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Did the Communication Barriers During the Lockdown Reduce Students' Satisfaction?

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The lockdown control measures implemented against the pandemic of COVID-19 have had a global effect on various aspects of our lives as a society. Considering the impact of the lockdown caused by COVID-19 on adolescents, we conducted practical longitudinal research on the changes in adolescent satisfaction before and after lockdown. A total of 221 students aged 13–19 years from a professional adolescent football school in China participated in a self-report satisfaction questionnaire before and after the lockdown. The results showed that the satisfaction of adolescents improved significantly after the lockdown. There were significant differences based on age in the improvement rate, but the correlation between the students' home regions (and how they were affected by COVID-19) and satisfaction improvement was not significant. To examine the possible reasons behind the improvement in adolescent satisfaction, we then analyzed in detail the online teaching and training methods implemented by the school during the lockdown. Based on this investigation, we outlined recommendations to guide future practice. This research is expected to deepen the theory and practice associated with the development of Chinese adolescent teaching, which may be applied to other training institutions.

Keywords: adolescent satisfaction, Chinese football school, COVID-19, lockdown, online teaching, training institutions

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1 INTRODUCTION

As of October 24, 2021, there have been 243 million confirmed cases of COVID-19, including 4.9 million deaths, the coronavirus disease 2019 (COVID-19) globally (World Health Organization, 2021), with the virus continuing to spread. Following the example of Wuhan, China, many countries implemented lockdown measures to alleviate the spread of the infection and contain the outbreak (Lau et al., 2020). The latter, have not only affected human lives and the economy on a global level, but are also expected to affect micro-personal psychology, cognition, and interrelationships (Chang et al., 2020; Chen et al., 2020; Zhao et al., 2020; Zhu et al., 2020).

Among them, Di Crosta et al. (2021) conducted research on consumer behavior and its psychological antecedents during the pandemic showed that consumer behavior was affected by the new coronavirus. Cannito et al. (2021) also researched consumer behavior preferences during the epidemic and proved the impact of COVID-19 on consumer behavior. The study of Ceccato et al. (2021) verified the impact of COVID-19 on the future life expectations of tested adults. Related studies have also confirmed the impact of COVID-19 on different age groups (Ceccato et al., 2021;

Rosi et al., 2021). Ceccato et al. (2021) conducted research on age-related differences in crisis emotions, cognitive attitudes, and behavioral responses showed that in the COVID-19 epidemic, the elderly as high-risk groups had lower negative emotions than young people and middle-aged people. The results of Rosi et al. (2021) showed that the older the age, the lower the susceptibility to Covid-19, but the higher the perceived severity. Different predictors explained the perception of risk severity and vulnerability in different age groups. In COVID-19 related research, youth should also be a group of concern.

In most countries, including China, during the lockdown period, schools and educational institutions, most factories, non-emergency supplies stores, and institutions were closed, while the people were required to stay at home, and not go out unless necessitated by an emergency (British Broadcasting Corporation, 2020; DW News, 2020). At this time, many people were separated from their close ones while their homes acted as offices and schools, following the implementation of remote work and online distance learning (Prospects, 2020; Science Focus, 2020). Therefore, many families and individuals had to adapt to these changes (Adjust, 2020).

For students of one football school in China, the lockdown of 3 months meant foregoing face-to-face teaching and coaching with their teachers and coaches, group collaboration with teammates, and outdoor sports training, which may have been associated with some physical and psychological effects.

Satisfaction is an important indicator for sports teams (Burns et al., 2012). Numerous studies have shown that athlete satisfaction and sports performance are closely related (Sriboon, 2002; Bebetsos and Theodorakis, 2003; Cunningham and Dixon, 2003; Reinboth and Duda, 2006). Moreover, team cohesion and leadership are related to athlete satisfaction (Aoyagi et al., 2008; Karreman et al., 2009; Chen et al., 2015). During the lockdown period, we were unable to fully evaluate the team performance of sports teams and the individual performance of the student-athletes due to the lockdown conditions, however, we were able to assess the self-reported satisfaction of the student-athletes.

Therefore, the purpose of this study was to examine the changes in the satisfaction of students after going through a COVID-19 imposed lockdown in a football school and to analyze the online teaching and training methods that might have affected these changes.

2 THEORETICAL HYPOTHESIS

Communication theory believed that communication was a process of expression, interaction, and influence. In this process, individuals interacted with other individuals through similar expressions to affect their cognition, emotions, and behaviors (Craig, 1999, p143). There were barriers to the communication environment caused by changes in the communication space and time of communication. There were also communication barriers due to changes in understanding and expression, and levels. Changes in mentality and communication media also created communication barriers (Eisenberg, 2010).

During the lockdown, coaches had to rely on online education and video methods to teach. This allowed students and coaches to switch from face-to-face communication to video communication, which was a change in the communication medium. Online education did not limit the time and space of video communication between students and coaches, which made the communication space and communication time between them change. For the coach to express communication content through video more clearly, the way of expression also changed. At the same time, due to the prolonged lockdown, the mentality of coaches and students changed. These were theoretically possible barriers to communication. From an intuitive understanding, this barrier may affect student satisfaction.

Studies have found that the existence of communication barriers will reduce the effectiveness of communication (Lunenburg, 2010; Guttman et al., 2018). Park and Song (2005) investigated the communication barriers experienced by patients and nurses in their research, and believed that it is necessary for nurses to understand patients' perceptions of communication barriers and obtain better communication skills and attitudes. Norouzinia et al. (2016) found in a study that communication barriers affect the relationship between nurses and patients, but these obstacles can be eliminated by raising the awareness of nurses and patients and creating an ideal environment. They recommend effective communication between nurses skills training and encourage nurses through continuous monitoring of acquired skills. The research of Norouzinia et al. (2016) inspired us, perhaps through a more detailed online education implementation process to reduce the negative impact of communication barriers on student satisfaction with coaches. More importantly, Li et al. (2020) found in a study that online teaching during the lockdown period improved the coach-athlete relationship. Regarding student satisfaction, the online teaching project of this research has been implemented as rigorously and meticulously as possible, and various methods have been adopted to avoid communication barriers. Therefore, we tried to make the following assumptions.

