



STUDENTS' FEAR OF COVID-19, PSYCHOLOGICAL MOTIVATION, COGNITIVE PROBLEM-SOLVING SKILLS AND SOCIAL PRESENCE IN ONLINE LEARNING

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ABSTRACT

Online learning has been considered a successful source for reaching learners anywhere, and anytime despite all challenges for decades. This two-fold study was designed to explore how COVID-19 fear affected students' social presence in online learning, and how their internal psychological resources such as motivation moderated to make their online learning experience successful in public, and private universities. A cross-sectional, descriptive, and correlational research design was carried out by using a simple random sampling (N=244 students from Public sector universities, and N=178 students from Private universities). Online structured questionnaires were developed to collect data by using Google forms. The study found fear of COVID-19 highly insignificant in relationship with Social Presence, while Cognitive Problem-Solving Skill was significant with Psychological Motivation in Public Sector universities. Psychological Motivation also exhibited a strong positive and significant correlation with Cognitive Problem-Solving Skills. The study concluded that in Public Sector Universities, the existence of fear of COVID-19 was accompanied by greater psychological motivation among students, resulting in an increase in their cognitive problem-solving ability. While in Private Sector universities fear of COVID-19 was seen having a significant relationship with Social Presence, Cognitive Problem-Solving capability, and Psychological Motivation. In Private Sector universities, fear of COVID-19 was also accompanied by greater psychological motivation among students, resulting in an increase in their social presence.

Contribution/Originality: This study contributes to Constructivist's Theory (Cipolletta & Ortu, 2020; Hoic-Bozic, Mornar, & Boticki, 2008) concerning the online learning effectiveness of university students' during COVID-19. The logical analysis states that students' online learning satisfaction is determined by their psychological condition encompassing social, emotional, behavioral commitments, where psychological motivation regulates the relationship between COVID-19's fear and social presence, cognitive problem-solving skills.

1. INTRODUCTION

Since the COVID-19 was declared a global public health emergency, and pandemic (Cucinotta & Vanelli, 2020) the educational institutions were closed to control the spread of infection all over the world. The new mode of teaching for the smooth functioning of the education process was shifted from face teaching, and learning to online including in Pakistan (Ali, 2019). This sudden change caused several problems to students e.g., internet connectivity, and lack of resources which in return confined the students' capacity to participate more effectively in online learning (Zhong, 2020). The closure of educational institutes led the students to experience social distancing

(Toquero, 2020) and this restricted them to share real-time ideas, knowledge, and information regarding specific topics (Britt, 2006).

The new mode of online communication has also seriously influenced the lives of instructors, students, and educational organizations (Almanthari, Maulina, & Bruce, 2020) by increasing stress, and anxiety (Ahmed, Quadeer, & McKay, 2020) at all levels of education. This ultimately affected their online learning, and motivation since stress and anxiety are associated components of fear. Some students managed the stress of pandemic with resilience while others were restless and fearful. It was seen that this fear was the source of students' low motivation and less engagement in their online learning. The significance of this study increased when COVID-19 started affecting students' learning, and its negative effects multiplied when it was associated with the fear of failure especially for those who suffered economic losses due to lack of resources. A case of a 15-year-old girl who committed suicide because of similar problems can also be related to the devastating outcomes for people psychologically offended at a higher extent (Cao et al., 2020; Lathabhavan & Griffiths, 2020; Thakur & Jain, 2020).

The emergencies such as the COVID-19 and many others in the past have made it inevitable to explore the new dimensions of effective online learning in the context of fear of COVID-19. So, online teaching, and learning could be planned more effectively whenever there are emergencies or sudden lockdowns. This study was therefore planned to explore how the fear of pandemic affected the students' online learning and social presence, and how students coped up with the fear by using their learning strategies to make their online learning a successful experience.

1.1. Problem Statement

COVID-19 has led to many paradigmatic transitions in the education sector especially in online teaching, and learning. Therefore, seeing the futuristic significance of effective online learning, this study is planned to see the difference in intensity of fear of pandemic of COVID-19 among university students in the public, and private sectors and how it affected their psychological motivation, social presence, and cognitive problem-solving skills. Although rich research data is available on online learning, there is dearth of studies in pandemic like situations. This research gap exists in almost all levels of education especially in the comparative context of public, and private sector universities.

1.2. Objectives of the Study

1. To find out the effect of fear of COVID-19 on cognitive problem skills, and social presence in online learning among students of public, and private universities.
2. To investigate the relationship between fear of COVID-19, psychological motivation, cognitive problem-solving skills, and social presence in online learning among students of public, and private universities.
3. To explore the moderating role of psychological motivation between fear of COVID-19, and cognitive problem skills, and social presence in online learning among the students of public, and private universities.

