

The Relationship between Learning Style, Test Anxiety and Academic Achievement

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Abstract This study aimed to investigate the relationship between social studies pre-service teachers' (SSPTs) learning style, test anxiety and academic achievement. A total of 315 SSPTs participated in the study. Data were collected using Turkish versions of Grasha-Reichmann learning style scale (GRLSS) and test anxiety scale (TAS) by Spielberger. According to the findings, SSPTs' academic achievements had negative and low-level relationship with the TAS' worry sub-dimension while they had no significant relationship with the emotionality sub-dimension. No statistically significant relationship was observed between test anxiety and independent, participant and avoidant learning styles, which are among GRLSS sub-dimensions. The findings revealed that competitive and cooperative learning styles had positive, low-level and significant relationship with the TAS' emotionality sub-dimension, and the same relationship was observed between the competitive learning style and the worry sub-dimension. The relationship of gender and class level with learning styles and test anxiety was also investigated in this study.

Keywords Academic Achievement, Learning Style, Test Anxiety, Social Studies, Pre-service Teacher

1. Introduction

Learning, which is said to be a process, consists of various dimensions including planning, application, assessment and evaluation [58]. In parallel with the developments in instruction today, it is stated that the relation between the teaching, learning and evaluation processes has become more productive [67]. In academic studies conducted in this field, the variables that affect student success are tested as "students are the basic focus point of instructional systems" [82, p.6].

Although there are differences in the meaning attributed to the term success [55, p.571], improving education and enabling students to achieve their learning objectives or to become successful, have long become among the aims of

educators and politicians [37, p.687]. In this context, with reference to the idea that the reasons for students' success or failure should be thought of as being multidimensional and multivariable [85, p.12], studies aiming to determine the factors that affect students' success have an important place in educational research.

The effects of many individual and environmental factors on student success including student's age [65], attention [57], motivation [63], past [50], socio-economical state [12, 60], teacher's behaviors [26], teaching methods used by the teacher [42], class size [2,5,66], and peers [41] have been investigated by researchers in the education field.

It is frequently mentioned in related literature that individuals have different learning styles, which play an important role in the learning process [13,14, 68] and that test anxiety affects student success negatively [8,15,76] in exams, which are the essential tools in testing the effectiveness of schools and in determining whether students succeed academically [87]. With reference to these claims, the purpose of this study is to examine the effect of students' learning styles and their test anxieties on each other and on the students' academic successes.

Carrying out the application part of the study together with social studies pre-service teachers (SSPTs) is of particular importance. It is because social studies, which is not a science itself but a field of study consisting of social and human sciences designed to improve students' citizenship efficiencies, includes having to learn and succeed in various sciences, from history to psychology, mathematics or natural sciences [70]. This makes it necessary for future SSPTs to take classes on different sciences during their undergraduate education.

1.1. Theoretical Background

1.1.1. Test Anxiety

Anxiety is generally defined as the state of concern and fear [4,64] occurring as a result of stress that people often have to contend with in every aspect of their lives and at every age [61, 86] and that causes cognitive, affective, behavioral and physical reactions [80, p. 931]. Test anxiety

is stated as an emotional reaction or state of stress that occurs before exams and lasts during the exam period [8, 48].

The terms fear of test and test anxiety that are used interchangeably in literature, although they have different indicators, should be given attention [3]. Fear represents the reaction to a specific observable danger while anxiety is an aimless state of concern [6]. It is stated that fear of test motivates a person as long as it is within reason [3] while test anxiety is said to affect students negatively, cognitively, sensually and behaviorally [7,15,18,76]. As a result of such negative effects of test anxiety on students, studies aimed at determining and minimizing the effects of certain factors on students' test anxiety levels have gained momentum, and suggestions for minimizing students' levels of test anxiety have been made frequently in literature [79]. Although various comments have been made about the origins of test anxiety, it is stated that many factors including socio-economic and demographic variables, educational systems and cultural values of education [24], certain emotional states, students' past experiences and beliefs [64] affect the development of test anxiety.

1.1.2. Learning Style

Following Dunn and Dunn's [31] claim that learning is individual and occurs differently at every single age and intellectual capacity, the idea that students have different preferences in the periods of receiving and processing knowledge [40], or their learning process works differently as they have different learning styles, is accepted among educators [40,49,62,69,75].

