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What do researchers want to do?

The career intentions of doctoral researchers

2012

Vitae is supported by Research Councils UK (RCUK),
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What do researchers want to do?
The career intentions of doctoral researchers

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The survey on which this report is based originated in a research study for the Department for Business, Innovation & Skills (BIS). Limited results for doctoral researchers in science, technology, engineering and mathematics (STEM) disciplines were included in that report (STEM graduates in non-STEM jobs, 2011). We are grateful to BIS for permission to extend the survey to all disciplines and analyse the resultant data within the context of this wider project.

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Outline

Over 4,500 current postgraduate researchers undertaking doctoral degrees responded to a dedicated online survey in 2010. The study aimed to investigate the career intentions and aspirations of doctoral researchers, their career decision-making to date and what influenced those decisions.

Responses were received from postgraduate researchers in 130 UK universities and research institutes. Sufficient numbers were obtained to make comparisons between those in different research discipline groupings and stages of programme, and between full-time and part-time doctoral researchers. The relatively large sample size and good comparison of certain demographic parameters with those in the national cohort suggest that the sample was representative of doctoral researchers in the UK, although with some over-representation of those with Research Council funding.

Career trajectories to postgraduate research

The responses in this study showed that doctoral researchers in different disciplines displayed significant variations in their age, mode of study and career trajectories prior to postgraduate research. They confirmed that, overall, only a minority undertake doctoral research directly after a first degree. The majority enter research either from a Masters degree or from long-term employment, however, the respective proportions varied strongly with the research discipline.

The picture for part-time respondents was different, with the majority in all disciplines, except arts and humanities and physical sciences, having progressed from long-term employment and only a very small minority directly from an undergraduate degree.

The nature of these varied trajectories of respondents prior to undertaking postgraduate research in different research disciplines had to be taken into account when investigating their career intentions, career decision-making and related activities.

Current career intentions

Even in the later years of their doctoral programmes, only around a third of respondents had definite ideas about their future careers, and about a fifth had little or no idea. Of those who did have definite or reasonably well established ideas, the great majority of doctoral researchers definitely (63%) or probably (28%) intended to pursue occupations or careers related to their research discipline. This applied almost irrespective of the career direction they sought.

Overall, nearly half of respondents with well-established ideas aspired to a career in higher education and a quarter in research outside of the higher education sector; the latter appeared to be the next alternative for many considering a higher education career. However, the overall position masked significant variations by discipline. Three quarters of respondents from the arts and humanities, and over half in social sciences or education, sought a higher education career, while in biological sciences the most popular direction was research outside of higher education.

Only in biomedical sciences and engineering and technology were significant proportions of respondents (over 30%) anticipating careers outside research, although mostly in occupations and sectors which they saw as related to their research disciplines.

For respondents that intended to pursue an occupation related to their research, researchers' career intentions were dominated by their continued interest in the field and their desire to apply their specialist knowledge and high-level skills. They reported career-related issues, such as job availability, remuneration or prospects for progression, to be secondary factors. On the other hand, these career-related issues were much more significant for those who were unsure about their career direction than for those with more established career plans or ideas. For the fewer than 10% of respondents who actively intended to pursue a new direction, these factors can be significant drivers, but they were as, or more, likely to have been attracted by interest in the new direction, and a very few had simply not enjoyed their research.

Choosing postgraduate research

Fewer than one in six doctoral researchers in this study had well-formed career ideas when they had started their undergraduate degree course, and over half had only a vague idea of possible careers or no idea at all. In this respect, the extent of their career thinking seemed to be no different from that of undergraduates more widely[1]. Of respondents that did have ideas, very few (13%) were then thinking about a career in higher education, and only a further 25% about research outside higher education; so the majority had not been consciously thinking about a career in research during their undergraduate studies.

From this it can be inferred that, for most, the attraction of research developed during their university years, and not prior to higher education, which coincides with the time that they are targeted by corporate graduate recruiters looking for 'strong' graduates. Recognition of this potential competition for the most talented graduates, and how few undergraduates were thinking about a research career, may be useful in considering how to assure the future supply of high-calibre graduates into research, particularly with the potential impact of higher undergraduate fees and some employers' offers to counter this.

The overwhelming majority in this study chose to undertake doctoral research for intellectual curiosity and interest, and a desire to develop more specialised knowledge and expertise, while a minority had seen it as necessary for the career to which they aspired. This varied by discipline, with more of those in biological sciences (41%) and least of those in engineering and technology (30%) thinking it would help them to pursue the long-term job that they wanted.

Fewer than a tenth of final-year postgraduate researchers seemed dissatisfied with their choice to undertake doctoral research, although only 70% reported that they would choose the same or similar doctoral research programme again. The proportion that would choose the same programme again declined slightly with length of study; with those in their first year being most positive, while the proportion who would not undertake postgraduate research at all rose to one in ten in their final year.

[1] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills
www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

Value of the doctorate

Nine out of ten postgraduate researchers in this study thought their doctorate would be essential (54%) or make a difference (33%) in achieving their career aspirations. This was expressed most strongly by those intending to pursue a career related to their research field, and only varied modestly for those considering occupations outside higher education and research.

Careers advice and employment applications

Just under one third of UK final-year doctoral researchers had used their institutional careers service as postgraduates; a substantially smaller proportion than did so as undergraduates, and less than their international peers. At the same time, two thirds felt that they would have benefited if they had used such a careers service at some stage, and a slightly higher proportion still of female researchers.

Of those respondents who had used their university careers service as postgraduates, three quarters had found it very helpful (25%) or helpful (51%), irrespective of their current discipline, career intention or study mode.

Relatively few respondents had actually applied for specific jobs or positions even during the later stages of their research, suggesting that most leave it until after completion of their doctorate. The majority of those who did have job offers prior to completing their doctorate were entering postdoctoral research positions in higher education.

Work experience

The extent of work experience related to their postgraduate research, undertaken by doctoral researchers in this study, varied strongly between respondents in different disciplines. Most respondents in education and social sciences claimed to have postgraduate work experience related to their doctoral study, even those without prior long-term employment, but this was the case with only a minority of respondents from biological and physical sciences. This seems to be the reverse of the position when they were undergraduates, when the highest proportions with degree-related work experience were in engineering and the sciences. In other recent studies, over half of final year postgraduate researchers in sciences claimed to have undertaken degree-related work experience[2]. Around a quarter of doctoral researchers appeared to have had no structured work experience during their higher education years.

Of respondents who had undertaken related work experience as a postgraduate researcher, four out of five reported that the experience had had an effect on their career plans. Given this and the wider perceived value of structured work experience in developing an understanding of non-higher education employment and employability skills, it seems particularly important to understand why so few biological and physical sciences researchers, compared to other disciplines, undertook structured work experience as postgraduates.

Conclusions and recommendations

This study confirmed that the great majority of doctoral researchers were satisfied with their decision to undertake postgraduate research, and wished to pursue careers and occupations which were related to their research discipline and utilise their high level knowledge and expertise.

Their choice to undertake research was largely aspirational rather than pragmatic and their future career thinking appeared to remain so. It was amongst respondents who were considering careers beyond research that issues such as job availability, career prospects and reward were more prominent, although a decision to change direction completely tended to be driven by new interests and aspirations.

Most respondents believed that their doctoral qualification and experience would be essential or very helpful in achieving their desired career. However, satisfaction with the choice to undertake research declined slightly with length of study, and there was some evidence from the workplace of the lesser value of the qualification.

Recommendation: Further longitudinal research into the value of a doctoral qualification in relation to obtaining employment and progression beyond four years should be conducted to give researchers a fully balanced view of the value of their qualification as they consider career directions and opportunities.

A minority of respondents seemed to make use of their university careers service, yet most of those who do use it report that it is useful, and, on reflection, the majority of respondents thought it would have been useful to use it.

Recommendation: Institutions, and especially career services, should consider how to encourage doctoral researchers to use the information, support and advice available to them through the careers services, and to engage earlier and more proactively to achieve their career aspirations.

The vast majority of respondents who had work experience related to their postgraduate research reported that it had had an effect on their career thinking, but the proportions undertaking placements varied greatly by discipline and, particularly within the sciences, were much lower than for undergraduates.

Recommendation: Institutions should consider how to develop, provide and promote opportunities for work placements and create opportunities for researchers in all disciplines to interact with businesses and other external organisations.

The doctoral cohort in this study was very heterogeneous, with researchers in different disciplines having differing profiles and very varied career trajectories and experiences prior to their doctoral research. Only a minority progressed directly from first degree to doctoral research. When they first entered university, few respondents had a clear plan or intention to pursue a career in research or higher education. The desire to pursue research developed during higher education.

Recommendation: In order to assure a flow of talent into research in higher education and beyond, government, funders and institutions should consider how most effectively to promote research careers to young people.

Recommendation: Institutions should explore how to promote doctoral research opportunities and research careers to high-calibre students, amongst the range of career options open to them, in the light of potentially increasing levels of student debt.

[2] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills
www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

2 Context and introduction

A doctorate is the highest qualification routinely available from UK universities, awarded to recognise research which is undertaken with a high degree of independence. The research has to deliver a significant and original contribution to knowledge, worthy of peer-reviewed academic publication, and the candidate is required to demonstrate in-depth knowledge of the discipline.

The number of doctoral research programmes in the UK, and of doctoral researchers undertaking them, has grown in recent years. This is in part relates to the development of the UK economy, which is becoming increasingly dependent on knowledge-intensive industries and occupations. National quality assurance mechanisms have been developed for doctoral programmes, and there is increasing collaboration between universities and with industry.

The Roberts review ('SET for success') in 2002[3] was undertaken in response to a recognition of the potential contribution that could be made to the UK economy and society by individuals with high level skills and qualifications in science, technology, engineering and mathematics (now known as the STEM disciplines). Critically, it recommended that the benefit of a supply of people with such skills would be greater if they were equipped with better personal and transferable skills, to augment their technical knowledge. This was the catalyst for much more attention to and training in personal and career development skills.

Since that time graduates undertaking doctoral research programmes in the UK have had much more access to training and development opportunities, supported by the national UK GRAD and current Vitae programmes, and requirements for skills are articulated in national quality assurance practice[4] and statements. The continued focus on developing researchers' skills has been recognised as crucial to the future of the UK's competitiveness in an increasingly globalised and knowledge-intensive economy, in Lord Leitch's review of skills[5] and Sir Adrian Smith's recent postgraduate review[6].

With this increased attention on doctoral researchers, a series of underpinning research studies has been conducted to understand the impact of those with research-level qualifications and the impact of the skills they have developed through the training and support programmes, on the economy, society and the individuals themselves. Amongst this research has been Vitae's series of studies in relation to the career destinations of doctoral graduates ('What do researchers do?')[7]. This has provided increased understanding of the occupations entered by doctoral graduates and the career paths that they follow.

This new study aimed to extend knowledge in relation to the career development of doctoral researchers by investigating their career intentions and the attitudes and perceptions that drive their career decision-making. Its principal objectives were to understand the career-related ideas and aspirations of doctoral researchers, and how these had been formulated through their education and careers to date. It was hoped to investigate how this might vary with different characteristics and backgrounds of researchers, not least the discipline in which they conduct research. It could also provide some idea of how doctoral researchers' career aspirations relate to the opportunities that actually exist in the labour market, and thereby provide feedback into the structures that support and influence their career thinking.

It was also hoped that the background information about respondents generated would be useful in developing a better understanding of the make-up of the UK doctoral researcher cohort.

[3] Roberts, G (2002) SET for success: the supply of people with science, technology, engineering and mathematics skills. London: HM Treasury webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/set_for_success.htm

[4] www.qaa.ac.uk

[5] Leitch, S (2006) Prosperity for all in the global economy – world class skills. London: HM Treasury www.official-documents.gov.uk/document/other/0118404792/0118404792.pdf

[6] Smith, A (2010) One step beyond: making the most of postgraduate education. London: Department for Business, Innovation & Skills www.bis.gov.uk/one-step-beyond

[7] www.vitae.ac.uk/wdrd

3 Methodology and sample obtained

These findings were derived from responses to an online questionnaire from a sample of those undertaking doctoral research in the UK, across all disciplines, in March and April 2010. Potential respondents were invited to participate through a combination of outgoing email invitations, additional notices issued by contacts in Vitae Hub institutions and networks, and a notice on the Vitae website.

3.1 Responses and key sample characteristics

A total of 4,550 doctoral researchers responded to the survey, resulting in a final sample of 4,298 responses for analysis. The attraction strategy included targeted emails to Research Council funded postgraduate researchers (which resulted in about 40% of responses); this is likely to be reflected in the characteristics of the sample obtained. The following is a very brief overview of those characteristics (a full treatment is given in the Appendix):

- Roughly two thirds (65%) of respondents were from the UK, the rest split almost equally from the European Union/European Economic Area (EU/EEA) countries and the rest of the world (RoW), although respondents from the RoW made up almost a quarter of respondents in engineering/technology and social sciences.
- Just over half (55%) were in their first or second year, 12% in the third year of four and 33% in their final year; in many analyses the latter two groups were combined. Responses from those studying part-time were coded to the roughly equivalent stage.
- Respondents' disciplines of research study were coded to seven broad discipline groups (Table 3.1), chosen partly to facilitate comparison with career-related data for postgraduates and higher education research staff.
- Overall, 45% of respondents were male and 55% female. This masked considerable variation with discipline, with only 27% of engineering/technology and 43% of physical sciences respondents being female.
- Two thirds (68%) of respondents were aged 30 or under; this was 80% of full-time respondents but only 30% of those studying part-time. Nearly half (48%) of UK respondents studying part-time were aged over 40, compared with 8% of those studying full-time.
- The youngest profiles of respondents were in physical and biological sciences, with over 80% aged under 30 years, and the oldest in education and social sciences. UK researchers were generally younger than those from the EU/EEA or RoW (median ages: UK 26 years, EU/EEA 28 years, RoW 29 years), but the UK researchers' ages were more widely spread.
- Respondents were studying at 130 universities and research institutes, including all Russell Group and 1994 Group institutions. 56% of respondents were at a Russell Group institution, 23% at a 1994 Group institution and 22% at other universities and research institutes, although the proportions varied somewhat with discipline.
- The vast majority (96%) of respondents were studying for a PhD/DPhil rather than a professional doctorate; professional doctorates were concentrated in education (29%) and in engineering/technology (13%).
- Some 13% of respondents were studying part-time, ranging from 52% in education to 5% in physical sciences.
- Unsurprisingly, given the sourcing of contacts data from Research Councils for this study, the proportion of respondents with Research Council funding was high (68%), and a high percentage (80%) of respondents reported a single funding source. The majority of those studying part-time were at least partly self-funded. Funding sources varied quite widely with nationality and discipline studied.

Table 3.1 Total respondents, by discipline group

Discipline	Arts and humanities	Biological sciences	Biomedical sciences	Physical sciences	Engineering /technology	Social sciences	Education	Total
N	722	620	686	997	541	558	174	4298
%	17	14	16	23	13	13	4	100

3.2 Representativeness

Comparison of respondents' characteristics with known statistics for the total UK cohort suggested that the sample is representative of doctoral researchers in the UK. Some over-representation of those studying physical sciences and engineering/technology probably reflected the strong response rate achieved from Research Council funded postgraduate researchers. This could also have resulted in relative under-representation of RoW researchers and also part-time researchers, many of whom were funded in other ways. An overall response rate cannot be calculated because, due to the use of multiple networks, the total number of invitations sent is unknown.

A random sample of this size (4,298 respondents) from a total cohort of around 82,000[8] undertaking doctoral programmes in the UK[9] would indicate an expected confidence interval of about 1.5% at a confidence level of 95%. The relatively large samples in each of the discipline groupings, at different stages of study and of both full- and part-time researchers, was reassuring given that much of our analysis focuses on differences between these groups, rather than on deriving aggregate results for all respondents. Final-year respondents (c.1,400) could be considered a particularly strong sample, as it represents a significant proportion of a single year of qualifiers (c.17,500, reported for 2008-09 by HESA).

[8] HESA figure excludes those 'writing up or on sabbatical'

[9] HESA (2010) Resources of Higher Education Institutions 2008/2009. Cheltenham: Higher Education Statistics Agency www.hesa.ac.uk

4 Career intentions

A principal aim of the study was to understand the aspirations of doctoral researchers in relation to their future careers, and how these have developed. This section attempts to establish the extent to which career ideas were held ('strength') and their nature (occupational or career 'direction'). These were considered in terms of broad occupational sector and also how they related to the respondents' research discipline. The reasons underlying career intentions were explored, as well as the actions researchers were taking to achieve their career goals, along with their perceptions of how their doctoral qualification would support them.

4.1 Strength of career ideas

In order to establish the nature of the career intentions of respondents, it was necessary first to establish the extent to which they held well-developed career ideas at all, or whether their ideas were not well-formed.