1.3. Hypotheses

1. *H1: There is a significant difference in the mean score of public and private universities students on fear of COVID-19, cognitive problem-solving skills, psychological motivation, and social presence in online learning.*
2. *H2: There is a significant relationship between students' fear of COVID-19 and their cognitive problem skills and social presence in online learning among public sector university students.*
3. *H3: There is a significant relationship between students' fear of COVID-19 and their cognitive problem skills and social presence in online learning among private sector university students.*
4. *H4: Psychological Motivation moderates the relationship between students' fear of COVID-19, their cognitive problem-solving skills and social presence in online learning among public sector university students.*

5. *H5: Psychological Motivation moderates the relationship between students' fear of COVID-19 their cognitive problem-solving skills and social presence in online learning among private sector university students.*

2. LITERATURE REVIEW

2.1. Fear of COVID-19 and Online Learning

The fear of the COVID-19 pandemic not only caused the shutdown of all educational institutions including universities but also increased stress and anxiety among students (Ahmed et al., 2020; Perz, Lang, & Harrington, 2020) almost at all levels. These educational institutions managed this global physical and psychological health crisis with different strategies. Some students managed the stress of pandemic with resilience while others were observed as restless and fearful. It was perceived that this fear was the source of students' low motivation and less engagement in their online learning. It was also observed that the fear of COVID-19 was less physical and more psychological as if thousands were infected with the virus but millions were psychologically influenced. The intensity of this fear increased when the health workers got affected and died of diseases with the least availability of physical or psychological treatment. This fear influenced every age level but students were the most vulnerable as they were also facing another crisis and that was the shift of teaching and learning modes from on-campus to online learning. They faced several challenges e.g., availability of the resources, change of teaching, and learning strategies and the fewer expert teachers for online teaching.

COVID-19 crisis has also affected social networks among university students and their psychological wellbeing (Son, Hegde, Smith, Wang, & Sasangohar, 2020). There are heaps and dreads, depression, and tension among students and faculty due to this crisis. There is a paradigm shift among educational institutions to adopt technology and engage students in a different mode of online learning. This has created a big challenge to build effective sources for engaging students in online learning (Stacey, 2001). The unexpected change in modes of teaching and learning, through new technological resources, for which learners were not accustomed nor did receive any psychological support from their peers, further caused stress to less motivated and less engaged learners.

Although online teaching and learning is a thoroughly researched area no research is available about how university students should manage the fear of pandemic COVID-19 and adopt the online learning mode by utilizing psychological motivation and cognitive problem-solving skills, especially in the comparative context of public and private sector university students.

2.2. Social Presence and Online Learning

The term social presence was first defined by Short, Williams, and Christie (1976) as a degree of salience between two communicators. Since then, it has become a part of the debate for reconceptualization with various perspectives in online communication and learning (Park & Kim, 2020). Social presence is considered one of the components of successful online teaching and learning (Park & Kim, 2020). Although this term is less operationalized but well understood in the context of the constructivist approach towards learning which describes learning as a social activity, and that individuals learn best when they interact with others for knowledge construction, and meaningful learning (Oztok & Brett, 2011). When we understand this term from the constructivist point of view especially in online learning, the construct social presence becomes more important to connect to the online learning environment and motivates the learners (Oztok & Brett, 2011). During the COVID-19 pandemic, social interaction became almost impossible due to protocols like social distancing. The lack of emotional support and physical isolation further cast negative psychological effects on students (Elmer, Mephram, & Stadtfeld, 2020). Sufficient research is available on the social presence that validates its importance for successful, and effective online teaching, and learning (Oztok & Brett, 2011). Several pieces of researches have demonstrated the relationship between students' satisfaction, and the social presence in online learning (Caskurlu, Maeda, Richardson, & Lv, 2020; Landrum, Bannister, Garza, & Rhame, 2020).

2.3. Cognitive Problem-Solving in Online Learning

Problem-solving skills are one of the most critical components of teaching and learning (Foshay & Kirkley, 2003) at all levels across the globe. It is described as a mental process that people go through to discover, analyze, and solve problems. Some problems look simple and can be resolved easily as we are familiar with them. While others are unfamiliar, and need extensive thought process (Rahman, 2019). It involves several organized steps such as methodical observation and critical thinking to find the way out to achieve the decided goal (Rahman, 2019) depending upon the intricacy of the problem.

The problem-solving process becomes complex when people face routine problems which hinder the pace of work and cause stress. For such situations, an ordinary thought process becomes insufficient and requires more logical processes such as observation, and critical thinking. The observation process includes collecting data, understanding, and interpreting the meaning of information, using all senses. Critically thinking comprises conceptualizing, logical reasoning, applying strategy, analytical thinking, decision making, and synthesizing to solve problems (Xin & Zhang, 2009).