Hypothesis. During the period of the epidemic, online teaching under meticulous promotion will increase the satisfaction of students.

TABLE 1 | Age distribution of test participants.

Age	Test participants number	
	Before lockdown	After lockdown
13	30	45
14	49	19
15	35	40
16	24	33
17	24	27
18	0	13
19	19	20

3 METHODS

3.1 Participants

We conducted a longitudinal study of the impact of COVID-19 lockdown on 221 students (male, average age 15.33) aged

13–19 years (See **Table 1**), attendees of a professional adolescent football school in China. During the lockdown, the players who normally attend boarding school returned to their family homes located in different provinces in China for 3 months between January 4–17 and April 17, 2020. The students who participated in the survey were unable to meet their teammates and coaches during the 3-month lockdown. Every day, from Monday to Friday, they participated in online learning and training; the school teachers broadcasted live video lessons, arranged assignments and corrective assignments, and conducted daily teaching activities following the school's regular schedule. Coaches and students had daily video meetings, during which they conducted ball-free and confrontation-free training.

3.2 Measure

In this study, the Chinese version (Yang, 2019) of the subscale of the Athlete Satisfaction Questionnaire (Riemer and Chelladurai, 1998) was used to measure student athletes' satisfaction: the subscale of individual satisfaction contains three items on individual performance satisfaction (e. g. the improvement in my skill level thus far), while the subscale of satisfaction with the team contains three items on team performance satisfaction (e. g. the extent to which the team has met its goals for the season thus far). Riemer and Chelladurai (1998) reported the two subscales to originally have Cronbach's alpha levels of 0.85 and 0.95, respectively. The Cronbach's alpha values of the two subscales obtained for the Chinese version in Yang's study were 0.79 and 0.80, respectively. The Cronbach's alpha levels of the two subscales we obtained in the study were 0.81 and 0.87, respectively. The items were measured using a five-point Likert scale, with answers ranging from 1 (never) to 5 (always).

3.3 Data Collection Procedure

This research was conducted with the consent of the Ethics Committee of Beijing Jiaotong University. The second cross-sectional data collection in this study was approved by the Shandong Luneng Taishan Football School Ethics Committee. The student-athletes participating in the survey were informed that participation in the study was voluntary and anonymous, and that they would be allowed to withdraw at any time. They were not compensated for participating in the survey in any way. Their questionnaire completion process was completed independently.

The data were collected at two time points using the same questionnaire: before the full outbreak of the COVID-19 pandemic in December 2019, and then on April 17, 2020, when China's pandemic was fully controlled and the lockdown was lifted in various places. During the first data collection, we used a paper questionnaire. Student-athletes completed the questionnaires in a classroom at their school (approximately 30 players at a time) before the time of their evening self-study after dinner. They filled out the questionnaires in the classroom or the technical and tactical rooms.

Before the questionnaire survey began, the investigators explained to the students that the purpose of the questionnaire was to conduct scientific research and asked them to complete it independently without consulting each other. After all the student athletes completed the survey, the investigator collected the questionnaires. The entire process of data collection was conducted by the researchers, and neither the teachers nor the coaches were present. After the paper questionnaires were collected, the researchers coded the questionnaires and entered the data into the computer. After the data entry was completed, another researcher conducted a second check to validate and confirm the data from the first questionnaire survey.

For the second data collection, we used an electronic questionnaire. The student-athletes completed the electronic questionnaire at home. Similar to the procedure followed during the first data collection, the investigators introduced the purpose of the questionnaire and communicated the precautions before the student-athletes began filling out the questionnaire. The questionnaires were sent to the student-athletes through a WeChat group. Then, they were asked to choose a time of their convenience to complete the questionnaire within 1 day of receiving it.

A team of 28 student-athletes did not participate in the first questionnaire because they had gone out to participate in a competition. After deleting the questionnaires with missing data, 171 datasets were obtained in the first survey (the data validity rate was 77%). After the second, online, data collection, the questionnaires that were filled out within 40 or fewer seconds were deleted. We obtained 213 completed questionnaires in the second survey (the data validity rate was 96%).

3.4.1 Teaching Plan

Under the unified coordination of the head of the department, the teacher arranged every week of online teaching for a given student unit or grade 1 week in advance (before 4:00 pm on a Friday, from February 10 to May 15, 2020), and arranged the curriculum. A week of online teaching involved five study days a week and 20 lessons per week, including four to six lessons in Chinese, mathematics, and English, and one to three lessons in other subjects. The number of political sciences, language, mathematics, and English classes in high school grades remained the same as it was during classroom teaching (see Supplementary Materials 1 to 3 for course examples).

The teachers prepared the lesson plans. The teaching plan had to include, at least, the content of the teaching materials. The teachers had to provide a brief analysis of the teaching materials, teaching objectives, major and difficult points, preparation of teaching resources (coursework, lesson plans, online courses), and teaching methods (online courses, live lectures, smart classrooms, self-learning by publishing tasks). There were also teaching procedures, homework design (including tutorials), and homework feedback forms (see Supplementary Material 1 to 3 for course examples and Supplementary Material 4 for the online learning plan).

3.4.2 Teaching Resources

According to the teaching guidelines set for the new semester in response to COVID-19, teachers are to use the online cloud classroom resources. Teaching resources and technical support provided by the cloud platform were announced by the Ministry

of Education of China to enable the teachers to carefully prepare the lessons during the pandemic. Teachers prepared lesson plans or coursework, uploaded them for the students for the latter's learning, and matched appropriate exercises to consolidate the learning objectives. Teachers could upload the teaching resource links for the new textbook content, electronic versions of teaching materials, or forward images to students for learning. The learning resources or learning requirements sent by the teachers had to be integrated before they were published so that parents and students could understand the requirements instantly.