While there is not one single definition of learning style that is commonly accepted by everyone related to the issue [27], various definitions in which individual learning and student preferences are emphasized [30,53] and that are associated with personality [47,49] exist in literature. In brief, "Learning style is the usual way one prefers in the process of acquiring, proceeding and storing new information." [17, p. 290] and "... consists of distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment. It also gives clues as to how a person's mind operates" [44, p. 234].

The characteristics of learning styles that enable individualized instruction [33] serve to understand how students receive information in different ways [21] and help learning process to occur systematically. With reference to the fact that even experienced teachers cannot determine all their students' learning styles through observation [32, p. 79], various learning style models/inventories have been developed. When related literature is examined, it is seen that more than 70 scales based on different classifications [45,51] exist including many well-known scales such as "Dunn and Dunn- Learning Styles Inventory", "Felder and Silverman- Index of Learning Styles", "Grasha-Riechmann-Student Learning Style Scales", "Gregorc Mind Styles Delineator", "Honey and Mumford- Learning Styles

Questionnaire", "Kolb- Learning Style Inventory", "Myers-Briggs Type Indicator" and "Vermunt- Inventory of Learning Styles".

1.2. Present Study

The main purpose of this study is to determine whether there is a relation between SSPTs' learning styles, levels of test anxiety and academic successes. Besides this purpose, the effects of SSPTs' gender and class level on their learning styles and test anxieties are also tested. The research questions developed within the study are the following:

Research Question 1: Is there a relation between SSPTs' test anxieties and academic successes?

Research Question 2: Is there a relation between SSPTs' learning styles and academic successes?

Research Question 3: Is there a relation between SSPTs' learning styles and test anxieties?

Research Question 4: Does gender affect SSPTs' learning styles?

Research Question 5: Does gender affect SSPTs' test anxieties?

Research Question 6: Does class level affect SSPTs' learning styles?

Research Question 7: Does class level affect SSPTs' test anxieties?

2. Method

This study was designed on the basis of Relational Screening Model, "a research model that aims to identify the existence and/or level of covariance between two or more variables" [54, p.81].

2.1. Participants

The study group consists of 315 SSPTs ([1] class: 42 females + 40 males: 82, [2] class: 35 females + 41 males: 76, [3] class: 46 females + 40 males: 86, [4] class: 34 females + 37 males: 71) out of 399 SSPTs (186 females, 213 males) studying in the Department of Social Studies Education, Primary Education Department, Faculty of Education, Ömer Halisdemir University. The participants were chosen on a voluntary basis and 79 SSPTs who did not volunteer or could not be contacted anymore at the time the screening was conducted were not included in the study group. Also, the responses of five SSPTs who did not fill out the personal information part of the form or ranked more than one answer for some items were no longer included in the analysis.

2.2. Data-gathering Instruments

The Grasha – Riechmann Learning Style Scale (GRLSS),

the Test Anxiety Scale (TAS) and the Personal Information Form (PIF) were used as assessment tools in the study.

2.2.1. Test Anxiety Scale

TAS, the original of which was developed by Spielberger in 1980 and consisted of worry and emotionality sub-dimensions, is a Likert-type scale with 20 items. The scale was adapted to Turkish by Albayrak Kaymak [1] and Öner [72]. Internal consistency, which was found to be between .92 and .96 in the statistical process conducted by Spielberger was calculated to be between .82 and .92 in the Turkish form of the scale. Item load value in the original form was between .61 - .69 while it was between .46 and .53 in the Turkish form [1, p.62]. The factor analysis of the Turkish version of the scale showed that 12 items comprised the emotionality dimension and eight items formed the worry dimension as in the original form. Cronbach's Alpha value for the whole scale was calculated as 0.87 [72,73]. However, Cronbach's Alpha value in this study was found to be .92.

The highest point to reach in this scale is 80 while the lowest is 20 [1, p.56]. The point taken from the scale also indicates how high the student's anxiety level is [73]. Participants responded on a 4-point scale ranging from 1 = Never, 2= Sometimes, 3= Often, to 4= Always. The main reasons why TAS was used in this study are the following:

- to show statistically that the scale developed by Spielberger (1980) still preserves its actuality and reliability in Turkey and that it may be considered as a cross-cultural scale considering the fact that it was used in more than 20 countries including Israel, Norway, India, Pakistan, Italy, China, Hungary and Greece [10,83] and
- to state that the scale is appropriate to a wide range of age groups [1, p. 56] and that it can be applied for testing university students' test anxiety [18].

