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# Cyberostracism and knowledge sharing: The mediating role of social anxiety in e-learning environments

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**Highlights**

- Cyberostracism positively predicts social anxiety in e-learning environments (SAELE).
- SAELE negatively predicts knowledge sharing in e-learning environments (KSELE).
- SAELE mediates the relationship between Cyberostracism and KSELE.

**Article Info:** Research Article

**Keywords:** *Cooperative/collaborative learning, E-learning, Knowledge sharing, Cyberostracism, Social anxiety*

**Abstract**

Ostracized individuals face a series of negative situations and feel social anxiety during their interactions with others. However, individuals with social anxiety may not share their knowledge because of the discomfort they experience in interactions. The aim of this study is to examine the mediating role of social anxiety in learner–learner interaction in terms of the relationship between cyberostracism and knowledge sharing in e-learning environments. A total of 268 pre-service teachers participated in the study. The study determined the relationship between the variables with Pearson's correlation coefficients and used a regression-based mediation test to examine the mediator model. It found that cyberostracism was positively related to social anxiety in learner–learner interactions in e-learning environments and negatively associated with knowledge sharing. There was also a negative relationship between social anxiety and knowledge sharing. Moreover, cyberostracism predicted knowledge sharing in e-learning environments. Finally, we determined that social anxiety in learner–learner interactions was the full mediator in the relationship between cyberostracism and knowledge sharing. Therefore, it can be argued that cyberostracism is not a direct predictor of pre-service teachers' knowledge sharing behavior in e-learning environments and pre-service teachers avoid knowledge sharing due to social anxiety caused by cyberostracism. The research results also led to suggestions for practice and research.

## 1. Introduction

In recent years, social constructivist learning theory has been adopted in the field of education. It sees learning as a process of creating meaning, not merely acquiring knowledge (Girvan & Savage, 2010). According to this theory, although students acquire knowledge individually by creating subjective meaning in learning environments, this meaning-making process takes place in the social environment with the opinions of other individuals (Vygotsky, 1978). The theory argues that social interaction is necessary for development, conscious learning, and cognitive growth (Vygotsky, 1962, 1978). In learning environments characterized by these views, the formation of mental models for education depends on students sharing their ideas, opinions, experiences, and knowledge, being in communication and interaction, and reflecting their meanings (Aqda et al., 2011; Kanjug & Chaijaroen, 2012). In this respect, students' interaction, communication, and information sharing with others are all factors that facilitate learning.

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The development of technology has been reflected in learning environments, and social learning environments also feature online. This situation has provided students with time and place flexibility and created differences in knowledge sharing in learning environments (Mazlan et al., 2017). While these learning environments offer students ease of access to information, they have made it more interactive and interesting through a range of communication options (Arnone et al., 2011). However, despite the fact that humans are social beings by nature and must be in constant communication and interaction (Usta, 2010), encouraging people to share their knowledge by communicating and interacting in online learning environments has been a major challenge (Avcı-Yücel & Ergün, 2015). A range of factors explain these challenges, such as prior knowledge, epistemological belief, cultural background (Hill et al., 2009), student context (van den Berg, 2020), interface design, student roles and tasks, information overload (Vonderwell & Zachariah, 2005), depression, and Internet addiction (Yen et al., 2012). Another factor may be the ostracism that individuals experience in their social environments.

### *1.1. Ostracism, Cyberostracism, and Knowledge Sharing*

Ostracism is a social phenomenon in which the basic needs of individuals are threatened as they are ignored and excluded in their social environments (Mazinani et al., 2021; Robinson et al., 2013), giving rise to the potential of negative emotional and behavioral consequences (Nozaki, 2015; O'Reilly et al., 2015). Williams (2009) explained the effects of this phenomenon on individuals in the temporal need-threat model. According to this model, ostracized individuals feel pain, experience negative emotions, and perceive the experience as a threat to their basic human needs (e.g., meaningful existence or self-esteem). Individuals who cannot respond to the reactions due to fear are faced with adverse outcomes such as depression and hopelessness (Williams, 2009; Yu et al., 2021). Against this backdrop, ostracism has been defined as "social death" (Williams et al., 2000).

