

Appendices

Appendix A: Fall 2020 & Spring 2021 Descriptive Statistics

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APPENDIX A: Fall 2020 Descriptive Statistics

Fall 2020 Pre-Test Survey

To what extent do you agree with the following statements? I have access to the technology (e.g. personal laptop or other device, reliable internet) I need to attend class and complete assignments remotely.

	Freq.	Percent
Disagree	1	0.50
Somewhat Agree	10	4.98
Agree	188	93.53
Hard to say	2	1.00
TOTAL	201	100

To what extent do you agree with the following statements? I have trouble finding a space that fits my needs to work on my coursework.

	Freq.	Percent
Disagree	69	34.33
Somewhat Disagree	54	26.87
Somewhat Agree	55	27.36
Agree	23	11.44
TOTAL	201	100

To what extent do you agree with the following statements? The time zone where I currently reside impacts my ability to attend class or complete coursework.

	Freq.	Percent
Disagree	174	87.00
Somewhat Disagree	9	4.50
Somewhat Agree	14	7.00
Agree	2	1.00
Hard to say	1	0.50
TOTAL	200	100

To what extent do you agree with the following statements? I prefer remote and/or online classes during the ongoing covid-19 pandemic.

	Freq.	Percent
Disagree	51	25.37
Somewhat Disagree	35	17.41
Somewhat Agree	55	27.36
Agree	55	27.36
Hard to say	5	2.49
TOTAL	201	100

To what extent do you agree with the following statements? I feel less connected to my classmates in remote and/or online courses.

	Freq.	Percent
Disagree	4	2.00
Somewhat Disagree	3	1.50
Somewhat Agree	34	17.00
Agree	154	77.00
Hard to say	5	2.50
TOTAL	200	100

To what extent do you agree with the following statements? It is difficult for me to pay attention to remote classes that are held online compared to in-class learning.

	Freq.	Percent
Disagree	2	0.99
Somewhat Disagree	9	4.43
Somewhat Agree	62	30.54
Agree	130	64.04
TOTAL	203	100

To what extent do you agree with the following statements? I am more anxious about coursework when learning is remote and/or online.

	Freq.	Percent
Disagree	11	5.45
Somewhat Disagree	28	13.86
Somewhat Agree	50	24.75
Agree	107	52.97
Hard to say	6	2.97
TOTAL	202	100

To what extent do you agree with the following statements? I feel anxious about asking questions about the class without the presence of my peers in an in-person classroom.

	Freq.	Percent
Disagree	26	12.94
Somewhat Disagree	41	20.40
Somewhat Agree	39	19.40
Agree	85	42.29
Hard to say	10	4.98
TOTAL	201	100

Do you have any caretaking responsibilities at home such as for children or other family members?

	Freq.	Percent
No	173	87.82
Yes	24	12.18
TOTAL	197	100

If yes, about how many hours per week do these responsibilities require of your time?

	Freq.	Percent
10-15 hours	5	20.83
15-20 hours	2	8.33
5-10 hours	8	33.33
Less than 5 hrs.	5	20.83
More than 20 hrs.	4	16.67
TOTAL	24	100

Do you work outside of taking classes?

	Freq.	Percent
No	110	56.12
Yes	86	43.88
TOTAL	196	100

If yes, how many hours?

	Freq.	Percent
10-15 hours	18	20.93
15-20 hours	24	27.91
5-10 hours	23	26.74
Less than 5 hrs.	6	6.98
More than 20 hrs.	15	17.44
TOTAL	86	100

Fall 2020 Post-Test Survey

To what extent do you agree with the following statements? I was better prepared for the exam when working with a group to prepare a study guide instead of preparing a study guide individually.

	Freq.	Percent
Disagree	6	4.51
Somewhat Disagree	14	10.53
Somewhat Agree	34	25.56
Agree	76	57.14
Hard to say	3	2.26
TOTAL	133	100

To what extent do you agree with the following statements? Being in a group helped me learn the material more easily or better than if I had prepared a study guide on my own

	Freq.	Percent
Disagree	13	9.77
Somewhat Disagree	24	18.05
Somewhat Agree	41	30.83
Agree	51	38.35
Hard to say	4	3.01
TOTAL	133	100

To what extent do you agree with the following statements? I felt comfortable asking my group members questions about ideas or concepts did not understand well.