2.2.2. Learning Style Scale

The Turkish version of the GRLSS [78], by Saritaş and Süral [81], was used in this study. It is a five-point Likert scale with 60 items and six dimensions, namely Independent, Dependent, Collaborative, Competitive, Participant and Avoidant. The Cronbach's alpha value during the adaptation of the scale into Turkish, was measured as .80 for the whole scale [81]. Cronbach Alpha value in this study was found to be .92. Participants responded on a 5-point scale ranging from 1 = completely disagree, to 5= fully agree.

Some characteristic features revealed by students in the dimensions existing in the scale, stated by Riechmann and Grasha [78, p.221-222] were the following:

1. *Independent. This response style is characteristic of the student who likes to think for himself...*
2. *Dependent. This style is characteristic of the student who shows little intellectual curiosity and who learns only what is required...*

3. *Collaborative. This style is typical of the student who feels he can learn the most by sharing his ideas and talents...*
4. *Competitive. This response style is exhibited by the student who learns the material in order to perform better than others in the class...*
5. *Participant. This style is characteristic of the student who wants to learn the course content and likes to go to class.*
6. *Avoidant. This response style is typical of a student who is not interested in learning the course content in the traditional classroom..."*

The main reasons for using the Turkish version of GRLSS [81] in this study are the following:

- It is stated that the learning style scale developed by Grasha and Riechmann contains all the psychological-type theories, making it strong and ready to be used in determining the individual differences that have impacts on learning [43, p.119-120].
- Due to the dimensions and items included in the scale, GRLSS is an appropriate scale to determine the learning styles of university students [81] and it has a structure focusing on the attitudes of students to teachers, other students, classroom activities and learning style in general [16,27,28].

2.2.3. Personal Information Form

The gender, class level and general academic averages of the students studying in the Department of Social Studies Education were included in the PIF. Having regard to the fact that general academic average is the most correct and reliable tool to determine the success level of students at graduate level [77, p. 354], the SSPT success levels in this study were assessed based on general academic achievement scores. Because the general academic achievement averages in the university where the study took place are graded using a four-point grading system, students were asked to rank their general academic averages as "0 - 0.5", "0.51 - 1", "1.01 - 1.5", "1.51 - 2", "2.01 - 2.50", "2.51 - 3.00", "3.01 - 3.50" and "3.51-4.00".

2.3. Procedure

Within the application process of this study, the steps taken in sequence were the following:

- Permission to use the Turkish versions of GRLSS and TAS were sought and received from the academicians who developed them.
- SSPTs were informed about the purpose of the study and about the process to be carried out in detail, and that inclusion to the study was voluntary.
- The PIF, GRLSS and TAS were distributed to the students within the same week and they were made to be applied within one class hour (45 minutes).

- The responses of the SSPTs to the PIF and to the scales were statistically analyzed.
- Finally, the findings were discussed by supporting them with literature.

2.4. Data Analysis

Bivariate correlation, independent samples t-test and one-way ANOVA tests were used for the statistical analysis of the data; tables were created and descriptive statistics were used to create graphics. The correlation coefficients for “0.00-0.30”, 0.31-0.70” and “0.71-1.00” were measured as low relation, moderate relation and high relation, respectively [11, p.32].

3. Results

3.1. The Relationship between “Test Anxiety” and “Academic Achievement”

Table 1. The relationship of academic achievement with the whole test anxiety scale and its sub-dimensions.

	Academic Achievement	Dimensions of Test Anxiety		Total Scale	
		Worry	Emotionality		
Academic Achievement	r	1	-.183**	-.057	-.111
	p		.001	.312	0.50
	n	315	315	315	315

** p < .01.

When the SSPT levels of academic achievement and test anxiety were examined, no significant relationship was

found between academic achievement levels and TAS as a whole or only with the emotionality sub-dimension. However, it was seen that there was a significant, negative and low-level relationship between the worry sub-dimension and the academic achievement levels (Table 1).

3.2. The Relationship between “Learning Style” and “Academic Achievement”

When the relationship was examined between SSPT’s academic achievement levels and learning styles, which constitute the GRLSS, the following findings were observed:

Academic achievement levels have significant, positive and low-level relationship with independent, cooperative and dependent learning styles. There is positive, moderate-level and significant relationship between participant learning style and academic achievement levels. A negative, low-level and significant relationship exists between avoidant learning style and academic achievement levels (Table 2).

