***Yes*** 55 (57.3) No 32 (33.3) I don't know 9 (9.4)		***Yes*** 41 (38.0) No 21 (19.4) I don't know 46 (42.6)		28.60 9, *p<0.0 0001*
Continuous assessment of the difficulties experienced by individuals using AAC Systems is necessary.	***Yes*** 153 (75.0) No 3 (1.5) I don't know 48(23.5)		***Yes*** 92 (95.8) No 1 (1.0) I don't know 3 (3.1)		***Yes*** 61 (56.5) No 2 (1.9) I don't know 45 (41.7)		42.80 7, *p<0.0 0001*
Using AAC Systems reduces the workload for families.	***Yes*** 151 (74.0) No 8 (3.9) I don't know 45(22.1)		***Yes*** 90 (93.8) No 3 (3.1) I don't know 3 (3.1)		***Yes*** 61 (56.5) No 5 (4.6) I don't know 42 (38.9)		39.30 0, *p<0.0 0001*
The use of AAC Systems affects the job opportunities of employees working in special education and rehabilitation centers.	***Yes*** 64 (31.4) No 64 (31.4) I don't know 76(37.3)		***Yes*** 32 (33.3) No 44 (45.8) I don't know 20 (20.8)		***Yes*** 32 (29.6) No 20 (18.5) I don't know 56 (51.9)		25.43 5, *p< 0.000 01*
AAC Systems helps develop language skills.	***Yes*** 129 (63.2) No 20 (9.8) I don't know 55(27.0)		***Yes*** 73 (76.0) No 12 (12.5) I don't know 11 (11.5)		***Yes*** 56 (51.9) No 8 (7.4) I don't know 44 (40.7)		22.21 1, *p<0.0 0001 5*
The use of AAC Systems regresses existing speech skills.	Yes 15 (7.4) ***No*** 130 (63.7) I don't know 59(28.9)		Yes 7 (7.3) ***No*** 77 (80.2) I don't know 12 (12.5)		Yes 8 (7.4) ***No*** 53 (49.1) I don't know 47 (43.5)		24.64 0, *p<0.0 0001*

Discussion

This study aimed to examine the knowledge and awareness levels of SLT undergraduate students studying in different universities in Turkey according to the status of taking AAC Systems course. In addition, it was also aimed to evaluate the AAC Systems course taken in terms of adequacy and efficiency and to determine its relationship with knowledge and awareness levels. The findings obtained in line with these objectives were discussed in response to relevant questions.

1. What are the knowledge and awareness levels of SLT undergraduate students regarding AAC Systems?

The first finding to be discussed is the participants' rating of their own level of knowledge about AAC Systems. According to this, all participants think that their level of knowledge about AAC Systems is 3.99 on average out of 10 points. Considering the fact that there are some of the participants who did not take the course, it is seen that the level of knowledge about AAC Systems is insufficient. In this evaluation, in which the participants rated their knowledge level about AAC Systems, a statistically significant difference was found according to the status of taking AAC Systems course, with an average of 5.47 for the participants who took the course and 2.67 for the participants who did not take the course. This finding shows that the knowledge level of the participants who took the AAC Systems course increased according to their own thoughts and that they were more confident in their own knowledge about AAC Systems than those who did not take the course. As a result, it can be said that taking a course related to AAC Systems is effective in having basic knowledge in this field. However, the theoretical and practical nature of the course taken and its content according to the topics covered were not asked in our study. In future studies, information can be obtained from SLT students on these issues.

