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Research Article

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Evaluation of Online Medical Education during COVID-19 Pandemic in Shanghai：A Prospective Study

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Abstract:

Background: The global popularity of COVID-19 has led China's universities to conduct online teaching. However, the real feedback from medical teachers and students regarding online education is unclear. The purpose of this study was to investigate the characteristics and effectiveness of online teaching among teachers and students in Medical School of Tongji University during the COVID-19 pandemic.

Methods: A prospective survey was conducted to investigate the current status on online education among teachers and students in Medical School of Tongji University.

Results: 1) 488 valid questionnaires were collected from 223 males (45.7%) and 265 females (54.3%), including 394 students (80.7%) and 94 teachers (19.3%). 2) Although students thought that too much learning tasks were assigned in the mode of online teaching, most of teachers and students endorse this teaching mode. 3) Male students had better performance than female students in online class. 4) Compared with male teachers, female teachers had less experience on online educational course recording and teaching training. They had more difficulty in adapting to online education. There was no significant difference in the acceptance of online teaching among teachers in different age groups

Conclusions: 1) Most teachers and students supported and satisfied with the implement of online education during the epidemic pandemic. Although teachers were less adaptable to online education than students, they still had the positive opinions. 2) Gender influenced the acceptance of online teaching. Male teachers and students showed better adaptability than female counterpart. 3) Though online teaching had advantages, it still cannot completely replace traditional offline teaching.

Keywords: medical students and teachers; COVID-19; online teaching; questionnaire; prospective study

Background

Respiratory symptoms are the main manifestation of COVID-19, and patients may die from ARDS (Acute Respiratory Distress Syndrome)(1). Due to its rapid transmission (2), strong infectivity (3), high mortality (4), and no specific drug (5), COVID-19 has been spread around the world and been identified by the United Nations as PHEIC (Public Health Emergency of International Concern) (7). In order to control the pandemic, Chinese government has taken strict prevention measures such as prohibiting gatherings, closing schools, isolating people at home and keeping social distance(8). Therefore, online teaching has been completely adopted by Chinese colleges and universities (9).

Previous studies have demonstrated that more than 40% SARS (Severe Acute Respiratory Syndrome) survivors had PTSD (Post Traumatic Stress Disorder)(11), and people isolating at home during the SARS epidemic had more stress and depression (10). Therefore, similar to SARS, as a result of the limitation of activity space and the lack of outside entertainment (12), home segregation during the COVID-19 epidemic will also cause anxiety and irritability in the crowd.

Due to various courses and high professional requirements, medical students have more severe anxiety and depression (13). Every year, 3% of the students in Peking Union Medical College drop out of school due to psychological problems (14). Among the college students, there are gender differences on psychological status toward the pandemic (15). Female college students are more worried about health during quarantine and returning to school on schedule after quarantine than male students (16-17).

However, the real opinions on medical online education of both teachers and students during the epidemic were still unclear. Thus, we investigated the current status of

online teaching in medical school of Tongji University during the pandemic via the online questionnaire survey.

Methods

An online survey was conducted from March 24, 2020 to April 10, 2020. Self-designed questionnaire were distributed to teachers and students in the School of Medicine of Tongji University in anonymous way. All participants are above 18 years old. The teachers and students received the questionnaire file via their social software accounts and needed to fulfill the questionnaire within 2 weeks. During the valid period, participants were repeatedly reminded to enroll as many subjects as possible.

The questionnaire had a total of 43 questions. Data were collected in age, gender, psychological state, opinions of online teaching, learning and teaching effect and suggestions towards online teaching in the future.

Questionnaire data with too short response time (less than 2 minutes) were excluded, and the same person could only answer the questionnaire once. All the questionnaire data were imported into SPSS 24.0 software and analyzed by chi-square test. $P<0.05$ was regarded as statistically significant difference.

