Gender differences in BSc/MPhys degree pathways

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1. Background to the project

This paper describes a project that is being carried out at the University of Bath to investigate gender differences in BSc/MPhys degree pathways. This project arose as a result of national data collated by the Institute of Physics, showing that:

i. Although similar proportions of male and female students are registered on MPhys courses during their first year, female students are less likely than male students to graduate with an MPhys degree (as shown in Figures 1 and 2).

ii. Female students graduating with a BSc Physics (and related) degree are more likely than their male counterparts to gain a 1st or a 2:1[1].

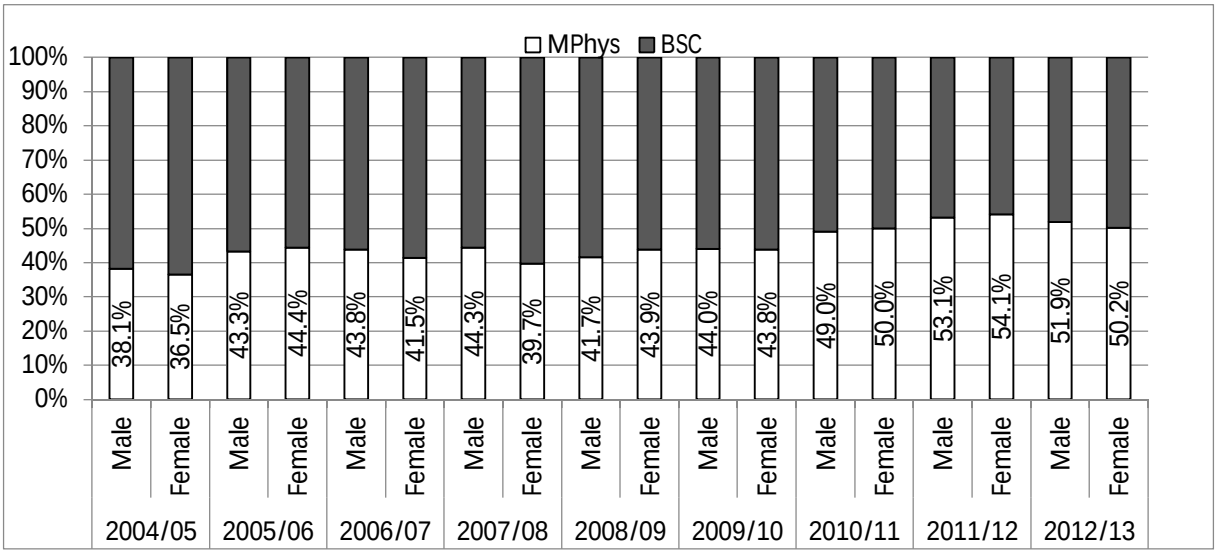

Figure 1: Percentage of students registered on BSc or MPhys courses in their first year studying at least 50% physics and/or astronomy by gender (Source: IoP)

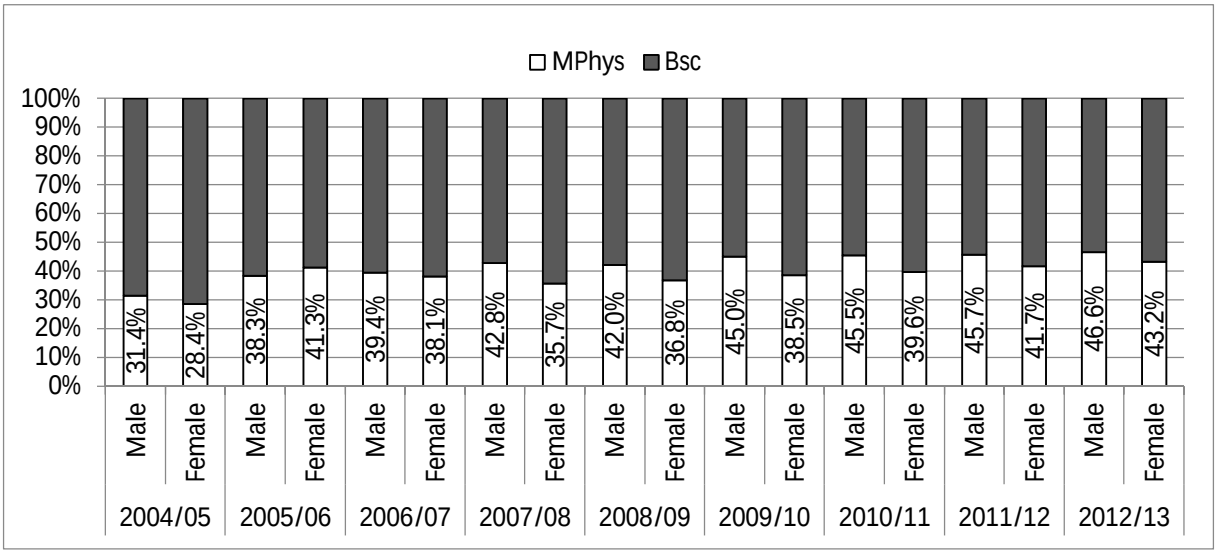

Figure 2: Percentage of graduates from BSc or MPhys courses which are at least 50% physics and/or astronomy by gender (Source: IoP).

[1] 58.3% of female BSc Physics students graduating between 2008/9 to 2012/13 achieved a 1st or a 2:1, compared with 49.3% of male BSc graduates.

It seems reasonable to assume that most students who graduate with a 1st or a 2:1 degree would have achieved the exam results needed at the end of years 1 and/or 2 in order to progress on an MPhys course, should they have wished to do so. The data therefore appears to show that a higher proportion of female students (compared to male) choose not to continue on an MPhys course for reasons other than attainment.

This in turn raises questions about a possible gender difference in:

i. students' experience during the first years of their degree course; and/or
ii. the perceived value to students of an MPhys degree compared to a BSc.

This project therefore aimed to explore these issues in more detail, in collaboration with the Institute of Physics. An online survey was designed and distributed to undergraduate students in all UK Physics departments, in order to investigate in more detail the reasons for students choosing to pursue BSc and MPhys degree courses. This included an investigation of the reasons for students changing course, their perception of the relative value of the two qualifications, their experience within their department and on their course, and whether their views have changed over time.