3.3. The Relationship between “Learning Style” and “Test Anxiety”

The analysis of the sub-dimensions of GRLSS and TAS showed that there was a positive, low-level and significant relationship between the dependent, competitive and participant learning styles and the emotionality sub-dimension. Such a relationship was also found between the competitive learning style and the worry sub-dimension. No significant relationship was found between the independent, avoidant and collaborative sub-dimensions in GRLSS and the worry and emotionality sub-dimensions in TAS (Table 3).

Table 2. The relationship between academic achievement and learning styles.

	Academic Achievement	Dimensions of GRLSS						
		Independent	Avoidant	Collaborative	Dependent	Competitive	Participant	
Academic Achievement	r	1	,187**	-,302**	,138*	,179**	,108	,310**
	p		,001	,000	,015	,001	,055	,000
	n	315	315	315	315	315	315	315

*p < .05. ** p < .01.

Table 3. The relationship of the whole TAS and its sub-dimensions with GRLSS sub-dimensions.

	Dimensions of GRLSS						Dimensions of TAS		
	Independent	Avoidant	Collaborative	Dependent	Competitive	Participant	Worry	Emotionality	
Independent	r	1	.039	.287**	.201**	.138*	.233**	-.103	-.060
	p		.489	.000	.000	.014	.000	.067	.292
	n	315	315	315	315	315	315	315	315
Avoidant	r	1	-.105	-.069	-.231**	-.461**	.095	.002	
	p		.063	.222	.000	.000	.091	.975	
	n	315	315	315	315	315	315	315	
Collaborative	r		1	.383**	.314**	.384**	.030	-.011	
	p			.000	.000	.000	.600	.847	
	n		315	315	315	315	315	315	
Dependent	r			1	.390**	.536**	.094	.148**	
	p				.000	.000	.096	.009	
	n			315	315	315	315	315	
Competitive	r				1	.542**	.139*	.132*	
	p					.000	.014	.019	
	n				315	315	315	315	
Participant	r					1	.062	.116*	
	p						.272	.039	
	n					315	315	315	
Worry	r						1	.802**	
	p							.000	
	n						315	315	
Emotionality	r							1	
	p								
	n								315

*p < .05. ** p < .01.

3.4. The Relationship between “Gender” and “Learning Style”

When the relationship between gender and learning style was examined, it was seen that the independent learning style ($t(313)=1.198, p>0.05$), cooperative learning style ($t(313)=.218, p>0.05$) and competitive learning style ($t(313)=1.263, p>0.05$) did not differ according to gender. However, the avoidant learning style ($t(313)=4.491, p<0.05$), dependent learning style ($t(313)=4.532, p<0.05$) and cooperative learning style ($t(313)=4.101, p<0.05$) differed according to gender (Table 4).

Table 4. The distribution of GRLSS according to gender.

Dimensions of GRLSS	Gender	n	\bar{x}	s	t	p
Independent	Female	157	38.55	4.02	1.198	.232
	Male	158	39.12	4.36		
Avoidant	Female	157	27.36	5.30	4.491	.000**
	Male	158	30.33	6.37		
Collaborative	Female	157	37.97	5.20	.218	.828
	Male	158	38.11	5.65		
Dependent	Female	157	39.27	3.90	4.532	.000**
	Male	158	37.13	4.46		
Competitive	Female	157	34.47	6.31	1.263	.208
	Male	158	33.43	8.20		
Participant	Female	157	38.17	4.88	4.101	.000**
	Male	158	35.66	5.89		

** p < .01.

The averages obtained after the analysis showed that the difference observed in avoidant learning style was in favor of males while that in dependent and cooperative learning styles was in favor of females (Figure 1).

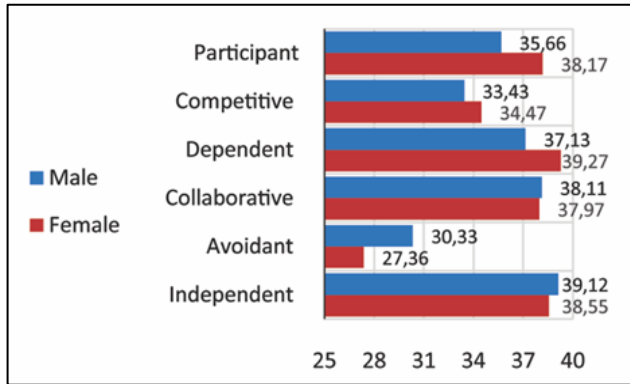


Figure 1. The distribution of learning styles according to gender

3.5. The Relationship between “Gender” and “Test Anxiety”

In terms of the relationship between the gender of SSPTs and their test anxieties, it was seen that the worry sub-dimension of TAS ($t(313)=1.939$, $p>0.05$) did not differ according to gender whereas the emotionality sub-dimension ($t(313)=4.394$, $p<0.05$) and the whole scale

($t(313)=3.611$, $p<0.05$) differed according to gender (Table 5).