At the time of the survey, about a third of all final-year respondents had a definite career in mind, while almost half were considering several alternatives (Figure 4.1). Roughly one in six had either only a vague idea of possible careers (13%) or no idea at all (3%). Compared with figures obtained for final-year science, technology, engineering and mathematics (STEM) undergraduates[10], this appeared to suggest that doctoral researchers were no more definite than undergraduates about their career ideas, although fewer of them (one in six, compared with one in four final-year undergraduates) had only vague ideas or no ideas at all.

Final-year respondents from the rest of the world (RoW) tended to be more definite than those from the UK. A higher proportion (42%) had a definite career in mind, while 12% only had vague ideas (and almost none had no ideas). The situation for the European Union/European Economic Area (EU/EEA) respondents was similar to that for UK nationals, but with a slightly lower proportion definite about their ideas.

This variation paralleled survey data for research staff[11], where those from outside the UK were more 'career-decided' and committed to higher education research careers than UK research staff. It may reflect, unsurprisingly, that many of those from outside the UK and Europe have had to make a greater commitment to pursue research, including physically relocating to the UK, than have UK-domiciled researchers. It might also reflect that, in this sample, RoW researchers tended to be somewhat older and could be at a different stage in their career thinking.

There was also slight variation by discipline group, with the highest proportion of final-year researchers in the arts and humanities having a definite career in mind and the lowest proportions in engineering/technology and physical sciences (see Figure 4.2).

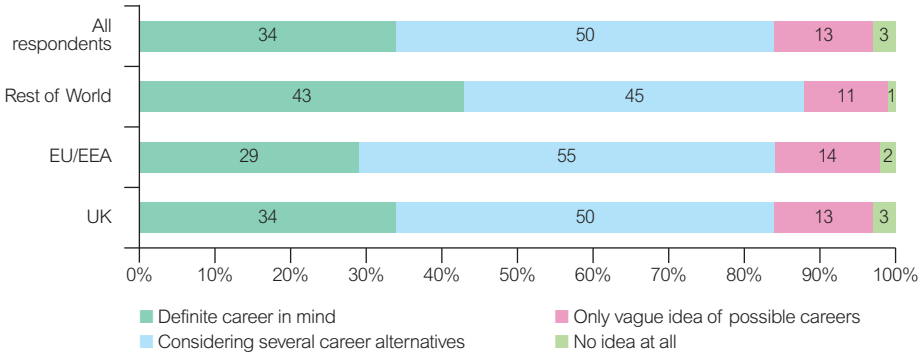

Figure 4.1 Strength of career ideas, by nationality: final-year respondents

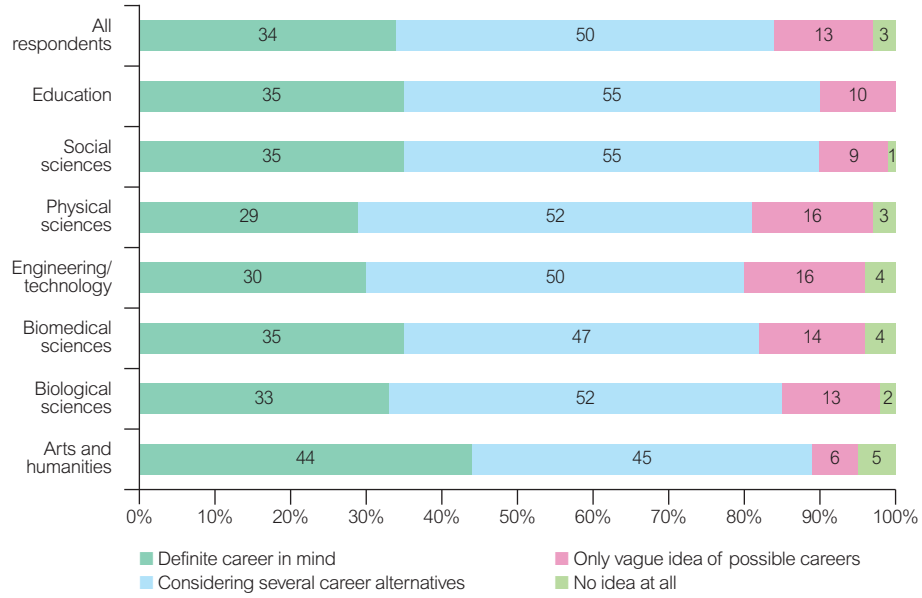

Figure 4.2 Strength of career ideas, by discipline group: final-year respondents

However, overall, over 80% in all disciplines had either a definite idea or several clear alternatives in mind, around 90% for those in education, social sciences and arts and humanities.

In general, researchers in earlier years tended to be slightly less certain about their future career plans, with 21% of researchers prior to final year having only vague ideas (18%) or none at all (3%) of possible careers, compared with 16% of final-year researchers. This trend was consistent across all disciplines with the exception of education, where the position was reversed (which could also be related to their different ages and career trajectories). The evolution of careers ideas with progression through higher education has been considered in a later section.

[10] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

[11] CROS (2009) Careers in Research Online Survey (CROS) 2009: analysis of aggregated UK results. Vitae www.vitae.ac.uk/cros

4.2 Occupational intentions

Having established that 80-90% of final-year respondents, but slightly fewer in earlier years, had reasonably well-established career ideas, the nature of those ideas, i.e. their career intentions, were investigated. The 2010 Vitae report, 'What do researchers do? Doctoral graduate destinations and impact three years on' introduced a new way to describe and study the labour market outcomes of doctoral graduates by combining occupational groups and employment sectors to create six occupational clusters.[12] These clusters group together similar doctoral graduate occupations to provide a useful typology to explore the extent to which doctoral graduates were working in research in and beyond higher education, in teaching and lecturing roles and other common doctoral occupations outside higher education.

The occupational clusters are:

- Higher education (HE) research roles: those employed as research staff in HE, accounting for 19% of doctoral graduates working in the UK three and a half years after graduating
- Teaching and lecturing in HE (22%)
- Research (not in HE sector) (13%)
- Other teaching roles (6%)
- Other common doctoral occupations: those working in other roles with a high volume of doctoral graduates, for example health professionals, senior managers, engineering professionals, and business, finance and statistical professionals (27%)
- Other occupations (14%)

Those with either a definite career in mind or who were considering several alternatives were asked to list the careers they were considering within the following occupational clusters. A few respondents who expressed an intention to work in higher education but did not make clear whether this was in research or teaching, were classified separately in our analyses, as group C.

A HE research

B Teaching and lecturing in HE

C Unspecified HE

D Research (not in HE sector)

E Other common doctoral occupations

F Other occupations

G Other teaching roles

Table 4.1 shows that, overall, about half of respondents (49%) aspired to a career in higher education, 43% in research outside the higher education sector and 34% in other common doctoral occupations.

More specifically, 46% of those with a definite career in mind wanted a career in higher education, 23% in research outside the higher education sector, 16% in other common doctoral occupations and the remaining 15% in other occupations, of which teaching was the largest. Those considering several alternatives were asked to specify their two most favoured occupations, labelled 'Alternative First', etc. in Table 4.1. Teaching within higher education appeared to be somewhat less popular amongst these respondents, but research outside the higher education sector was more popular.

Respondents were also invited to indicate their career goal by giving an illustrative job title. These job titles enabled additional, more granular analysis of intended career directions. From these data, just over half (57%) of those with definite ideas sought a career of some kind in higher education, somewhat higher than in Table 4.1. This subsidiary analysis was also valuable in gaining an idea of the proportions seeking different roles within higher education:

- 27% higher education teaching only
- 18% higher education teaching and research
- 12% higher education research only

Of those with several alternatives, the proportion seeking a career in higher education was somewhat lower; and of these rather more tended to be seeking a career in higher education research and fewer in higher education teaching alone. Many were considering both careers within higher education and in other sectors.

An overarching observation from these analyses is that around a half of the doctoral researchers were seeking a career within higher education, the majority of whom were seeking either a teaching or combined teaching and research role, whilst only a minority were seeking a pure research role.

This was broadly in line with results from the Postgraduate Research Experience Survey (PRES) 2011[13] in relation to higher education careers, which suggest that overall 57% of doctoral researchers seek a career in higher education (13% in purely research). However it is markedly different for other career directions; for example, far fewer (only 15%) of PRES respondents anticipated working in research outside higher education. It should be noted that the PRES results record a single anticipated career direction (i.e. multiple responses were not incorporated) which does not reflect the ideas of those considering more than one career alternative.

Table 4.1 Occupational intention: respondents with a definite career in mind or considering several alternatives (%)

	Definite career	First alternative	Second alternative	Alternatives combined*	All respondents*
HE research	13	12	7	19	17
Teaching and lecturing in HE	30	16	8	23	26
Unspecified HE	3	4	4	7	6
Research (not in HE sector)	23	34	25	56	43
Other common doctoral occupations	16	20	29	46	34
Other occupations	5	7	15	20	14
Other teaching roles	9	5	10	14	12
Occupation not specified	1	1	2	2	2
Not answered	1	1	0	1	1
(N)	1361	2102	1882	2102	3463

* The figures in this column total more than 100% as respondents considering several alternatives could list more than one occupation.

[12] Vitae (2010) What do researchers do? Doctoral graduate destinations and impact three years on. Vitae www.vitae.ac.uk/wdrd

[13] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

4.2.1 Variation of occupational intentions with discipline

When analysed by respondents' discipline of research, quite significant variations were observed. Amongst those with a definite career in mind (Table 4.2), the proportion seeking a research career in higher education was fairly consistent (11-16%). However the proportion seeking a higher education teaching career varied from 9% in biological sciences to 38% in social sciences, 49% in education and 61% in arts and humanities. Conversely, the proportion seeking non-higher education research roles was much higher in the biological, biomedical and physical sciences than other disciplines. Over 30% of biomedical sciences and engineering/technology sought other common doctoral occupations.

Deeper analysis was conducted of the biomedical sciences and engineering/technology respondents who planned to work in other common doctoral occupations. For the vast majority, those 'other common doctoral occupations' were employment sectors and functions related to their field:

- 85% of those biomedical sciences respondents expected to work in the health sector and 88% in a health and social care job function.
- 70% of those engineering/technology researchers expected to work in the engineering sector and 66% in an engineering job function, while 18% expected to work in a consulting job function.

Relatively similar patterns to these were observed in the responses of those who had several career alternatives in mind. A breakdown of occupational intentions by discipline for all respondents (i.e. both those with a single definite idea and those with several alternatives) is given in Table 4.3. This demonstrates the strong differences by discipline of research.

These patterns were largely in line with limited analysis of career aspirations by broad disciplinary group within PRES 2011, which found higher proportions of researchers in health and STEM disciplines, than those in arts and humanities or social sciences, aspiring to careers outside higher education and also to purely research careers inside or outside higher education.

Table 4.2 Occupational intention, by discipline group: respondents with a definite career in mind (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
HE research	14	13	12	11	16	13	12	13
Teaching and lecturing in HE	61	9	15	15	15	38	49	30
Unspecified HE	3	1	2	4	2	6	5	3
Research (not in HE sector)	3	55	34	17	40	6	1	23
Other common doctoral occupations	3	13	31	38	12	13	5	16
Other occupations	6	4	1	4	5	9	1	5
Other teaching	8	5	5	10	9	11	23	9
Not specified	3	0	0	2	1	1	1	1
Not answered	0	0	0	1	0	2	1	1
(N)	305	169	235	132	255	188	77	1361

Table 4.3 Occupational intention, by discipline group: respondents with a definite career or several alternatives combined (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
HE research	15	15	19	10	18	20	17	17
Teaching and lecturing in HE	58	10	15	11	12	38	52	26
Unspecified HE	8	3	4	6	2	10	10	6
Research (not in HE sector)	11	76	56	40	60	24	14	43
Other common doctoral occupations	12	25	40	72	37	35	16	34
Other occupations	24	15	9	8	15	15	7	14
Other teaching	13	14	7	11	12	11	26	12
Not specified	3	1	1	2	2	2	3	2
Not answered	1	0	1	1	0	1	1	1
(N)	622	488	560	420	737	482	154	3463

Note: Column percentages total to more than 100% as respondents could specify multiple options.

4.2.2 Comparison with known destinations

The career intentions of doctoral researchers were compared with information about doctoral graduate employment destinations. Based on a HESA 2008/09 survey and analysed by discipline[14], destinations of doctoral graduates three and a half years after graduation were used for comparison (Table 4.4).

Some similarities in trends by discipline were evident. Both intentions and destinations for careers in higher education were highest for social sciences and arts and humanities researchers. Research outside higher education was highest for both intentions and destinations for those studying biological sciences and physical sciences[15], and other occupations was highest for both intentions and destinations for those in engineering/technology and biomedical sciences. The balance for other common doctoral occupations and those within the other occupations is also notably similar for intentions and destinations (i.e. arts and humanities vs. biomedical sciences). These similarities appeared to demonstrate that there was some match between the aspirations of researchers and the career paths that they were managing to take, while some individual differences could reflect differing short-term pathways towards long-term career goals.

Table 4.4 Known occupational data for doctoral researchers in UK employment, by discipline (%)[14]

	Arts and humanities	Biological sciences	Biomedical sciences	Physical sciences and engineering	Social sciences	All respondents
HE research	8	27	23	19	14	19
Teaching and lecturing in HE	50	7	15	14	47	22
Research (not in HE sector)	3	23	10	18	8	13
Other common doctoral occupations	6	18	40	31	13	27
Other occupations	22	18	9	14	15	14
Other teaching	11	8	3	5	4	6
(N)	180	220	405	555	180	1625

Data source: Destinations of Leavers from Higher Education Longitudinal Survey 2004/05, 2009 (IES analysis)

4.3 How career intentions related to field of research study

To understand career intentions more fully, respondents were asked how their intentions related to the discipline of their research. It was hoped this might shed particular light on ideas about careers outside higher education as it seemed reasonable to assume that most entering higher education careers would do so in connection with their research discipline or broader discipline.

Most final-year respondents (91%) indicated that they wanted to pursue a career in an occupation directly related to the broad discipline area of their research, with nearly two thirds (63%) reporting that they definitely wanted to do so and just over a quarter (28%) that they might. Only 2% reported that they definitely did not intend to pursue a career relating to their research discipline and a further 5% that they might not do so, while 2% did not know.

More of those considering a career in higher education (research or teaching) and in research outside higher education expected to pursue an occupation directly related to their research discipline than those considering other destinations. However, even amongst those considering other occupations, a majority with definite career ideas (62%) intended to pursue an occupation related to their research discipline, as did over half of those with several career alternatives in mind.

These indicators of career intention were almost identical for male and female respondents in their final year. There were, nevertheless, some differences in the strength to which they held the career intention by discipline of study, as Figure 4.3 indicates. Final-year respondents in education (80%), arts and humanities (73%) and social sciences (70%) were more likely than others, especially those in engineering/technology (55%), physical (58%) or biological sciences (58%), to say they definitely wanted to pursue a career related to their research discipline. There were also some differences by nationality with RoW respondents (74%) and those from the EU/EEA (65%) being more likely than UK respondents (62%) to say that they definitely wanted to pursue a career directly related to the discipline of their research.

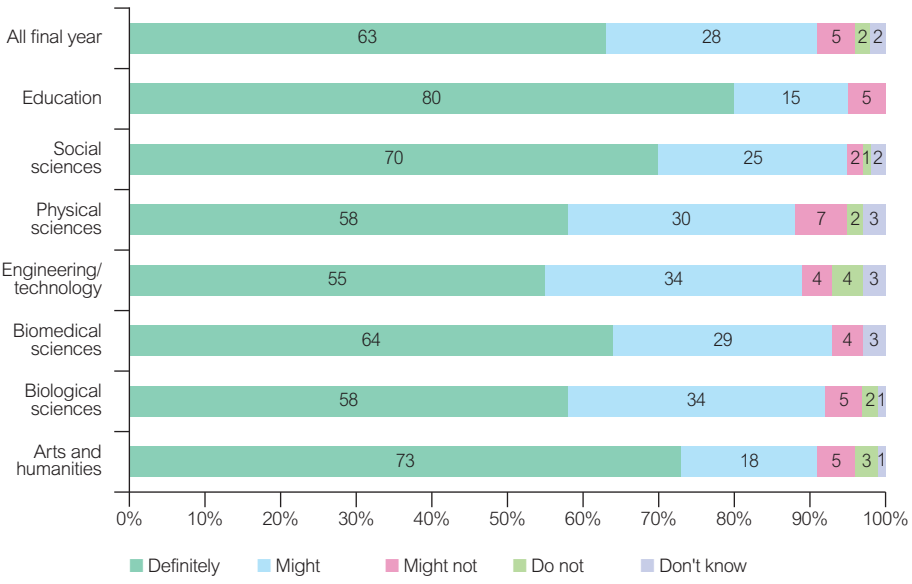

Figure 4.3 Intention to pursue a career in an occupation directly related to the broad discipline of your research: final-year respondents

[14] Vitae (2010) What do researchers do? Doctoral graduate destinations and impact three years on. Vitae www.vitae.ac.uk/wdrd

[15] 'What do researchers do?' combines physical science and engineering/technology as a single category, so some disaggregation of its data was required for comparison purposes.