2. Methodology

Appendix A shows the survey questions. The weblink to the survey was sent to the Heads of Department / Directors of Learning & Teaching of all UK Physics departments with at least one IoP-accredited Physics degree course (44 in total). This email was sent by Jenni Dyer (Head of Diversity at the IoP), with a request for them to forward it to all of their undergraduate students to complete. The survey was anonymous, with the exception that respondents were invited to submit their email address at the end of the survey if they wished to enter a prize draw for a £50 Amazon voucher. However, the prize draw winner was drawn at random as soon as the survey response window had closed, and all email addresses were deleted before any analysis of the data was carried out, thus ensuring that all respondents' anonymity was respected.

3. Data analysis

A total of 822 students from 14 different UK universities completed part or all of the survey; Appendix B presents more detailed information about the characteristics of these respondents. The overall proportion of female respondents was slightly higher but similar to those within UK national (HESA) Physics cost centre data. Similarly, the BSc/MPhys breakdown of the survey respondents was similar to national data.

The survey data shows similar gender differences to those outlined in Section 1. For example, Figure 3 shows a statistically significant gender difference between the year group profiles; in particular, there is a noticeably smaller proportion of female respondents in Year 4, compared to male. This is expanded in Figure 4, which breaks down the data in Figure 3 by current BSc/MPhys registration. This shows that while the relative proportions of male and female BSc respondents are fairly constant across the different year groups, this is not the case for the MPhys respondents: there is a steady decline through the year groups in the proportion of MPhys respondents who are female.

These differences are also seen in the numbers of students who report that they have changed their degree registration. 59 male respondents have changed their registration from BSc to MPhys, while only 28 have changed from MPhys to BSc. In contrast, the numbers of female respondents transferring in each direction are much more similar: 19 transferred from BSc to MPhys, while 17 transferred from MPhys to BSc.

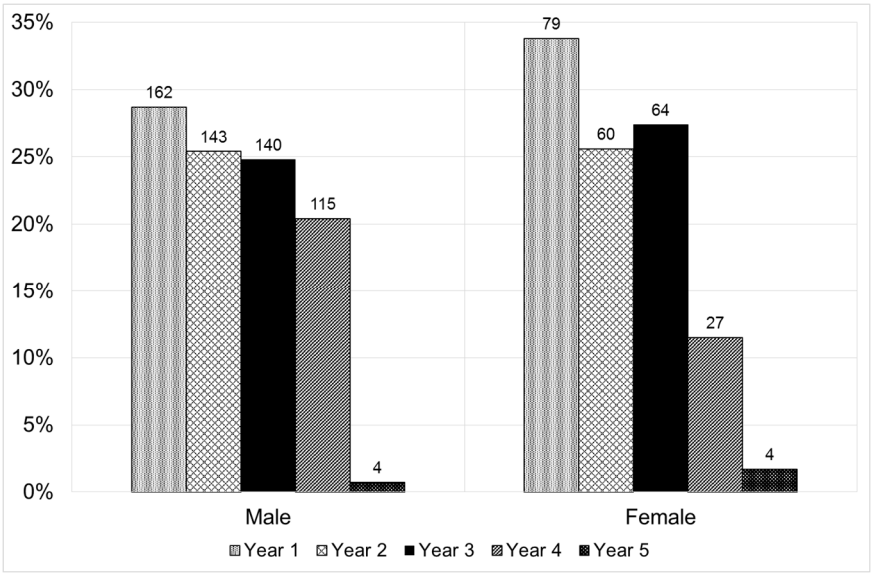

Figure 3: Percentages of respondents within each year group (split by gender).

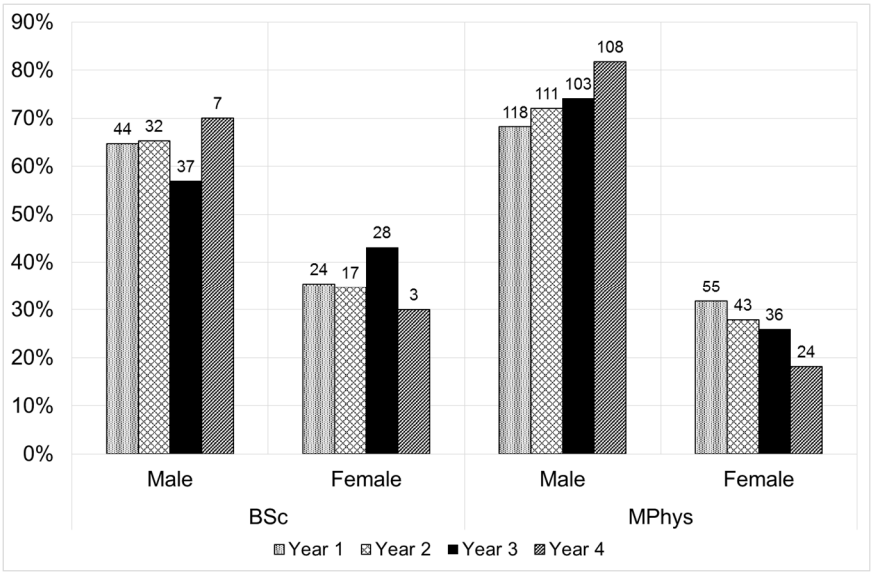

Figure 4: Gender breakdown of respondents within each year group (split by BSc/MPhys registration)

3.1 Reasons for original BSc registration

Survey question 4 asked respondents who had originally registered on a BSc degree for their reasons for doing so.

The only stated reason for which there was a statistically significant gender difference was "*I was concerned about the difficulty of doing an MPhys/MSci*"; as shown in Figure 5, female respondents were significantly more likely to state that this was a relevant factor in their decision to originally register for a BSc.

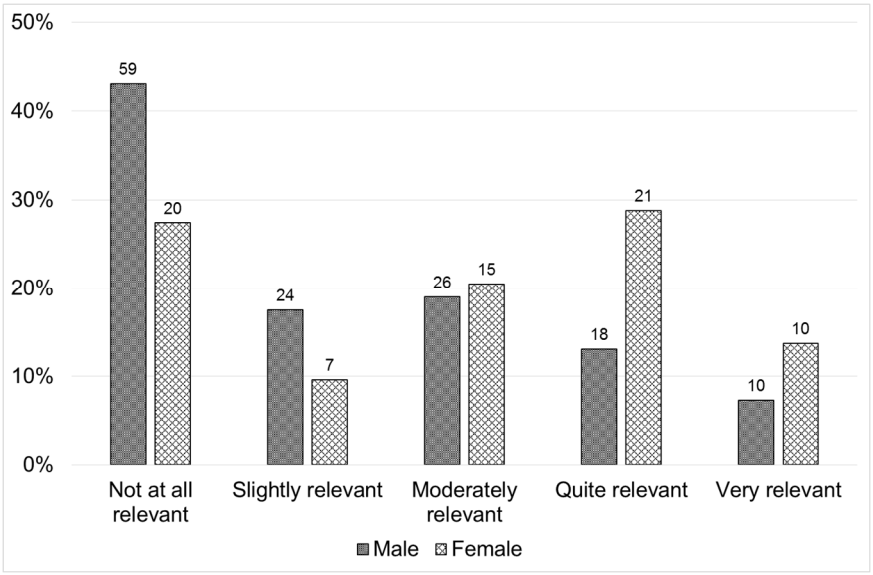

Figure 5: Relevance of the statement "*I was concerned about the difficulty of doing an MPhys/MSci*" to respondents' decisions to register originally for a BSc

3.2 Reasons for original MPhys registration

Survey question 5 asked respondents who had originally registered on an MPhys degree for their reasons for doing so. There were no statistically significant gender differences in the relevance attributed to each of the different reasons.