When the averages were examined, it was seen that the test anxieties of female students were higher (Figure 2).

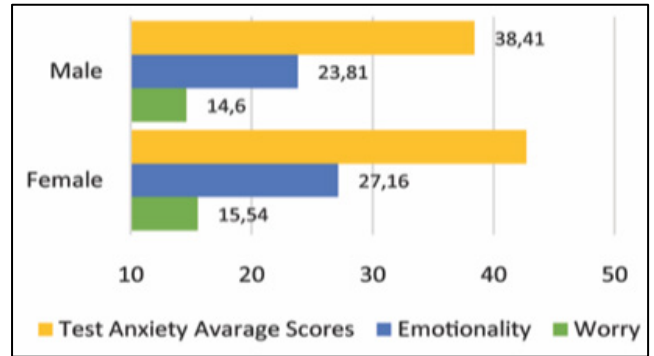


Figure 2. The distribution of test anxiety according to gender

3.6. The Relationship between “Learning Style” and “Class Level”

The results of the analysis showed that there was no statistically significant difference between SSPTs' learning styles and their class levels (Table 6).

Table 5. The distribution of the whole test anxiety scale and its sub-dimensions according to gender.

	Gender	n	\bar{x}	s	t	p*
Worry	Female	157	15.54	4.18	1.939	.053
	Male	158	14.60	4.42		
Emotionality	Female	157	27.16	6.61	4.394	.000**
	Male	158	23.81	6.91		
TAS Total Scale	Female	157	42.70	10.09	3.611	.000**
	Male	158	38.41	10.96		

** $p < .01$.

Table 6. The distribution of learning styles according to class level.

Dimensions of GRLSS		Sum of Squares	df	Mean Square	F	p
Independent	Between Groups	62.623	3	20.874	1.188	.315
	Within Groups	5466.120	311	17.576		
	Total	5528.743	314			
Avoidant	Between Groups	168.950	3	56.317	1.554	.201
	Within Groups	11273.037	311	36.248		
	Total	11441.987	314			
Collaborative	Between Groups	79.374	3	26.458	.900	.442
	Within Groups	9147.090	311	29.412		
	Total	9226.463	314			
Dependent	Between Groups	14.374	3	4.791	.255	.858
	Within Groups	5848.026	311	18.804		
	Total	5862.400	314			
Competitive	Between Groups	264.577	3	88.192	1.655	.177
	Within Groups	16576.611	311	53.301		
	Total	16841.187	314			
Participant	Between Groups	123.078	3	41.026	1.338	.262
	Within Groups	9538.433	311	30.670		
	Total	9661.511	314			

Table 7. The distribution of the whole TAS and its sub-dimensions according to class level.

		Sum of Squares	df	Mean Square	F	p
Dimensions of Test Anxiety	Worry	Between Groups	121.634	3	40.545	2.196 .089
		Within Groups	5742.829	311	18.466	
		Total	5864.463	314		
	Emotionality	Between Groups	180.216	3	60.072	1.243 .294
		Within Groups	15024.400	311	48.310	
		Total	15204.616	314		
TAS Total	Between Groups	560.128	3	186.709	1.628 .183	
	Within Groups	35661.859	311	114.668		
	Total	36221.987	314			

3.7. The Relationship between “Class Level” and “Test Anxiety”

With respect to this analysis, there was no statistically significant difference between SSPT’s class levels and the whole TAS and its sub-dimensions (Table 7).

4. Discussion

The variables in SSPTs' PIF (gender, class level and academic achievement score) and SSPTs' replies to GRLSS and TAS were examined in light of the literature.