2. What are students' perceptions of the adequacy and efficiency of the AAC Systems course?

Although the quality and content characteristics of the AAC Systems course were not questioned in this study, the participants who took the course gave an average of 6.16 to the efficiency of the course and 6.36 to the adequacy of the course out of 10. This scoring shows that there are basic competences and efficiencies of the course according to the participants. Shahbaz et al. (2022), as a result of a study conducted with 50 final year SLT undergraduate students, found that the majority of the students who took the AAC Systems course had sufficient knowledge and training on AAC Systems (Shahbaz et al., 2022). The results of our study supported this study. However, in a study conducted by Koçak et al. (2023) to examine the opinions of 45 SLT's about AAC Systems, although 57.8% of the participants took AAC Systems course during their undergraduate education, only 8.9% of them stated that they found this course sufficient (Koçak et al., 2023). In our study, the participants' opinions about the adequacy and efficiency of the AAC Systems course were not found to be as low as those of graduated SLT's. This difference may have resulted from the fact that the participants in our study had not yet performed independent clinical practice for AAC Systems and therefore had not tested the adequacy and efficiency of the theoretical knowledge in the AAC Systems course. Another reason for this difference may be that the participants in the study received education in different schools with different course contents. In addition, in our study, all participants gave an average score of 3.79 out of 10 points, the participants who took the course gave an average score of 5.47, and the participants who did not take the course gave an average score of 2.31. This finding shows that having taken the AAC Systems course has an effect on the use and recommendation of AAC Systems. However, the average score of the participants who took the course could have been higher. This may have been due to their lack of clinical experience for the use of AAC Systems and their hesitation to mislead.

3. What is the impact of taking an AAC Systems course on SLT students' levels of knowledge and awareness, as well as their understanding of target users, the implementation

process, and perceived professional implications?

One of the basic pieces of information about AAC Systems is knowing that the acronym stands for 'Augmentative and Alternative Communication' Systems and knowing that the former acronym in Turkey was 'ADIY'. In this study, although most of the participants knew the acronym AAC Systems, the majority stated that they did not know that AAC Systems was previously called ADIY in Turkey. This finding shows that although SLT undergraduate students do not take AAC Systems courses directly, they have heard of AAC Systems anywhere, but they need to do more research or take a course to know that it is called AAC Systems, which is retrospective information. In addition, the fact that this information is not known by the participants taking the course may be since the development of AAC Systems in Turkey is not covered as a course content. This situation should be taken into account when designing the course content course.

AAC Systems can be used in all individuals who need to improve their communication skills for different reasons, regardless of age (ASHA, 2024). AAC Systems is not only used for individuals who have problems in verbal communication but can also be used for different purposes in healthy individuals. For example, AAC Systems can be used to support literacy skills in education and training services (Foley & Staples, 2003). The use of gestures and mimics together with speech to support communication is another example of the use of AAC Systems in healthy individuals. AAC Systems is used in communication disorders that may be experienced due to many developmental and acquired disorders. In our study, with the questions prepared to test this knowledge, the knowledge levels of SLT undergraduate students about AAC Systems were compared according to their course taking status. Except for certain items, it was found that the level of knowledge about AAC Systems in the undergraduate period was good. However, as expected, it was found that the accuracy rate in the answers of the participants who took the course was higher than those who did not take the course, the answers given differed statistically according to the status of taking the AAC Systems course, and the percentage of 'I don't know' answers given by the participants who did not take the course was high. This finding shows that taking AAC Systems course increases the level of knowledge. For this reason, trainings can be given and seminars can be organised to overcome the knowledge deficiencies of those who have not taken AAC Systems course. In addition, these topics can be covered with different contents in other courses before taking the AAC Systems course.

When the salient findings from the information questions in this study are examined in detail, *'AAC Systems should be used for life*' , *'AAC Systems cannot be used in infancy'* , *'AAC Systems can be used by healthy individuals'*, and *'Individuals with dementia cannot use AAC Systems due to cognitive impairment*', it was seen that the 'I don't know' answers of the individuals who did not take the course were higher than the correct answers. These findings show that taking undergraduate courses is very important in the selection of individuals who will use AAC Systems. This finding is consistent with the finding in an awareness study conducted with 111 SLT's in Iran that the level of knowledge of therapists about the target group of AAC Systems is insufficient and that more training is needed (Zarifian et al., 2021). The good knowledge of SLT's about the identification of suitable candidates for AAC Systems and determining the needs of these candidates will ensure that people in need of AAC Systems have access to appropriate services at an early stage. In this study, the reason why the knowledge questions included questions about the candidates suitable for the use of AAC Systems is that this is the first competence to be provided in this subject.