Furthermore, a variety of applications were used together during the online course. The advantages of various types of software were integrated. For example, in addition to the commonly used "Xiao Rui homework", the "onion math" micro-learning and classroom quiz functions were used to guide students to turn pre-emptive learning into reality for the subject of mathematics. The English course made full use of the assessment and display function of the "Middle School Together" online platform to guide students to practice spoken language and perform animation (video) dubbing. With the help of the platform, all the functions of regular English teaching were realized, from word pronunciation to reading comprehension, and from word dictation to oral training. Some teachers also explored the "little butler" function in the WeChat mini-program to upload and give feedback for homework, and used the "Solitaire" mini-program to reduce screen swipes, perform recitation, and check-in. In short, the teachers adhered to the concept of "everything for the children" and "everything to optimize the teaching effect," and continued to practice and explore.

3.4.3 Evaluation of the Teaching Process

Course preparation, teaching, assignment submission, review, and feedback were accomplished by the requirements of conventional teaching and were effective. Teachers were familiar with the teaching content; the teaching process was smooth; and the explanation was clear and concise, easy to understand, reflected the teachers' personal style, and could attract the students. Teachers strengthened the control of the students' learning process through effective methods. Students who failed to enter the classroom in time were promptly reminded, noted, and timely feedback was sent to students and parents.

Another important aspect was moral education during the pandemic. According to the relevant requirements for pandemic prevention and control, combined with the current long-term separation of school students from their parents and the need for multi-element cultivation, the teachers organized homework experiences and activities encouraging the students to raise the national flag on the internet, thank their parents by helping the latter with housework and cooking. Teachers also organized online donations to support initiatives such as "the most beautiful retrogrades" (telling the story of the doctors who fight against the pandemic around them), "talking on the weekends" (players discussed how they felt after reading a biography of a famous football player), "tree-planting festival knowing green and protecting the green" (student-athletes shared photos or videos of what they planted in their gardens), and other practice activities for moral education. Through these activities, teachers guided the students to care about their family, their country and the world, while learning to be grateful and responsible.

Furthermore, due to time and equipment limitations during regular school hours, students had few opportunities to share their work. The teachers utilized the display function of the online platform (School's WeChat official public platform) to carry out subject competition display activities. Some of these activities organized by the teachers included handwritten newspaper displays, speaking or Oral English competition in front of the camera, and hard pen calligraphy competition, according to the different characteristics of a given subject. The opportunities presented to each student aimed to allow them to fully exercise their diverse abilities.

3.4.4 Control of the Teaching Outcomes

To ensure the effectiveness of online learning, the teaching outcomes were timely monitored, feedback on the students' learning status was provided in time, and necessary adjustments were made. The teacher evaluated and gave feedback to the students according to the students' participation in lectures, homework completion, and discussions. In response to problems in learning attitude, teachers communicated with the relevant department leaders and coaches, and received strong support from the leaders. The effect of this joint education by coaches and teachers was immediate.

Each department counted the number of teaching plans and evaluated them once a week on an important basis for teacher performance evaluation (see Supplementary Material 5 for details). Based on the evaluation of the Faculty of Education, the Teaching Department evaluated the teachers' distance teaching work based on the quality of the teaching plans (including coursework), resources, and platform usage. Recommend outstanding cases were shared with all the teachers.

Teachers provided face-to-face feedback to the parents on the students' learning process and the deficiencies in the learning process, as well as the areas where parents need to cooperate with them, during online parent-teacher meetings through the "Live Streaming Cloud" or "Tencent Meeting". The meetings helped achieve good parent-teacher communication. To understand the effect of the online classroom and obtain reasonable suggestions from parents, a questionnaire survey was completed by the parents. A few of the questions this questionnaire survey covered were related to the students' study time, homework methods, amount of work, and activity development. The questionnaire showed the parents' satisfaction to have reached 98.2%.

3.5 Statistical Analysis

Analyses were performed with SPSSAU and Microsoft Excel. Distribution normality was assessed using the Kolmogorov-Smirnov test. Normally distributed data were analyzed with a *t*-test, while non-normally distributed data were analyzed with a rank-sum test.

TABLE 2 | Normality test of data.

Variable	Group	N	Normality		Extreme difference			Kolmogorov–Smirnov Z	Sig.
			Mean	SD	Absolute	Plus	Minus		
Individual Performance	Before	171	3.883	0.844	0.157	0.093	−0.157	0.157	*0.000*
	After	213	4.186	0.738	0.161	0.135	−0.161	0.161	*0.000*
Team Performance	Before	171	3.877	0.937	0.125	0.115	−0.125	0.125	*0.000*
	After	213	4.357	0.804	0.248	0.212	−0.248	0.248	*0.000*

N, number of samples; SD, standard deviation.

TABLE 3 | Testing of significant differences.

Variable	Group	N	Mean ranks	Sum of ranks	Mann-whitney U	Wilcoxon W	Z	Sig.
Individual Performance	Before	171	170.82	29,209.50	14,503.500	29,209.500	−3.482	*0.000*
	After	213	209.91	44,710.50				
Team Performance	Before	171	158.73	27,142.50	12,436.500	27,142.500	−5.492	*0.000*
	After	213	219.61	46,777.50				

N, number of samples.

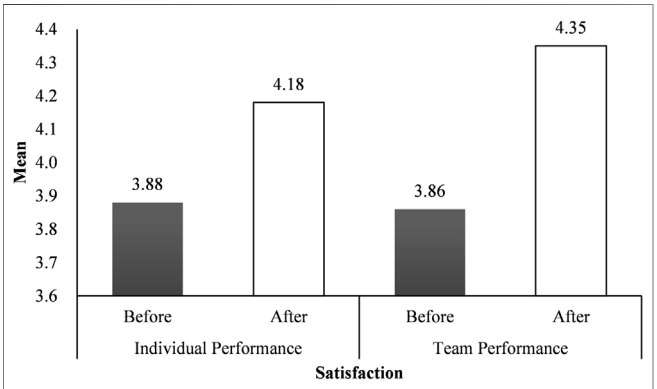

FIGURE 1 | Satisfaction comparison chart of individual performance and team performance.

4 RESULTS

4.1 Normality Test

We conducted a Kolmogorov–Smirnov normality test as the sample size was greater than 50 (Lilliefors, 1967; Drezner et al., 2010). Specifically, for all the data collected before and after the COVID-19 lockdown, the results were significant ($p < 0.05$), suggesting that the data were not normally distributed (**Table 2**).