Ostracism is relatively common in daily life and can occur in both online and face-to-face environments (Filipkowski & Smyth, 2012; Nezlek et al., 2012). When experienced online, the phenomenon is called "cyberostracism" (Williams et al., 2000). Cyberostracism is more powerful at decreasing positive emotions than face-to-face ostracism (Filipkowski et al., 2021). Not responding to an individual's messages in an online discussion panel, ignoring their comments (Donate et al., 2017), not responding to status updates (Tobin et al., 2015), not participating in the meeting they created, ignoring their ideas (Nasir et al., 2017; Nezlek et al., 2012) or blocking (Aizenkot, 2020) in chats, not responding after the "seen" sign is activated all exemplify cyberostracism (Mai et al., 2015), or not being tagged in an Instagram post (Büttner & Rudert, 2022). Even when technical problems give rise to these situations, individuals may feel ostracized (Williams et al., 2000). Cyberostracized individuals have a reduced sense of belonging and control, lower self-esteem, and feel no meaningful presence (Schneider et al., 2017; Tobin et al., 2015). Individuals who do not receive a reaction to their actions feel sadness (Hayes, Carr, & Wohn, 2016), which can affect their behavior toward people (Kouchaki & Wareham, 2015). Neurotic individuals who exclude people may not even be aware of all these effects they cause (Wang et al., 2019).

Since individuals engage in knowledge sharing in e-learning environments, it is likely that cyberostracism will affect online knowledge sharing. In studies conducted in different workplaces, ostracism was shown to negatively affect information-sharing behaviors (Islam et al., 2021; Mo et al., 2020). According to the existing research, ostracized individuals typically have cold conversations with their workplace colleagues, their suggestions are ignored during interviews, and they avoid discussions (Bilal et al., 2020). In these studies, the work performance and productivity of ostracized individuals decreased, with these individuals reporting procrastination behaviors, regression, a decrease in their voluntary behavior, and resignation (Bilal et al., 2020; Erdemli & Kurum, 2021). A similar situation may occur in e-learning environments. Pre-service teachers who are ostracized in e-learning environments may distance themselves from other friends, not want to interact, not work in cooperation, or avoid discussions. Thus, we posit that cyberostracism will affect knowledge sharing behaviors in e-learning environments. In this context, we

hypothesized that cyberostracism negatively predicts knowledge sharing behaviors in e-learning environments.

### *1.2. Mediating Role of Social Anxiety*

Ostracised individuals experience social anxiety (Mazlan et al., 2017; Usta, 2010). According to the APA, social anxiety is defined as the fear of being negatively evaluated by others, belittled, or uncomfortable with doing something wrong (American Psychiatric Association [APA], 2013). In online learning environments, the social anxiety of individuals is decreased due to anonymity and the separation between individuals (Grieve et al., 2017; Weidman et al., 2012). Individuals who are hiding behind this secrecy are likely to interact (Çuhadar, 2012; Mazlan et al., 2017). However, in e-learning environments, knowledge sharing is limited in its anonymity. Usually, it is clear who the student is if they answer a question, participate in a discussion, or submit an assignment. In such cases, not responding to a student's question, ignoring their ideas in the discussion, or not giving feedback on homework (Nasir et al., 2017) may cause experiences that induce moments of social anxiety. In the light of this, we hypothesized that cyberostracism positively predicts social anxiety in e-learning environments.

As in other studies (e.g. Dell'Osso et al., 2014), students may then avoid talking to someone, expressing their disagreement, or collaborating in an e-learning environment. They may have difficulty interpreting their friends' assignments and talking with their friends (McCord et al., 2014; Rubin et al., 2009). Therefore, social anxiety may damage the relationship between students in the e-learning environment and students may prefer solitude (Çuhadar, 2012). This may lead to a weakening of studying relationships, the absence of study groups, and a decrease in knowledge sharing (Takhsha et al., 2020). In these conditions, it can bring a decrease in academic achievement (Bernstein et al., 2008). Therefore, we hypothesized that social anxiety in e-learning environments negatively predicts knowledge sharing behaviors in e-learning environments.