Such continuously existing stressful situations have forced educational institutions to prepare students with skills not only to solve complex life problems creatively (Masalimova et al., 2019) but also manage the stressful situations with resilience (Brewer et al., 2019). This skill becomes important when identifying the problem and finding a solution are seen as ineffective, and mitigates the impact of the problem (Xin & Zhang, 2009). A similar type of situation is now being faced by university students during this pandemic in the form of multiple new situations.

Several studies have supported that students who learn to solve problems with a systematic thought process manage new situations and stress more peacefully (Masalimova et al., 2019) while those who are taught with the traditional mode of teaching have been observed weak, and slow in adapting to the stressful situations with creativity (Ali, 2019). The significance of this effective component for the online learning environment has increased in the prevailing situation of COVID-19 when the online learning environment was the only choice for the educational institutes and students. So, this quality component for online learning environment needs to be thoroughly explored to make it more effective.

2.4. Psychological Motivation and Online Learning

Students' motivation remained critical in both face-to-face, and in online learning almost at all levels of education. It is considered that online learning gives more autonomy (Eom, Wen, & Ashill, 2006) and "flexibility in terms of time, place, and pace" to students as compared to the face-to-face learning environment, and demands more responsible behavior towards their learning (Gedera & Williams, 2013). Much of the research work is available on different perspectives of motivation for learning but the learner perspectives have scarcely been researched in online learning distinctively in emergency situations (Schunk & DiBenedetto, 2014).

Motivation is described as "underlying behavior" (Guay et al., 2010). This psychological construct is categorized into two types: i) internal motivation, and ii) external motivation. The internal motivation is the energetic expression with personal interest, and enjoyment while extrinsic motivation is manifested in behaviors such as play, exploration, and challenge seeking that people often do for external rewards (Dec, Koestner, & Ryan, 1999).

The online learning environment is gaining momentum not only in dealing with crises but also in achieving the global education agenda of reaching every child anywhere and at any time. The online learning educational phenomena are not thoroughly explored (Bekele, 2010); therefore, nothing can be said with certainty. It is reported in several pieces of research that online learning demotivates students because of its less interactive nature, and invisibility of visual cues or facial expressions in an online learning environment (Gedera, Williams, & Wright, 2015). Similarly, Heflin, Shewmaker, and Nguyen (2017) share that online learning can make the results worst as

students spend less time on tasks, and demonstrate worst in learning. They believe that especially when technology is used for online teaching, students can learn only when they are motivated (Oudeyer, Gottlieb, & Lopes, 2016). Contrarily, Wighting, Liu, and Rovai (2008) found that online students are more intrinsically motivated than their on-campus counterparts. Since last few decades, the use of technology has become common in the UK, and many other educationally developed countries. It is considered as one of the pedagogical shifts to increase students' motivation, satisfaction, and engagement, and to make education approachable, and accessible almost at all levels. However, it is not necessary that the use of technology can improve students' motivation (Abou El-Seoud, Taj-Eddin, Seddiek, El-Khouly, & Nosseir, 2014) as it is less personal than a face-to-face learning environment, and makes the students' personal perspectives or psychological aspects of motivation more dominant. Seeing frequent emergencies and lockdown situations, it is assumed that in coming decades the use of technology and online learning environment will become more common in the education sector. Therefore, it is imperative to explore thoroughly what actually motivates learners in an online learning environment especially when certain extreme fears and stress are also associated especially at higher education in the comparative context of public and private sector university students.

2.5. Comparative Context of Public and Private Universities

The unexpected shift of the mode of education from face-to-face to online teaching and learning has created a lot of panic among the students. It has been noted that private sector universities are more proactive in adopting online teaching and learning modes as compared to the public sector. Although students demonstrate restlessness over quality of resources for online learning but are found more satisfied in private universities than public universities. Moreover, it is also noted that private sector university teachers are more positive towards this transition as compared to public sector university teachers. Although there could be many other factors that need to be explored but the current phenomenon of COVID-19 appears as one of the contributory factors for a comparatively successful adoption to paradigmatic shift (Cipolletta & Ortu, 2020).

Universities play a significant role in a country's economy by providing higher education across borders. Virtual online and blended learning is becoming a successful strategy for providing education and training across borders with anywhere and anytime accessibility approach. Particularly this pandemic situation has transformed the significance of online teaching and learning. Ample research is available on the quality comparisons of public and private universities (Mushtaq & Malik, 2018) which demonstrate better quality of teaching and learning than the public sector while few have demonstrated the public sector as better in quality teaching and learning. As this was the first time in history especially in educationally developing countries where online education is not being practiced, therefore, it was required to see how their student adapted to this sudden shift from on-campus to online learning and also see how differently public and private universities' students experienced the fear of COVID-19 and adapted to this paradigm shift in learning.