4.2 Average Value Difference Examination

4.2.1 Difference Examination

Since the samples did not conform to a normal distribution, the rank-sum test was used to verify the differences. The Mann-Whitney U test was thus employed to verify the differences collected before and after the lockdown. As **Table 3** shown, the results indicated that the students' satisfaction on individual performance before the COVID-19 lockdown was significantly different from that after the COVID-19 lockdown ($Z = -3.482$, $p < 0.001$). Athletes' satisfaction with team performance also had the same characteristics ($Z = -5.492$, $p < 0.001$).

Next, we compared the differences between the two groups. As **Figure 1** shown, the mean value of individual performance after the COVID-19 lockdown was higher than that before (4.18 > 3.88). Thus, the COVID-19 lockdown was beneficial for the athlete's individual performance. The mean value of team performance after the COVID-19 lockdown was also higher than that before (4.35 > 3.86). Thus, the COVID-19 lockdown was beneficial for the athlete's team performance.

4.2.2 Analysis by Age

We next compared and analyzed the data of the two dimensions of satisfaction before and after the COVID-19 lockdown according to age (see **Figures 2**, **3**). As shown by the figures, in the 13-, 14-, 15-, 16-, 17-, and 19 year-old groups, the values of individual performance satisfaction significantly increased after the lockdown. The post-lockdown and pre-lockdown data were 14 years old (4.36 > 3.87), 15 years old (4.05 > 3.59), 16 years old (4.18 > 3.78), 17 years old (3.91 > 3.73), and 19 years old (4.30 > 3.82). As for team performance, the satisfaction increased after the lockdown in the 13-, 15-, 16-, and 17 year-old groups. The post-lockdown and pre-lockdown data were 13 years old (4.37 > 4.21), 15 years old (4.40 > 3.80), 16 years old (4.75 > 3.45), and 17 years old (4.01 > 3.05). However, the figures for 14- and 19 year-olds did not improve significantly. The post-lockdown and pre lockdown data were 14 years old (4.18 < 4.23), and 19 years old (4.02 < 4.07).

4.2.3 Geographical Analysis

We used SPSSAU to analyze the correlation between the two sets of data. As shown in **Table 4**, we used correlation analysis to study the correlation between Individual Performance and Team

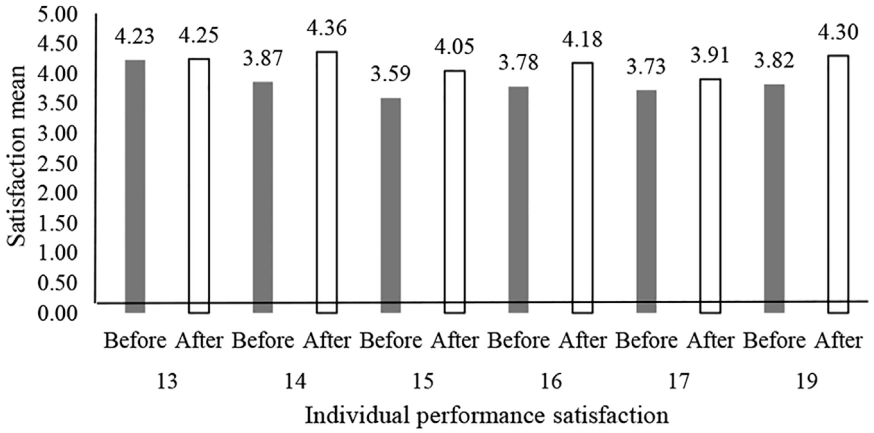

FIGURE 2 | Satisfaction of individual performance chart by age.

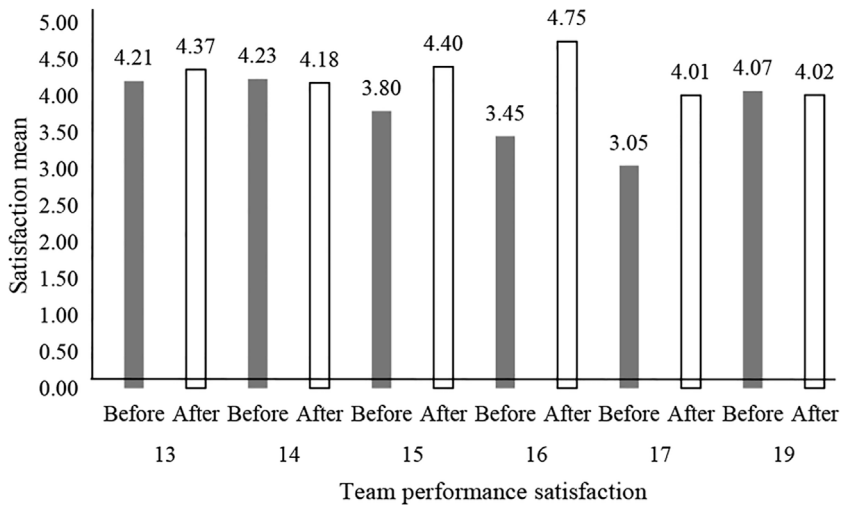

FIGURE 3 | Satisfaction of team performance chart by age.

TABLE 4 | Analysis of the correlation between student satisfaction and regions.

Variable	Mean	SD	Individual performance	Team performance	Regions
Individual Performance	4.100	0.374	1		
Team Performance	4.347	0.567	0.485*	1	
home regions	0.568	0.439	-0.186	-0.081	1

* $p < 0.05$.

Performance, Regions and used the Pearson correlation coefficient to express the correlation. Specific analysis showed that: the correlation coefficient between Individual Performance and Team Performance was 0.485, and it showed a significance of 0.05 level, which showed that there was a significant positive correlation between Individual Performance and Team Performance. The correlation coefficient value between Individual Performance and Regions was -0.186, which was close to 0, and the *p*-value was 0.431 > 0.05, which showed that there was no correlation between Individual Performance and Regions.