### *1.3. Present Study*

As a requirement of their profession, pre-service teachers are in environments with a lot of communication, interaction, collaboration, and knowledge sharing. It is crucial to have a high level of social skills to be successful teachers in their working life. Acquiring and applying these skills in their academic life will be beneficial in their future professional lives. According to humanistic psychology, the first step for the teacher to teach students new skills is to establish a relationship with them based on respect, empathy and honesty (Eggen & Kauchak, 2020). Cyberostracism and social anxiety can prevent establishing healthy relationships (Mazlan et al., 2017). In this respect, understanding the qualities of teacher candidates that will prevent them from establishing relationships will significantly improve their professional competencies before starting the profession (Önal & Özdemir, 2021). Thus, it is important that understanding of pre-service teachers' behaviours in e-learning environments.

In summary, teacher candidates need to gain interpersonal communication, as well as interaction and knowledge sharing behaviors (Usta, 2010). Examining the factors affecting these behaviors will also contribute to teacher education (Çelik & Konan, 2019). There is currently not enough research about the effects of ostracism on human behavior, which is the subject of this research (Poon et al., 2020). Studies on this phenomenon are necessary in order to develop effective coping strategies against the negative effects of ostracism in online environments (Galbava et al., 2021). In this study, we determined the relationship between pre-service teachers' cyberostracism and their knowledge sharing in e-learning environments. Because social anxiety caused by ostracism may have negative effects on knowledge sharing behaviors. In this context, we hypothesized that social anxiety mediates the relationship between cyberostracism and knowledge sharing in e-learning environments. We, in the study, examined the mediating role of social anxiety on the relationship between pre-service teachers' cyberostracism and their knowledge sharing in e-learning environments. This study is essential in understanding the causes of knowledge sharing problems

that affect pre-service teachers' professional lives and learning situations. In summary, followed hypothesises is asserted in the study and the hypothetical model is presented in Figure 1.

H1: Cyberostracism negatively predicts knowledge sharing in e-learning environments.

H2: Cyberostracism positively predicts LLI social anxiety in e-learning environments.

H3: LLI social anxiety negatively predicts knowledge sharing in e-learning environments.

H4: LLI social anxiety mediates the relationship between cyberostracism and knowledge sharing, knowledge giving, knowledge receiving in e-learning environments.