	Freq.	Percent
Disagree	17	12.78
Somewhat Disagree	18	13.53
Somewhat Agree	44	33.08
Agree	45	33.83
Hard to say	9	6.77
TOTAL	133	100

To what extent do you agree with the following statements? Being in a group helped me feel better connected to other students in the course.

	Freq.	Percent
Disagree	14	10.61
Somewhat Disagree	19	14.39
Somewhat Agree	46	34.85
Agree	46	34.85
Hard to say	7	5.30
TOTAL	132	100

To what extent do you agree with the following statements? I got along well with my other group members.

	Freq.	Percent
Disagree	4	3.03
Somewhat Disagree	6	4.55
Somewhat Agree	32	24.24
Agree	75	56.82
Hard to say	15	11.36
TOTAL	132	100

To what extent do you agree with the following statements? I will continue to keep in touch with the members of my group now that the course is finished.

	Freq.	Percent
Disagree	52	39.10
Somewhat Disagree	45	33.83
Somewhat Agree	19	14.29
Agree	8	6.02
Hard to say	9	6.77
TOTAL	133	100

To what extent do you agree with the following statements? Completing a group assignment was too time consuming.

	Freq.	Percent
Disagree	49	36.84
Somewhat Disagree	60	45.11
Somewhat Agree	19	14.29
Agree	3	2.26
Hard to say	2	1.50
TOTAL	133	100

To what extent do you agree with the following statements? I contributed more to the group assignment than other members of the group.

	Freq.	Percent
Disagree	34	25.76
Somewhat Disagree	38	28.79
Somewhat Agree	25	18.94
Agree	24	18.18
Hard to say	11	8.33
TOTAL	132	100

To what extent do you agree with the following statements? The credit assigned for the completion of the group assignment fairly reflected the work that went into it.

	Freq.	Percent
Disagree	4	3.03
Somewhat Disagree	7	5.30
Somewhat Agree	46	34.85
Agree	58	43.94
Hard to say	17	12.88
TOTAL	132	100

Did you already know any members of your group?

	Freq.	Percent
No	118	88.72
Yes	15	11.28
TOTAL	133	100

Were you aware of how other groups were being asked to prepare a study guide?

	Freq.	Percent
No	104	80.00
Yes	26	20.00
TOTAL	130	100

Fall 2020 Demographic Information

Gender

	Freq.	Percent
Female	127	65.13
Male	68	34.87
TOTAL	195	100

Age

	Freq.	Percent
18	71	36.04
19	77	39.09
20	28	14.21
21	11	5.58
22	5	2.54
23	2	1.02
24	1	0.51
29	1	0.51
NA	1	0.51
TOTAL	197	100

Major

	Freq.	Percent
Anthropology	1	0.52
Art & Art History	1	0.52
Atmospheric & Oceanic Sciences	1	0.52
Biochemistry	2	1.04
Business Administration	7	3.63
Chemistry	1	0.52
Classics	1	0.52
Communication	4	2.07
Economics	4	2.07
Education Equity & Cultural Diversity	3	1.55
Elementary Education	26	13.47
English	1	0.52
Environmental Design	2	1.04
Environmental Engineering	3	1.55
Environmental Studies	5	2.59
Finances	5	2.59
Geological Science	1	0.52
History	4	2.07

Humanities	1	0.52
Integrative Physiology	8	4.15
International Affairs	10	5.18
Journalism	5	2.59
Mathematics	1	0.52
Media Studies	1	0.52
Neuroscience	1	0.52
Other	2	1.04
Philosophy	1	0.52
Physics	1	0.52
Political Science	65	33.68
Psychology	3	1.55
Sociology	2	1.04
Theatre & Dance	1	0.52
Undeclared	18	9.33
TOTAL	193	100

Year in school

	Freq.	Percent
Freshman	90	45.92
Sophomore	82	41.84
Junior	13	6.63
Senior	11	5.61
TOTAL	196	100

Ethnicity

	Freq.	Percent
Asian	9	4.66
Asian/White	1	0.52
Black/African American	6	3.11
Black or African American/White	1	0.52
Hispanic or Latino	27	13.99
Native Hawaiian or Pacific Islander	1	0.52
Native Hawaiian or Pacific Islander/White	1	0.52
White	144	74.61
I'd rather not answer	3	1.55
TOTAL	193	100

Spring 2021 Descriptive Statistics

Spring 2021 Pre-Test

To what extent do you agree with the following statements? I have access to the technology (e.g. personal laptop or other device, reliable internet) I need to attend class and complete assignments remotely.