As shown in **Figure 4**, we compared the average scores of individual performance satisfaction in each of the students' home regions, while also looking at the extent to which these regions

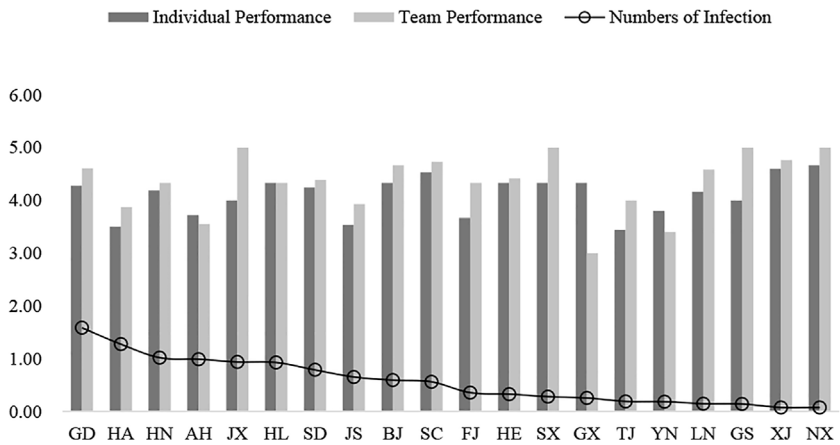

FIGURE 4 | Satisfaction and the number of confirmed COVID-19 infections in each province.
English abbreviations of Chinese provinces: Ningxia NX, Xinjiang XJ, Gansu GS, Liaoning LN, Yunnan YN, Tianjin TJ, Guangxi GX, Shanxi SX, Hebei HE, Fujian FJ, Sichuan SC, Beijing BJ, Jiangsu JS, Shandong SD, Heilongjiang HL, Jiangxi JX, Anhui AN, Hunan HN, Henan HA, Guangdong GD.

were affected by the COVID-19 pandemic, and found no relationship. Similarly, satisfaction with team performance and the spread of the pandemic per region were not found to be related. Therefore, neither of the two dimensions of satisfaction, individual performance and team performance, related to the geographical distribution of the pandemic.

4.4.4 Results of the Online Teaching and Training Program

At present, the teachers of the school are 100% proficient at using the live broadcast cloud application technology. As of May 14, 2020, Shandong Luneng Taishan Football School had conducted more than 3,000 live courses, providing more than 150,000 min of live broadcasting for more than 300 students. In addition to the improvement of factors such as student satisfaction, we were able to extract some recommendations to guide future practice.

Previously, in regular teaching, there used to be only one teacher per class. Online teaching was conducted in grades, which greatly saves the time spent by teachers in preparing for and attending classes. Especially when there were two teachers in two parallel classes, the lecture plan was discussed and formulated, and the teaching was implemented in turn. The teachers listened to and learned from each other.

The teachers were initially troubled with the tracking of homework via online teaching. As the teachers explored the functions of various applications, they were able to exchange solutions to problems and learn from each other. The difficulties were, thus, solved.

Due to the effective use of smart classroom functions, it was found that in addition to teaching, smart classrooms can also be used for video-assisted training. Smart classrooms serve both online courses and online training, increasing the value of equipment input and output.

In the past, it was difficult for the teachers and teams to go out to participate in competitions and learning activities. In particular, a teacher was responsible for the guidance of seven or eight subjects. In the future, with the help of online teaching, the learning organization and learning effect during competition outings and training sessions could be easily solved, thereby ensuring the achievement of the two goals of learning and training.

The school held a meeting with the parents online. In particular, the school had a large number of students, of whom more than half come from other provinces, which caused great trouble for the in-person parent-teacher meetings. The live broadcast method too was unstable at times, and not always conducive to the interaction between teachers and parents; nevertheless, the successful practice of such online parent-teacher meetings would effectively solve the problem of parents not being able to participate in the meetings because of their residing far away from school, and laid the foundation for the regular holding of online parent-teacher meetings in the future.

Combining the results of the empirical analysis and the practical results of this project, the hypothesis of this research has been verified. In other words: during the period of the epidemic, online teaching under meticulous promotion increased the satisfaction of students.

5 DISCUSSION

The purpose of this study was to test whether the satisfaction of students had changed after the COVID-19 lockdown compared to that before the lockdown. The research results showed that the two dimensions of athlete satisfaction (satisfaction with individual performance and satisfaction with team performance) improved significantly after the lockdown. The results also showed that the satisfaction with individual performance improved for all age groups except 13-year-olds. As for satisfaction with team performance, it improved significantly among 13-, 15-, 16-, and 17-year-old student-athletes,

and declined significantly among 14- and 19-year-olds, after the lockdown. The study also showed that satisfaction before and after the lockdown was not significantly related to the home region of the student-athletes and the spread of the COVID-19 pandemic in each region.

Because of the differences in research objects and research content, our conclusions are not the same as those of Di Crosta et al. (2021) and Cannito et al. (2021) on consumer behavior. We have also not done research on the impact of expectations on the future life. But our research has similarities. We have all discovered the impact of COVID-19 on the behavior or cognition of the research subjects, which may involve the past, present and future (Ceccato et al., 2021). In addition, similar to the findings of (Ceccato et al., 2021) and Rosi et al. (2021) on the elderly, in the study of different populations, we found that during the COVID-19 lockdown period, the satisfaction of students improved. One possibility for this improvement may be that some students were more satisfied because they underestimated the risk of COVID-19 (perhaps because they belong to the least vulnerable age group). Or it may be because they saved money by staying at home and believed that the lockdown was a special school holiday. For the deep-seated reasons for this improvement, the following discussion may be able to answer.

After the lockdown, many of the schools in China and worldwide had to implement online teaching. Shandong Luneng Taishan Football School decided to base their online teaching on the Plan, Execution, Check, and Processing (PDCA) cycle originally proposed by Dr. Hugh Hart, an American quality management expert (Tague, 2005; pp. 390–392). It was later adopted and publicized by Deming and gained popularity; thus, it is also called the Deming cycle (Mauléon and Bergman, 2009). The purpose of the PDCA cycle is to divide quality management into four stages, namely Plan (Plan), Execution (Do), Check (Check), and Processing (Act) (Tague, 2005; pp. 390–392). In quality management activities, it is required to make plans, implement plans, check the implementation results according to various tasks, and then incorporate successful tasks into the standard operating procedure, leaving the unsuccessfully implemented tasks to be resolved in the next cycle (Moen and Norman, 2006). Based on this approach, a "large cycle" (3 months) and 12 "small cycles" (12 weeks) of online teaching were completed.