3.3 Reasons for changes in registration from BSc to MPhys

Survey question 10 asked respondents who had transferred from a BSc to an MPhys degree for their reasons for doing so. There were no statistically significant gender differences in the relevance attributed to each of the different reasons.

3.4 Reasons for changes in registration from MPhys to BSc

Survey question 9 asked respondents who had transferred from an MPhys to a BSc degree for their reasons for doing so. There were statistically significant gender differences in the relevance attributed to two of the stated reasons: "*I was not enjoying the course*" and "*I was not interested enough in the course*".

Figures 6 and 7 show the relative relevance levels attributed to each of these reasons by respondents.

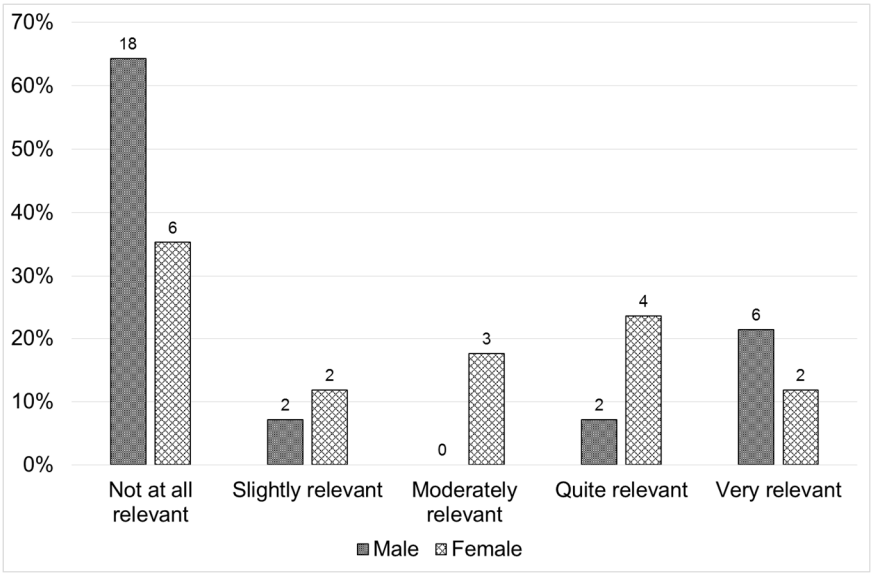

Figure 6: Relevance of the statement "*I was not enjoying the course*" to respondents' decisions to transfer from an MPhys to a BSc

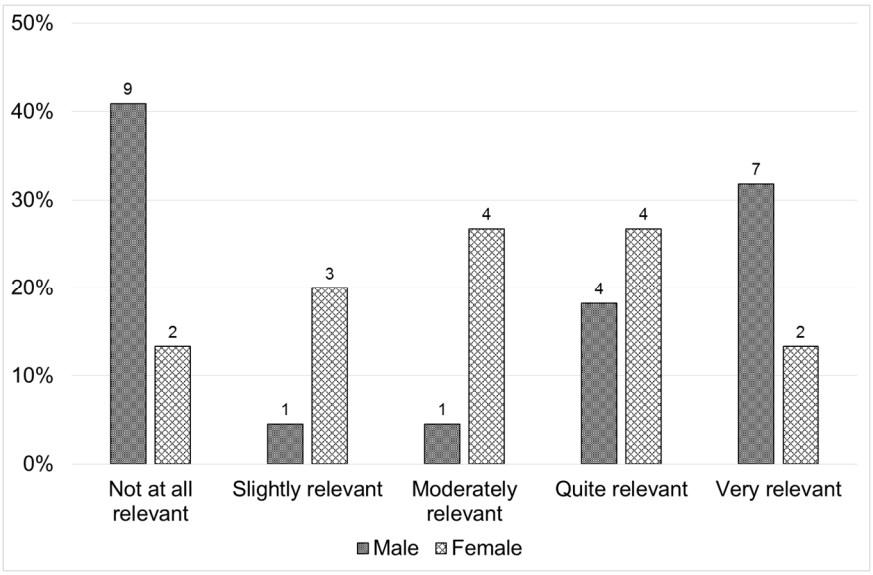

Figure 7: Relevance of the statement "*I was not interested enough in the course*" to respondents' decisions to transfer from an MPhys to a BSc

3.5 Self-image as physicist

Survey question 11 asked respondents whether they think of themselves as a physicist. 66.8% of male respondents answered "Yes" to this question, as did 62.9% of female respondents; this was not a statistically significant difference.

3.6 Grades achieved to date, years on course and self-image as physicist

Survey question 7 asked respondents for their average grade achieved to date; this question was included in order to investigate a possible link between grades achieved to date and whether respondents identify themselves as being a physicist and/or the probability of them transferring registration between BSc and MPhys.

A statistically significant gender difference was observed between the reported distributions of marks received to date, with the male respondents reporting significantly higher grades compared to their female counterparts. The distribution of marks reported by the male respondents appears anomalously high compared to the national distribution of Physics degree classifications.

There were no statistically significant gender differences within different grade levels for whether respondents identify themselves as a physicist. Similarly, no statistically significant gender differences were observed within different year groups for whether respondents identify themselves as a physicist.