	Freq.	Percent
3-Somewhat Agree	1	1.61
4-Agree	59	95.16
5-Hard to Say	2	3.23
TOTAL	62	100.00

To what extent do you agree with the following statements? I have trouble finding a space that fits my needs to work on my coursework.

	Freq.	Percent
1-Disagree	23	37.10
2-Somewhat Disagree	19	30.65
3-Somewhat Agree	11	17.74
4-Agree	9	14.52
TOTAL	62	100.00

To what extent do you agree with the following statements? The time zone where I currently reside impacts my ability to attend class or complete coursework.

	Freq.	Percent
1-Disagree	54	88.52
2-Somewhat Disagree	3	4.92
3-Somewhat Agree	2	3.28
4-Agree	2	3.28
TOTAL	61	100.00

To what extent do you agree with the following statements? I prefer remote and/or online classes during the ongoing COVID-19 pandemic.

	Freq.	Percent
1-Disagree	16	25.81
2-Somewhat Disagree	12	19.35
3-Somewhat Agree	14	22.58
4-Agree	17	27.42
5-Hard to Say	3	4.84
TOTAL	62	100.00

To what extent do you agree with the following statements? I feel less connected to my classmates in remote and/or online courses.

	Freq.	Percent
1-Disagree	2	3.23
3-Somewhat Agree	6	9.68
4-Agree	50	80.65
5-Hard to Say	4	6.45
TOTAL	62	100.00

To what extent do you agree with the following statements? It is difficult for me to pay attention to remote classes that are held online compared to in-class learning.

	Freq.	Percent
1-Disagree	2	3.23
2-Somewhat Disagree	4	6.45
3-Somewhat Agree	15	24.19
4-Agree	38	61.29
5-Hard to Say	3	4.84
TOTAL	62	100.00

To what extent do you agree with the following statements? I am more anxious about coursework when learning is remote and/or online.

	Freq.	Percent
1-Disagree	2	3.23
2-Somewhat Disagree	13	20.97
3-Somewhat Agree	13	20.97
4-Agree	31	50.00
5-Hard to Say	3	4.84
TOTAL	62	100.00

To what extent do you agree with the following statements? I feel anxious about asking questions about the class without the presence of my peers in an in-person classroom.

	Freq.	Percent
1-Disagree	8	12.90
2-Somewhat Disagree	14	22.58
3-Somewhat Agree	14	22.58
4-Agree	23	37.10
5-Hard to Say	3	4.84
TOTAL	62	100.00

Do you have any caretaking responsibilities at home such as for children or other family members?

	Freq.	Percent
No	53	88.33
Yes	7	11.67
TOTAL	60	100.00

If yes, about how many hours per week do these responsibilities require of your time?

	Freq.	Percent
15-20hours	1	14.29
5-10hours	4	57.14
Lessthan5hours	2	28.57
TOTAL	7	100.00

Do you work outside of taking classes?

	Freq.	Percent
No	24	40.00
Yes	36	60.00
TOTAL	60	100.00

If yes, how many hours per week do you typically work?

	Freq.	Percent
10-15 hours	7	19.44
15-20 hours	5	13.89
5-10 hours	12	33.33
Less than 5 hours	3	8.33
More than 20 hours	9	25.00
TOTAL	36	100.00

Spring 2021 Post-Test Survey

To what extent do you agree with the following statements? I was better prepared for the exam when working with a group.

	Freq.	Percent
2-Somewhat Disagree	3	7.69
3-Somewhat Agree	16	41.03
4-Agree	20	51.28
TOTAL	39	100.00

To what extent do you agree with the following statements? Being in a group helped me learn the material more easily or better than if I had prepared a study guide on my own.

	Freq.	Percent
2-Somewhat Disagree	5	12.82
3-Somewhat Agree	11	28.21
4-Agree	23	58.97
TOTAL	39	100.00

To what extent do you agree with the following statements? I felt comfortable asking my group members questions about ideas or concepts I did not understand well.