2.6. Theoretical Framework

The study is based on the constructivist's theory, emphasizing that knowledge is constructed on the basis of learners' own interpretations of experiences in the world (Jonassen & Rohrer-Murphy, 1999). They are more focused on knowledge construction, critical thinking, and problem-solving. It is observed that cognitive problem-solving skills give students opportunities to collaborate with peers under the instructions of their teachers (Hoic-Bozic et al., 2008). This approach towards learning refines their ability to make decisions, contextualize meaning, and resolve conflicts (Bayrak & Bayram, 2011). These skills are significant to learn at higher education level not only to become a successful professional but also to contribute to the country's global competitiveness (Songkram, Khlaisang, Puthaseranee, & Likhitamrongkiat, 2015).

2.7. Conceptual Framework

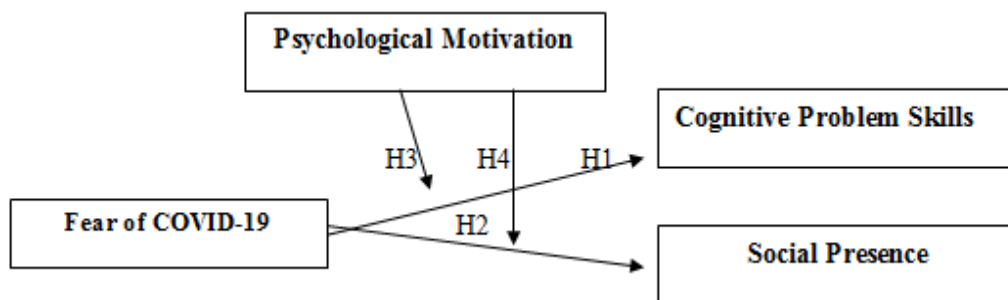


Figure-1. Conceptual framework based on Constructivist’s Theory supporting Online Learning during pandemic. Source: Cipolletta and Ortu (2020).

3. METHODOLOGY

A cross-sectional, descriptive, and correlational design was carried out by using a simple random sampling technique. The sample comprised of 244 undergraduate students of public universities, out of which 38% were females and 62% males. The adapted instrument was divided into five sections; the first section comprised of the demographic details; followed by a section on the fear of COVID-19 measured by 7-items (Ahorsu et al., 2020). Social Presence (SP) tool was adapted from Strong, Irby, Wynn, and McClure (2012) with 14 items, Psychological Motivation (PM) was measured using six items scale developed by Lee, Song, and Hong (2019) and Cognitive Problem-Solving (CPS) was measured using 5-items (Lee et al., 2019). All questions were rated on a Likert scale of five points (1 = strongly disagree to 5=strongly agree). An online structured questionnaire was developed and, a survey was conducted using Google forms.

3.1. Interpretation and Data Analysis

3.1.1. Demographic Section

The total number of gathered responses from public and private sector universities included 244 and 178 valid filled questionnaires respectively and their data was analyzed. The findings on demographic section showed that among the 244 and 178 respondents, 84 (34%) and 69 (38%) were females and males accounted for 160 (66%) and 110 (62%) in the sample of public and private universities respectively. All the respondents belonged to Pakistan from its various cities, with the highest percentage from Lahore with 67% and 62% in each sector as shown in Table 1.

Table-1. Demographics showing percentages and frequencies of the study participants from public and private sector universities.

| Sr. # | Demographic Items | Public Sector | | Private Sector | |
|-------|-------------------|---------------|------------|----------------|------------|
| | | Frequency | Percentage | Frequency | Percentage |
| 1 | Gender Female | 84 | 34% | 69 | 38% |
| | Male | 160 | 66% | 110 | 62% |
| 2 | Country Pakistan | 244 | 100% | 178 | 100% |
| 3 | City Lahore | 163 | 67% | 110 | 62% |
| | Others | 81 | 33% | 68 | 38% |
| | Total (N) | 244 | 100% | 178 | 100% |

3.2. Descriptive, Correlations among Variables, KMO Validity and Construct Reliability

3.2.1. Descriptive Analysis

The descriptive analysis of the respective mean and standard deviation values of all the variables for students’ views from public and private sector universities are shown in Table 2. The construct psychological motivation has

mean value of 2.6374 and 2.8558 with standard deviation measured 1.0010 and 1.0296 respectively. Cognitive problem-solving shows mean value i.e. 3.1111 (public) & 3.2764 (private) and SD of 0.9193 (public) & 0.8575 (private). The mean value for Fear of Covid-19 construct is 3.0492 for public universities and 2.8925 for private universities; along with their standard deviation of 0.9566 and 1.0078 respectively. Lastly, social presence reveals a mean of 3.4477 while it has standard deviation value of 0.6778 in public sector universities; for private sector universities it has a mean value of 3.5819 and standard deviation is 0.73601.