[16] Reproduced from Vitae (2010) What do researchers do? Doctoral graduate destinations and impact three years on. Vitae www.vitae.ac.uk/wdrd

Further analysis shows that for UK respondents there were additional differences by year of study (Figure 4.4). First- and second-year respondents were more likely to intend to pursue an occupation relating to their research discipline (65%). Respondents in their third year of four (51%) were less likely than those in either their first two years (65%) or their final year (61%) to say that they definitely wanted to pursue a career directly related to the discipline of their research. This trend was consistent across all discipline areas and may indicate that in their penultimate year some researchers were having doubts about their ability either to complete their research or to find work related to it. It also appeared that the small minority who were unsure, who might not or do not want to work in the discipline of their research, increased over time. Interestingly, these trends with year of study were not observed in the data from respondents from outside the UK.

A higher proportion of those who had been employed prior to starting their doctorate had definite career plans to pursue an occupation related to their subject of research (73%) than those who had been undergraduates immediately prior to their doctorate (51%), although the total numbers considering these occupations were similar.

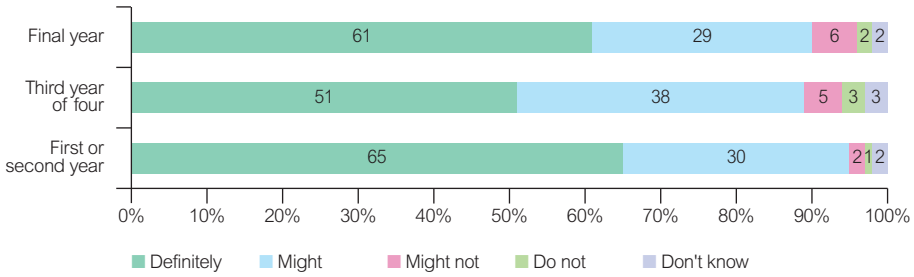

Figure 4.4 Intention to pursue a career in an occupation directly related to the broad discipline of research: UK respondents by year of study

Therefore, overwhelmingly it seems that researchers would like to pursue an occupation which is related to the discipline of their research; this was the case for around 90% of respondents and was relatively uniform across all discipline groups. Within this, the proportion that were definite about their intention varied somewhat more by discipline, being highest for those studying education whilst rather lower (but still around 60%) in engineering/technology, physical and biological sciences.

The conviction to which doctoral researchers held this view seemed to be somewhat weaker in later stages of their doctoral study than in early years. This paralleled findings in a study of undergraduates in engineering[17], which found a decline in commitment to a career within the discipline with stage of study, especially for women. However, this should not detract from the overall picture that a large majority of doctoral researchers want to pursue a career related to their research discipline; this persisted across different occupational intentions, although it was, unsurprisingly, highest for those aspiring to careers in higher education and research.

4.4 Reasons for a career intention related to research discipline

Respondents who definitely wanted to work in the broad area of their research gave four main reasons (see Table 4.5):

- To put their knowledge/discipline expertise into practice (83%)
- They would find the work interesting and exciting (80%)
- They enjoy their research so it seems logical to work in this field (66%)
- To use their high-level skills (developed during research) (63%)

Those who might want to work in the broad field of their research gave similar reasons, although somewhat fewer (49%) mentioned that they enjoyed their research so it seemed logical to work in that field and far fewer said that they had always wanted to work in that field (17% compared to 43%). However, rather more of them reasoned that they would find it easier to get a job (16% compared to 9%).

On the other hand, the small number of respondents who said they might not work in the broad field of their research were generally less likely to mention any of these reasons. A far lower proportion mentioned that they would find the work interesting and exciting (32%) or that they enjoyed their research so it seemed logical to work in that field (11%). More of this group also mentioned that they would find it easier to get a job (21%) and that they would be letting people down if they didn't (16%) as reasons to work in an occupation related to their research discipline. Very few of them (6%) reported that they had always wanted to work in that field, perhaps indicating that those who have the longest-held interest in research were those with the most definite intention to pursue it. Overall, this group appeared somewhat more utilitarian in their thinking; their main reasons for considering working in occupations related to their research were to put their knowledge/discipline expertise into practice (57%) and to use their high-level skills (developed during research) (44%), rather than overt expressions of interest or enjoyment.

Table 4.5 Reasons for a career intention to pursue an occupation directly related to the broad discipline of research: all respondents

	Definite %	Might %	Might not %
To put my knowledge/discipline expertise into practice	83	79	57
I will find the work interesting and exciting	80	72	32
I enjoy my research so it seems logical to work in this field	66	49	11
To use my high-level skills (developed during research)	63	63	44
I have always wanted to work in this field	43	17	6
I have enjoyed related work experience	27	20	4
I will have better long-term career prospects	24	20	8
I will be better paid (than in other types of work)	13	15	8
It will enable me to work in my preferred location	10	10	4
I will find it easier to get a job	9	16	21
I know other people who do this kind of work	9	9	11
I will be letting people down if I don't	3	5	16
Other reason	3	2	6
Not answered	0	0	4
(N)	2760	1245	127

[17] CRAC (2007) The career thinking of UK engineering undergraduates. Cambridge: Careers Research & Advisory Centre www.crac.org.uk/148682/Current-and-recent-research-portfolio-.html

4.4.1 Differences by discipline group

In general, there were only slight differences in reasons for career intentions by discipline group. The same top two reasons (putting knowledge/expertise into practice and interest in the work) were mentioned by respondents regardless of discipline; this was the case both for those with definite career intentions and those who might consider work related to their research (see Figure 4.5). Finding the work interesting and exciting was the most frequently mentioned reason by those with definite intentions for a career in biological and physical sciences.

4.4.2 Gender differences

There were few gender differences in replies to this question. Male respondents who definitely intended to pursue work related to their research discipline or might consider doing so were slightly more likely than females to mention being better paid (males 16-18%, females 11-12%, respectively). This reflected other research[18,19] which indicates that rather more males are motivated by remuneration than females, but the proportion of both genders in this study was relatively low, so potential remuneration was not a major driver for doctoral researchers to work in their field of research.

4.4.3 The main drivers for discipline-related career intentions

To summarise, most doctoral researchers want to work in an occupation which relates to the discipline of their research, in order to put their high-level knowledge and expertise into practice and to maintain their high interest in the field. Only a minority expressed more pragmatic or career-related reasoning, such as better prospects or employment opportunities, and fewer still better pay. This differentiation was strongest for those definite about an intention to stay in their field. Amongst those who were less definite, there was a wider range of reasons, with interest less dominant as a driver and some pragmatic reasons more widely held, although directly career-related reasoning was cited by less than one in five.

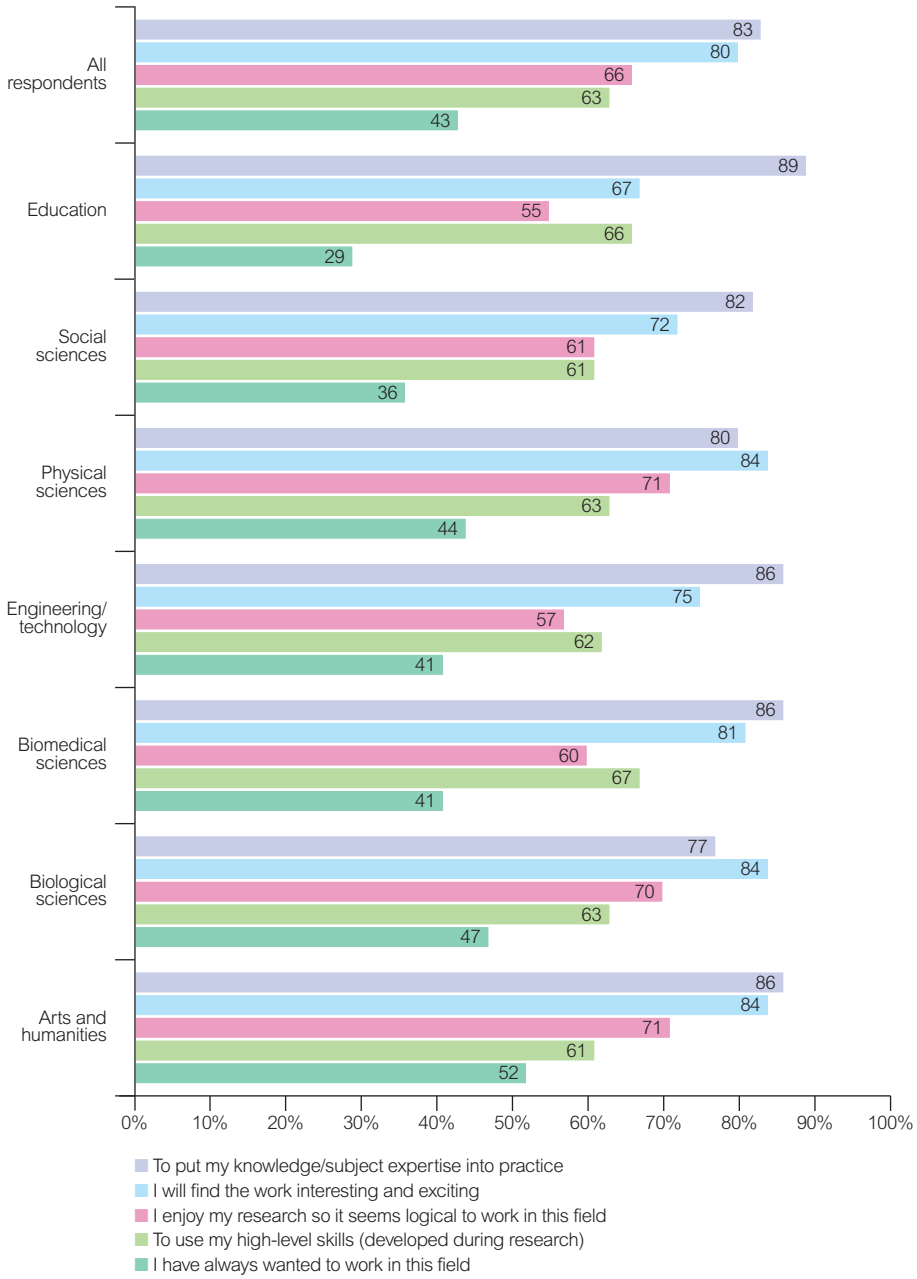

Figure 4.5 Most popular reasons to pursue an occupation directly related to research discipline, by discipline of study: all respondents with definite career intention to do so

In other studies, the top motivations of doctoral graduates for taking their current employment (i.e. after completion) have been reported as "fitting my career plans" and "the type of work I wanted"[20], which to an extent parallels this dominance of personal choice over more pragmatic reasoning. Similar findings have been reported for undergraduates in STEM disciplines[19], i.e. that they were largely aspirational in their thinking, at least while they remain within higher education.

In the next section, we analyse the reasoning in the minds of researchers considering occupations which are not related to the discipline of their research.

[18] CRAC (2007) The career thinking of UK engineering undergraduates. Cambridge: Careers Research & Advisory Centre www.crac.org.uk/148682/Current-and-recent-research-portfolio-.html

[19] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

[20] Vitae (2009) What do researchers do? First destinations of doctoral graduates by subject. Vitae www.vitae.ac.uk/wdrd

4.5 Reasons for career intentions not related to discipline of research

As we have seen, very few respondents (fewer than 10% in most disciplines) either definitely did not or might not want to work in a field related to their research discipline. They gave three main reasons for their intention not to do so:

- They have become more interested in another field
- They want to use their high-level skills but not in this field
- They have not enjoyed their research

The range of reasons given is shown in Table 4.6. On closer analysis, nearly a quarter of those definitely not intending to work in the broad discipline of their research reported that they were now either retired or too old to work; these comprised a very distinct subset of respondents.

Notably, approaching 10% of those not intending to pursue their research direction were expecting to enter teacher training.

In order to provide a bigger sample for analysis, the much larger group of respondents who reported that they might work in an occupation related to their discipline were also asked why they might not do so (shown in the right-hand column of Table 4.6). Many of these respondents gave rather different replies. In particular, more of them mentioned a lack of career opportunities either in their field or in their preferred location as reasons to consider unrelated occupations instead.

Just over a third of both those who might and those who might not work in the discipline field of their research mentioned being better paid doing other work as a reason for considering work unrelated to their research field. Comparing this with findings in the previous section, remuneration would therefore seem to be a bigger driver to work in other fields than to remain in occupations relating to research discipline.

Table 4.6 Reasons for not pursuing a career related to the discipline of research: Respondents who might, might not and definitely do not want to do so

	Definitely not %	Might not %	Might %
There are too few career opportunities in my field	22	30	43
I will be better paid doing other work	22	36	35
Too few relevant jobs in my preferred work location	19	16	35
Better long-term career prospects doing something else	24	30	26
I will find it easier to get different kind of job	17	14	22
I have become more interested in another field	33	43	18
I want to use my high-level skills but not in this field	31	51	16
Knowledge of others doing this kind of work has put me off	20	23	13
I have not enjoyed my postgraduate research	31	40	12
Insufficient ability/experience to get a job related to my research	11	10	10
I have been put off by my work experience	13	20	5
I never intended to work in this field	15	11	5
I have tried and failed to get jobs related to my research	6	1	3
Other reason	28	10	8
Not answered	2	2	2
(N)	54	127	1245

4.5.1 Gender differences

There appeared to be some differences by gender in the reasons given by respondents for not working in an occupation related to their research discipline. In particular, again among respondents who might consider working in their field of research, more males mentioned that they would be better paid doing other work (39% compared to 32%), while more female respondents mentioned that there were too few career opportunities in their field (47% compared to 41%) and too few relevant jobs in their preferred location (39% compared to 32%).

These reasons appeared to reflect findings for undergraduates where some females seem to be less confident about their employment prospects and some males are more concerned about remuneration[21,22]. There could of course also be indirect underlying issues for both genders in relation to partners' careers and locations.

The small number of respondents who definitely do not or might not want to work in an occupation related to the discipline of their research limits the analysis that is possible within these groups, but there were two apparent main differences by gender:

- More females than males reported that they had not enjoyed their research
- More females wanted to use their high level skills but not in their research field

4.5.2 Pragmatic reasons for intentions not to pursue research-related careers

The predominance in the sample of those wanting to pursue careers related to their research discipline limits the degree to which we can quantitatively assess why some respondents had different career intentions. However, by including those who might (or might not) want to pursue a discipline-related occupation or career, as well as those who definitely or probably do not, some reasons emerged. A small number had not enjoyed their research, and/or had become more interested in another field, but the majority reasoned that alternative career directions could be more attractive on the grounds of better career prospects, job opportunities or remuneration. Certainly those issues appeared to be more significant as motivations for leaving discipline-related careers than for pursuing them.

[21] CRAC (2007) The career thinking of UK engineering undergraduates. Cambridge: Careers Research & Advisory Centre www.crac.org.uk/148682/Current-and-recent-research-portfolio-.html

[22] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

4.5.3 Differences by discipline

As few respondents definitely did not or might not want to work in the field of their research, it was not possible to analyse their replies by discipline of study. The analysis of reasons for not working in an occupation related to research discipline was therefore conducted using the responses of those who might want to do so: this did show some differences (Figure 4.6).

Two-thirds (67%) of arts and humanities respondents who might consider working in the broad field of their research mentioned that there were too few career opportunities in their field, as a reason not to do so. This was also the case for nearly half (48%) of those in biological and 45% in physical sciences. Almost as many (46%) biological sciences respondents in this group also thought that they would be better paid doing other work and 42% that they would have better long-term career prospects doing something else. Along with arts and humanities respondents (42%), many biological sciences respondents (42%) also mentioned that there were too few relevant jobs in their preferred location.