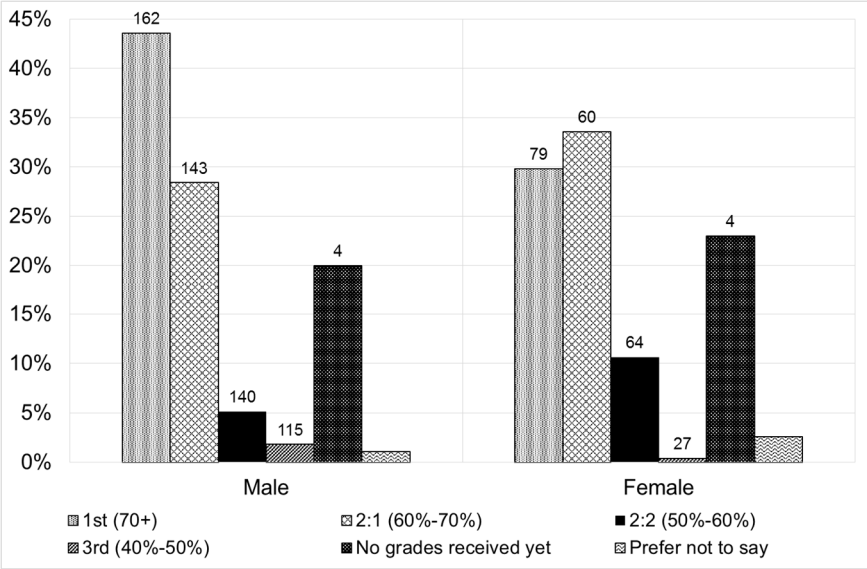

Figure 8: Distribution of grades for marks reported to have been received to date by respondents

3.7 Satisfaction with course and department environment

Survey question 12 asked respondents about their level of satisfaction with a number of aspects of their department and course, the aim being to investigate any gender differences in satisfaction, along with any possible link with satisfaction levels and the probability of students transferring between BSc and MPhys courses.

Statistically significant gender differences were found in the levels of agreement with four of the statements: "*I feel that I am good at physics*", "*I feel overstressed by the demands of my university workload*", "*I have a good relationship with the students on my course*", and "*I feel welcome in my department*". When compared to their male counterparts, the female respondents are less likely to feel that they are good at physics or to feel welcome in their department; they are also more likely to feel overstressed by their workload. They are more likely, however, to have a good relationship with the other students on their course.

Figures 9-12 show the relative levels of agreement with each of these statements by respondents.

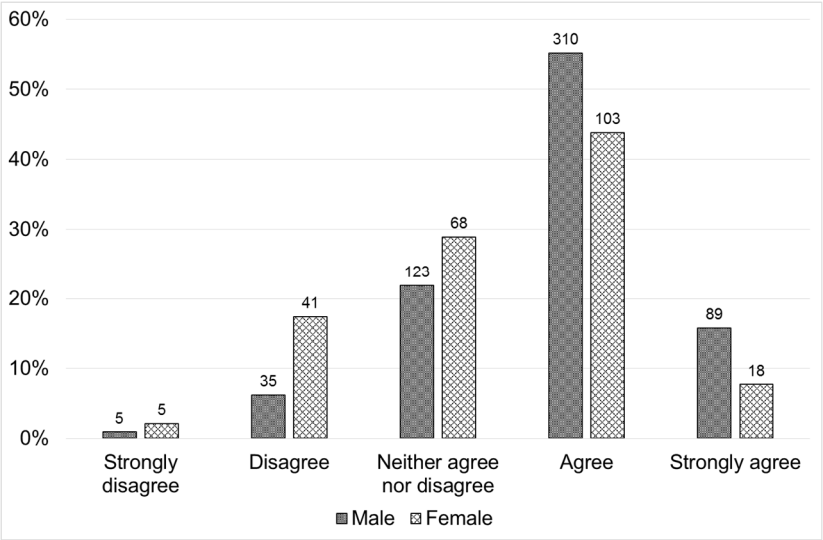

Figure 9: Respondents' levels of agreement with the statement "*I feel that I am good at physics*"

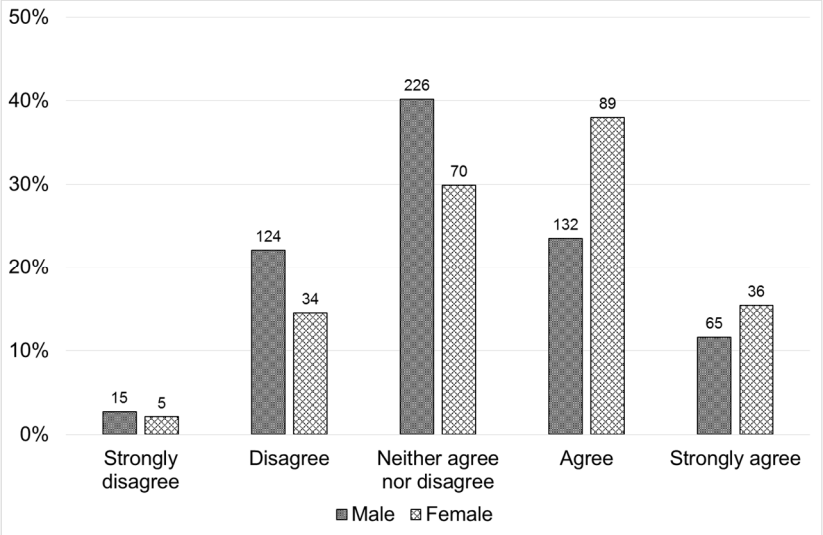

Figure 10: Respondents' levels of agreement with the statement "*I feel overstressed by the demands of my university workload*"

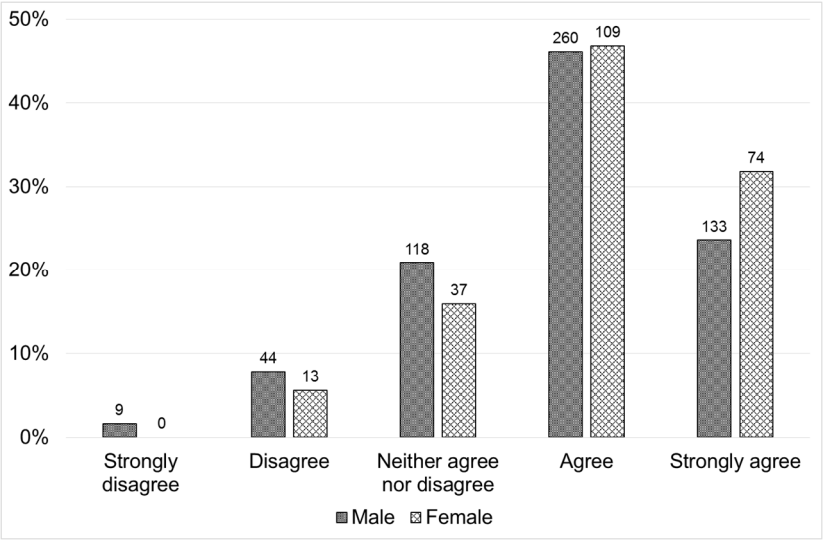

Figure 11: Respondents' levels of agreement with the statement "*I have a good relationship with the students on my course*"