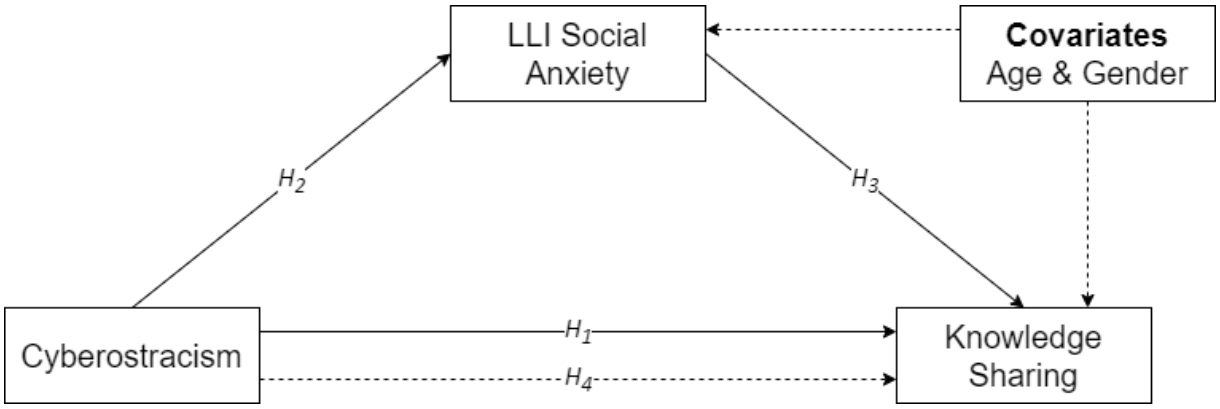



**Fig. 1.** Hypothetical model

## 2. Method

### *2.1. Participants*

Two hundred and sixty-eight participants were recruited for the study. All participants took lessons via distance education tools for one and half years during the COVID-19 pandemic. Their mean age was 21.25, the standard deviation was 2.74, and their ages ranged between 18 and 38. Of the participants, 212 (79.1%) were female, and 56 (20.9%) were male. The average number of friends of the participants on social media was 204.32, and the average number of friends they actively talk to on social media is 27.84. In addition, most of the participants use social media for studying (How often do you use social media [Facebook, Instagram, TikTok, etc.] for studying? never = 2 [%0.7], rarely = 24 [%9.0], sometimes = 97 [%36.2], frequently = 110 [%41.0], always = 35 [%13.1]).

### *2.2. Measures*

**Knowledge Sharing Behavior in Online Learning Environments Scale (KSBOLES)** was used to assess knowledge sharing behavior of university students. Tseng and Kuo (2014) developed KSBOLES, and Avcı-Yücel and Ergün (2015) adapted the scale to Turkish. The scale has two subscales (knowledge giving and knowledge receiving) and 9 items (e.g., "I often upload my teaching resources to online environments." and "I get other members' teaching experience, knowledge or skill in online environments"). Items response occurs on a seven-point Likert-type scale ranging through "strongly disagrees" (1) to "strongly agree" (7). The KSBOLES score ranges from 9 to 63, and higher scores pointed to higher knowledge sharing behavior. The data collected in the current study indicated that the internal reliability of KSBOLES was good ($\alpha$ = 0.85, $\omega$ = 0.85).

**The Social Anxiety Scale for E-Learning Environments (SASE)** was developed to evaluate students' social anxiety in e-learning platforms by Keskin et al. (2020). Social anxiety in learner-learner interaction (LLI) and social anxiety learner-instructor interaction (LII) can be assessed with SASE. Each subscale has 23 items (e.g., I am afraid of being criticized on discussion forum in e-learning environments) and a seven-

point Likert-type scale ranging from "never describe me" (1) to "totally describe me" (7). The LLI and LII scores range from 23 to 161. Higher scores obtained from the scale indicate higher social anxiety in an e-learning environment. The data of the current study indicated that internal reliability of LLI (α = 0.96, ω = 0.96) and LII (α = 0.97, ω = 0.97) was good.

**The Cyberostracism Scale (CS)** developed by Hatun and Demirci (2020) was used to assess ostracism in social media. The scale consists of 14 items (e.g., They do not include me in their social media live actions) and three subscales. CS responses on a five-point Likert type scale range through "never" (1) to "always" (5). Accordingly, the scale scores range from 14 to 70, and higher scores point to higher cyberostracism. The data collected in the current study indicated that the internal reliability of CS was good (α = 0.83, ω = 0.85).

### *2.3. Procedures*

The study procedures followed the Declaration of Helsinki and were approved by the Kastamonu University Social Sciences and Humanities Research and Publication Review Board (REF = 1/7/2022). The consent form was provided to all participants and announced to them that they could withdraw at any time from the study. The purpose of the research and how the data would be used was explained to the pre-service teachers in debrief. The research data was gathered via an online survey site from volunteer pre-service teachers.

### *2.4. Data Analysis*

The study aimed to examine the mediating role of social anxiety in e-learning environments in the relationship between cyberostracism and knowledge sharing behavior in online learning environments. Pearson's correlations were calculated to evaluate the association between variables. Then, descriptive statistics of variables were presented. Lastly, mediation analyses were conducted to examine the relationship between social anxiety, cyberostracism, and knowledge sharing behavior in online learning environments. Hayes's (2018) PROCESS 4.0 macro (model 4) was used to test the mediation model. A total of 10,000 bootstrap samples were generated and bias-corrected, 95% confidence intervals were calculated. In the mediation analyses, gender and age were entered into the model as the control variables to eliminate the effects of these. The data were analyzed with SPSS for Windows 22.0.

## 3. Results

### *3.1. Preliminary Analysis*

The descriptive statistics of the study variables and the results of correlation analysis are presented in Table 1.