3.3. Correlations

Based on the results of the correlation analysis from public and private sector universities, it can be inferred that fear of covid-19 has a highly insignificant relationship with social presence with correlation extent of 1.6% and p-value > 0.01 i.e. 0.800 in public universities. Contrarily, in case of private universities, fear of covid-19 has a significant relationship with social presence with correlation extent of 22% and p-value < 0.01 i.e. 0.003. Similarly, there also exists an insignificant association between fear of covid-19 and cognitive problem-solving capability of students with extent of 5.6% and p-value > 0.01 i.e. 0.388 yet a significant relationship with psychological motivation i.e. 0.328% (p-value < 0.01 i.e. 0.000) within the context of public sector universities. Based on the results of the correlation analysis from private sector universities it can be inferred that, there also exists a significant association between fear of covid-19 and cognitive problem-solving capability of students with extent of 27.6% and p-value < 0.01 i.e. 0.000 and with psychological motivation i.e. -1.2% (p-value > 0.01 i.e. 0.856).

Perversely, for both public and private sector universities, psychological motivation exhibits a strong positive and significant correlation with cognitive problem solving i.e. 71.8% and 70.6% (p-value = 0.000 i.e. $p < 0.01$) and social presence i.e. 54.1% and 59.7% (p-value = 0.000 i.e. $p < 0.01$) respectively. There exists a significantly positive 52.4% (public sector) and 65.7% (private sector) (p-value < 0.01 i.e. 0.000) correlation between cognitive problem solving and social presence and the results are shown in [Table 2](#).

3.4. KMO Validity

The results of the exploratory factor analysis conducted on data gathered from both public and private sector universities are shown in [Table 2](#). Two items of social presence i.e. 'I felt comfortable making conversation through this text based medium' and 'Discussions using the medium of computer-mediated communication tend to be more unbiased than face-to-face medium' were removed from the originally adapted scale while collecting data from public sector universities, since their loading was less than 0.5. This resulted in an increased KMO index of 0.813 and p-value of 0.000 confirming the adequacy of the sample taken for the study. Likewise, for private sector universities, only 1 item for social presence i.e. 'I felt comfortable making conversation through this text based medium' was removed from the originally adapted scale since its loading was less than 0.5. Doing so resulted in an increased KMO index of 0.851 and p-value of 0.000.

The KMO value for Fear of COVID-19 results in 0.896 and 0.884 ($p = 0.000$) for public and private universities respectively. For cognitive problem solving, KMO index is equal to 0.857 and 0.877 ($p = 0.000$) in both public and private universities respectively. Lastly, the sample driven data adequacy has also been confirmed for psychological motivation with KMO index of 0.909 (public) and 0.902 (private).

3.6. Construct Reliability

The results of reliability coefficients for all the variables studied in context of public and private sector universities showed that Cronbach's Alpha coefficients for social presence were 0.812 & 0.884, 0.887 & 0.903 for fear of covid-19, 0.925 and 0.935 for psychological motivation, and 0.884 & 0.905 for cognitive problem solving respectively. The results are summarized in [Table 2](#) and depict strong internal item consistency for each of the constructs.

Table-2. Descriptives, correlations, cronbach's alpha coefficients and kmo indexes.

| Constructs | Fear of COVID-19 | Social Presence | Cognitive Problem Solving | Psychological Motivation |
|---------------------------|--|--|--|--|
| Fear of COVID-19 | ----- | | | |
| Social Presence | (0.016 ¹)(0.22 ^{2*}) | ----- | | |
| Cognitive Problem Solving | (0.056 ¹)(0.276 ^{2*}) | (0.524 ^{1*})(0.657 ^{2*}) | ----- | |
| Psychological Motivation | (-0.012 ¹)(0.328 ^{2*}) | (0.541 ^{1*})(0.597 ^{2*}) | (0.718 ^{1*})(0.706 ^{2*}) | ----- |
| N (Public & Private) | (244 ¹)(178 ²) | (244 ¹)(178 ²) | (244 ¹)(178 ²) | (244 ¹)(178 ²) |
| Mean | (3.049 ¹)(2.892 ²) | (3.447 ¹)(3.582 ²) | (3.111 ¹)(3.276 ²) | (2.637 ¹)(2.856 ²) |
| Std. Deviation | (0.957 ¹)(0.008 ²) | (0.678 ¹)(0.736 ²) | (0.919 ¹)(0.856 ²) | (1.001 ¹)(1.029 ²) |
| Reliability | (0.887 ¹)(0.903 ²) | (0.812 ¹)(0.884 ²) | (0.884 ¹)(0.905 ²) | (0.925 ¹)(0.935 ²) |
| KMO Index | (0.896 ¹)(0.884 ²) | (0.813 ¹)(0.851 ²) | (0.857 ¹)(0.877 ²) | (0.909 ¹)(0.902 ²) |

3.8. Moderated Regression Analysis for Public Sector Universities

Table 3 and Table 4 are a consolidated illustration of the hierarchical moderation analysis conducted for both public and private sector universities in the form of two basic and two interaction models for each of the sector's data respectively. In order to judge the direct effect of fear of COVID-19 on social presence and cognitive problem solving and interaction based effect of fear of COVID-19 again on social presence and cognitive problem solving of students at both public sector and private sector universities, a hierarchical regression analysis was conducted. Implementing hierarchical regression analysis helped estimating both 'Basic Models' as well as 'Interaction Models'. Upon satisfying the regression assumptions, moderated regression analysis was conducted and confirmed using the Process method.