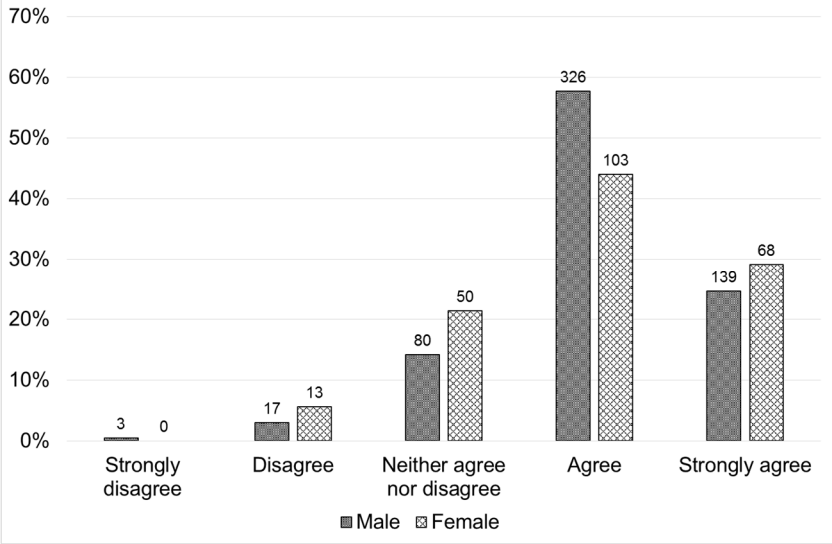

Figure 12: Respondents' levels of agreement with the statement "*I feel welcome in my department*"

3.8 Gender differences in satisfaction with course and department environment for students registered on MPhys and BSc degrees

For those respondents who are currently registered on an MPhys course, the survey data showed statistically significant gender differences for three of the statements in survey question 12: "*I feel that I am good at physics*", "*I feel overstressed by the demands of my university workload*" and "*I feel welcome in my department*".

For those respondents who are currently registered on a BSc course, the survey data showed a statistically significant gender difference for only one of the statements: "*I have a good relationship with the students on my course*".

Figures 13-15 show the relative levels of agreement with each of these statements by respondents in these different categories.

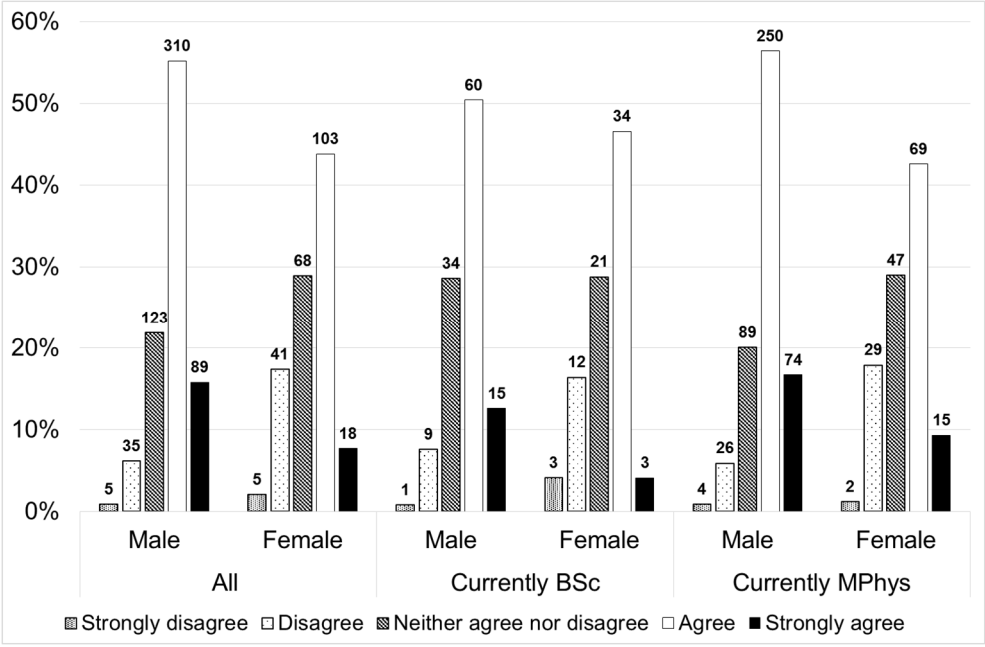

Figure 13: Respondents' levels of agreement with the statement "*I feel that I am good at physics*"

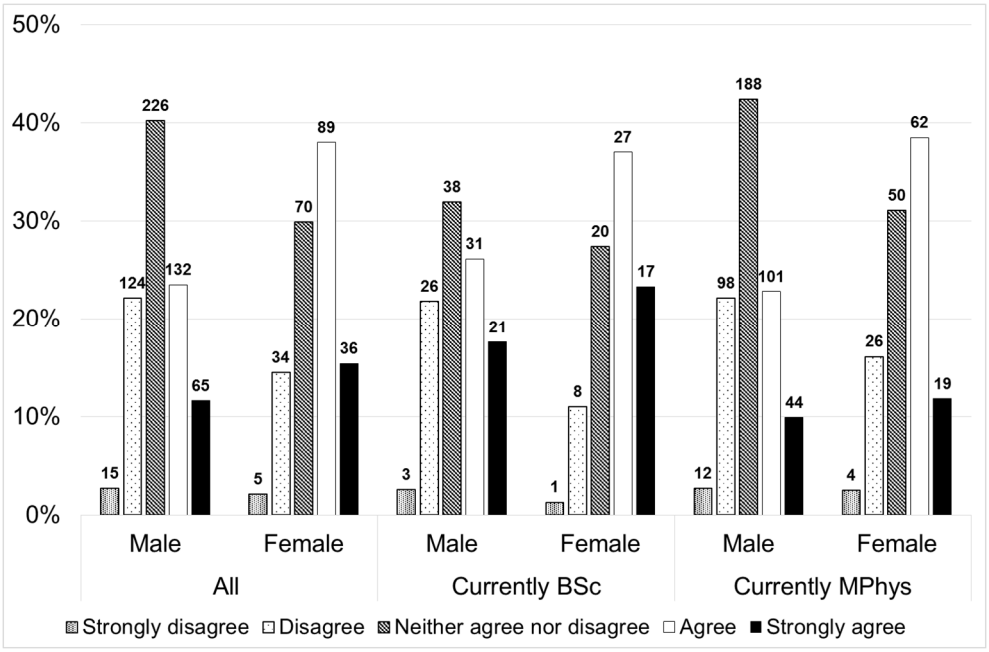

Figure 14: Respondents' levels of agreement with the statement "*I feel overstressed by the demands of my university workload*"