**Table 1.**

Correlation coefficients and descriptive statistics of variables

| Variables | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Knowledge sharing | - | | | |
| 2. LLI Social Anxiety | -.27* | - | | |
| 3. LII Social Anxiety | -.27* | .90* | - | |
| 4. Cyberostracism | -.18* | .29* | .27* | - |
| Mean | 43.69 | 71.11 | 67.60 | 20.86 |
| Standard Deviation | 9.01 | 29.10 | 31.94 | 4.65 |
| Skewness | .028 | .432 | .564 | .437 |
| Kurtosis | -.711 | -.586 | -.486 | -.437 |

**p < .01, Knowledge sharing = knowledge sharing behavior in e-learning environments, LLI = Learner-Learner Interaction, LII= Learner-Instructor Interaction*

Table 1 shows that all the correlation coefficients are significant. As expected, knowledge sharing behavior in e-learning environments was negatively correlated with cyberostracism LLI social anxiety and LII social anxiety in e-learning environments. Cyberostracism is positively correlated with LLI social anxiety and LII

social anxiety in e-learning environments. The correlation coefficient between LLI social anxiety and LII social anxiety is .90, pointing to the multicollinearity problem (Field, 2018). Therefore, LLI social anxiety was preferred in the model because they have higher correlation coefficients with knowledge sharing behavior in e-learning environments and cyberostracism. Moreover, to test the multicollinearity problem, variance inflation factor (VIF) and tolerance values were examined. According to the results, VIF values (ranged from 1.103 to 1.108) are below 10, which is the criteria value, and tolerance values (ranged from .902 to .976) are higher than .02, which is the criteria value (Field, 2018).

The skewness and kurtosis values were used to determine whether the distribution of the data was normal. The results showed that the skewness values ranged from .028 to .464, and the kurtosis values ranged from -.711 to -.437. Considering these results are between the criteria values (±1) stated by Field (2018), the data have normally distributed.

### *3.2. Mediational Analysis*

The hypotheses were tested via PROCESS (model 4). The results of the mediation analysis are presented in Table 2 and Figure 2. The results indicated a significant total direct effect (path c; without mediator) of cyberostracism on knowledge sharing behavior in e-learning environments (B = -.348, t(268) = 2.973, p < 0.01, 95%CI = -.578, -.117), significant direct effect (path c'; with mediator) (B = -.207, t(268) = 1.739, p > .05, 95%CI = -.442, .028), and a significant indirect effect through LLI social anxiety (B = -.074, 95%CI = -.112, -.032).