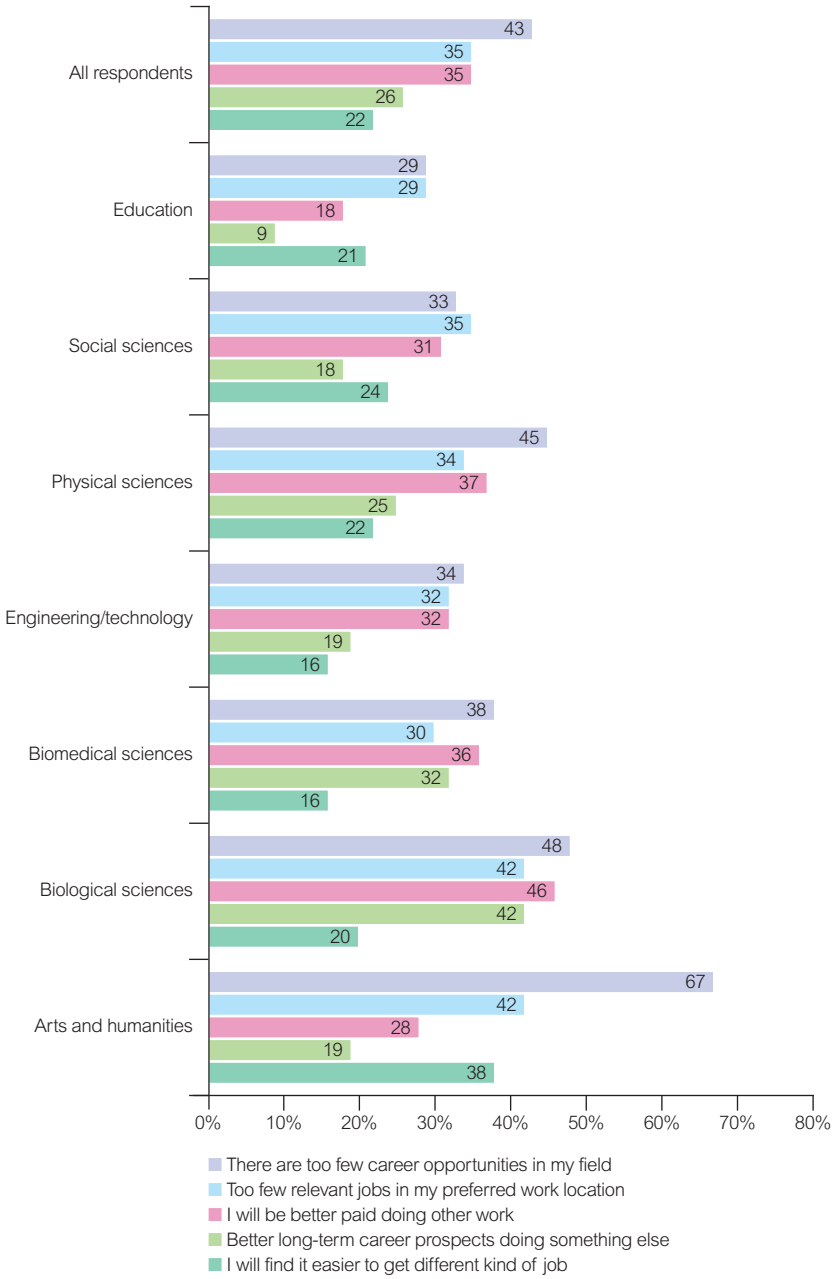

Figure 4.6 Most popular reasons not to pursue an occupation related to research, by discipline group: percentages of all respondents who might intend to pursue such a career

4.6 How essential is a doctorate to achieve the career goal?

The preceding sections have focused on the reasons behind different career intentions of doctoral researchers. But how useful did they think their doctorate was in helping them to fulfil such career aspirations?

The majority (54%) of final-year respondents with a career in mind thought that a doctorate was essential to achieve their career goal, i.e. they could not do their intended job without a doctorate in their discipline; while a further 33% thought a doctorate in their discipline would make a difference. This is shown in the column headed "All" in Table 4.7. Only 7% thought that the discipline of their doctorate would not be relevant and 3% that they would not need a higher degree to achieve their career goal. This seems somewhat unexpected given the occupational intentions reported, where a third appeared to have broadly non-doctoral occupations in mind, including non-higher education teaching). It may be that they believe the doctorate may speed their advancement in such occupations, or be helpful in other ways for them to pursue the occupation to their satisfaction.

There was a strong correlation in reasoning when broken down to whether respondents intended to pursue an occupation related to their research discipline or not, (see Table 4.8). Almost all those with a definite intention for a career related to their research discipline thought that the doctorate was either essential or preferred for that job. On the other hand, of those who definitely do not or might not want a career in that direction, a higher proportion thought their specific doctorate was not needed, although only around a third of them considered that a higher degree was not needed at all for that occupation.

Considerable variations in this expectation were seen by discipline group, also shown in Table 4.7. Only a minority of respondents in engineering/technology (30%) and in education (38%) thought that a doctorate was essential to achieve their career goal, although more of them (52% in engineering/technology, 43% in education) thought that it would be preferred. In contrast, more than two-thirds (69%) in arts and humanities and 62% in biological sciences thought their doctorate would be essential to achieve their career goal. The proportion believing their higher degree, or any higher degree, was unnecessary for their career goal was highest for education and engineering/technology respondents (19%) and lowest for those in biological sciences (6%). These trends presumably reflect the proportions of different career intentions held by researchers in different discipline groups, i.e. greater proportions may think a higher degree is essential in disciplines where more were aspiring either to a career in higher education or in non-higher education research.

When analysed by career intention, overall, over 90% of respondents considering a career in higher education or research thought their PhD was either essential or preferred in achieving such careers. Respondents contemplating an HE research occupation (72%) or teaching and lecturing in HE (70%) were those most likely to consider their PhD would be essential to achieve their career goal. However, a majority (55%) considering research outside higher education also thought a doctorate in their discipline would be essential, and almost 40% thought preferable, to achieve that career.

Table 4.7 How essential is doctorate for intended career, by discipline group: respondents with a definite career plan or considering several alternatives (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All
Essential (could not do job without a doctorate in my discipline)	69	61	52	30	52	52	38	54
Preferred (doctorate in my discipline makes a difference)	20	32	39	52	37	37	43	33
Not essential (discipline of doctorate not relevant)	6	4	5	14	7	7	12	7
Do not need higher degree to do this job	3	2	3	4	4	3	7	3
Do not need a degree to do this job	1	0	1	1	1	1	0	1
Don't know	0	0	1	0	0	0	0	0
(N)	616	482	554	413	732	474	152	3423

Table 4.8 How essential is doctorate for intended career, by strength of intention to pursue an occupation related to discipline of research: final year respondents (%)

	Definitely want	Might want	Might not want	Do not want	Don't know	All final year
Essential (could not do job without a doctorate in my discipline)	64	36	10	0	36	54
Preferred (doctorate in my discipline makes a difference)	31	43	29	18	45	33
Not essential (discipline of doctorate not relevant)	3	13	31	47	18	7
Do not need higher degree to do this job	2	5	22	24	0	4
Do not need a degree to do this job	0	2	6	12	0	1
Don't know	0	1	2	0	0	1
(N)	813	277	49	17	11	1167

For those intending to pursue other occupations, a doctorate within the researcher's discipline was still considered to be essential or preferred by roughly four out of five respondents (see Figure 4.7). Perhaps surprisingly, this was similar for all occupations outside of higher education and teaching. This appeared to indicate that most researchers were convinced of the value of their PhD almost irrespective of their expected sector of employment.

This could also indicate that they were considering very specialist roles within these other occupational settings, or simply had confidence in the perceived value of a doctorate in the broader job market. For comparison, around 70% of doctoral graduates working in other common doctoral occupations believed that their doctoral qualification had either been required or important in gaining their current job, as opposed to 60% of those in other occupations[23].

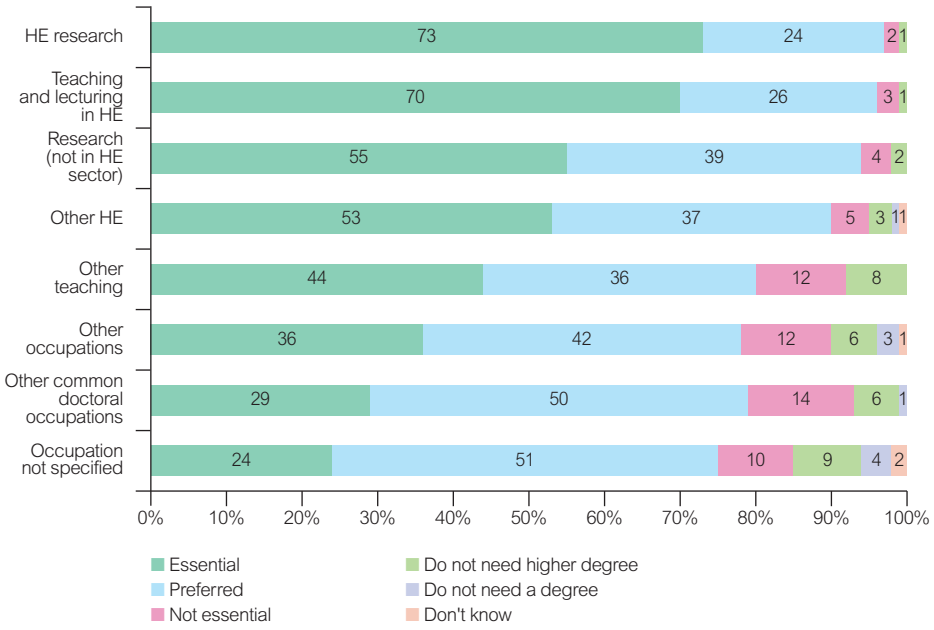

Figure 4.7 How essential is doctorate to achieve career goal, by intended occupation: Respondents with a definite career in mind or considering several alternatives

4.7 Achieving next career steps

4.7.1 Plans after completion

To ascertain how doctoral researchers were trying to turn their career ideas into reality, respondents were asked about their next stage plans and the actions they were taking to implement them. This analysis focused on those in their final year of doctoral study.

More than three quarters of final-year respondents expected to obtain employment related to their long term (52%) or short term (27%) career plans, once they had completed their doctoral programme. Rather more of the engineering/technology respondents (62%) expected to obtain long term employment related to their career plans than overall, and fewer in education (40%), (Table 4.9). Although about half of those in physical and biological sciences anticipated gaining long-term employment related to their career plans, somewhat higher proportions (32%-33%) expected to obtain short-term employment compared with other disciplines: for many this would presumably take the form of a postdoctoral research contract.

Table 4.9 Main aim for year after completion of research, by discipline of study: final year respondents (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
Obtain long-term employment related to career plan	50	48	49	62	50	58	40	52
Obtain short-term employment related to career plan	26	32	23	22	33	21	20	27
Obtain other employment (not related to career plans)	3	2	2	2	2	1	0	2
Become self-employed	3	1	1	3	2	3	8	2
Undertake teacher training	1	3	1	1	2	1	0	2
Undertake more postgraduate training/study	1	2	2	2	1	2	0	2
Undertake further specialist/vocational training	0	1	3	1	2	3	3	2
Travel or take time out	3	6	6	2	3	3	3	4
Don't know	4	1	5	3	2	0	3	3
Continue in current employment	1	2	3	1	1	1	10	2
Other reason	6	2	2	1	1	3	13	2
(N)	235	198	230	175	374	154	40	1406

[23] Vitae (2010) What do researchers do? Doctoral graduate destinations and impact three years on. Vitae www.vitae.ac.uk/wdrd

Table 4.10 Most popular aims after completion of research, by career intention: final year respondents with a definite career in mind or considering several alternatives (%)

	HE research	Teaching and lecturing in HE	Unspecified HE	Research (not in HE sector)	Other common doctoral occupations	Other occupations	Other teaching	Occupation not specified	All final year
Obtain long-term employment related to career plan	58	56	55	56	57	48	46	42	55
Obtain short-term employment related to career plan	32	29	24	33	25	29	23	19	28
Obtain other employment (not related to career plans)	0	1	5	2	1	2	1	3	1
Become self-employed	0	1	5	1	4	3	5	3	2
Undertake teacher training	0	2	0	1	1	1	12	0	2
(N)	212	263	62	526	401	190	111	31	1171

Column percentages may not sum to 100% as respondents can be entered in two columns if they were considering more than one alternative.

Table 4.10 presents this next step information in relation to respondents' career intentions. Although the differences were not substantial, it showed that slightly more of those intending to enter research careers expected to obtain short-term employment, than those seeking other careers. On the other hand, it also seemed to suggest that a high proportion of respondents seeking a higher education career expected to gain long-term employment, in fact higher than of those seeking other careers. Based on the prevalence of fixed-term postdoctoral research contracts, as opposed to open-ended contracts[24], this may not be a wholly realistic expectation.

There was a minor but consistent trend across almost all disciplines, and overall, for higher proportions of male respondents to expect to obtain long-term employment on completion than females in the same disciplines; only in biological sciences was the opposite observed with significance. In many, but not all, disciplines, a higher proportion of female respondents expected to obtain short-term employment than males, although the proportion by gender overall was equal.

The one in six final-year respondents with only a vague idea of possible careers or no idea at all were less likely to expect to obtain long-term employment (37%) after completion, unsurprisingly. More of them expected to travel or take time out (9%), to obtain employment not related to their career plans (6%), or not to know at all (12%), than other final-years.

Overall, around 6% of final-year respondents were expecting to enter further training after completion, whether to enter teaching or another vocational career pathway or to gain additional high-level skills through a taught postgraduate course.

4.7.2 Actions to seek employment

At the time of the survey, the majority (60%) of final-year respondents had started looking for employment but only a minority (37%) had actually applied for jobs related to their long-term career plans (Figure 4.8). Around a fifth (19%) had been offered a job related to their career plan, although some of these had not indicated that they had applied for jobs. The majority of those job offers were for postdoctoral research positions within higher education. For those who were undertaking research part-time, while employed, the question may not have applied in the same way.

The proportion with job offers ranged from 25% in engineering/technology and 24% in social sciences to 14% in arts and humanities The low figure for education (10%) may be something of a special case as so many of them were studying part-time while also working.

Predictably, fewer of the final-year respondents with only a vague idea or no idea of possible careers had started looking for employment than those with a definite career or several alternatives in mind. However, that figure was still relatively high at 45%, so presumably these researchers were considering multiple options. Fewer of them (20%) had actually applied for jobs, or had been offered one, than those with firmer plans. For example, 30% of respondents with a definite career in mind had been offered a job when surveyed, compared to 7% of those with only a vague or no idea of possible careers (Figure 4.8).

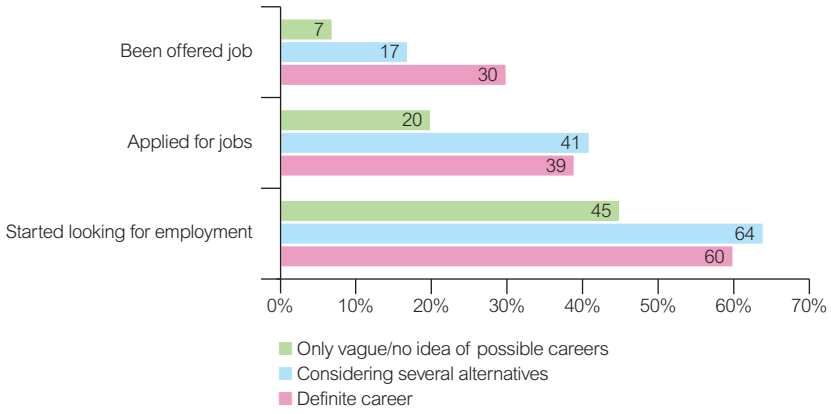

Figure 4.8 Steps taken to secure employment, by strength of career ideas: Percentages of final year respondents

[24] Vitae (2011) Careers in Research Online Survey (CROS) 2011. Analysis of UK aggregate results. Vitae www.vitae.ac.uk/cros

4.8 Influences on doctoral researchers' career intentions

Just under half (46%) of respondents indicated that they had changed their career plans to some extent while they had been a postgraduate, and a further 8% that they had changed their career plans completely. The career ideas that they had held at earlier stages, i.e. before their postgraduate research, and how these compare with current plans, are considered in a later section.

Respondents who had changed their career plans during their doctoral studies were asked what had influenced the development of their career ideas. The top three influences during postgraduate research (each mentioned by over half the relevant respondents) were:

- My research experience (71%)
- My personal interests/values (64%)
- My supervisor/faculty staff (56%).

Other significant influences on these researchers' career ideas included:

- People I know working in a particular career (44%)
- Conferences/meetings/seminars I have attended (40%)
- My friends/fellow postgraduate researchers/peer group (37%)
- My work experience employer (25% of those who had undertaken work experience as a postgraduate).

Somewhat more researchers in their third or final year (44%) mentioned conferences/meetings/seminars they had attended as an influence than researchers in their first or second year (36%). A more detailed consideration of work experience and its impact is provided in section 6.

The findings thus far have focused on the career intentions and attitudes held by doctoral researchers, and the related activities they have undertaken. In the next sections we turn to how their career thinking has developed over time, particularly in relation to their progression through higher education.

5 Career development in progression to research

A major aim of the survey was to understand how the career ideas of doctoral researchers have developed. We sought information on the prior educational and career pathways of the respondents, and tried to see how this related to the development of their career thinking and decision making. It was hoped this might illuminate the development of their career thinking; understanding how respondents made past decisions may also be helpful in understanding their current decisions and intentions. For example we hoped to ascertain whether research had been a long-standing career aim or whether this interest had only developed more recently. Understanding this may have implications for any future policy to underpin or increase the supply of graduates into doctoral research programmes.