Results

General information

A total of 490 subjects responded, including 488 valid questionnaires with an effective rate of 99.6%. There were 223 males (45.7%) and 265 females (54.3%), including 394 students (80.7%) and 94 teachers (19.3%). Among all the teachers, 39 of those (41.5%) were under 40 years old. There was no statistical difference in the

age ratio between male and female teachers as well as in the number of students between different genders.

Comparison of teachers' and students' opinions on online education

There were no statistical differences between teachers and students in such aspects, including "Agreement with online teaching", "Opinions on online education", "Satisfaction with online teaching", "Expectation for normalization" and "Agreement about resource sharing between colleges". However, there were statistical differences in responses to questions such as "Good communication in online class"(47.9% in teachers vs. 29.7% in students, P<0.05), "Appropriate amount of learning tasks" (90.6% in teachers vs. 43.9% in students, P<0.001) and "Ideal efficiency of online education" (68.1% in teachers vs. 43.4% in students, *P*<0.05). (Table 1)

Table 1 Opinion comparison about online teaching between teachers and students

Question	Identity		Total(%) n=488	*P* value
	Student (%) N=394	Teacher (%) N=94		
Agreement with online teaching	353(89.6)	82(87.2)	435(89.1)	0.509
The views for online education				
Only an emergency measures	155(39.3)	37(39.4)	192(39.3)	0.999
Supplement to offline teaching	189(48.0)	50(53.2)	239(49.0)	0.363
Replacement of offline teaching	27(6.9)	5(5.3)	32(6.6)	0.59
Adaptation to online teaching	354(89.8)	77(81.1)	431(86.5)	0.017
Good communication in online class	117(29.7)	45(47.9)	162(33.2)	0.001
Appropriate amount of learning tasks	173(43.1)	85(90.4)	258(52.8)	<0.001
Ideal efficiency of online education	171(43.4)	64(68.1)	235(48.2)	<0.001

Satisfaction with online teaching	243(61.7)	53(60.7)	209(61.5)	0.625
Expectation for normalization	114(28.9)	25(26.6)	139(28.5)	0.652
Agreement about resource sharing between colleges	246(62.4)	66(70.2)	312(63.9)	0.158

Comparison on learning between male and female students

Compared with females, male students had higher attendance rate (20% vs.10.1%), educational quality (27.6% vs. 15.3%), learning interest (27.6% vs. 14.9%), learning attention (29.2% vs. 14.4%), learning efficiency (30.2% vs. 16.7%), much more worrying about delaying study (82.5% vs. 73.5%) and degree of recognition for appropriate learning tasks (54.6% vs. 34.6%) ($P<0.05$). There was no significant difference in the following aspects, including "Agreement with online teaching", "Good communication", "Satisfaction with educational quality", "Less exercise during quarantine", "Irregular daily schedule", "Anxiety moods", "Spending extra time on electronic devices" and "Slack in online class" ($P>0.05$). (Table 2)

Table 2. Learning Effect of student in different gender about online learning

Item	Gender		Total(%) N=394	*P* value
	Male (%) N=183	Female (%) N=211		
The most concerned questions				
Delay in study	151(82.5)	155(73.5)	306(77.7)	0.031
Anxiety moods	132(72.1)	144(68.3)	276(70.1)	0.401
Irregular daily schedule	83(45.4)	97(46.0)	180(45.7)	0.903
Less exercise	74(47.0)	89(43.6)	163(41.4)	0.726
Agreement with the online teaching	158(86.3)	195(92.4)	353(89.6)	0.791
Spending extra time on electronic devices				