For Public Sector Universities, the analysis shows that for Basic Model 1, the predictor or independent variable i.e. fear of COVID-19 has an insignificant direct effect on the criterion or dependent variable i.e. cognitive problem solving ($\beta = 0.053$, p -value = $0.388 > 0.01$). Contrarily, the moderating variable psychological motivation shows making a direct significant effect on cognitive problem solving ($\beta = 0.655$, p -value = $0.000 < 0.01$), showing the evidence of the presence of robust role of the moderator i.e. psychological motivation. Considering the Interaction Model 1 with product term between the independent (x) and moderating variable (z) or the interaction relationship between fear of COVID-19 and psychological motivation, the results depict that there is a significantly positive interaction effect of the product term on cognitive problem solving of students ($\beta = 0.824$, p -value = $0.000 < 0.01$). This can be inferred that in public sector universities the fear of COVID-19 is accompanied by greater psychological motivation among students and that their cognitive problem-solving ability is also increased. The increase in R^2 change value ($\Delta R^2 = 0.010$, p -value = 0.024) based on the interaction effect confirms the strong influence of psychological motivation, which in turn results in higher cognitive problem solving due to higher fear of COVID-19 among students. The quantitative results are shown in Table 3.

For public sector universities, the results of the analysis show that for Basic Model 2, the predictor or independent variable i.e. fear of COVID-19 has an highly insignificant direct effect on the criterion or dependent variable i.e. social presence ($\beta = 0.012$, p -value = $0.800 > 0.01$). Contrarily, the moderating variable psychological motivation shows a direct significant effect on social presence ($\beta = 0.366$, p -value = $0.000 < 0.01$) showing the evidence of the presence of robust role of the moderator i.e. psychological motivation. Considering the Interaction Model 2 with product term between the independent (x) and moderating variable (z) i.e. interaction relationship between fear of COVID-19 and psychological motivation, the results depict that there is a significant interaction effect of the product term on social presence of the students ($\beta = 0.651$, p -value = $0.000 < 0.01$). This can be inferred that in public sector universities, the fear of COVID-19 is accompanied by greater psychological motivation among the students, their social presence also increased. The results of Basic Model 2 and Interaction Model 2 for public sector universities have been exemplified in Table 3.

Table-3. Direct and interaction effects for public sector universities.

| Independent Variable | Basic Model 1 | | Interaction Model 1 | | Basic Model 2 | | Interaction Model 2 | |
|-------------------------|---------------|---------|---------------------|---------|---------------|---------|---------------------|---------|
| | B | t | B | t | B | t | B | t |
| Intercept (α) | 2.948 | 14.961* | 2.920 | 19.459* | 3.413 | 23.452* | 3.396 | 27.129* |
| X (β_1) | 0.053 | 0.856 | -0.435 | -7.294* | 0.012 | 0.254 | -0.273 | -5.487* |
| Z (β_2) | 0.189 | 13.280* | 0.655 | 16.087* | 0.110 | 9.274* | 0.366 | 9.957* |
| X_x_Z (β_3) | | | 0.824 | 13.280* | 0.110 | 9.274* | 0.651 | 9.274* |
| R ² | 0.003 | | 0.424 | | 0.000 | | 0.263 | |
| Adjusted R ² | -0.001 | | 0.420 | | -0.004 | | 0.257 | |
| F | 0.749 | | 88.822 | | 0.064 | | 43.051 | |
| ΔR^2 | | | 0.0101 | | | | 0.000 | |