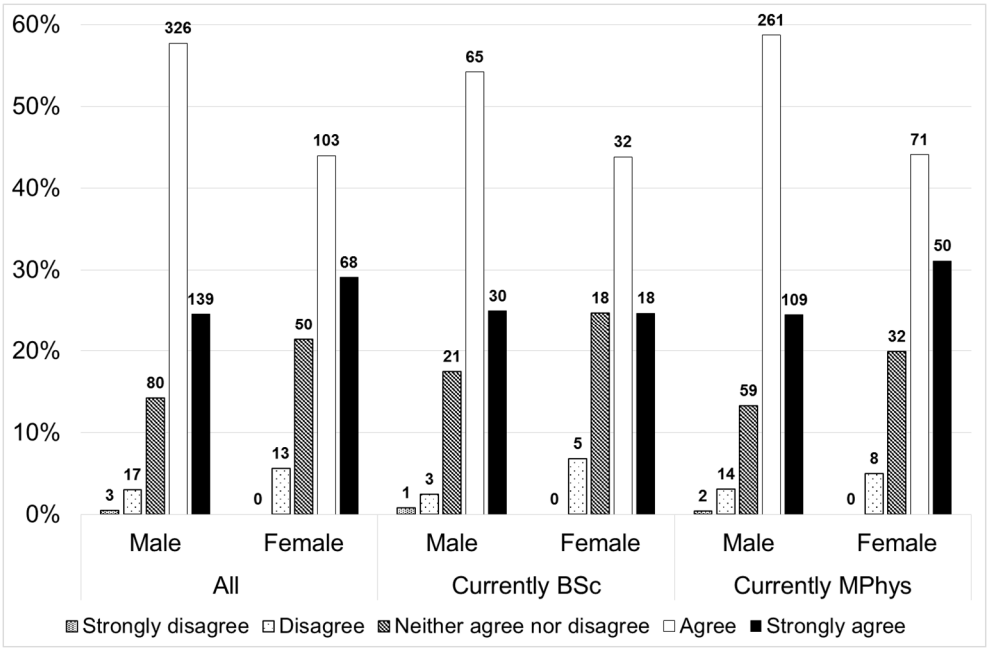

Figure 15: Respondents' levels of agreement with the statement "*I feel welcome in my department*"

3.9 Transfers from MPhys to BSc: links with satisfaction with course and department environment

For those respondents who had transferred from an MPhys course to a BSc, the survey data showed statistically significant gender differences for only one of the statements in survey question 12: "*I feel that I am good at physics*".

For those respondents who had transferred from a BSc course to an MPhys, the survey data showed no statistically significant gender differences with any of these statements.

3.10 MPhys/BSc-related differences in satisfaction with course and department environment for students of each gender

Another way of looking at these issues is to consider the populations of male and female respondents separately, and to investigate the associations between students' levels of agreement with the statements in survey question 12 and their current MPhys/BSc course registration.

For male respondents, the survey data showed statistically significant differences for four of the statements: "*I am enjoying my course*", "*My motivation to study is generally good*", "*I have a good relationship with the students on my course*", and "*I have a good relationship with my lecturers*". In all cases, positive responses to these statements from male students are associated with them being registered on an MPhys degree course.

Figures 16-19 show the relative levels of agreement with each of these statements by male respondents in these different categories.

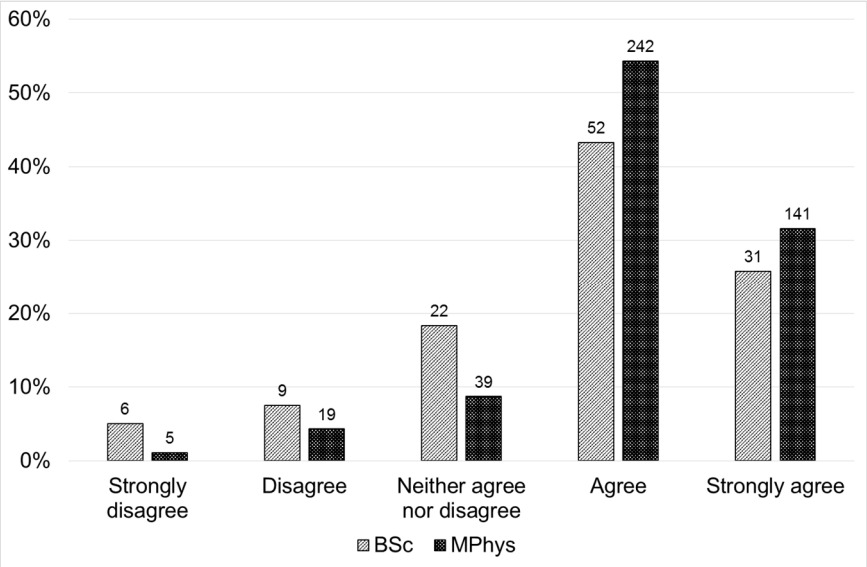

Figure 16: Male respondents' levels of agreement with the statement "*I am enjoying my course*"

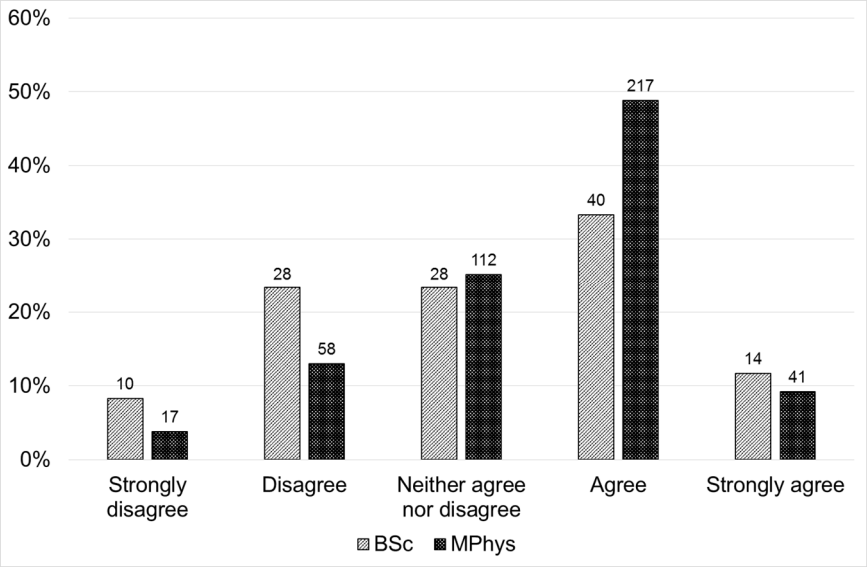

Figure 17: Male respondents' levels of agreement with the statement "*My motivation to study is generally good*"