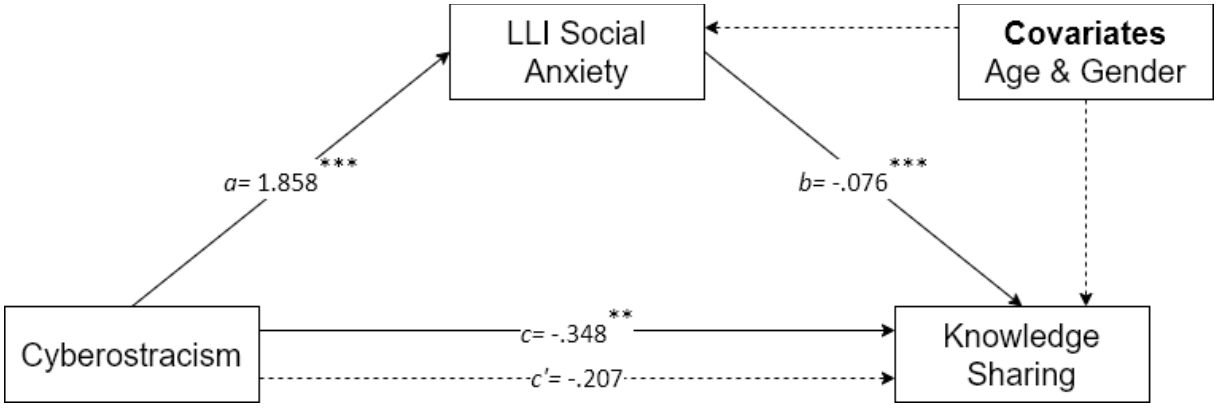
**Table 2.**

Path coefficients of the model

| **Model** | | **Estimate** | ***SE*** | ***t*** | **95% CI** | |
|---|---|---|---|---|---|---|
| | | | | | **Lower** | **Upper** |
| Model without mediator | | | | | | |
| Path *c* | CO → KS | -.348 | .117 | 2.973** | -.578 | -.117 |
| Model with mediators | | | | | | |
| Path *a* | CO → LLI-SA | 1.858 | .367 | 5.061*** | 1.135 | 2.581 |
| Path *b* | LLI-SA → KS | -.076 | .019 | 3.958*** | -.113 | -.038 |
| Path *c'* | CO → KS | -.207 | .119 | 1.739 | -.442 | .028 |
| | Indirect effect of LLI-SA | -.074 | .023 | | -.112 | -.032 |

***p < .01, ***p < .001, CI: confidence interval; CO: Cyberostracism (independent variable); KS: knowledge sharing behavior in e-learning environments (dependent variable); LLI-SA: LLI Social Anxiety (mediator)*

The results also showed that the cyberostracism significantly predicted LLI social anxiety (path a; B = 1.858, t(268) = 5.061, p < 0.001). Also, LLI social anxiety (path b; B = -.076, t(268) = 3.958, p < 0.001) was significantly predicted knowledge sharing behavior in e-learning environments.




*** p < .01, *** p < .001*

**Fig. 2.** The mediation model

Consequently, pre-service teachers who are excluded by their friends on social media experience more social anxiety in e-learning environments. As a result of experiencing social anxiety, pre-service teachers share less information in e-learning environments.

## 4. Discussion

This study examined the mediating role of learner-learner interaction social anxiety in the relationship between pre-service teachers' cyberostracism and knowledge sharing behavior in e-learning environments. The results obtained in the research are given below.

### *4.1. The Prediction of Cyberostracism on Knowledge Sharing Behaviours (H1)*

The study determined that there is a negative relationship between the cyberostracism experienced by pre-service teachers and their knowledge sharing behaviors in e-learning environments; the experiences of cyberostracism negatively predicted their knowledge sharing behaviors in e-learning environments. Accordingly, it has been concluded that pre-service teachers who experience cyberostracism tend to share less information in e-learning environments. Although there are studies that draw attention to the effects of pre-service teachers' ostracism on learning and learning-oriented behaviors (Zambo & Davidson, 2013), these studies are limited. In studies conducted in different business sectors, it has been stated that exclusion in social environments will be an essential determinant of knowledge sharing behaviors (Zaman et al., 2021; Zhao et al., 2016) and that there is a negative relationship between them (Albana & Yeşiltaş, 2021; Islam et al., 2021). The instructors also experienced similar effects of ostracism. Accordingly, ostracised instructors do not share information, regress, or decrease their performance (Bilal et al., 2020; Zimmerman et al., 2016). With this result, it can be said that ostracism does not only negatively affect the individual in business environments but also knowledge sharing behaviors, which are important indicators of success in e-learning environments.

### *4.2. The Prediction of Cyberostracism on Social Anxiety (H2)*

The study concluded that cyberostracism in the mediator model predicts social anxiety in learner-learner interaction in e-learning environments. According to this result, pre-service teachers exposed to cyberostracism experience social anxiety while interacting in e-learning environments. In the studies conducted by Baumeister et al. (1995; 1990), it was concluded that social anxiety is a negative situation that occurs as a reaction to ostracism within the social group. Different studies indicate that ostracism causes social anxiety, supporting this result (Levinson et al., 2013; Tsumura & Murata, 2015). Similarly, fear of social rejection as a form of ostracism is also associated with social anxiety (Zadro et al., 2006).

On the other hand, there are studies with opposite results. Nishiyama et al. (2015) stated that the activity in the anterior cingulate cortex (ACC) region, which is activated during social exclusion, is not associated with social anxiety. For this result, Nishiyama et al. suggested that the measurement tool they determined for social anxiety is not widely used, that the result may be due to this, and that more widely used measurement tools should be used. Similar to the results of this study, Iffland et al. (2014), who experimentally tested the relationship between social anxiety and ostracism, did not find any difference in social anxiety between ostracised and non-ostracised individuals. It can be thought that the reason for reaching this conclusion in this particular experiment was the examination of ostracism right after the game of ostracism (Cyberball game). Ostracism is not a situation that is immediately accepted or recognized, and its adverse effects are not experienced immediately (Williams, 2009), so it may take time for the individual to admit that they are excluded and see the negative effects.