These data were also of some intrinsic interest in terms of revealing doctoral graduates' backgrounds and progression routes. Before providing information about their higher education pathways, it was important to understand the position of their current research study within their broader career context. For many their career path has not been a direct succession of phases of higher education but has included periods of employment. These researchers may well have had different motivations for research and may now have different future career expectations.

5.1 Trajectories leading to doctoral research

Respondents were asked what they had been doing immediately before they started their doctoral programme. The results show significant differences between those studying full-time and part-time, by age (unsurprisingly) and also between different disciplinary areas, see Figures 5.1 and 5.2.

Significantly, in all disciplines, less than half (and in some disciplines far fewer) entered doctoral research directly from an undergraduate degree. This was the case for more UK respondents than for their non-UK equivalents, but for UK respondents it was still less than half in all disciplines other than physical sciences (52%). Only amongst those aged 21 to 25 had a majority entered doctoral research direct from their undergraduate degree. The majority had therefore either been employed and/or undertaken a Masters degree prior to doctoral study.

In addition, however, 12% of UK respondents had been employed full-time in a job that they intended to be permanent before they went to university for their first degree, and this was markedly higher in certain disciplines.

As Figure 5.1 shows, most full-time respondents in the arts and humanities, social sciences and education entered postgraduate research from either employment or having completed a Masters, and very few direct from undergraduate education. Over half in arts and humanities had been studying for a Masters (50%) or research-only Masters qualification (6%), while in the social sciences and education half or more had been working, although with a substantial proportion studying for a Masters qualification. This presumably reflects the requirement for a Masters within doctoral programme funding in these disciplines.

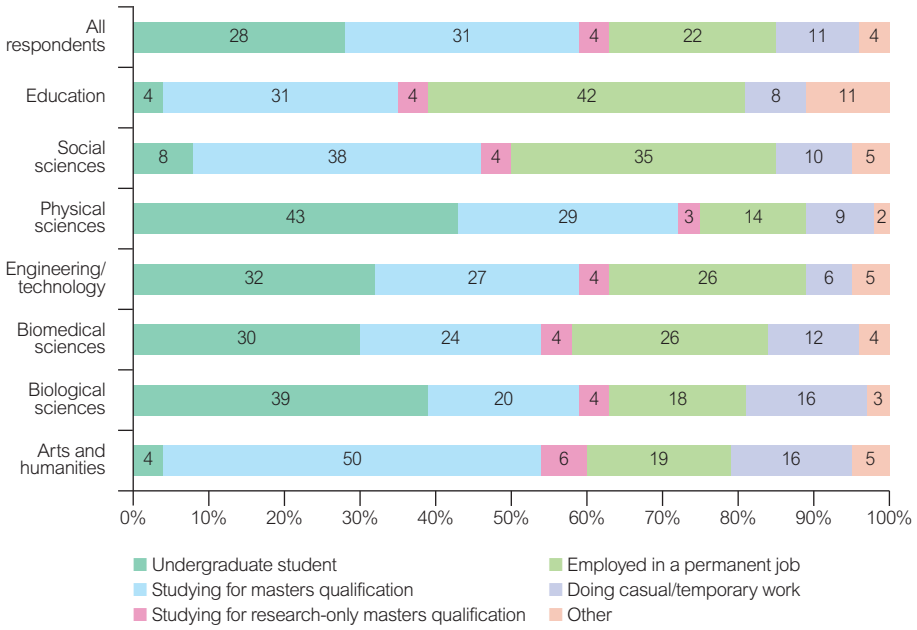

Figure 5.1 Previous activity, by discipline group: all full-time respondents

In contrast, in the other discipline areas, there were three, rather than two, main pathways for full-time doctoral researchers. Comparatively, many more had entered doctoral research directly from an undergraduate degree, ranging from 43% in the physical sciences to 30% in biomedical sciences. The proportion in these disciplines that had studied for a Masters or research-only Masters immediately before their doctoral research ranged from 29% in physical sciences to 24% in biological sciences. Just over a quarter (26%) of engineering/technology and biomedical sciences respondents had been in permanent employment, compared with 18% in biological and 14% in physical sciences, although significant proportions had been in temporary employment in most disciplines. Taking the employment types together, fewer physical sciences respondents (24%) had entered doctoral research from employment, compared to other disciplines, for which it was always at least a third.

The picture was rather different for those studying part-time, of whom more than half overall had been working before they started their research, as shown in Figure 5.2. By discipline, this varied from over 60% in education and biomedical sciences, to less than 40% in arts and humanities and physical sciences. Those who were currently employed while undertaking their doctorate part-time were identified as a separate group within the figure. For almost all disciplines, proportionally fewer had entered research either straight from their undergraduate degree or from studying for a Masters qualification, than their full-time equivalents.

It should be noted that as a full employment history was not collected, some respondents would have been employed before undertaking their Masters degrees and some of those who had been employed immediately prior to their doctorate would have obtained a Masters degree previously. HEFCE data suggests that around 42% of recent postgraduate researchers have undertaken a Masters degree at some point, the majority not immediately prior to their doctoral research[25].

Data from PRES 2011 suggest that around 35% of current doctoral researchers progressed from a prior Masters degree, 18% direct from a first degree, and 37% from employment, but the survey did not break this down by discipline or study mode[26].

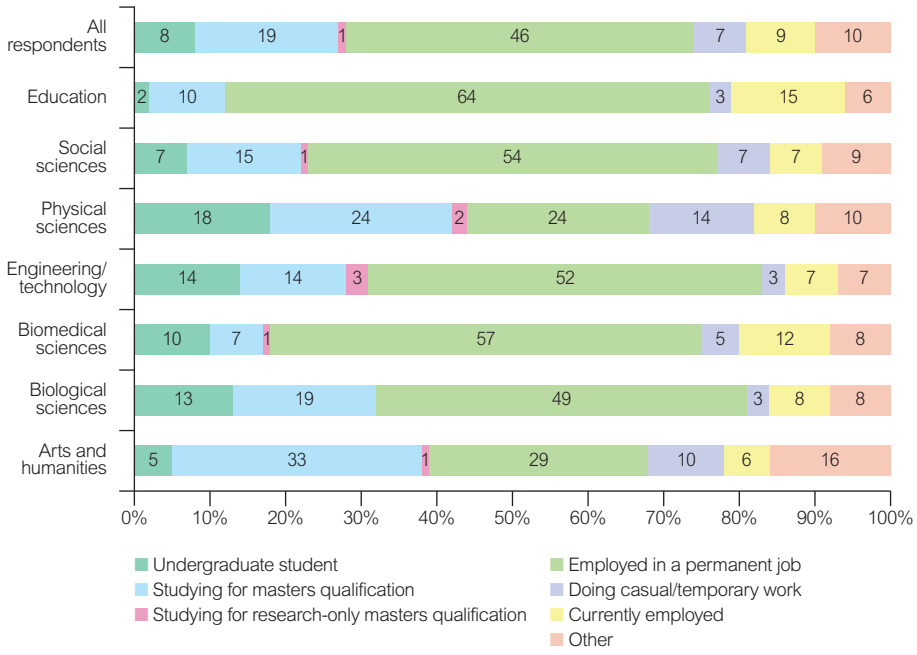

Figure 5.2 Previous activity, by discipline group: all part-time respondents

Table 5.1 Occupational intention by previous activity: all respondents with definite career in mind (%)

	Undergraduate student	Studying for a Masters qualification	Employed in a job that was intended to be permanent	Doing casual/temporary work	All respondents
HE research	13	15	11	14	13
Teaching and lecturing in HE	12	39	32	23	30
Research (not in HE sector)	41	19	16	34	23
Other teaching	9	6	12	5	9
Other common doctoral occupations	17	10	20	15	16
Other occupations	6	5	3	7	5
(N)	233	403	447	134	1361

The occupational intentions of those with a definite career in mind varied depending on their previous activity before starting their doctorate (Table 5.1). Of those who had progressed directly from an undergraduate degree, 41% were thinking about research careers outside the higher education sector and only a quarter about a career in HE (12% of these for a teaching and lecturing role). By contrast higher proportions of those who had previously studied for a Masters degree (39%) or been employed long-term (32%) before commencing doctoral study, aspired to a teaching and lecturing career in HE, while comparatively fewer (19% and 16% respectively) were hoping for a research career outside HE. For many of those who had previously been employed long-term, this could indicate that the choice to undertake doctoral research signalled an intention for a career move into academia rather than facilitating career progression outside the HE sector.

Having understood broadly the main career trajectories undertaken to reach respondents' current doctoral research programmes, we now turn to their experiences during different stages of their higher education pathways.

[25] HEFCE (2009) PhD Study: Trends and Profiles 1996-97 to 2004-05. Bristol: Higher Education Funding Council for England www.hefce.ac.uk/pubs/hefce/2009/09_04/

[26] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

5.2 Higher education: undergraduate and Masters degrees

Half the respondents of UK nationality had undertaken their undergraduate education at a Russell Group university, 20% at a 1994 Group university and 26% at other UK universities. A further 3% of the UK nationals undertook their undergraduate education at a university outside the UK. This shows the strong representation of doctoral researchers with undergraduate degrees from Russell Group institutions, which collectively award around 21% of all UK undergraduate degrees.

Predictably, most respondents from outside the UK had completed their undergraduate education overseas, but a quarter of EU/EEA respondents had undertaken their first degree at a UK university, as had 12% of RoW respondents.

5.2.1 Choice of undergraduate course

In seeking to understand researchers' career intentions, it is worthwhile knowing their motives when they first entered higher education, not least to learn whether they have always intended to pursue research or whether this interest developed during their time at university or later.

Respondents were asked to identify the factors that were most important to them when they chose their undergraduate course (Table 5.2). Five factors were mentioned much more frequently than any others, although this varied by research discipline and to a lesser degree by nationality (the percentages here were of all respondents):

- They had a personal interest/aptitude in this discipline (73%)
- They enjoyed studying this discipline at A-level (or equivalent) (54%)
- They wanted to follow a career in this field (46%)
- The course would keep lots of career options open for them (32%)
- They liked the university/department when they visited it (32%)

Slightly more of the UK respondents mentioned each of these reasons than did non-UK respondents, especially that they enjoyed studying this discipline at A-level (or equivalent) (62% compared with 54% overall).

Having a personal interest/aptitude in the discipline was the most frequently mentioned reason by respondents in every discipline group. Enjoyment of studying the discipline at A-level or equivalent was the second most popular reason for those in all disciplines except for biomedical sciences and engineering/technology, for whom wanting to follow a career in this field was more highly rated. This reason was also mentioned by over half (56%) of those in biological sciences.

The course would keep lots of career options open for me was the factor mentioned more frequently by respondents in engineering/technology (40% overall, and 48% of UK respondents) and physical sciences (43% overall, and 48% of UK) than by those in other disciplines.

Therefore, although personal interest and/or aptitude for a discipline was the dominant reason underlying choice of discipline when choosing their undergraduate course, career-related reasoning was also in the minds of over half of respondents in engineering/technology, biomedical and biological sciences, but fewer than half in the other disciplines.

These results paralleled findings for final-year STEM undergraduates, where (overall) very similar proportions gave these reasons[27], and findings within the longitudinal Futuretrack study[28]. In contrast, more taught postgraduate respondents (67%) in STEM disciplines in that former study had cited a direct career purpose as their motivation for choosing their Masters course[14].

This gives a clear indication that relatively few current doctoral respondents held particular ambitions for a career in research when they first entered university. The desire to pursue research therefore appears largely to develop during or after their first degree.

Table 5.2 Reasons for choice of undergraduate course, by current discipline group: all respondents (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
I enjoyed studying this discipline at A-level (or equivalent)	56	65	49	42	67	37	40	54
I had a personal interest/aptitude in this discipline	81	76	71	66	78	61	61	73
I wanted to follow a career in this field	37	56	54	50	45	36	39	46
The course would keep lots of career options open for me	23	26	30	40	43	30	22	32
I wandered into this course after my A-levels (or equivalent)	6	7	7	4	7	8	11	7
I was influenced by my parents/relatives	10	10	13	18	12	15	13	13
I was influenced by other people I know who had studied it	10	6	8	9	6	9	8	8
My teacher at school/college recommended it	14	9	8	10	13	8	7	10
I liked the university/department when I visited it	35	35	28	34	38	23	20	32
It is a required qualification for my chosen career	5	14	16	11	10	6	11	10
Other reason	4	2	3	3	3	4	5	3
Not answered	4	3	3	5	3	6	6	4
(N)	722	620	686	541	997	558	174	4298

[27] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

[28] HECSU (2008) Stage 1 Future Track report: Applying for university: career choices, (by Elias and Purcell), Warwick: IER for the Higher Education Careers Services Unit www.hecsu.ac.uk/assets/assets/documents/Applying_for_higher_education.pdf

5.2.2 Career plans when first entering university as an undergraduate

Only a minority of respondents had either a definite career in mind (19%) or were considering several alternatives (26%) when they first went to university as undergraduates (Table 5.3). Most (54%) had only a vague idea of possible careers (36%) or no idea at all (18%). Higher proportions of those in education (34%) and biomedical sciences (26%) reported that they had a definite career in mind when they first went to university, and fewer in physical sciences (15%) and social sciences (16%), compared with 19% overall.

Those respondents who had a definite career plan, or who were considering several alternatives when they first went to university were asked what main career they had in mind at that time. Although less than half the respondents had sufficiently well-formed ideas to be asked for this information, only a small proportion (13%) had been consciously considering a career in higher education and a minority of these in higher education research. However, 26% were considering a career in research outside higher education, while over a third (36%) were considering a career in other common doctoral occupations (Table 5.3).

In Table 5.3 the career ideas held at entry to first degree by all respondents with career ideas were compared with the current career aspirations held by respondents overall (reported in section 4.2). Although these samples were not the same, it appears that there were two differences: the much higher proportion now seeking to work within higher education, compared with intentions at first entry to university as an undergraduate, and the similarly high proportion of those seeking to work in non-higher education research. The proportions expecting to work in what we classified as other common doctoral and other occupations were roughly similar.

This possibly indicated one or more of a number of explanations:

- Although these proportions were of those who did have career plans, it may be that those career ideas were not especially well formed prior to university.
- The attractiveness of a career in higher education or in research grows with actual experience of university and research; i.e. respondents knew very little about careers in higher education and/or routes into research careers before entering university.
- It could also be that those considering a career in research may not easily have distinguished higher education research from other research before they entered university.

Table 5.3 Career intentions at point of survey and at entry to university: respondents with a definite career plan or considering several alternatives (%)

	At survey (while in postgraduate study)	At entry (to undergraduate degree)
HE research	17	4
Teaching and lecturing in HE	26	8
Unspecified HE	6	1
Research (not in HE sector)	43	26
Other common doctoral occupations	34	36
Other occupations	14	14
Other teaching	12	9
Occupation not specified	2	1
Not applicable	1	0
(N)	3463	1901

Percentages in 'At survey' column sum to more than 100% as multiple options could be selected

Table 5.4 Career intention at entry to university, by current discipline of research: respondents with a definite career plan or considering several alternatives (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All
HE research	6	5	1	1	8	3	1	4
Teaching and lecturing in HE	26	4	4	2	4	6	9	8
Unspecified HE	3	1	1	1	1	2	1	1
Research (not in HE sector)	3	52	32	18	43	9	7	26
Other common doctoral occupations	11	26	52	61	29	46	27	36
Other occupations	36	5	4	10	8	27	14	14
Other teaching	14	6	5	6	7	5	40	9
Occupation not specified	2	1	0	0	1	1	1	1
Not applicable	0	0	0	0	1	1	0	0
(N)	316	285	359	251	371	231	88	1901

The distribution of career intentions among this group, who did have early career plans when they first went to university as an undergraduate, differed markedly by research discipline group (see Table 5.4). For example, 35% of arts and humanities respondents were already considering some sort of career within higher education (mostly in higher education teaching) at entry, while 14% were considering a career in other teaching and 36% in other occupations. In contrast, 57% of biological sciences respondents with early career plans were already considering a career in research, but only 5% in higher education research. The picture for physical sciences respondents with career plans was quite similar to that for biological sciences, although with a somewhat higher proportion of them aspiring to enter higher education research.

In a similar manner to the questions reported in section 4.2, those with plans at entry to university were asked to give an illustrative job title. From that information, most of the engineering/technology respondents who had plans (61%) were considering non-research occupations, three quarters of them as engineering specialists within the engineering sector. In a similar way, over half (52%) of biomedical sciences respondents who had plans had been considering careers in other common doctoral occupations, over 80% of them to work in the health sector in either health or social care occupations. Nearly half (46%) of social sciences respondents had been considering other sectors, split between the accountancy and business service sector (20%) and government and public administration (18%), and most were considering job functions such as accountancy and finance, consultancy, and health and social care. Not surprisingly, many education respondents (40%) had already been considering a career in teaching at that time.