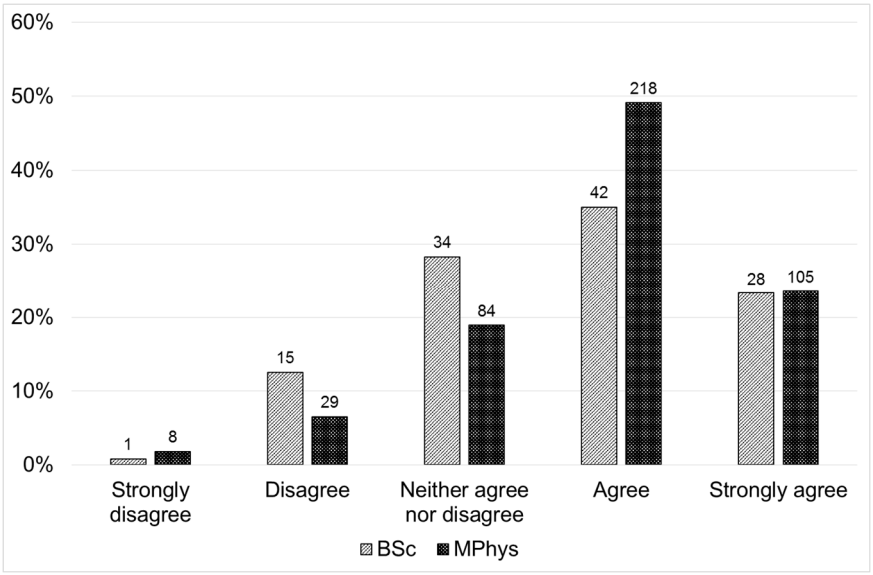

Figure 18: Male respondents' levels of agreement with the statement "*I have a good relationship with the students on my course*"

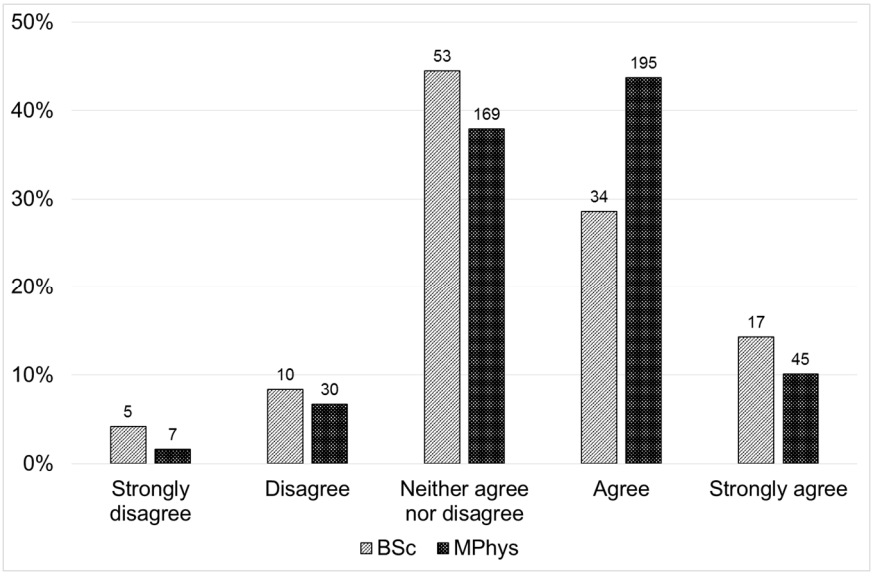

Figure 19: Male respondents' levels of agreement with the statement "*I have a good relationship with my lecturers*"

For female respondents, the survey data showed no statistically significant differences for any of the statements in survey question 12.

4. Summary of findings to date

The following statistically significant associations have been found within the survey data:

- Concerns about the difficulty of doing an MPhys/MSci are more likely to result in women registering for a BSc degree in their first year, compared to men.
- There are gender differences in the nature of the associations between the level of students' enjoyment/interest in the course and the likelihood that they transfer from an MPhys to a BSc degree course.
- There is no gender difference in the proportion of students reporting that they think of themselves as a physicist, with around 2/3 of respondents answering this question positively.
- When considered across both MPhys and BSc courses, women are less likely than men to feel that they are good at physics or to feel welcome in their department; they are also more likely to feel overstressed by their workload. These gender differences are also present when the views of female MPhys students are compared with those male MPhys students. However, there are no gender differences in relation to these factors for BSc students.
- When considered across both MPhys and BSc courses, women are more likely than men to consider that they have a good relationship with the other students on their course; this gender difference is also present when only BSc students are considered. However, there is no equivalent gender difference for MPhys students.
- Men who are registered on an MPhys course are more likely than those on a BSc to report that they are enjoying their course, have a good motivation to study, and have good relationships with other students and their lecturers. There are no equivalent differences for women registered on MPhys and BSc courses.

Appendix A

Q1 Please select which university you are attending. (*Drop-down menu of choices*)

Q2 Which year of your course are you currently in? (*Choice of 1-5*)

Q3 Which type of degree did you originally enrol on at the start of university? (*Choice of "BSc (Physics-based)", "MPhys/MSci (Physics-based)" and "Non-Physics based"*)

Q4 If BSc, please use the grid below to select how relevant each of these factors were in your decision to choose to study a BSc degree. (*All subquestions have a choice of "Very relevant", "Quite relevant", "Slightly relevant", "Moderately relevant", "Not at all relevant" and "Other"*).

- Q4_a The length of an MPhys/MSci course seemed too long
- Q4_b I was more interested in the modules which would be available to me
- Q4_c A BSc had lower UCAS entry requirements compared to an MPhys/MSci
- Q4_d I was concerned about the difficulty of doing an MPhys/MSci
- Q4_e Many of my friends were choosing the same type of degree
- Q4_f I was concerned about the cost of studying for an extra year
- Q4_g Any other factors (please specify in the box provided)

Q5 If MPhys/MSci''', please use the grid below to select how relevant each of these factors were in your decision to choose to study a MPhys/MSci degree. (*All subquestions have a choice of "Very relevant", "Quite relevant", "Slightly relevant", "Moderately relevant", "Not at all relevant" and "Other"*).