### *4.3. The Prediction of Social Anxiety on Knowledge Sharing Behaviours (H3)*

This study has focused on identifying the predictive role of social anxiety in learner-learner interaction in e-learning environments. It was seen that the social anxiety of teacher candidates predicted their knowledge sharing behaviors. It was found that there was a negative relationship between them, and as the pre-service

teachers' social anxiety increased, knowledge sharing behaviors decreased. In previous research, there are findings that online learning environments affect reducing social anxiety with the sense of privacy and distance they provide to individuals (Grieve et al., 2017; Keskin et al., 2020). However, in these studies, the authors stated that they felt less anxiety in online environments compared to face-to-face interactions. In this respect, it can be thought that face-to-face interaction problems are not reflected in online learning environments. On the other hand, the negative effects of interaction problems occur in online environments. Situations such as not responding to the message, negative evaluation, and unrequited interaction attempts (Nasir et al., 2017), which may occur in e-learning environments, can cause social anxiety to be felt in these environments. Therefore, pre-service teachers may exhibit avoidant behaviors in environments where their social anxiety occurs. Social anxiety experienced by students in these environments can affect students' behavior (Dell'Osso et al., 2014). In another study, it was determined that while the employees of a company said that the Wiki environments used for academics were a suitable environment for sharing information, their social concerns did not have an effect on the process or content of knowledge sharing (Iglesias-Pradas et al., 2015). Here, the author stated that the participants reached this conclusion because they shared information anonymously in Wiki environments. Unlike Wiki environments, e-learning environments where students can share anonymously are limited. Especially in formal teaching, it is clear who shares the information, who comments, and who owns the thoughts and assignments. Considering all these situations, it will be an expected result that individuals who have social anxiety in interactions in e-learning environments will have less knowledge sharing behaviors in the same environments. In addition, there are studies supporting the result obtained in this study (Bordia et al., 2006; Presbitero & Attar, 2018).

### *4.4. The Mediator Role of Social Anxiety on the Relationship between Cyberostracism and Knowledge Sharing Behaviours*

In the study, it was determined that cyberostracism predicted knowledge sharing behaviors in e-learning environments. When social anxiety in learner-learner interaction in e-learning environments was entered into the model as a mediator variable, it was concluded that cyberostracism experiences were not a direct predictor of knowledge sharing behaviors. Previous studies in different disciplines have reported that ostracism negatively affects knowledge sharing (Islam et al., 2021; Takhsha et al., 2020). Further, although ostracism is defined as being separated from the group, the individual reacts to avoid the harmful effects of ostracism (Williams, 2009). In this context, students want to interact with the individuals in the group, which can bring the fear of being negatively evaluated and belittled, and the feeling of discomfort not to do anything wrong. Therefore, ostracism causes social anxiety (Mazlan et al., 2017; Usta, 2010). Although online environments provide a sense of being far away and therefore more comfortable than the pressures of face-to-face environments (Çuhadar, 2012; Weidman et al., 2012), cyberostracism may cause students to have social anxiety in these environments due to this foreignness and distance. Considering the environments where knowledge sharing is conducted less anonymously, such as e-learning environments, it is expected that cyberostracism predicts knowledge sharing through social anxiety in learner-larner interactions. According to this result, cyberostracism causes increased social anxiety in learner-learner interaction in e-learning environments, and increased social anxiety causes decreased knowledge sharing behaviors. Cyberostracism thus has an indirect effect on knowledge sharing behaviors in e-learning environments.