5.2.3 Masters degrees

Overall 29% of respondents had been completing a Masters degree immediately before they started their doctoral programme, compared with a figure of 35% which has been reported in PRES (2011)[29]. In reality, a higher proportion than these figures will actually have a Masters degree as some will have completed one at an earlier stage and then been employed, for example, before starting their doctoral research. 80% of those previously studying for a Masters degree did so at a UK university and 16% overseas, while 4% did not give details of where they studied. Just over half (53%) of the respondents who had completed their Masters degree at a UK university had done so at a Russell Group university, 27% at a 1994 Group institution and 20% at another UK university.

5.2.4 Changing institutions

Although details of institutions for all degrees were not obtained, it was possible to track researchers' movements within the higher education system using knowledge of where they completed their undergraduate degree, whether they changed university prior to postgraduate study or doctoral research, and their current institution.

Among those UK respondents who had studied for a Masters degree immediately before their research, two thirds (66%) went on to doctoral research at the same university, with nearly half (46%) of these respondents completing their Masters at the same UK university as their undergraduate degree. From this we can infer that 30% who proceeded directly from a Masters to doctoral research remained in the same university for all three phases of their higher education.

Of those who had not undertaken a Masters degree immediately prior to their doctoral research, 42% of UK respondents were studying for their doctorate at the same university at which they had completed their undergraduate degree. Whether or not any of these respondents had done a Masters at some point prior to postgraduate study was unknown.

5.3 Progression into doctoral research

5.3.1 Reasons for undertaking research

Respondents were asked why they had decided to undertake doctoral research. As shown in Table 5.5, the three reasons most commonly identified, by over half the respondents irrespective of discipline, were:

- They were interested in the discipline (73% overall)
- They wanted to continue studying to a higher level (62%)
- They wanted to develop more specialist knowledge and expertise (58%)

Interest in the discipline was the most frequently cited reason for undertaking postgraduate research regardless of discipline area, while the two other reasons were cited fairly evenly in all disciplines, except for arts and humanities and physical sciences where wanting to continue studying to a higher level was more commonly mentioned.

In addition, a number of other reasons were also mentioned by 30-50% of respondents. These included (with overall percentages):

- It is essential for the career they wished to develop (46%)
- They wanted to develop more high level skills (46%)
- It would broaden the range of potential career opportunities (42%)
- It should help them get the sort of job they want in the long term (32%)

Table 5.5 Reasons for undertaking postgraduate research, by discipline of study: all respondents (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
I was interested in this discipline	81	73	68	68	77	65	65	73
I wanted to continue studying to a higher level	70	60	56	52	69	55	63	62
I wanted to develop more specialist knowledge and expertise	61	60	58	56	58	57	56	58
It is essential for the career I wish to develop	55	56	51	30	40	46	32	46
I wanted to develop more high-level skills	38	51	51	47	48	41	41	46
It will broaden the range of potential career opportunities	29	48	49	43	44	39	47	42
It should help me get the type of job I want in the long term	31	41	34	28	32	28	23	32
I wanted to change career direction	12	6	12	12	9	16	17	11
It was difficult to get the type of job I wanted at the time	4	7	4	12	8	7	3	7
I was unable to get degree-related work with my first degree	5	6	4	4	4	4	1	4
Other reason	3	2	3	4	2	4	8	3
(N)	722	620	686	541	997	558	174	4298

Note: Column percentages may not sum to 100% as multiple responses were allowed

[29] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy http://www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

Table 5.6 Main reasons for undertaking postgraduate research, by career intention: all respondents with a definite career in mind or considering several alternatives (%)

	HE research	Teaching and lecturing in HE	Other HE	Research (not in HE sector)	Other common doctoral occupations	Other occupations	Other teaching	Occupation not specified	Not answered	All
Interested in this discipline	78	73	73	76	69	74	74	54	54	72
Wanted to continue studying to a higher level	68	67	60	63	52	65	66	43	63	61
Wanted to develop more specialist knowledge and expertise	64	62	60	64	57	61	59	51	50	61
Essential for the career I wish to develop	56	65	51	53	35	38	42	35	42	52
Wanted to develop more high-level skills	47	41	45	53	48	45	49	43	29	47
To broaden range of potential career opportunities	41	36	46	50	49	48	44	34	33	42
To help me get the type of job I want in the long term	36	35	34	40	32	34	32	18	21	34
(N)	574	888	194	1499	1187	495	416	68	24	3463

Note: Column percentages may not sum to 100% as multiple responses were allowed

Some of these reasons were mentioned more or less frequently by respondents in certain disciplines. Essential for the career they wished to develop was indicated as a reason by fewer in engineering/technology (30%, and just 19% of UK respondents) and in education (32%) than other disciplines. Broadening the range of potential career opportunities was highlighted as a reason for undertaking their doctoral research by only 29% of respondents in arts and humanities, but by up to half in some disciplines. On the other hand, 41% of respondents in the biological sciences thought their discipline of study would help them get the sort of job they wanted in the long term, compared with 32% overall.

What this showed was some variance in the reasoning of current doctoral researchers in terms of their decision to undertake research at this level. Although interest in the discipline and a passion to develop high level knowledge and expertise within it were major drivers for almost all, career-oriented reasons were significant for fewer and this varied by discipline. This is similar to results in PRES 2011 where around 40% expressed career-related motivations to undertake a research degree[30]. Career or job-related reasons were cited by relatively few respondents in engineering/technology, perhaps reflecting the perception that a doctorate does not add greatly to career options from that field, but these reasons were mentioned by many more in arts and humanities and biological and biomedical sciences. The relatively high proportion (up to half) in STEM disciplines who considered that a doctorate broadened their career options was presumably indicative of the wide value placed on STEM qualifications within many employment sectors (as demonstrated for STEM undergraduates[31]).

Some of these correlations were demonstrated in Table 5.6, where the main reasons for undertaking doctoral research were analysed by respondents' current career intentions. Although interest in the discipline was high as a motivator for all, there was marked variation in the proportions citing being essential for the career they wished to develop as a reason. As might be expected, almost twice as many of those seeking a higher education teaching career cited this reason as those seeking to work in occupations outside higher education or research.

5.3.2 Would respondents choose the same doctoral research programme again?

Almost three quarters of respondents (74%) would do the same or a similar doctoral programme if they were to start again (Table 5.7). Overall, 15% would do a different doctoral research programme, compared to 24% of final year undergraduates who would do a different degree[32]; only 6% would not do postgraduate research at all, while 6% did not know what they would do if they had their time again. This seems to be a positive endorsement of their choice to undertake doctoral research. There was relatively little difference with discipline studied; the proportion who would do the same programme again varied between 79% of arts and humanities respondents to 72% in biological sciences and engineering/technology. In all discipline groups only 1 in 10 (or fewer) would not do postgraduate research if they were given the chance again.

Although PRES seeks a rating of overall research experience against expectations, results were broadly in line with these figures. In PRES 2011, 64% felt that their experience exceeded their expectations, for 22% it met expectations and 14% reported that their experience was below their expectations.

When analysed by year of their doctoral study, respondents in different years gave slightly different answers to this question. The proportion overall that would do the same doctoral research programme again was 78% of those in years one and two, but only 69% of final year respondents (Table 5.7). The proportion who would do a different doctoral programme was 13% for those in years one and two but 18% amongst final-years. The percentage that would not do postgraduate research again at all was only 4% of early years but 10% of final-year respondents.

This trend of slightly less satisfaction in later years was present at least partly within all discipline groups. The trend was evident in Figure 5.3, based on the proportions of final-year respondents at different stages of study who would do the same or a similar doctoral programme again. Higher proportions of those in years one or two would do the same programme again than final-years, in all disciplines except education. The lowest proportions of final-year respondents who would do the same again were in biological sciences (63%), engineering/technology (64%) and social sciences (65%). Notably, 15% biological sciences would not do postgraduate research at all, almost double the proportion of first or second years in this discipline.

[30] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy http://www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

[31] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

[32] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

Table 5.7 Given the chance, whether respondents would choose the same postgraduate programme again, by stage of study: all respondents (%)

	First or second year	Third of four year	Final year	All respondents
Same or similar doctoral research programme	78	73	69	74
Do a different doctoral research programme	13	16	18	15
Not do postgraduate research	4	7	10	6
Delay your entry to higher education	6	6	5	6
Not go to university at all	1	2	1	1
Don't know	6	5	6	6
Other reason	2	3	3	3
(N)	1723	408	1150	3281

Note: Column percentages may not sum to 100% as multiple responses were allowed

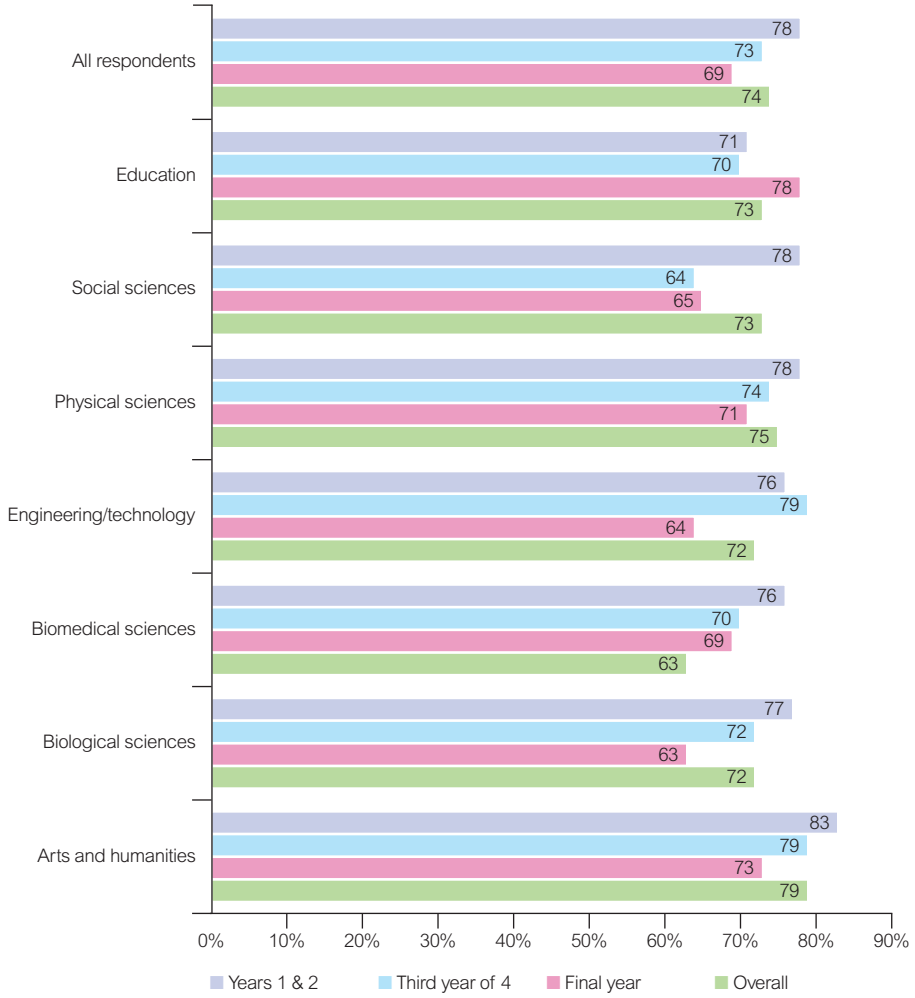

Figure 5.3 Respondents at different stages who would choose the same postgraduate programme again, by discipline of study: all respondents

5.4 Summary

In this section we noted the wide variation in career trajectories that individuals took in progressing to doctoral research. It was important to note how these applied in different disciplines and to different groups, as they may well affect the context for research and also future career aspirations.

The decision to undertake doctoral research was chiefly driven by interest and enjoyment in the discipline and a desire to develop more specialist knowledge and expertise, for all disciplines. Reasons which were more obviously career-related were expressed by lower proportions (30-40%) and this varied somewhat by discipline.

There is a clear indication that the decision to undertake research was taken during or after first degree for most, as very few had been thinking about a research career prior to entering their undergraduate degree.

On the basis of the rather crude measure of whether they would make the same choice again, high proportions appeared to be satisfied that they had undertaken their doctoral research, although with a slight but discernible decrease in this proportion as they progressed through the years of their doctoral study. This overall satisfaction for the majority presumably supported aspirations to continue a career in research in one form or another.

6 Work experience

Structured work experience for higher education students, through placements and internships, is currently receiving much attention for its value in improving the employability skills and potential employment of graduates. We have already noted that many doctoral researchers have mentioned it as a significant influence in their career thinking.

Overall, just over half (52%) of all respondents reported that they had undertaken degree-related work experience while undergraduates, but rather fewer (35%) had undertaken study/research-related work experience while postgraduates. Significant differences emerged amongst different groups of respondents (Figure 6.1). Of UK full-time respondents, only 27% had study-related work experience as postgraduates (half of whom had also undertaken it as an undergraduate), 36% had only undergraduate work experience and 36% had no work experience at all.

A higher proportion of UK part-time respondents had work experience (41%) related to their postgraduate study, which presumably reflects that many were working part-time in areas related to their research. For simplicity, the remainder of this section focuses on full-time respondents.

Significantly more full-time respondents from outside the UK (42%) reported that they had postgraduate study-related work experience, and fewer (26%) none at all, compared to UK full-time respondents (36%).

Interestingly there was no significant difference between the proportion of first and second year respondents who had undertaken study-related work experience as a postgraduate and those in their third or final years. This presumably indicates that most researchers who undertook any work experience related to their research tended to do so early in their doctoral programmes.

There were also differences in the proportions of researchers who had undertaken study-related work experience by discipline area.

For undergraduates:
Less than half of the respondents in arts and humanities (38%), social sciences (46%) or education (47%) had undertaken degree-related work experience while undergraduates, compared with higher proportions in engineering/technology and biomedical sciences (59%) and biological sciences (57%). Recent research with final-year STEM undergraduates[33] gives a broadly similar figure for engineers (c.65%) but a somewhat lower figure for biological scientists (c.45%). Notably this research also showed a strong correlation between those with undergraduate degree-related work experience and those with better formed career ideas.

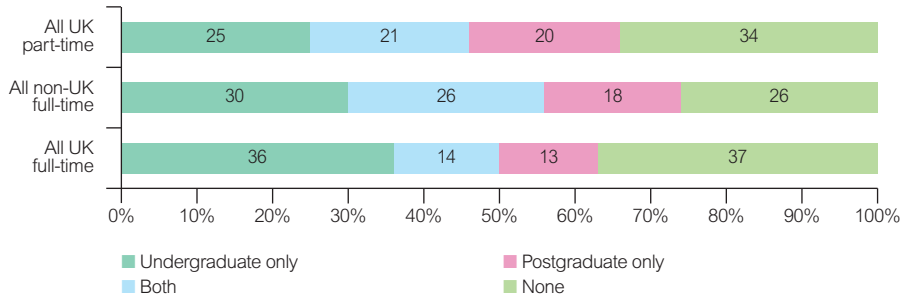

Figure 6.1 Undergraduate and postgraduate study/research related work experience

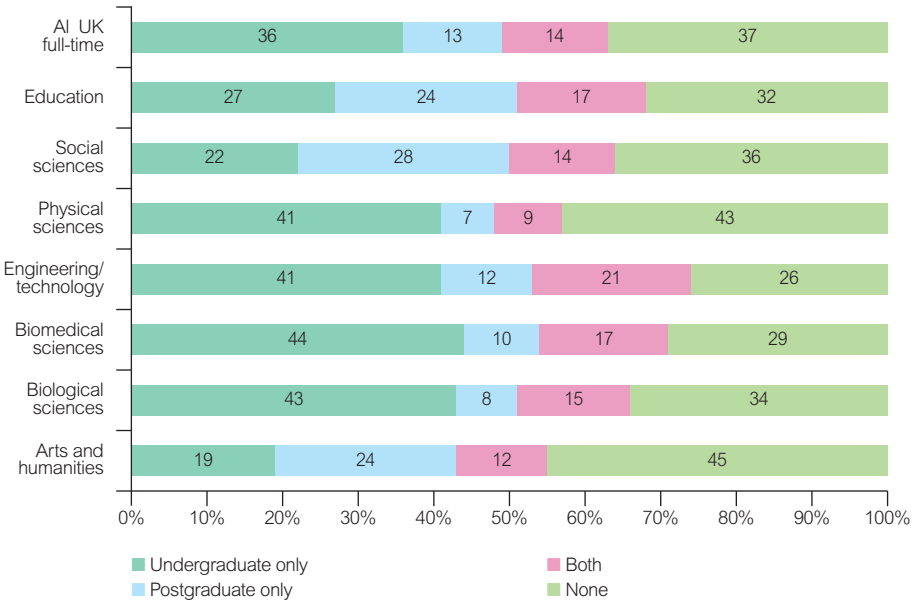

Figure 6.2 Undergraduate and postgraduate work experience: all UK full-time respondents

For postgraduates:
However, this trend by discipline group appeared to be reversed at postgraduate level, with higher proportions of social sciences (52%), education (50%) and arts and humanities (41%) respondents having work experience related to their postgraduate study/research, compared with only 23% in physical sciences and 28% in biological sciences. For both these disciplines, the contrast between the proportions with postgraduate and undergraduate work experience was especially marked.
These variations were seen in Figure 6.2, which is for UK full-time respondents only.