	Freq.	Percent
1-Disagree	1	2.56
2-Somewhat Disagree	5	12.82
3-Somewhat Agree	8	20.51
4-Agree	25	64.10
TOTAL	39	100.00

To what extent do you agree with the following statements? Being in a group helped me feel better connected to other students in the course.

	Freq.	Percent
2-Somewhat Disagree	3	7.69
3-Somewhat Agree	14	35.90
4-Agree	22	56.41
TOTAL	39	100.00

To what extent do you agree with the following statements? I got along well with my other group members.

	Freq.	Percent
2-Somewhat Disagree	1	2.56
3-Somewhat Agree	8	20.51
4-Agree	28	71.79
5-Hard to Say	2	5.13
TOTAL	39	100.00

To what extent do you agree with the following statements? I will continue to keep in touch with the members of my group when the course is finished.

	Freq.	Percent
1-Disagree	8	20.51
2-Somewhat Disagree	12	30.77
3-Somewhat Agree	4	10.26
4-Agree	10	25.64
5-Hard to Say	5	12.82
TOTAL	39	100.00

To what extent do you agree with the following statements? Completing a group assignment was too time consuming.

	Freq.	Percent
1-Disagree	13	33.33
2-Somewhat Disagree	19	48.72
3-Somewhat Agree	4	10.26
4-Agree	2	5.13
5-Hard to Say	1	2.56
TOTAL	39	100.00

To what extent do you agree with the following statements? I contributed more to the group assignment than other members of the group.

	Freq.	Percent
1-Disagree	8	20.51
2-Somewhat Disagree	11	28.21
3-Somewhat Agree	7	17.95
4-Agree	7	17.95
5-Hard to Say	6	15.38
TOTAL	39	100.00

To what extent do you agree with the following statements? The credit assigned for the completion of the group assignment fairly reflected the work that went into it.

	Freq.	Percent
1-Disagree	1	2.56
2-Somewhat Disagree	1	2.56
3-Somewhat Agree	8	20.51
4-Agree	28	71.79
5-Hard to Say	1	2.56
TOTAL	39	100.00

Did you already know any members of your group?

	Freq.	Percent
No	38	97.44
Yes	1	2.56
TOTAL	39	100.00

Were you aware of what other groups were being asked to do?

	Freq.	Percent
No	20	51.28
Yes	19	48.72
TOTAL	39	100.00

Spring 2021 Demographic Information

Please select which of these you identify.

	Freq.	Percent
Female	40	66.67
Male	19	31.67
Gender fluid/non-binary	1	1.67
TOTAL	60	100

Age

	Freq.	Percent
18	18	30
19	23	38.33
20	11	18.33
21	2	3.33
22	3	5
24	2	3.33
30	1	1.67
TOTAL	60	100

Major

	Freq.	Percent
Astrophysical & Planetary Sciences	1	1.72
Business Administration	4	6.90
Cinema Studies & Moving Image Arts	1	1.72
Civil Engineering	1	1.72
Communication	3	5.17
Ecology & Evolutionary Biology	1	1.72
Environmental Studies	3	5.17
Finance	2	3.45
Humanities	1	1.72
International Affairs	6	10.34
Journalism	1	1.72
Mechanical Engineering	1	1.72
Molecular, Cellular, & Development Biology	1	1.72
Neuroscience	1	1.72
Philosophy	1	1.72
Political Science	28	48.28
Psychology	1	1.72
Sociology	1	1.72

TOTAL	58	100
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Year in school

	Freq.	Percent
Freshman	31	51.67
Sophomore	23	38.33
Junior	4	6.67
Senior	2	3.33
TOTAL	60	100

Ethnicity

	Freq.	Percent
Asian	4	6.67
Black/African American	2	3.33
Hispanic or Latino	8	13.33
White	45	75
I'd rather not answer	1	1.67
TOTAL	60	100

APPENDIX B: Pre- and Post- Survey questionnaires and focus group questions

Pre-Survey for Online Teaching Experiment for Large Introductory Classes

Material needs

To what extent do you agree with the following statements?