1-3 hours	46(24.9)	46(22.0)	92(23.4)	0.504
3-5 hours	77(41.6)	77(36.9)	154(39.1)	0.332
5-7 hours	39(21.1)	56(26.8)	95(24.1)	0.186
7-9 hours	11(6.0)	20(9.6)	31(7.9)	0.182
More time	12(6.5)	10(4.8)	22(5.6)	0.463
Attendance rate				
Reduced	24(13.0)	11(5.2)	35(8.9)	0.007
Unchanged	122(67.0)	179(84.7)	301(76.4)	<0.001
Rose	37(20.0)	21(10.1)	58(14.7)	0.005
Slack in online class	63(34.1)	67(32.1)	130(32.8)	0.674
Good communication	59(23.3)	58(27.5)	117(29.7)	0.303
Higher quality for online education	51(27.6)	32(15.3)	83(21.1)	0.003
Learning interest in online class				
Rose	51(27.6)	31(14.9)	82(20.8)	0.002
Unchanged	90(48.7)	124(59.3)	214(54.3)	0.034
Decreased	44(23.7)	54(25.8)	98(24.9)	0.638
Learning attention in online class				
Rose	54(29.2)	30(14.4)	84(21.3)	<0.001
Unchanged	61(33.0)	97(46.4)	158(40.1)	0.007
Decreased	70(37.9)	82(39.2)	152(38.6)	0.776
Better learning efficiency in class	56(30.2)	35(16.7)	91(23.1)	0.001
Appropriate learning tasks	100(54.6)	73(34.6)	173(43.1)	<0.001
Satisfaction with educational quality	125(68.3)	118(55.9)	243(91.7)	0.051

Views of teachers in different gender and ages

Compared with the male, female teachers had a lower proportion of votes on the following aspects, including "No disagreement with online teaching" (55.6% vs. 77.5%), "Made preparation for online teaching" (70.4% vs. 87.5%), "Had record experience before" (25.9% vs. 50%), "Had training for online teaching" (53.7% vs.77.5%), and "Do not spend more time to prepare for the online class" (59.3% vs. 92.5%)($P < 0.05$). There was no significant difference of teachers' age variation on each question about online teaching ($P > 0.05$) (Table 3).

Table 3. Online teaching status of teachers

Item	Age Group		*P* Value	Gender		*P* Value
	<40 (%) N=39	≧40 (%) N=55		Male (%) N=40	Female (%) N=54	
Disagreement with online teaching	8(20.5)	5(9.1)	0.106	9(22.5)	24(44.4)	0.031
Had record experience	14(35.9)	20(36.4)	0.963	20(50.0)	14(25.9)	0.016
Understood the meaning of online teaching	23(59.0)	37(67.3)	0.409	30(75.0)	30(55.6)	0.052
Made preparation for online classes	30(76.9)	43(78.2)	0.885	35(87.5)	38(70.4)	0.049
Had training for online teaching	26(66.7)	34(61.8)	0.63	31(77.5)	29(53.7)	0.018
Adaptation to the online teaching	30(76.9)	47(85.5)	0.29	36(90.0)	41(75.9)	0.08
Did not spend longer time to prepare for the online class	29(74.4)	40(72.7)	0.86	37(92.5)	32(59.3)	<0.001
No influence on teaching enthusiasm	26(66.7)	40(72.7)	0.527	29(72.5)	37(68.5)	0.585
Achievement of ideal goals	27(69.2)	36(83.6)	0.701	30(75)	33(61.1)	0.127

Suggestions on future online teaching

Teachers hoped to improve the function of live broadcast software (70.2%), strengthen the management of online learning (69.2%), make full use of current online resources (55.3%) and upload supporting educational materials in time for the reference (34.0%). Meanwhile, students hoped to optimize learning software (75.1%), enhance online classroom experience (61.9%), and raise learning consciousness (52.8%). Both teachers (67.0%) and students (59.1%) anticipate constructing the resources sharing system of online teaching among different schools.

Discussion

Online teaching is Chinese government's initiative to prevent and control the spread of COVID-19. Our research showed that the majority of teachers and students in

medical school supported online teaching during the epidemic. The main reasons were as following: 1) Online teaching was able to effectively prevent the infection of Covid-19; 2) All the students and teachers were satisfied with the government's anti-epidemic work (20-21); 3) The network teaching could make the university teaching work advance as scheduled; 4) Online teaching could relieve~~s~~ the anxiety of medical students about quarantine and exert a positive effect on their mental health (22-25).