3.9. Moderated Regression Analysis for Private Sector Universities

For private sector universities, the results of the analysis show that in the Basic Model 1, the predictor or independent variable i.e. fear of COVID-19 has a significant direct effect on the criterion or dependent variable i.e. cognitive problem solving ($\beta = 0.235$, p-value = 0.000 < 0.01). Contrarily, the moderating variable psychological motivation shows a direct significant effect on cognitive problem solving ($\beta = 0.164$, p-value = 0.000 < 0.01) showing the evidence of the presence of robust role of the moderator i.e. psychological motivation. Considering the Interaction Model 1 with product term between the independent (x) and moderating variable (z) i.e. interaction relationship between fear of COVID-19 and psychological motivation, the results depict that there is a highly significant interaction effect of the product term on cognitive problem solving of the students ($\beta = 0.955$, p-value = 0.000 < 0.01). This can be inferred that in private sector universities, fear of COVID-19 accompanied by greater psychological motivation among the students, and as a result their cognitive problem solving ability increases. The quantitative results are given in Table 4. For Private Sector Universities, the results of the analysis show that for Basic Model 2, the predictor or independent variable i.e. fear of COVID-19 has an a significant direct effect on the criterion or dependent variable i.e. social presence ($\beta = 0.161$, p-value = 0.003 < 0.01). Contrarily, the moderating variable psychological motivation shows a direct significant effect on social presence ($\beta = 0.134$, p-value = 0.000 < 0.01) showing the evidence of the presence of robust role of the moderator i.e. psychological motivation. Considering the Interaction Model 2 with product term between the independent (x) and moderating variable (z) i.e. interaction relationship between fear of COVID-19 and psychological motivation, the results depict that there is a significant interaction effect of the product term on social presence of the students ($\beta = 0.913$, p-value = 0.000 < 0.01). This can be inferred that in private sector universities the fear of COVID-19 is accompanied by greater psychological motivation among students, and that their social presence increases. The significant R² change value ($\Delta R^2 = 0.031$, p-value = 0.036) based on the interaction effect confirms the positive influence of fear of COVID-19 on social presence based on higher psychological motivation among students. The results of Basic Model 2 and Interaction Model 2 for Private Sector Universities have been exemplified in Table 4.

Table-4 Direct and interaction effects for private sector universities.

| Independent Variable | Basic Model 1 | | Interaction Model 1 | | Basic Model 2 | | Interaction Model 2 | |
|-------------------------|---------------|---------|---------------------|---------|---------------|---------|---------------------|---------|
| | B | T | B | t | B | t | B | t |
| Intercept (α) | 2.597 | 13.759* | 3.005 | 19.814* | 3.117 | 23.452* | 3.452 | 27.129* |
| X (β_1) | 0.235 | 3.808* | -0.393 | -5.206* | 0.161 | 0.254* | -0.355 | -5.487* |
| Z (β_2) | 0.164 | 10.762* | 0.573 | 12.080* | 0.134 | 9.780* | 0.409 | 9.063* |
| X_x_Z (β_3) | | | 0.955 | 10.72* | | | 0.913 | 9.780* |
| R ² | 0.076 | | 0.444 | | 0.048 | | 0.620 | |
| Adjusted R ² | 0.071 | | 0.438 | | 0.043 | | 0.378 | |
| F | 14.502 | | 69.894 | | 8.948 | | 54.699 | |
| ΔR^2 | | | 0.003 | | | | 0.031 | |

4. DISCUSSION

Drawing upon the constructive theory, this research investigated the effects of Fear of COVID-19 on the social presence and cognitive problem solving of the students with the moderating effects of psychological motivation among Pakistani private and public undergraduate students. No doubt, online learning demands social perspectives, and social interactions are the core of the learning cycle (Rovai & Learning, 2002; Sung & Mayer, 2012). Even though, social interaction is significantly positively associated with learning outcomes (Rovai & Learning, 2002; Sung & Mayer, 2012) and satisfaction among students (Borup, West, & Graham, 2012; Richardson & Swan, 2003)

In this research, data was grouped into public and private Pakistani university students. Fear of COVID-19 has highly insignificant relationship (p -value > 0.01 i.e. 0.800) with the social presence while Fear of COVID-19 has also an insignificant (p -value > 0.01 i.e. 0.388) association with the cognitive problem-solving skills of public university students while Fear of COVID-19 reported significant relationship (p -value < 0.01 i.e. 0.000) with psychological motivation. Contrarily, psychological motivation showed positive relationship (p -value = 0.000 i.e. $p < 0.01$) with social presence while significant association between cognitive problem-solving skills (p -value = 0.000 i.e. $p < 0.01$) and social presence. On the other hand, Fear of COVID-19 has significant relationship between social presence (p -value < 0.01 i.e. 0.003) and cognitive problem-solving skills (p -value < 0.01 i.e. 0.000) with psychological motivation (p -value > 0.01 i.e. 0.856). Psychological motivation exhibits a strong positive relationship (p -value = 0.000 i.e. $p < 0.01$) with cognitive problem-solving skills and social presence (p -value = 0.000 i.e. $p < 0.01$). Yet, significant positive (p -value < 0.01 i.e. 0.000) association among Cognitive Problem Solving and Social Presence. In view of literature, previous studies analyzed that pandemic increased anxiety, stress and panic among Chinese universities' students by using online mode of learning platform (Wang et al., 2020). While students who quarantined themselves during disease were bound to experience the impact of intense stress disorder, adjustment disorder, and pain. These factors detrimentally affect the learning (Steele & Kuban, 2011).