### *4.5. Implications*

Ostracism is defined as "social death" by researchers who examine ostracism as a theory (Case & Williams, 2004; Williams, 2007). Considering the results of ostracism, it is essential to investigate whether cyberostracism has similar results. Because the results of ostracism, which are stated to have depressive effects, are easier to notice in face-to-face environments than in cyber environments, early recognition of these experiences of learners excluded in cyber environments will prevent negative consequences of cyberostracism. In this respect, instructors have essential roles. It is necessary to identify learners who are ostracised in cyber environments and to take measures for this. These measures are collaborative teaching

activities, small group projects, discussion groups, and peer assessment in e-learning environments. Instructors should follow the learners' comment content, number of comments, number of messages, participation in discussion, and give reinforcing feedback to help prevent learners from feeling excluded. Because, early detection of exclusion in learning environments and intervention in this situation is important in preventing many negative effects of ostracism (Yaakobi, 2021).

In addition, a lack of social skills can result in exclusion in adolescents (Braddock et al., 2015; Sakız et al., 2021). A study found that social skills training protects children against social rejection (Frankel et al., 1996). Considering the findings of this research, the psycho-educational group activities that university psychological counseling centers will carry out for learners with social skills deficiency will be a protective factor against social ostracism and cyber ostracism. It is also important to raise the awareness of behaviors that may cause cyberostracism among learners studying in e-learning environments. Increasing learners' awareness can help their friends in the e-learning environment reduce the behaviors that cause them not to experience these harmful effects.

Similarly, training on the ability to use social media effectively can be a protective factor in cyberostracism. Learners who experience social anxiety caused by cyberostracism should be given feedback to relieve their anxiety, and learners should be encouraged to interact with their classmates and advisors (Çuhadar, 2012). Motivational feedback should be provided by considering the contributions of learners who share information to in-class teaching. Learners who are ostracised and suffer social anxiety should be observed in e-learning environments, and psychological counseling centers of universities should provide support, if even from a distance (Çuhadar, 2012). Evaluating all these suggestions can ensure that learners develop healthy social relations in e-learning environments, reducing their social anxiety and increasing their knowledge sharing behaviors to improve their learning performance.

In the literature, the effects of ostracism experiences in different sectors have been examined. However, studies on the effects of ostracism in online environments are limited. It is vital to conduct studies on cyberostracism because it is more difficult to notice the effects of ostracism since individuals do not see each other in online environments. In addition, it is essential to determine the effects of these effects on learning situations in e-learning environments. Conditions such as belonging to the environment threatened by ostracism (Devisakti & Ramayah, 2021) and feeling a meaningful presence (Goloshumova & Chernova, 2017) are necessary for successful e-learning. Thus, the effects of ostracism experienced in face-to-face education in e-learning environments and the effects of cyberostracism on behaviours of learners in face-to-face learning environments can and should be examined. All these suggestions can contribute to a better understanding of the effects of different types of ostracism on learners.

### *4.6. Limitations*

Some limitations can be listed regarding the results of the study. Firstly, the participants were recruited from only one state university, and the conveniences sampling method was used. In this respect, collecting data from different universities in Turkey can increase the generalizability of the research findings. Secondly, the data collection method is limited to self-administered scales, and it may be helpful to use different research designs in future studies. Finally, the results were based on cross-sectional analysis, and therefore do not provide information about the cause-effect relationship between the variables. In this respect, future experimental and longitudinal studies will provide more details on the cause-effect relationship. The results of this study should be evaluated by considering these limitations.

## 5. Conclusion

The findings of the study showed that social anxiety in e-learning environments mediates the relationship between cyberostracism and knowledge sharing behavior in e-learning environments. In the literature, studies are examining the relationship between ostracism and social anxiety and learner behavior in educational settings (e. g. Sakız et al., 2021; Taş, 2021). However, these studies were conducted in face-to-

face education settings. This research differs from the existing studies in that it deals with learner emotions and behaviors in e-learning environments and social networks. Another different aspect of the study is to test mediation role of social anxiety in e-learning environments. Thus, it has been revealed that cyberostracism reduces pre-service teachers' knowledge sharing behaviors in e-learning environments by increasing social anxiety. In this respect, it has been shown that it is not sufficient to provide learners with facilities such as internet connection, computers and tablets to increase the quality of e-learning, but it is also essential to support coping with exclusion and social anxiety.

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