In the process of online teaching, the majority of teachers and students could adapt to the changes of teaching forms. However, teachers were less adaptable to online teaching as compared with students. The elder people have less intelligence and cognitive ability than the young and slow to accept new things (26). In addition, they are less likely to put forward negative comments (28). Thus, teachers could be aware of the shortcomings of online teaching and accurately estimate its effect.

Interestingly, there were significant differences in the adaptability and learning status of online teaching between male and female in both teachers and students ($p<0.05$). Male teachers tended to be more adaptable to the form of online teaching. Male students had higher learning satisfaction although their attendance rate was lower. Males are generally more familiar with computers and more easily adaptable to online teaching (17). Females usually have more sensitive emotions and higher demands on themselves, which let them easier to be affected by stress (29-30). These gender personality and characteristics may partly explain the differences.

In the present study, we found that students thought that teachers had assigned too much online learning tasks. For the reasons may be described as below: 1) poor online communication between teachers and students; 2) low learning efficiency of students during home isolation (31-33); 3) lack of initiative on learning by students; 4) in order

173 to ensure the quality of teaching, teachers tended to assign more learning tasks.
174 Therefore, during the epidemic period, while improving students' learning autonomy,
175 teachers should try more to communicate with students and coordinate the amount of
176 learning tasks.

177 Our study showed that the advantages of online education for medical students
178 included as follows: 1) reducing the risk of COVID-19 infection caused by population
179 flow, meanwhile making teaching tasks be carried out during quarantine; 2) through
180 course playback and courseware sharing, students can flexibly arrange their study
181 time. However, the disadvantages of online teaching included as follow: 1)
182 objective long distance limited the interaction between teachers and students,
183 influenced teachers' personal style and students' attention in class, and made the
184 students' learning difficult to manage; 2) long-term use of electronic products could
185 damage eyesight and health. Hence, online teaching cannot completely replace
186 traditional teaching, only as a temporary alternative. Such findings were similar with
187 those of online teaching studies in other majors (34). These results indicated that the
188 combination of online and offline teaching may become the new normal of medical
189 education in the future.

190 Due to short preparation time and heavy teaching tasks, there were many problems in
191 the implementation of online teaching during the epidemic. Following solutions might
192 be helpful: 1) making full use of the uploaded online courses to avoid wasting
193 teaching resources by duplication of recording; 2) optimizing and integrating learning
194 software to improve online learning experience; 3) strengthening the interaction
195 between teachers and students in online courses.

196 First of all, our questionnaire respondents focused on clinical medicine, and the
197 conclusion only represents the feedback of online teaching. Secondly, our survey

relies on the respondents' online self-report. Although it is convenient to collect data, the subjective judgment of respondents may lead to recall bias and misclassification. To this end, we guarantee anonymity and confidentiality to the interviewees to exclude the possibility of other untrue data as far as possible.

Conclusions

Most teachers and students in medical school supported and satisfied with the implement of online teaching during the COVID-19 period. Although teachers were less adaptable to online teaching than students, they still held the positive evaluation and believed online teaching was more effective. Gender difference significantly affected the acceptance of online teaching. Although online teaching has unique advantages such as breaking the space limit and making learning time flexible, its inherent defects of objective distance and less direct communication make it impossible to replace the traditional teaching at present.

Declarations

- Ethics approval and consent to participate

  All methods were carried out in accordance with relevant guidelines and regulateons. All experimental protocols were approved by the ethnic committee of Shanghai Tenth People ‘s Hospital. Informed consent was obtained from all subjects.

- Consent for publication

  Not applicable

- Availability of data and materials

All data generated or analyzed during this study are included in this published article.

- Competing interests

The authors declare that they have no competing interests

- Funding

Not applicable

- Authors' contributions

Xinying Liu and Ai Peng designed the questionnaire. Yaxiang Song and Shu Wang were the major contributors in writing the manuscript. Shu Wang coordinated the study. Yixian Liu collected and analyzed the data. All authors read and approved the final manuscript.

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