Subsequently, hierarchical moderation analysis was conducted for both Public and Private Sector Universities in the form of two basic and two interaction models for each of the sector's data respectively. For Public Sector Universities, the results of the analysis show that for Basic Model 1, the predictor or independent variable i.e. Fear of COVID-19 has an insignificant direct effect on the criterion or dependent variable i.e. Cognitive Problem Solving ($\beta = 0.053$, p -value = 0.388 > 0.01). Contrarily, the moderating variable Psychological Motivation shows a direct significant effect on Cognitive Problem Solving ($\beta = 0.655$, p -value = 0.000 < 0.01) showing the evidence of the presence of robust role of the moderator i.e. Psychological Motivation. Considering the Interaction Model 1 with product term between the independent (x) and moderating variable (z) i.e. interaction relationship between Fear of COVID-19 and Psychological Motivation, the results depict that there is a significantly positive interaction effect of the product term on Cognitive Problem Solving of the students ($\beta = 0.824$, p -value = 0.000 < 0.01). This can be inferred that in Public Sector Universities, fear of COVID-19 is accompanied by greater psychological motivation among the students, their cognitive problem-solving ability is also increased. The increase in R^2 change value ($\Delta R^2 = 0.010$, p -value = 0.024) based on the interaction effect confirms the strong influence of Psychological Motivation, which in turn results in higher cognitive problem solving due to higher fear of COVID-19 among students. Gradually, the nature of schools appears as a significant factor in the experience of anxiety and pressure. Students having a place with Government schools were encountering more stress than students of private (Jahan & Devi, 2018). While Fear of COVID among public university students reported insignificant than private university students. While governmental medical college's students experienced stress significantly different from students of private medical colleges by using different coping strategies (Jahan & Devi, 2018). Similarly, in Basic Model 2, the predictor or independent variable i.e. Fear of COVID-19 has highly insignificant direct effect on the criterion or dependent variable i.e. Social Presence ($\beta = 0.012$, p -value = 0.800 > 0.01).

Contrarily, the moderating variable Psychological Motivation shows a direct significant effect on Social Presence ($\beta = 0.366$, p -value = 0.000 < 0.01) showing the evidence of the presence of robust role of the moderator

i.e. Psychological Motivation. This can be inferred that in Public Sector Universities, having existence of fear of COVID-19 accompanied by greater psychological motivation among the students, their social presence also increased. Such as, the motivation and learning expectations were indispensable for problem-solving activities coupled with learning satisfaction in the online learning environment (Mingfang & Qi, 2018). Furthermore, having negative cognition with quarantine status, the interdependence between mental health status and negative cognition by way of COVID-19 was related emotional distress. Though, their mediation is associated with negative cognition, quarantine status, and self-half after the outbreak of COVID-19 (Ren et al., 2020).

Lastly, the predictor or independent variable i.e. Fear of COVID-19 has a significant direct effect on the criterion or dependent variable. Contrarily, the moderating variable Psychological Motivation shows a direct significant effect on Social Presence ($\beta = 0.134$, $p\text{-value} = 0.000 < 0.01$) showing the evidence of the presence of robust role of the moderator. Compared with the study, psychological states of public reported SAS score 36.92 (SD = 7.33) and 6.33% had anxiety during the outbreak among university students (Wang et al., 2020). This affirms with the previous studies showing that urging mental health of the students is influenced by the epidemic.

5. CONCLUSION

Educational institutions around the globe have suspended face to face learning due to COVID-19 but not suspended the learning. It has become a mandatory factor for all educational institutions to adopt remote learning practices quickly at large scale, equally in developing and ever-evolving COVID-19 settings. It means the pandemic substantially affected the physical, psychological, cognitive, and behavioral responses of universities' students. Many of the students have perceived anxiety, intolerance, and suffered fear while flaring up with COVID-19. Wang et al. (2020) concluded that the majority of university students reported psychological problems, Fear of COVID-19, and learning satisfaction during online learning. In essence, social presence is appraised as one of the key factors for the accomplishment of online learning when it has impacted online communication, student satisfaction, integrity of online conversation, and critical reasoning. Since the commencement of this online mode of learning, public-sector students have perceived more anxiety and are found worried about the future during the outbreak of COVID-19 than private-sector students. Despite this, students' engagement and cognitive problem-solving skills have suffered during the eLearning environment while cognitive problem solving refers to internal cognition of the learners including knowledge formation, applications, and memorization. Student's online learning satisfaction is a psychological condition in which psychological motivation has a positively moderated relationship between fear of COVID-19 and social presence, cognitive problem-solving skills. Consequently, the motivation of students comprises social, emotional, and behavioral commitments. Learning behavioral and social skills is identified with peer interaction, and cognitive problem skills belong to emotional participation.

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