Our assumption that the improvement in student satisfaction was, to an extent, driven by the change in teaching methods, cannot be empirically proved as upon implementing the online teaching program the school did not expect it to be the subject of research (Beijing Jiaotong University and Shandong Luneng Taishan Football School). Nevertheless, our findings are consistent with previous research confirming the benefits of online teaching in relation to student outcomes. The change in overall satisfaction before and after the pandemic in this study could be attributed to the teaching methods.

Social presence was previously found to have a positive effect on online learning satisfaction, which means that students tend to be most satisfied when their social status in online learning is high (Horzum, 2017). According to this research, we can assume that in online live classrooms, student-athletes are in a relatively equal position when compared to their teachers and coaches. We can also anticipate that learning knowledge with a relatively equal social status may increase the satisfaction of young student-athletes.

Online teaching was also found to adhere better to both student autonomy and interactivity. Although our research found that the degree of satisfaction improvement was slightly different according to age, it may have been impacted by the fact that a 28-person team did not fill in the first questionnaire because of their being engaged with participating in a competition.

Nevertheless, the overall trend was that of satisfaction improvement, which warrants consideration of the fact that online education is different from traditional teaching, and that online teaching can contribute more effectively to building the learning autonomy and interactivity of students (Peng et al., 2005). The online live teaching implemented in this study was an indirect "person-computer-person" interaction; this is different from the direct interaction process between teachers and students in traditional teaching as it forces the students to learn independently. Online learning resources for students included text, images, animation, audio, video, and other information carriers, each of which can stimulate students' learning interest and exploration spirit, especially when the students are adolescents (Peng et al., 2005). In addition, in the actual online teaching practice, the interaction between students and teachers, the interaction among the students, and the interaction between students and teaching materials have all been previously found to be related to satisfaction with online learning (Gray and DiLoreto, 2016; Xu et al., 2017; Bervell et al., 2019; Zhang and Lin, 2020).

The study also found no differences in satisfaction between students belonging to different regions. Research has found that online live broadcast teaching is not geographically restricted, and can integrate existing teachers, teaching materials, and equipment to improve resource utilization efficiency, achieve resource sharing, and eliminate the impact of regional differences (Peng et al., 2005); this is consistent with our findings.

Although online live education, at least partially, achieved the results of improving student satisfaction, we must clearly understand that the premise behind this study's investigation of online live education was that teachers, coaches, and young student-athletes already had a long-term foundation of traditional education. Traditional education is multi-faceted and includes emotional exchange between teachers and students, the friendly relationship between students, and the environment and atmosphere during the growth process. Online live teaching can truly simulate all these aspects of traditional education, but it cannot completely replace these (Peng et al., 2005). In this sense, online live teaching will not replace traditional school education. Therefore, online live teaching and traditional education are most beneficial when they coexist in a complementary relationship (Peng et al., 2005).

The above analysis may merely serve as guidance for practical experience, and practical research will probably reveal many differences. The most important test of distance learning is the

conscious self-discipline of the students. As some parents have already returned to work, children's learning is often unsupervised during the day, and in some families, parent-child communication may be poor. Therefore, distance learning mainly poses three major problems. The first problem is that of student self-discipline (self-disciplined children learn better than non-disciplined children). Second, the interactivity that can be achieved in distance teaching is not as high as what can be achieved in offline teaching, and some students' understanding and acceptance of knowledge need to be strengthened. Third, although the teachers organize check-ins from time to time during class, it is difficult to monitor whether students are playing games during the class. This quality problem cannot be solved by technology.

In response to the above problems, the following approaches could be implemented. We can strengthen the guidance education of students' self-discipline awareness with the cooperation of coaches. Moreover, teachers can slow down the pace of teaching, repeat and consolidate key knowledge, and cover only one subject per lesson. With the consent of the parents and students, teachers may try to use two learning tools-one for listening and the other for monitoring the learning process at the same time to supervise the individual students who are inactive or cannot be supervised by the parents.

It cannot be said for certain that the change in satisfaction was due to the change in teaching methods because the environment is also an important factor. School effectiveness research has always shown that the quality of the learning environment is the most important policy factor for achieving positive student outcomes and learning efficiency (Organisation for Economic Co-operation and Development, 2009). During the lockdown, the students' learning environment had to be converted to their family homes. However, the students were still interacting with the same group of students, so it can be inferred that changes in teaching methods may be the main factor that brought about changes in satisfaction.

The Shandong Luneng Taishan Football School did not expect their methods to be a part of scientific research, and therefore, the effectiveness of the method could not be tested empirically, which is a limitation of this study. The lockdown period of 3 months forced us to choose the method of online live education. The future development and use of advanced internet technologies such as 5G will provide traditional education with even more opportunities for development. We can expect that the combination of online live broadcast teaching and traditional education can form a perfect network-based teaching system. This new network-teaching model can adopt the advantages of both online and traditional teaching while discarding their respective shortcomings. Therefore, we assume that, to a certain extent, the online teaching and training done by the school was effective. We also hope that our research and practice can provide a reference for other schools during the lockdown period.

6 CONCLUSION

Without the lockdown associated with the COVID-19 pandemic, such teaching and training management methods may not have been implemented for more than 300 students over a long period. However, in the face of the lockdown, remote teaching and training methods had to be adopted. The data we obtained through the authoritative scale showed that the satisfaction of students improved significantly after the lockdown. Furthermore, the results showed that while there were significant differences in the improvement rate among various age groups, there was no correlation with the students' geographical home region. Through a thorough analysis of the online teaching methods, we further outlined aspects in which the change from traditional teaching to online teaching may have affected the increase in student satisfaction. The present results show that in the face of lockdowns caused by sudden emergencies, schools and other organizations can achieve the results of improving the satisfaction of students and parents through strict organizational and process control. To evaluate the improvement of academic or athletic performance, further follow-up research is needed.