It also showed that the proportion with some kind of work experience was highest amongst those in engineering/technology (75%) and biomedical sciences (72%). At least a quarter of respondents, in all disciplines, and over 40% in some disciplines, had no study-related work experience.

[33] CRAC (2011) STEM graduates in non-STEM jobs. London: Department for Business, Innovation & Skills
www.bis.gov.uk/assets/biscore/further-education-skills/docs/s/11-771-stem-graduates-in-non-stem-jobs.pdf

Given the significant differences in the profile of researchers in the different discipline groups, it was worthwhile analysing the data further. In Figure 6.3, the percentage with postgraduate study-related work experience was shown for respondents in different discipline groups, according to their previous activity. This showed that the trend in levels of work experience was not an artefact of higher proportions having been employed prior to research, which would also be related to differing age profiles, but subsisted across all career trajectories. Why the contrasts exist, and how they relate to differential rates of opportunity to undertake degree-related work experience or different cultures within doctoral research programmes, is worthy of further study.

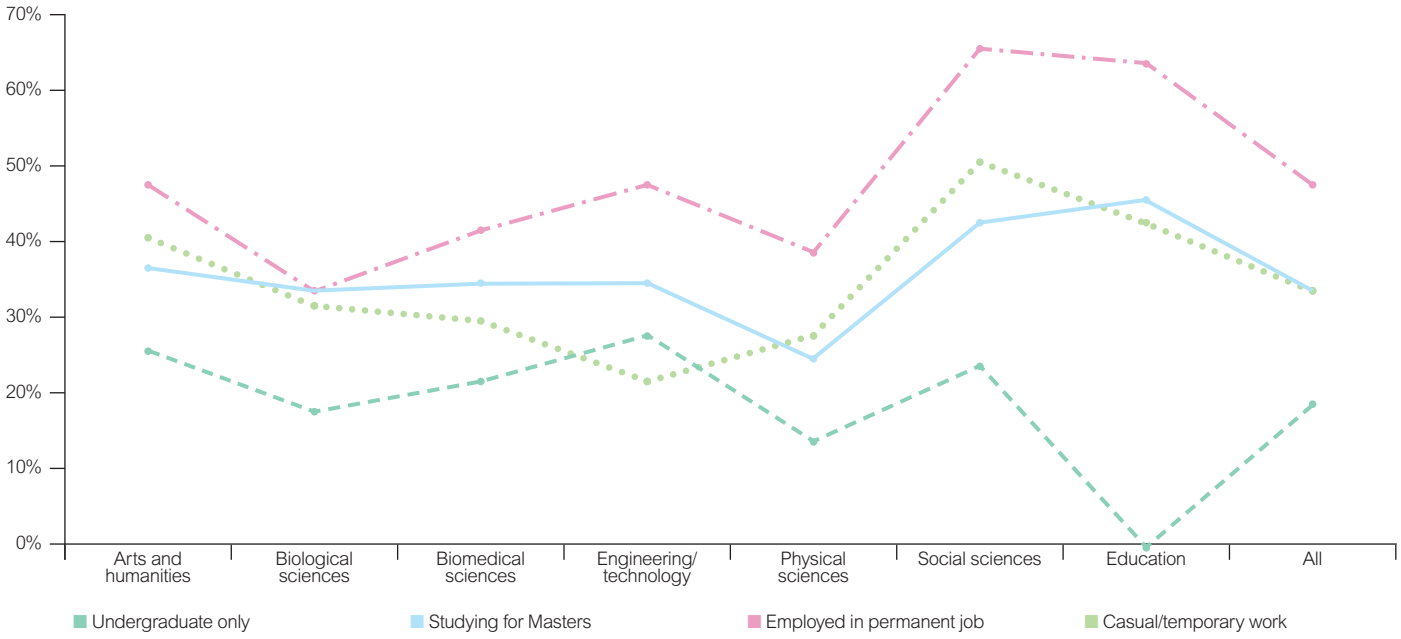

Figure 6.3 Percentage of researchers with postgraduate work experience by prior activity: all full-time respondents

6.1 Impact of degree-related work experience as an undergraduate

The vast majority of respondents who had degree-related work experience as an undergraduate described it as having been positive, either very helpful (47%) or quite helpful (32%), towards completion of their first degree/course. Slightly more of them described the experience as very (53%) or quite (30%) helpful to their career and work choices. Almost half (48%) described it as very and 21% as quite helpful in their decision to undertake postgraduate study/research.

Slightly higher than overall proportions of respondents in biological sciences (63%), biomedical sciences (56%) and physical sciences (56%) said their undergraduate work experience was very helpful in their decision to undertake postgraduate study/research, although this could partly relate to their relatively younger age profile and more direct route into research.

Respondents were also asked how their work experience influenced their career choices. The most significant impact, mentioned by 42% of those who had undertaken degree-related undergraduate work experience, was that they decided this was the sort of occupation that they wanted to pursue. Half the respondents in biological sciences and biomedical sciences with undergraduate work experience cited this as a main reason for their career intention. Overall, a quarter mentioned that it was through their undergraduate work experience that they realised that they needed a postgraduate qualification/further training to get work in this field, although this proportion varied considerably by discipline area, being highest (38%) in the biological sciences.

6.2 Impact of work experience related to postgraduate study/research

Most respondents who had undertaken study-related work experience as postgraduates (35% overall) evaluated it very positively, even more helpful than their undergraduate work experience. As many as 58% overall described it as very helpful to their postgraduate study/research. This varied relatively little by discipline, although a somewhat higher proportion of respondents in education (69%) rated it as very helpful.

In much the same way, 60% of respondents overall rated their postgraduate study-related work experience as very helpful to their career and work choices; this too varied little by discipline but was highest (65%) amongst those in biological sciences. Fewer than one in ten in any discipline described their postgraduate work experience as not very or not at all helpful to their career choices.

Among these respondents, as a result of their postgraduate work experience slightly under half (46%) decided this was the sort of work they wanted to do, although 20% realised that they needed further qualifications/training to obtain it (Table 6.1). One in five (19%) had been offered a job by their work experience employer. The experience put very few respondents off working in that field, either because of the kind of work (5%) or for other reasons (3%).

As Table 6.1 shows, there is some variation in the impact of work experience by discipline area. Those in the biological sciences were the most likely to have decided this was the sort of work they wanted to do (53%), and also the most likely to have realised that they needed further training to enter this employment sector (26%). Nearly a quarter (24%) of engineering/technology respondents had been offered a job by their work experience employer, compared to 19% overall (and a much lower proportion in the arts and humanities, 13%).

Overall, only 19% of respondents with work experience related to their postgraduate study reported that it had no effect on their career plans (varying from 26% of arts and humanities and education researchers, to 15-16% in biological, biomedical and social sciences). By implication, this indicated that for 80% overall (and over three quarters in any discipline) postgraduate work experience did have a significant effect on their career thinking.

From these data, it seemed conclusive that undertaking work experience related to postgraduate study/research had a positive impact on both research study and career thinking. For full-time respondents at least, there was some evidence that physical, biological and biomedical sciences researchers, in particular, were less able to take advantage of such work experience opportunities as postgraduates, compared with opportunities at undergraduate level, and compared with those in other disciplines. The picture for part-time respondents may be different and is more likely to reflect the part-time employment simultaneously undertaken during their doctoral programme.

Table 6.1 Impact of study-related postgraduate work experience, by discipline group (%)

	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All respondents
I was offered a job by this employer	13	18	19	24	20	21	15	19
I decided that I did not want to work for this employer	5	12	11	11	12	9	1	9
I decided that this was the sort of work I want to do	47	53	44	43	48	43	40	46
I was put off seeking a career in this field because of the kind of work	3	5	3	7	8	5	2	5
I was put off seeking a career in this field for other reasons	3	7	2	5	2	3	4	3
I realised that I needed further qualifications/ training to get work in this field	19	26	21	20	19	18	15	20
It had no effect on my career plans	26	15	16	19	18	16	26	19
Other outcome	1	1	2	3	1	3	1	2
Not answered	8	5	12	7	9	11	8	9
(N)	286	171	229	188	224	280	84	1462

Note: Column percentages may not sum to 100% as multiple responses were allowed

7 Careers advice and guidance

Formal careers advice and guidance were not overtly mentioned by many respondents as amongst the top influences on their career choices. However, it is important in the context of this study to consider the role that access to formal careers advice and guidance may have played on researchers' choices at different points in their progression. Not least, we wished to consider whether such support had been sought or used by researchers, and/or whether there were times when they would have benefited from additional support of this kind.

7.1 Use of the university careers service

Overall, a quarter of respondents had used their university careers service during their doctoral programme. Unsurprisingly this was higher (32%) amongst those in their final year or third year of four, than of first or second year respondents (19%). Figure 7.1, for final-year respondents, showed that slightly fewer of the UK respondents (28%) had used their higher education careers service than equivalent researchers from the EU/EEA (41%) or RoW (36%). On the other hand, markedly more UK final-year respondents had used their university careers while an undergraduate (46%) than had other nationalities. This may reflect on the lower levels of provision for careers advice in many countries' higher education systems, compared with the UK.

When analysed by their current career intention, somewhat fewer of those seeking a long-term career in higher education teaching had used their careers service compared with those with other career aspirations. Otherwise there was no significant evidence to suggest that those seeking careers outside research had used their careers services more than others, or vice versa.

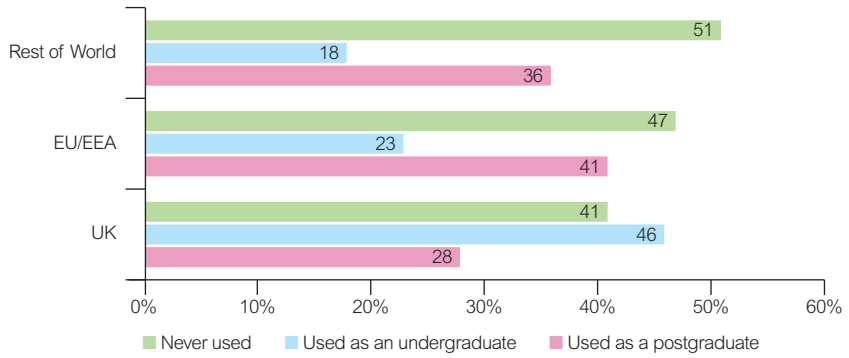

Figure 7.1 Use of university careers service, by nationality: final-year researchers only

7.2 Helpfulness of the university careers service

Respondents who had used their university careers service either as an undergraduate or as a postgraduate were asked to rate how helpful they had found the service.

Among UK respondents who had used their university careers service as an undergraduate, 60% rated that experience as very helpful (14%) or quite helpful (46%). Those who had used it while a postgraduate were slightly more satisfied than at undergraduate level. Just over three quarters (76%) of all such respondents in this group rated their university careers service as very helpful (25%) or quite helpful (51%). There were only small differences by discipline group, other than a larger proportion of those in arts and humanities seemed to be somewhat dissatisfied with their experience of their university careers service as postgraduates (30% rating it as not very or not at all helpful, compared with 23% overall). Fewest respondents in engineering/technology were dissatisfied (only 15%).

The small number of part-time respondents who had used their university careers service as a postgraduate rated it just as helpful as those who were studying full-time.

7.3 Perceived lack of careers support

Although, overall, at least 40% claimed that they had never used their higher education careers service, 65% of respondents reported that they would have benefited from additional careers advice and support at some stage, slightly more so for those from outside the UK. There were also moderate differences by discipline group, with around 70% of UK respondents in social sciences and education reporting that they would have benefited from additional support at some stage, and rather fewer (55%) in physical sciences (Figure 7.2).

Respondents were also asked at which stages they would have liked the advice or support. Overall, 46% of UK respondents reported that they would have benefited from additional careers support before they went to university, and 36% while they were postgraduates (Figure 7.2). Slightly higher proportions of UK respondents in social sciences and biological sciences (43%) felt they would have benefited from additional career support while they were postgraduates.

Interestingly there was also a moderate difference by gender. More female respondents than males reported that they would have benefited from additional careers advice and support (69% compared to 59% respectively). The gender difference persisted across all discipline areas and, therefore, was not just a function of the different proportion of male and female respondents working in the different discipline areas.

Half the female respondents believed they would have benefited from additional careers support both before they went to university and while they were undergraduates, compared with about 40% of males, in each case. The gender difference was less marked for postgraduates, however, with 42% of female respondents compared to 36% of males reporting that they would have benefited from additional careers support as postgraduates. Nevertheless this gender difference was found at all levels in all disciplines with just a couple of notable exceptions. Female respondents in engineering/technology were less likely than males to feel they would have benefited from additional careers support as postgraduates (36% compared to 41%) and the difference between male and female respondents in the physical and social sciences was also negligible. It may be that this is because many female researchers working in male-dominated fields such as some of these have made more considered career decisions.

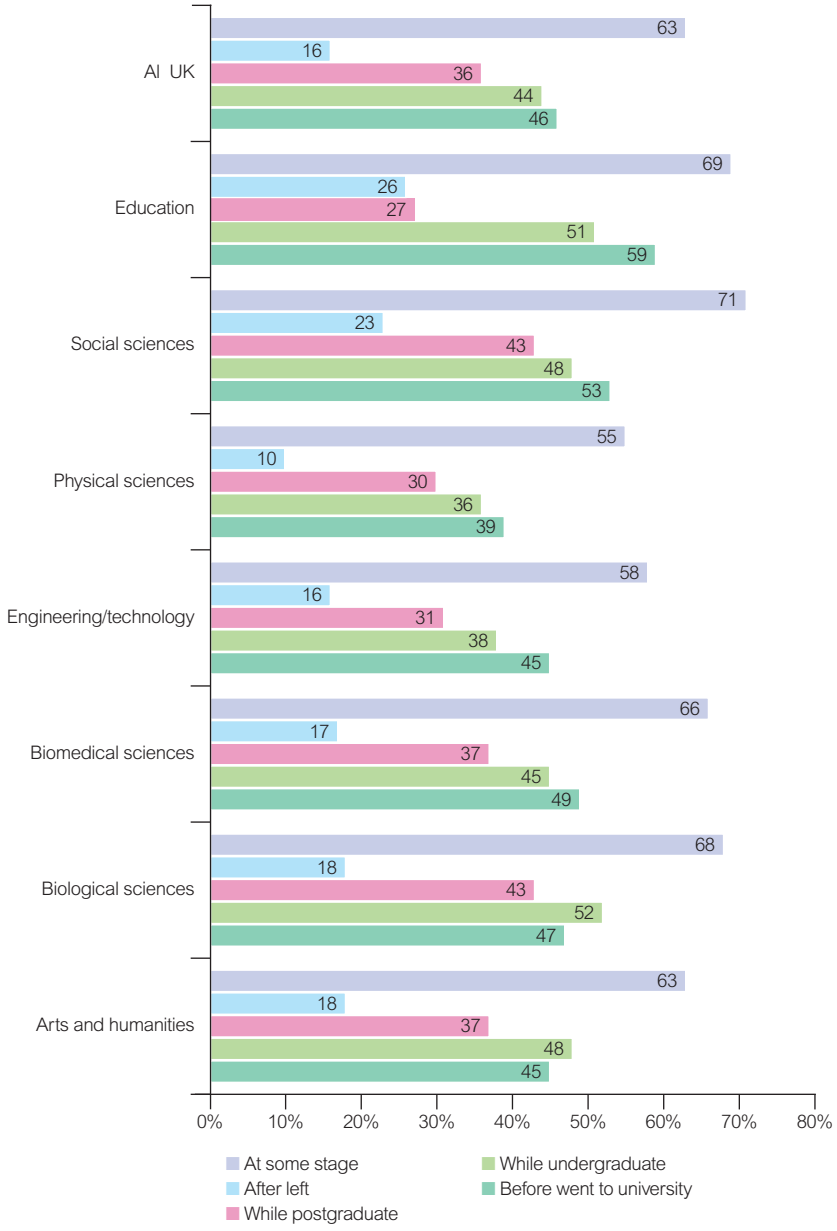

Figure 7.2 Stage at which respondents would have benefited from more careers advice and support, by discipline: all UK respondents

7.4 Summary of attitudes to formal careers support

To summarise this section, only a minority (about a third) of final year doctoral researchers seem to have used their university careers service as postgraduates, and even fewer of the part-time researchers at a similar stage. Slightly more of those from outside the UK had done so, which contrasted with the trend in use of similar services as undergraduates, where considerably more (nearly half) of UK respondents had used their service than had foreign nationals.