Responses for the following questions will use this scale:

1- Disagree 2- Somewhat Disagree 4- Somewhat Agree 5- Agree 6- Hard to Say

For the purposes of remote and/or online learning:

1. I have access to the technology (e.g. personal laptop or other device, reliable internet) I need to attend class and complete assignments remotely.
2. I have trouble finding a space that fits my needs to work on my coursework.
3. The time zone where I currently reside impacts my ability to attend class or complete coursework.
4. I prefer remote and/or online classes during the ongoing covid-19 pandemic.
5. I feel less connected to my classmates in remote and/or online courses.

Challenges with the workload

To what extent do you agree with the following statements?

Responses for the following questions will use this scale:

1- Disagree 2- Somewhat Disagree 4- Somewhat Agree 5- Agree 6- Hard to Say

1. It is difficult for me to pay attention to remote classes that are held online compared to in-class learning.
2. I am more anxious about coursework when learning is remote and/or online.
3. I feel anxious about asking questions about the class without the presence of my peers in an in-person classroom.

Experiences & Preferences

14. Which of the following have you personally experienced or taken part in as part of remote and/or online learning? Select all that apply.

- a. Classes held at the same time as they were originally scheduled, i.e. remote learning.
- b. Flexible class times / recorded lectures
- c. Flexible deadlines for assignments
- d. Online office hours with an instructor or TA
- e. Individual meetings online with an instructor or RA
- f. Higher workload than an in-person course
- g. Easier grading than an in-person course
- h. Lower expectations for performance than an in-person course

15. Which of the following do you consider essential for successful remote and/or online learning? Select all that apply.
- a. Classes held at the same time as they were originally scheduled, i.e. remote learning.
 - b. Flexible class times / recorded lectures
 - c. Flexible deadlines for assignments
 - d. Online office hours with an instructor or TA
 - e. Individual meetings online with an instructor or RA
 - f. Higher workload than an in-person course
 - g. Easier grading than an in-person course
 - h. Lower expectations for performance than an in-person course

Open-ended questions

16. Which approaches work best for you when learning remotely and/or online?
17. What is the biggest challenge for you when learning remotely and/or online?
18. Please briefly describe how the covid-19 pandemic has influenced your learning.

Demographic questions

19. Please select the category with which you identify.

- a. Female
- b. Male
- c. Trans-identified
- d. Gender fluid/non-binary
- e. No listed
- f. I'd rather not answer

20. Age (in years): [Choose from drop-down list.]

21. Major: [Choose from listed options.]

Advertising, Public Relations & Media Design
Aerospace Engineering Sciences
Anthropology
Applied Mathematics (Engineering)
Architectural Engineering
Art & Art History
Asian Languages and Civilizations
Asian Studies
Astrophysical & Planetary Sciences
Atmospheric & Oceanic Sciences
Biochemistry
Business Administration

Business Analytics
Chemical & Biological Engineering
Chemical Engineering
Chemistry
Cinema Studies & Moving Image Arts
Civil Engineering
Classics
Cognitive Science Studies
Communication
Computer Science
Creative Technology & Design
Critical Media Practices
Ecology & Evolutionary Biology
Economics
Education Equity & Cultural Diversity
Electrical Engineering
Electrical, Computer & Energy Engineering
Elementary Education
Engineering Management
Engineering Physics
English
Environmental Design
Environmental Engineering
Environmental Studies
Ethnic Studies
Finance
French & Italian
Geography
Geological Sciences
Germanic & Slavic Languages & Literatures
History
Humanities
Information Science
Integrative Physiology
International Affairs
Jewish Studies
Journalism
Law
Leadership & Community Engagement
Learning Sciences & Human Development
Linguistics
Materials Science & Engineering
Mathematics
Mechanical Engineering
Media Studies
Molecular, Cellular & Developmental Biology

Music
Neuroscience
Philosophy
Physics
Political Science
Psychology
Religious Studies
Sociology
Spanish & Portuguese
Speech, Language & Hearing Sciences
Statistics & Data Science
Supply Chain Management
Teacher Licensure
Technology, Cybersecurity & Policy
Theatre & Dance
Women & Gender Studies
Other
Undeclared

22. Year in the program? [Choose from listed options.]

Freshman
Sophomore
Junior
Senior

23. Race/Ethnicity [Choose from drop-down list.]

American Indian or Alaska Native
Asian
Black or African American
Hispanic or Latino
Native Hawaiian or Pacific Islander
White