DATA AVAILABILITY STATEMENT

The studies involving human participants were reviewed and approved by Beijing Jiaotong University (JG201905017). The participants and, where necessary, the participants' legal guardian/next of kin provided written informed consent to participate in this data are available upon request.

AUTHOR CONTRIBUTIONS

JL designed the research and completed the manuscript, SL and JH designed the research with Juan Li and proposed the discussion, CZ completed the data collection, and PL completed most of the data analysis.

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REFERENCES

Adjust (2020). 7 Tips on Adjusting to Work from home. Available at: https://www.adjust.com/blog/adjust-working-from-home-tips/ (Accessed March 25, 2020).

Aoyagi, M. W., Cox, R. H., and McGuire, R. T. (2008). Organizational Citizenship Behavior in Sport: Relationships with Leadership, Team Cohesion, and Athlete Satisfaction. *J. Appl. Sport Psychol.* 20 (1), 25–41. doi:10.1080/10413200701784858

Bebetsos, E., and Theodorakis, N. (2003). Athletes' Satisfaction Among Team Handball Players in Greece. *Percept Mot. Skills* 97 (3_Suppl. l), 1203–1208. doi:10.2466/pms.2003.97.3f.1203

Bervell, B., Umar, I. N., and Kamilin, M. H. (2019). Towards a Model for Online Learning Satisfaction (MOLS): Re-considering Non-linear Relationships Among Personal Innovativeness and Modes of Online Interaction. *Open Learn. J. Open, Distance e-Learning* 35, 236–259. doi:10.1080/02680513.2019.1662776

British Broadcasting Corporation (2020). Coronavirus: Italy Extends Emergency Measures Nationwide. Available at: https://www.bbc.co.uk/news/world-europe-51810673 (Accessed March 10, 2020).

Burns, G. N., Jasinski, D., Dunn, S. C., and Fletcher, D. (2012). Athlete Identity and Athlete Satisfaction: The Nonconformity of Exclusivity. *Personal. Individual Differences* 52 (3), 280–284. doi:10.1016/j.paid.2011.10.020

Cannito, L., Anzani, S., Bortolotti, A., Palumbo, R., Ceccato, I., Di Crosta, A., et al. (2021). Temporal Discounting of Money and Face Masks during the COVID-19 Pandemic: The Role of Hoarding Level. *Front. Psychol.* 12, 642102. doi:10.3389/fpsyg.2021.642102

Ceccato, I., Palumbo, R., Di Crosta, A., La Malva, P., Marchetti, D., Maiella, R., et al. (2021). Age-related Differences in the Perception of COVID-19 Emergency during the Italian Outbreak. *Aging Ment. Health* 25 (7), 1305–1313. doi:10.1080/13607863.2020.1856781

Ceccato, I., Palumbo, R., Di Crosta, A., Marchetti, D., La Malva, P., Maiella, R., et al. (2021). "What's Next?" Individual Differences in Expected Repercussions of the COVID-19 Pandemic. *Personal. Individual Differences* 174, 110674. doi:10.1016/j.paid.2021.110674

Chang, J., Yuan, Y., and Wang, D. (2020). Analysis of Mental Health Status and Influencing Factors of College Students under the New Coronavirus Pneumonia Epidemic. *J. South. Med. Univ. (Nan Fang Yi Ke Da Xue Xue Bao)* 40 (2), 171.

Chen, L. H., Kee, Y. H., and Chen, M.-Y. (2015). Why Grateful Adolescent Athletes Are More Satisfied with Their Life: The Mediating Role of Perceived Team Cohesion. *Soc. Indic. Res.* 124 (2), 463–476. doi:10.1007/s11205-014-0798-0

Chen, X., Yang, C., Bao, Q., Zhu, K., Wang, H., Jiang, Q., et al. (2020). Analysis of the Impact of the New Coronary Pneumonia Epidemic on the Chinese Economy and Countermeasures. *Bull. Chin. Acad. Sci.* 35, 1–5.

Craig, R. T. (1999). Communication Theory as a Field. *Commun. Theor.* 9 (2), 119–161. doi:10.1111/j.1468-2885.1999.tb00355.x

Cunningham, G. B., and Dixon, M. A. (2003). New Perspectives Concerning Performance Appraisals of Intercollegiate Coaches. *Quest* 55 (2), 177–192. doi:10.1080/00336297.2003.10491798

Di Crosta, A., Ceccato, I., Marchetti, D., La Malva, P., Maiella, R., Cannito, L., et al. (2021). Psychological Factors and Consumer Behavior during the COVID-19 Pandemic. *PLoS one* 16 (8), e0256095. doi:10.1371/journal.pone.0256095

Drezner, Z., Turel, O., and Zerom, D. (2010). A Modified Kolmogorov-Smirnov Test for Normality. *Commun. Stat. - Simulation Comput.* 39 (4), 693–704. doi:10.1080/03610911003615816

DW News (2020). Coronavirus: What Are the Lockdown Measures across Europe? Available at: https://www.dw.com/en/coronavirus-what-are-the-lockdown-measures-across-europe/a-52905137 (Accessed April 14, 2020).

Eisenberg, E. M. (2010). *Organizational Communication: Balancing Creativity and Constraint*. New York, NY: Saint Martin's.

Gray, J. A., and DiLoreto, M. (2016). The Effects of Student Engagement, Student Satisfaction, and Perceived Learning in Online Learning Environments. *Int. J. Educ. Leadersh. Preparation* 11 (1), n1, 2016 . Available at: https://eric.ed.gov/?id=EJ1103654.