40% of UK final year researchers had never used a university careers service at all, but as many as two thirds report that they would have benefited from additional careers support at some stage; this seemed to be somewhat higher for females than males. Despite the rather uneven pattern of usage of careers services, most of those who had used these services considered that they had been helpful.

8 Overall findings and recommendations

Researcher profiles and trajectories

The doctoral cohort in this study was very heterogeneous, with postgraduate researchers in different disciplines having differing profiles in terms of age or gender and very varied career trajectories and experiences prior to their postgraduate research.

Only a minority of respondents undertook doctoral research directly after their undergraduate degree, although this was highest (c.40%) in physical and biological sciences, and very low in arts and humanities or education. For the majority, the proportions that entered research from a Masters degree or from employment also varied strongly by discipline field.

Despite the range of differing career trajectories prior to doctoral research, around a third of respondents undertook their research at the same university as their first degree. Although there were modest flows between the different institutional types, the majority remained within the type of university in which they studied their first degree.

Current career intentions

The study confirmed that the great majority of doctoral researchers in this cohort were satisfied with their decision to undertake postgraduate research, and wished to pursue careers and occupations which were related to their research discipline, predominantly on the grounds of continuing personal interest and being able to apply their specialist knowledge and high-level expertise.

Only around a third of respondents in the later stages of their doctoral programmes had definite ideas about their future careers, half were considering several alternatives, while about one in six still had little or no idea.

Of those with definite ideas, around half would ultimately like a career in higher education, whilst a quarter would like a career in research outside higher education. Of respondents considering several career alternatives up to half were thinking about research outside higher education.

Significantly higher proportions of respondents from biomedical sciences and engineering/ technology than in other disciplines anticipated careers outside research, although of these the majority sought occupations and employment sectors related to their discipline. Higher proportions in physical or biological sciences, and more especially in arts and humanities, aspired to careers in higher education.

Very few were actively considering careers unrelated to their research discipline, but those that did tended either not to have enjoyed their research or had become interested in something else. Issues like the availability of jobs, remuneration and career progression were not the main driver for the change, but were much more significant factors for those who were unsure of their future direction.

The pattern of long-term career intentions bore some resemblance to the broad pattern of known career destinations measured three and a half years after graduation; indicating some progression along their intended path. However, with likely over-supply of those seeking to enter higher education careers, this could suggest that fall-out will occur for many after one or more postdoctoral positions.

Recommendation: The wide range of career options available to doctoral researchers should be highlighted during undergraduate and postgraduate degrees.

Development of career thinking and commitment to research

Very few doctoral researchers had well-formed career ideas when they entered university for their first degree. The attraction of academia and/or research developed during their undergraduate education, which coincided with the time that they would be targeted by corporate graduate recruiters looking for strong graduates. Assuring a continued supply of the highest calibre graduates into research may require more overt promotional efforts to counter those competitors, particularly with the impact of higher fees.

The overwhelming majority chose to undertake doctoral research for intellectual curiosity and interest, rather than career-related reasons. Prior to commencing doctoral research very few had seen it as necessary for their career. As so few have research as a career goal before they enter university, there must be scope to promote research as an interest-rich career to young people prior to higher education, as recommended by Thrift[34]. This may be increasingly important as more graduate employers introduce recruitment programmes for school-leavers, with the aim of identifying and recruiting good graduates prior to university and supporting them during their degree.

Recommendation: In order to assure a flow of talent into research in higher education and beyond, government, funders and institutions should consider how to most effectively promote research careers to young people.

Recommendation: Institutions should explore how to promote doctoral research opportunities and research careers to high-calibre students, in the light of potentially increasing competition from employers from non-higher education.

Practical actions and value of the doctorate

Relatively few doctoral researchers had actually applied for specific jobs/positions even at the later stages of their research, suggesting that most left this until after completion of their doctorate. Of those with job offers prior to completion, the majority had postdoctoral research positions within higher education.

Around 90% overall thought that their doctorate would be important if not essential in achieving their career aspiration. Given the choice again, three quarters of doctoral researchers would undertake the same or similar doctoral programme again, and fewer than 1 in 10 would not undertake research at all, irrespective of discipline. There was a slight but distinct trend in all disciplines for satisfaction levels to fall in later years of doctoral research.

Recommendation: Further longitudinal research into the value of a doctoral qualification in relation to obtaining employment and progression beyond four years should be conducted to give researchers a fully balanced view of the value of their qualification as they consider career directions and opportunities.

[34] Thrift, N (2008) Research careers in the UK: a review. London: Department for Innovation, Universities and Skills www.dius.gov.uk/higher_education/shape_and_structure/he_debate/research_careers.aspx

Careers advice and guidance

Only about a third of UK final-year doctoral researchers had used their higher education careers service as postgraduates, substantially less than did so as undergraduates, while international postgraduates tended to use it more. Around 40% claimed never to have used a university careers service at all. Yet two thirds felt they would have benefited if they had used a careers service at some stage, especially female respondents.

High proportions of those researchers who had used a university careers service had found it helpful, irrespective of when they accessed it, their current discipline or study mode.

Recommendation: Institutions, and especially careers services, should consider how to encourage doctoral researchers to use the information, support and advice available to them through the careers services, and to engage earlier and more proactively in achieving their career aspirations.

Work experience

There seems to be a contrast between different disciplines when it comes to the level of work experience relating to postgraduate study that had been undertaken by doctoral researchers. A majority of those in education and social sciences had done so, compared with only low proportions in biological and physical sciences. The trend persisted even when accounting for different prior employment profiles of those in different disciplines. Interestingly this was the reverse of the position during their undergraduate education, where over half in several sciences did have degree-related work experience. Overall, at least a quarter appeared to have no study-related work experience at all during higher education. Four fifths of those with work experience reported that it has had an effect on their career decision-making

Recommendation: Institutions should consider how to develop, provide and promote opportunities for work placements and create opportunities for researchers in all disciplines to interact with businesses and other external organisations.

Appendix: Sample parameters and profile of respondents

The key background characteristics of the doctoral researchers who responded to this survey, including gender, nationality and discipline of research were reviewed. This provided some understanding of the backgrounds of the respondents, which was used in our exploration of the career thinking and career development of these doctoral researchers. It also provided an indication of how representative the sample of respondents was of the overall UK doctoral research cohort, through comparison of certain demographic data with those of the overall cohort. This representativeness issue may be significant given the particular sampling strategy used in the research.

Responses to the survey and key sample characteristics

A total of 4,550 postgraduate researchers responded to the survey. Once duplicate responses (20), incomplete responses (204), respondents from non-UK universities (19) and respondents studying for research Masters degrees (9) were excluded, the responses from 4,298 doctoral researchers were retained as the final sample for analysis. 40% of these were in response to invitation emails, mostly to Research Council funded postgraduate researchers, and the remainder in response to other attraction methods such as website notices and forwarding via networks.

Domicile

Overall, 65% of respondents were from the UK, almost equal numbers from the EU/EEA countries or the rest of the world (RoW) with 15.5% each, while 4% did not answer this question. Table A.1 provides a breakdown of respondents by year of study, discipline and nationality. Compared with HESA data[35] (57% UK, 14% other EU, 29% RoW), the response sample has a somewhat higher proportion of home (UK) researchers and a correspondingly lower RoW proportion.

Stage of study

The small number of respondents who reported that they were writing up, waiting for their viva or had just completed, were coded as being in their final year, while researchers studying part-time were coded to nearest full-time equivalent year. Just over half (55%) were in their first or second year and 33% in their final year, while 12% were in the third year of four; for some analyses the latter were combined with the final year group. The sample therefore seems to give a good balance of those at relatively early stages in their research and those who were approaching completion and who might be considering next steps.

Discipline of research study

As Table A.1 indicates, the researchers were grouped into seven broad discipline groups, coded from respondents' allocation of their field of research into 19 JACS discipline code areas. This matches the classification used in Vitae's 'What do researchers do?' reports[36], to facilitate comparisons, with the exception of physical sciences which is shown here separate from engineering/technology, partly due to the large number of responses from those in physical sciences (23%).

Comparison with HESA data (in the column headed 'UK cohort') suggested a good representation was achieved by discipline, although with some over-representation of those within physical sciences and under-representation of those in social sciences; this presumably resulted from the focus of the sampling strategy.

Table A.1 Nationality of respondents, by year of study and discipline group (%)

Year of Study	UK		EU/EEA		RoW		All respondents		UK cohort	
	Number	%	Number	%	Number	%	Number	%	Number	%
First/second year	1524	54	352	53	393	59	2353	55		
Third year of four	371	13	68	10	72	11	531	12		
Final year	912	32	249	37	197	30	1406	33		
Other	6	0	0	0	2	0	8	0		
Total	2813	100	669	100	664	100	4298	100		
Discipline										
Arts and humanities	493	68	104	14	99	14	722	17		16
Biological sciences	440	71	102	16	62	10	620	14		13
Biomedical sciences	467	68	111	16	88	13	686	16		14
Engineering/										
technology	315	58	68	13	129	24	541	13		14
Physical sciences	692	69	156	16	120	12	997	23		18
Social sciences	294	53	106	19	132	24	558	13		18
Education	112	64	22	13	34	20	174	4		7
Total	2813	65	669	16	664	15	4298	100		100

[35] HESA (2010) Resources of Higher Education Institutions 2008/2009. Cheltenham: Higher Education Statistics Agency www.hesa.ac.uk/

[36] Vitae (2009) What do researchers do? First destinations of doctoral graduates by subject. Vitae www.vitae.ac.uk/wdrd

Table A.2 Gender and age by discipline group (%)

Gender	Arts and humanities	Biological sciences	Biomedical sciences	Engineering/ technology	Physical sciences	Social sciences	Education	All
Male	35	35	32	68	54	38	31	43
Female	61	63	65	27	43	58	66	53
Not answered	3	2	2	4	3	4	3	3
Age group								
21 to 25	21	46	35	36	48	15	5	34
26 to 30	37	35	33	41	34	34	16	35
31 to 35	12	8	11	9	8	17	14	11
36 to 40	6	4	7	4	3	9	17	6
41 to 45	4	2	4	3	1	8	14	4
46 to 50	6	0	4	1	1	7	14	3
Over 50	9	0	2	1	1	5	17	4
Not answered	5	3	4	6	4	6	3	5
Total cases	722	620	686	541	997	558	174	4298

Gender

The majority of UK respondents (55%) were female which varied slightly from some recent figures for UK postgraduate researchers (50%, PRES 2011; 46% HESA 2009/10)[37]. A slightly higher proportion of EU/EEA respondents (59%) and lower proportion of those from RoW (49%) were female. Table A.2 provides a breakdown of the gender of respondents by discipline and shows that only 27% of engineering/technology respondents and 43% of physical scientists were female. In all other discipline groups women were in the majority.

Age

Overall, about two thirds (69%) of respondents were aged 30 or under, but only 21% of those in education, 49% in social sciences and 58% in arts and humanities were in this age category. In contrast, 82% of physical scientists and 81% of biological scientists were aged 30 or under. This is a somewhat younger age profile than was obtained in PRES (2011) where 59% were aged 30 or under (overall), and this difference too may reflect the particular sampling strategy within our study.

Researchers from the UK were generally younger than those from the EU/EEA or RoW with 43% aged 25 or under compared to 20% of those from the EU/EEA and 17% from RoW. However, more of the UK researchers were also aged over 40 (14%) than those from the EU/EEA (5%) or RoW (9%). The median ages of researchers were: UK 26 years, EU/EEA 28 years and RoW 29 years.

Ethnicity and disability

In terms of ethnicity, 87% of UK respondents were white British, 5% from other white backgrounds and 8% from other minority ethnic backgrounds. 5% of all respondents reported that they had a disability or other long-term health condition that might affect their employment prospects.

Mode of study

Table A.3 shows that 13% of respondents were studying part-time, the proportion ranging from 52% in education and 21% in arts and humanities to 5% in physical sciences and engineering/technology and 6% in biological sciences. This was lower than the available comparable figures of 29% for 2008/09[38] or 19% in PRES (2011). Because HESA classifies postgraduate researchers who were writing up as part-time, both our survey and the PRES results will under-represent part-time researchers slightly by comparison. Within this sample, most (73%) of the part-time respondents were from the UK, close to the proportion recognised by HESA39 (75%); this equates to 15% of all UK respondents reporting that they were part-time.

Overall, more female researchers (15%) were studying part-time than males (11%) but this difference disappears once discipline differences were taken into account, with no significant differences in the percentage of male and female researchers studying part-time within individual discipline areas.

[37] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

[38] HESA (2010) Resources of Higher Education Institutions 2008/2009. Cheltenham: Higher Education Statistics Agency www.hesa.ac.uk

Table A.3 Respondents by discipline group, mode of study and programme (%)

Discipline of Study	PhD/DPhil	Professional doctorate	Full-time	Part-time	All respondents	
	%	%	%	%	Number	%
Arts and humanities	100	0	79	21	722	17
Biological sciences	100	0	94	6	620	14
Biomedical sciences	95	5	85	15	686	16
Engineering/technology	87	13	95	5	541	13
Physical sciences	99	1	95	5	997	23
Social sciences	97	3	82	18	558	13
Education	71	29	48	52	174	4
All respondents	96	4	87	13	-	100
(N)	4110	188	3726	561	4298	-

Table A.3 also shows that 96% of all respondents were studying for a PhD/DPhil and 4% for a professional doctorate. Professional doctorates were predominantly in education (29% of its doctoral researchers) and engineering/technology (13%), and significant in biomedical sciences (5%), with tiny numbers in other disciplines. A similar figure of 4% overall has been reported for PRES respondents[39].

Institution type

The respondents were from 130 different UK universities and research institutes, including all institutions within the Russell and 1994 Groups. Numerically, 56% of respondents were studying at a Russell Group university, 23% at a 1994 Group university and 22% at other UK universities and research institutes. This was quite close to the known national cohort breakdown, within which 50% of recent doctoral researchers were in Russell Group institutions, 20% in the 1994 Group and 30% in other institutions[40], although the Russell Group has recently reported that in 2008-09, 57% of doctorates in the UK were awarded to researchers in its institutions.

How well the sample represents the cohort

We consider that the sample obtained is reasonably representative of the UK cohort of doctoral researchers, based on the similarity of many of the characteristics outlined above, such as gender, age, type of institution and discipline of study. The slight over-representation of those studying physical sciences and engineering/technology almost certainly reflected strength in responses from Research Council funded postgraduate researchers, to whom invitation emails were sent directly.

In terms of statistical significance, receipt of c.1,750 responses from around 13,000 Research Council funded postgraduate researchers targeted was a response rate of over 13%; an overall rate cannot be calculated because the total number of invitations sent was unknown, due to using multiple, potentially overlapping networks. However, a random sample of 4,298 respondents within a total UK cohort of around 82,000[41] would indicate a confidence interval of around 1.5% at a confidence level of 95%. Compared with HESA's reported number of doctoral qualifiers for a recent year (17,500 in 2008-09), the sample of over 1,400 final-year respondents is particularly strong.

[39] HEA (2011) Postgraduate Research Experience Survey: 2011 results. Higher Education Academy www.heacademy.ac.uk/assets/documents/postgraduate/PRES_report_2011.pdf

[40] HEFCE (2009) PhD Study: Trends and Profiles 1996-97 to 2004-05. Bristol: Higher Education Funding Council for England www.hefce.ac.uk/pubs/hefce/2009/09_04

[41] HESA (2010) Resources of Higher Education Institutions 2008/2009. Cheltenham: Higher Education Statistics Agency www.hesa.ac.uk/

Vitae

Vitae is supported by Research Councils UK (RCUK), managed by CRAC: The Career Development Organisation and delivered in partnership with regional Hub host universities.

Vitae works with UK higher education institutions (HEIs) to embed professional and career development in the research environment. Vitae plays a major role in innovating, sharing practice and enhancing the capability of the higher education sector to provide professional development and training for researchers.

Our vision is for the UK to be world-class in supporting the personal, professional and career development of researchers.

Our aims:

- build human capital by influencing the development and implementation of effective policy relating to researcher development
- enhance higher education provision to train and develop researchers
- empower researchers to make an impact in their careers
- evidence the impact of professional and career development support for researchers.

For further information about the range of Vitae activities go to www.vitae.ac.uk or contact website@vitae.ac.uk

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