For individuals using AAC Systems to use the system efficiently, an individual assessment should be carried out by SLT's, a skill profile should be prepared, and an appropriate system should be recommended by identifying their communicative skills. Accurate assessment is vital in recommending appropriate and sustainable AAC Systems (Costigan and Light, 2010). The questions *'Communication profile is not necessary for every individual in the evaluation of AAC Systems*' and *'When using AAC Systems, the individual should use the same system without changing it*' were

answered as 'I don't know' by those who did not take the course. Following the evaluations, the process of AAC Systems implementation and intervention can be challenging and requires special knowledge (Siu et al., 2010). Due to the need for advanced knowledge to answer these questions, participants who did not take the AAC Systems course may have stated that they did not know the answer. For this reason, there is a necessity to include information about the communication profile of individuals who are the target audience of AAC Systems, and AAC Systems is a process that needs to be constantly renewed according to the needs profile of the person. Increasing the knowledge and awareness of SLT's on these issues will ensure that AAC Systems assessment and intervention processes are carried out correctly.

Finally, the question "*The use of AAC Systems affects the job opportunities of those working in special education and rehabilitation centers*," which questions the effect of AAC Systems on the work and job opportunities of SLT's, was answered as "no" by those who took the course and as "I don't know" by those who did not take the course. This result shows that those who took the course are aware that AAC Systems is the field of work of SLT's and that recommending AAC Systems to their clients will not negatively affect their business lives. SLT's who graduated from undergraduate education by taking the AAC Systems course can decide on the adequacy of the training in this field and analyze the impact on job opportunities.

Conclusion

The findings revealed that most SLT undergraduate students perceived their knowledge about AAC Systems as limited. This limited understanding also appeared to influence their hesitation to recommend AAC Systems in clinical practice. These results emphasize the need for targeted educational efforts in undergraduate programs to improve foundational awareness and knowledge in this field.

Although students who had taken the AAC Systems course felt somewhat more confident, their evaluations of the course's adequacy and efficiency suggested that the current content may not be fully meeting their learning needs. This highlights the importance of reviewing and enhancing the course structure, possibly by integrating more practical components and up-to-date clinical applications.

The course appeared to positively influence students' knowledge and awareness, particularly in recognizing individuals who may benefit from AAC Systems and understanding the basic processes of assessment and implementation. However, students who had not taken the course demonstrated notable gaps in these areas. Addressing these gaps through structured education and additional training opportunities would contribute to better clinical readiness. Enhancing undergraduate training in AAC Systems can ultimately support early intervention strategies and improve the quality of life for individuals in need.

This study contributes uniquely to the literature by focusing on SLT students rather than graduates, thereby identifying knowledge gaps and educational needs at an earlier stage of professional development.

Clinical Implications

SLT's should receive the necessary training to carry out the identification, evaluation and therapy processes for individuals in need of AAC Systems services to provide clinical services. These trainings start during the undergraduate period. As emphasized in this study, taking effective and sufficient courses during the undergraduate period will strengthen the content of the services provided in the clinical environment.

Limitations and Future Directions

In this study, while comparing the level of awareness and knowledge according to the status of taking an undergraduate course on AAC Systems in Turkey, information such as the content of the course taken and whether an application was made was not questioned. In new studies to be conducted with undergraduate students, the content and qualitative characteristics of the course can be questioned. In addition, participants who do not take the course can be given training about AAC Systems in accordance with the course curriculum, and the effect of the course can be observed more accurately by reapplying the same questionnaire after the training.

Ethics Committee Approval

This study was conducted in accordance with the Declaration of Helsinki and approved by Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (25.03.2024, 42). Subjects were informed about the aims and procedures of the study, and informed consent was given after they agreed to participate. Dated 25.3.2024/42. Ankara Medipol University.

Author Contribution Statement

Planning of the study MMP and MA; survey design ING, MMP, MA, DÇ; data collection ING, MA and DÇ; interpretation of the results ING and MMP; writing of the article ING, MMP and DÇ.

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No potential conflict of interest was reported by the authors

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