Guttman, O. T., Lazzara, E. H., Keebler, J. R., Webster, K. L. W., Gisick, L. M., and Baker, A. L. (2018). Dissecting Communication Barriers in Healthcare. *J. Patient Saf.* Publish Ahead of Print. 2018 Nov. doi:10.1097/pts.0000000000000541

Horzum, M. B. (2017). Interaction, Structure, Social Presence, and Satisfaction in Online Learning. *Eurasia J. Math. Sci. T* 11 (3), 505–512. doi:10.12973/eurasia.2014.1324a

Karreman, E., Dorsch, K., and Riemer, H. (2009). Athlete Satisfaction and Leadership: Assessing Group-Level Effects. *Small Group Res.* 40 (6), 720–737. doi:10.1177/1046496409346450

Lau, H., Khosrawipour, V., Kocbach, P., Mikolajczyk, A., Schubert, J., Bania, J., et al. (2020). The Positive Impact of Lockdown in Wuhan on Containing the COVID-19 Outbreak in China. *J. Trav. Med.* 27 (3), 037. doi:10.1093/jtm/taaa037

Li, J., Gao, H., Liu, P., and Zhong, C. (2020). Does Distance Produce Beauty? the Influence of COVID-19 Lockdown on the Coach-Athlete Relationship in a Chinese Football School. *Front. Psychol.* 11, 560638. doi:10.3389/fpsyg.2020.560638

Lilliefors, H. W. (1967). On the Kolmogorov-Smirnov Test for Normality with Mean and Variance Unknown. *J. Am. Stat. Assoc.* 62 (318), 399–402. doi:10.1080/01621459.1967.10482916

Lunenburg, F. C. (2010). Communication: The Process, Barriers, and Improving Effectiveness. *Schooling* 1 (1), 1–10. Available at: https://www.mcgill.ca/engage/files/engage/communication_lunenburg_2010.pdf.

Mauléon, C., and Bergman, B. (2009). Exploring the Epistemological Origins of Shewhart's and Deming's Theory of Quality. *Int. J. Qual. Serv. Sci.* 1 (2), 160–171. doi:10.1108/17566690910971436

Moen, R., and Norman, C. (2006). *Evolution of the PDCA Cycle*. Asian Network for Quality Conference in Tokyo. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.470.5465&rep=rep1&type=pdf (Accessed Aug 8, 2018).

Norouzinia, R., Aghabarari, M., Shiri, M., Karimi, M., and Samami, E. (2016). Communication Barriers Perceived by Nurses and Patients. *Glob. J. Health Sci.* 8 (6), 65–74. doi:10.5539/gjhs.v8n6p65

Organisation for Economic Co-operation and Development (2009). *Creating Effective Teaching and Learning Environments: First Results from TALIS*. Paris: OECD. Available at: http://www.oecd.org/dataoecd/17/51/43023606.pdf (Accessed July 21, 2009).

Park, E. K., and Song, M. (2005). Communication Barriers Perceived by Older Patients and Nurses. *Int. J. Nurs. Stud.* 42 (2), 159–166. doi:10.1016/j.ijnurstu.2004.06.006

Peng, H., Chen, X., Yang, J., and Zhu, L. (2005). *Complementary Research on the Advantages of Online Education and Traditional Education Teaching Methods [Basic Medical Education Edition]*. Taiyuan, China: Journal of Shanxi Medical University, 45–47. Available at: http://www.cnki.com.cn/Article/CJFDTotal-SXYD200502021.htm.

Prospects (2020). *5 Tips for Studying at home*. Available at: https://www.prospects.ac.uk/applying-for-university/university-life/5-tips-for-studying-at-home (Accessed April, 2020).

Reinboth, M., and Duda, J. L. (2006). Perceived Motivational Climate, Need Satisfaction and Indices of Well-Being in Team Sports: A Longitudinal Perspective. *Psychol. Sport Exerc.* 7 (3), 269–286. doi:10.1016/j.psychsport.2005.06.002

Riemer, H. A., and Chelladurai, P. (1998). Development of the Athlete Satisfaction Questionnaire (ASQ). *J. Sport Exerc. Psychol.* 20 (2), 127–156. doi:10.1123/jsep.20.2.127

Rosi, A., van Vugt, F. T., Lecce, S., Ceccato, I., Vallarino, M., Rapisarda, F., et al. (2021). Risk Perception in a Real-World Situation (COVID-19): How it Changes from 18 to 87 Years Old. *Front. Psychol.* 12, 646558. doi:10.3389/fpsyg.2021.646558

Science Focus (2020). 10 Science-Backed Tips to Help You Work from home Successfully. Available at: https://www.sciencefocus.com/the-human-body/wfh-sos-how-to-work-from-home-successfully-during-lockdown/ (Accessed April 14, 2020).

Sriboon, N. (2002). *Coach Leadership Behaviors, Team Cohesion, and Athlete Satisfaction in Relation to the Performance of Athletes in the 1999 Rajabhat Games*. Tallahassee, United States: Doctoral dissertation, Florida State University. Available at: https://elibrary.ru/item.asp?id=5344902.

Tague, N. R. (20051995). "Plan–Do–Study–Act Cycle," in *The Quality Toolbox*. 2nd ed. (Milwaukee: ASQ Quality Press), 390–392.

World Health Organization (2021). Weekly Epidemiological Update on COVID-19 - 26 October 2021. Available at: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19—26-october-2021 (Accessed November 2, 2021).

Xu, X., Zhao, W., and Liu, H. (2017). Factors Influencing College Students' Satisfaction in Online Learning. *Distance Edu. China* 5 (5). Available at: Available at: http://www.cnki.com.cn/Article/CJFDTotal-DDJY201705005.htm.

Yang, S. (2019). Revision of Athletes' Organizational Citizenship Behavior Scale Based on Item Response Theory and its Mediating Role in Cohesion and Satisfaction. *J. Shenyang Inst. P. E.* 38 (2), 52–57. Available at: http://xb.syty.edu.cn/CN/abstract/abstract8961.shtml.

Zhang, Y., and Lin, C.-H. (2020). Student Interaction and the Role of the Teacher in a State Virtual High School: what Predicts Online Learning Satisfaction? *Technol. Pedagogy Edu.* 29 (1), 57–71. doi:10.1080/1475939X.2019.1694061

Zhao, N., Wang, Y., Li, S., Liu, X., Wu, P., and Zhu, T. (2020). Wuhan's "closing the City" on People's Psychological Behavior and Countermeasures. *Proc. Chin. Acad. Sci.* 35 (3), 264–272.

Zhu, L., Chen, M., Zhang, T., Zhang, T., Jiang, C., and Gao, D. (2020). Research on the Status and Influencing Factors of Sleep and Emotion during the Outbreak of New Coronary Pneumonia. *J. Stroke Nervous Dis.* 37 (3), 196–200.

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