- Q5_a The length of a BSc course seemed too short
- Q5_b I thought an MPhys/MSci would improve my career opportunities compared to a BSc
- Q5_c I wanted to stay at university for as long as possible
- Q5_d I wanted to study physics in more depth
- Q5_e Many of my friends were choosing the same type of degree
- Q5_f I wanted to gain as high a qualification as possible
- Q5_g It was department policy that all students registered on MPhys/MSci
- Q5_h I thought an MPhys/MSci would be better for a career in research
- Q5_i Any other factor (please specify in the box provided)

Q6 Which course did you originally enrol on at the start of university? (*Choice of "Physics", "Astrophysics/Astronomy", "Physics with/and Astrophysics/Astronomy", "Theoretical Physics", "Mathematics with/and Physics", "Physics with/and another science based subject(s)", "Physics with/and a non-science based subject(s)", "Other*")

Q7 What is your average grade for your completed modules so far? (*Choice of "1st (70%+)", "2:1 (60%-70%)", "2:2 (50%-60%)", "3rd (40%-50%)", "No grades received yet", "Prefer not to say", "Other")*

Q8 Have you changed type of degree since first starting university? (i.e. changed from an MPhys/MSci to a BSc or vice versa). (*Choice of "Yes", "No", "Other*")

- Q8_a During which year of your course was this change made? (*Choice of "1st", "2nd", "3rd", "Other"*)

Q8_a_i Were you required to change by your department because you did not make the pass mark to stay on your original degree type? (*Choice of "Yes", "No", "Other"*)

Q9 If you have changed from an MPhys/MSci to a BSc course since you have been at university, please select how relevant each of these factors were in your decision to change. (*All subquestions have a choice of "Very relevant", "Quite relevant", "Slightly relevant", "Moderately relevant", "Not at all relevant" and "Other"*).

Q9_a I was not enjoying the course
Q9_b I had a change of career plan
Q9_c I was finding the MPhys/MSci course too difficult
Q9_d Other students doing the same course also changed
Q9_e I was worried about the cost of studying for an extra year
Q9_f I wanted to move into the world of work
Q9_g I was not interested enough in the course
Q9_h I didn't feel clever enough
Q9_i Any other factors (please specify in the box provided)

Q10 If you have changed from a BSc to an MPhys/MSci course since you have been at university, please select how relevant each of these factors were in your decision to change.

Q10_a I was enjoying the course so much I wanted to study for an extra year
Q10_b I thought doing an MPhys/MSci would improve my career opportunities
Q10_c The cost of staying on at university wasn't as much as I first expected
Q10_d I realised that I wanted to do extra studying
Q10_e I had a change of career plan
Q10_f I wanted to study physics in more depth
Q10_g My grades were better than expected so I realised I had the ability to do an MPhys/MSci
Q10_h Other students doing the same course also changed
Q10_i I want to study a PhD/DPhil in the future
Q10_j Any other factors (please specify in the box provided)

Q11 Do you think of yourself as a physicist? (*Choice of "Yes", "No", "Other"*)

Q11_a Why? (*Free text box*)

Q12 Please choose which of the options most reflects your response to the following statements. (*Choice of "Strongly disagree", "Disagree", "Neither agree nor disagree", "Agree", "Strongly agree", "Other*")

Q12_a I am enjoying my course
Q12_b I am enjoying university
Q12_c I feel that I am good at physics
Q12_d I feel overstressed by the demands of my university workload
Q12_e My motivation to study is generally good
Q12_f I have a good relationship with the students on my course
Q12_g I have a good relationship with my lecturers

Q12_h I feel that everybody's contributions are treated in a respectful way in my department

Q12_i I feel welcome in my department

Q12_j I feel well supported by my department

Q13 What are your career aspirations when you graduate? (*Choice of "Postgraduate course in physics", "Postgraduate course in another subject", "Working in a physics related job", "Working in a non-physics related job", "Time out (e.g. gap year)", "Teaching/PGCE", "I don't know", "Other*")

Q14 Which gender are you? (*Choice of "Male", "Female", "Prefer not to say", "Other*")

Q15 What type of institution did you attend just before coming to university? (*Choice of "Single gender - all girls", "Single gender - all boys", "Mixed gender", "Home schooled", "Other*")

Q16 Please read the statement above. Were you aware of this when you applied to university? (*Choice of "Yes", "No", "Other"*)

Q16_a How did you feel about the above statement when you applied? (*Choice of "Unconcerned", "Concerned", "Very concerned", "Other"*)

Q16_b Did this affect your choice of whether to study a BSc or MPhys/MSci when applying to university? (*Choice of "Yes", "No", "Other*)

Q17 Now that you are at university, do you think this gender difference should be narrowed? (*Choice of "Yes", "Unsure", "No", "Other*")

Q18 Do you think this gender difference could be narrowed? (*Choice of "Yes", "Unsure", "No", "Other*")

Q18_a How? (*Free text box*)

Q19 If there are any further comments or feedback that you would like to leave us, please write in the box below. (*Free text box*)

Appendix B

Total respondents	822	
UK universities represented	14	
Gender breakdown	571 respondents (69.5% of overall total) self-identified male 237 respondents (28.9% of overall total) self-identified female	
Year group breakdown	Year 1: 246 respondents Year 2: 211 Year 3: 206 Year 4: 147 Year 5: 8	
Original degree type breakdown	BSc (Physics-based): 214 MPhys/MSci (Physics-based): 601 Non-Physics based: 7	
Current degree type breakdown	BSc (Physics-based): 193 MPhys/MSci (Physics-based): 608	
Original degree type breakdown by gender	BSc: 139 male (65.6%), 73 female (34.4%) MPhys/MSci: 427 male (72.5%), 162 female (27.5%)	
Current degree type breakdown by gender	BSc: 120 male (62.2%), 73 female (37.8%) MPhys/MSci: 446 male (73.4%), 162 female (26.6%)	
Current degree type breakdown by gender	Year 1:	BSc: 44 male (64.7%), 24 female (35.3%) MPhys/MSci: 118 male (68.2%), 55 female (31.8%)
	Year 2:	BSc: 32 male (65.3%), 17 female (34.7%) MPhys/MSci: 111 male (72.1%), 43 female (27.9%)
	Year 3:	BSc: 37 male (56.9%), 28 female (43.1%) MPhys/MSci: 103 male (74.1%), 36 female (25.9%)
	Year 4:	BSc: 7 male (70%), 3 female (30%) MPhys/MSci: 108 male (81.8%), 24 female (18.2%)