25. Approximate Overall GPA [Blank text box]

26. Do you have any caretaking responsibilities at home such as for children or other family members? [Yes/No]

If yes, about how many hours per week do these responsibilities require of your time?
[Less than 5, 5-10 hours, 10-15 hours, 15-20 hours, More than 20 hours per week]

27. Do you work outside of taking classes?

If yes, how many hours per week do you typically work?
[Less than 5, 5-10 hours, 10-15 hours, 15-20 hours, More than 20 hours per week]

Post-Survey for Online Teaching Experiment for Large Introductory Classes

Responses for the following questions will use this scale:

1- Disagree 2- Somewhat Disagree 4- Somewhat Agree 5- Agree 6- Hard to Say

1. To what extent do you agree with the following statements:
 - a. I was better prepared for the exam when working with a group.
 - b. Being in a group helped me learn the material more easily or better than if I had prepared a study guide on my own.
 - c. I felt comfortable asking my group members questions about ideas or concepts did not understand well.
 - d. Being in a group helped me feel better connected to other students in the course.
 - e. I got along well with my other group members.
 - f. I will continue to keep in touch with the members of my group now that the course is finished.
 - g. Completing a group assignment was too time consuming.
 - h. I contributed more to the group assignment than other members of the group.
 - i. The credit assigned for the completion of the group assignment fairly reflected the work that went into it.
2. Did you already know any members of your group? [Yes/No]
3. Were you aware of what other groups were being asked to do? [Yes/No]
4. What were the main benefits of working in your group? Select all that apply.
5. Were there any problems or challenges associated with working in your group? Select all that apply.
6. Are there any other comments you would like to make about the group assignment to prepare a study guide for the exam? [Open-ended response.]

Focus Group Questions for Online Teaching Experiment in Large Introductory Classes

Focus groups were approximately one hour long and will be held via Zoom.

Script & Sample Questions for Researcher(s) Conducting Focus Groups

We are interested in asking you a few questions about your experience with remote and/or online learning in this course. This is part of a research project about how to improve remote and/or online learning during the current covid-19 pandemic. You may refuse to take part in this research project at any time. If you have any questions or concerns about the research, you may contact [omitted to maintain anonymity].

Thank you for your participation!

General Discussion Questions for Focus Groups

First, we're going to ask you about your experience in this class overall.

1. When I call your letter, I'll ask you to rate this class. On a scale of 1-10, where 1 is the worst score and 10 is the best, how would you rate this class overall?
 - (If a student rates a 1): Please explain why you rated this course a 1.
 - (If a student rates a 10): Please explain why you rated this course a 10.

For the remainder of this focus group, we're going to ask you to set aside your feelings about the class and to answer the following questions about the learning experiment you participated in.

2. First I'll have each of you disclose what group you were in. When I call your letter, please tell me if you were assigned to meet on Zoom or communicate online, and what you had to produce.
3. What did you like about working in this group?
4. How did working in this group impact your learning?
5. What did you not like about working in this group?
6. In your opinion, did the benefits of working in a group for this assignment outweigh the challenges? Or, were the challenges not worth the benefits?
7. Did participating in this group make you feel more connected to other students in this class?
8. Consider the following activities: Did participating in this group make you feel MORE or LESS connected to other students than these activities:
 1. Breakout rooms / Small groups
 2. Class discussion in recitation
 3. Online check in groups / Discussion Boards
 4. Lecture
 5. Other _____

9. Which activity made you feel the MOST connected?
10. Did you talk to any members of this group outside of working on the study guide / game / studying for the exam?
11. Although the groups are not required for the final exam, do you plan on studying with a group for the final exam?

APPENDIX C: Post-Treatment Student Connectedness by Treatment Group (Fall 2020)

	Student Zoom Treatment	TA-Led Zoom Treatment	Slack Treatment	Discussion Group Treatment	Buddy Treatment
Post-Treatment Student Connectedness	0.0265 (0.11)	0.448* (2.1)	-0.587* (-2.32)	0.213 (0.91)	-0.259 (-1.16)
Constant	3.093*** (30.02)	2.990*** (28.52)	3.188*** (32.29)	3.075*** (29.62)	3.155*** (30.20)
<i>N</i>	132	132	132	132	132

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$