While no significant relationship was found between SSPT’s academic achievement levels and the whole TAS and its emotionality sub-dimension, a negative, low-level and significant relationship was found in the worry sub-dimension. With reference to related literature, while studies pointing out a negative relationship between the test anxiety and academic achievement in terms of the whole TAS existed in literature [25,29,56,74,76,88,90,91,93], some studies claimed that there was no relationship between test anxiety and academic achievement [19,47,71]. In parallel with the findings of some studies, it was also found in this study that the emotionality sub-dimension of TAS had more effect on academic achievement than the worry sub-dimension did [25,38,76,91]. This can indicate that as the academic achievement level increases, the SSPTs' test anxiety level in the worry sub-dimension decreases. That is, a decrease in test anxiety can positively affect SSPT’s academic achievements. Accordingly, it can be stated that activities to decrease the SSPT’s test anxieties can contribute to their academic achievements because SSPTs with high test anxiety levels may have difficulty in concentrating on the exams.

Upon analysis of the relationship between SSPTs' academic achievement levels and their learning styles, it can be concluded that students with independent, cooperative and dependent learning styles increased their academic achievement levels at low level; that participant learning style increased SSPTs' academic achievements moderately; and that avoidant learning style affected SSPTs'

academic achievements negatively and at low level. However, in the study by Hamidah and Sarina [46] in which GRLSS was used as the data collection tool, a significant relationship between cooperative learning style and academic achievement was found and it was stated that this learning style increased academic achievement. While many studies have stated that different learning styles positively affected students’ academic achievements [e.g.,20,22,31,34,35,59,62,84], Busato, Prins, Elshout and Hamaker [9] concluded in their study that there was no significant relationship between academic achievement and learning styles.

The findings obtained with the analysis of GRLSS and TAS may indicate that having dependent, competitive and cooperative learning styles increases the points taken from the emotionality sub-dimension of TAS and that competitive learning style increases the worry sub-dimension of TAS, even if it does so at a low level. However, as stated in the previous section of the study, only the study by Hariri and Seadatee Shamir [47] examined the effect of learning styles on test anxiety while there were many studies examining the effects of many other variables on test anxiety. Kolb’s Learning Style Inventory and Sarason Test Anxiety Questionnaire were used in their study and a negative relationship was found between learning styles and test anxiety. The difference between the two studies may result from the differences in sampling and scale. Therefore, it can be stated that further studies with different sampling and scales will contribute to the literature in terms of understanding the effects of learning styles on test anxiety better.

As for the relationship between gender and learning style, a statistically significant difference was observed in favor of males in avoidant learning style while the difference was in favor of females in dependent and cooperative learning styles. In the studies by Zelazek [92] and Hamidah and Sarina [46], it was concluded that gender did not affect learning styles. On the other hand, Zelazek [92] found that males and females had avoidant and cooperative learning styles respectively whereas Hamidah and Sarina [46] concluded that females achieved higher grades than males

in cooperative, dependent, competitive and participant learning styles, which may result from the difference in sampling. Similarly, Çaycı and Ünal [23] also found in their study that male and female students have different learning styles, which is a finding that complies with the findings of this study. It can be stated that in the education process, these findings can be used in forming not only the learning style but also the teaching process.

When the relationship was examined between gender and test anxiety of SSPTs, it was seen that the test anxieties of female students were higher than those of the male ones in the whole TAS and the emotionality sub-dimension. While studies exist claiming that there is no significant difference between gender and test anxiety [29,71,74], there are also some studies whose findings reveal that the test anxiety levels of female students are higher than those of the male students [18,39,52,89]. Such differences in the results of various studies show the necessity to conduct similar studies in different cultures with different samplings for the subject to be understood better.

The results of the analysis showed that there was no significant relationship between SSPTs learning styles and class levels, which may indicate that the education in different class levels has no impact on learning styles. This finding complies with the finding of the study by Piji Küçük [74]. Finally, no significant difference was observed between the class levels of SSPTs and TAS in general or its sub-dimensions. This finding complies with the finding of the study by DordiNejad et al. [29] which claims that there is no significant relationship between test anxiety and class level.

5. Recommendations

In light of the findings of this study, recommendations for further studies are the following:

- SSPT consists of the study group of this study. Conducting a similar study with pre-service teachers from different departments could considerably contribute to literature in terms of understanding the relationship of field education specifically with learning styles and test anxiety.
- With reference to the opinion that an assessment of whether learning occurs must be through testing, the importance of tests in education has been gradually increasing and the success of students in exams has become a determinant not only for one lesson but also for certain life decisions [36]. Therefore, testing the effects of different variables with different samplings on test anxiety is thought to be useful for activities aiming to minimize students' test anxiety.

As learning styles focus on different dimensions of learning, it can be stated that dealing with the issue through various learning style scales could be useful in terms of testing the efficiency of learning styles on both test anxiety

and academic success.

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