Hanging tough: Post-PhD researchers dealing with career uncertainty

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This study examines the impact of career uncertainty on post-PhD researchers' experiences. Drawing on an identity-trajectory approach and a mixed-methods design, we analysed experiences and career paths of post-PhDs from the UK and Switzerland. Our findings show that in the course of their work experiences, career uncertainty takes two different forms: intellectual uncertainty and occupational uncertainty. On a daily basis, both forms strongly impact the participants' work and personal lives by limiting their ability to plan for the future, impairing their developing research expertise and networks and inducing tension in trying to reconcile work and personal lives. While struggling with a blurred status, participants 'hang tough' despite their uncertain situation, notably by clinging to the academic researcher identity. Contributing to the previous work on the increasing casualisation of post-PhD positions and the resulting challenges, our study offers new insights into how career uncertainty influences post-PhDs' work and identity development.

Keywords: Post-PhD researchers; career uncertainty; intellectual uncertainty; identity; career development

As an intrinsic part of the research process, uncertainty, regarded as risk, unpredictability or ambivalence (Sigl 2016), is probably what makes being a researcher exceptional and particularly appealing for many people. Uncertainty also characterises the journey of becoming a researcher as establishing one's intellectual credibility and becoming recognised for one's expertise in a field, which represents a transition from dependent to independent research (Laudel and Gläser 2008); this period is often marked by self-doubt and questioning (Skakni and McAlpine 2017). To some extent, well-established researchers still deal with uncertainty through the ongoing search for making an intellectual contribution and the uncertain processes of research funding and publishing (Laudel 2006).

However, uncertainty has taken on different significance over recent years: increasingly, career uncertainty is emerging as a concomitant concern while individuals aspire to secure employment as researchers (Ortileb and Weiss 2018; Sigl 2016). On one hand, the growing number of PhD holders worldwide (OECD 2016) has increased the competition for tenure-track academic positions (Chen, McAlpine and Amundsen 2015; McDowell, Krukenberg and Polka 2014), with more than half of the PhD holders finding themselves outside academia (Vitae, 2016). On the other hand, postdoctoral positions have become precarious and are no longer short-term entrance trajectories into an academic career (Van der Weijden et al. 2015). The new norm consists of accumulating multiple short-term contracts over the years (Fitzenberger and Schulze 2013; Stanford et al. 2009), which often translates to several institutional or geographical relocations (McAlpine 2012). This situation is generally characterised by low incomes, high workloads, last-

minute appointments, poor resources and support, and few professional-development opportunities (Browning 2017; Rothengatter and Hill 2013). Such casualisation of postdoctoral positions (May et al. 2011) shapes not only researchers' working lives, but also the research they produce (Wöhrer 2014). In brief, choosing an academic career path now appears a risky undertaking (Brechelmacher et al. 2015).

Previous studies show that insecure career prospects contribute to the dissatisfaction of post-PhDs in their daily work experience (see, e.g., van der Weijden 2015), often inducing a high level of stress and anxiety (Gloria and Steinhardt 2016) as they try to reconcile their work and personal lives (McAlpine and Amundsen 2016). Short-term contracts and working on someone else's projects have also been shown to impede one's research niche development by leaving little time for fundamental and secondary analysis or high-quality publications (Wöhrer 2014). In the same vein, while a relatively uninterrupted research focus positively impacts postdoctoral experiences (Åkerlind 2005; Scaffidi and Berman 2011), short-term contracts/projects hinder developing an in-depth and coherent research profile (Wöhrer 2014). Throughout repeated changes of institutions, projects or funding, post-PhD researchers have to adapt to new topics and research paradigms continually and to publish on different subjects (Wöhrer 2014), which may be far from their own expertise and interests. Ultimately, the high level of uncertainty that characterises current post-PhD career paths reduces the attractiveness of academic research as a profession (Roach and Sauermann 2017) and the sector's ability to recruit in the future (May et al. 2013). While this previous work has been helpful in highlighting the increasing casualisation of postdoctoral positions and its challenges, very few studies have examined how post-PhDs deal with career uncertainty. This article contributes in this sense by focusing on the impact career uncertainty has on post-PhDs' work experiences and identity development. More specifically, we examined how post-PhDs from the UK and Switzerland deal with career uncertainty by asking the following questions:

- *What form does career uncertainty take within post-PhD researchers' work experiences?*
- *How does career uncertainty manifest on a daily basis?*
- *How does career uncertainty influence their developing researcher identities?*

Conceptual framework
Career and identity development are examined here at the intersection of individual and contextual factors that evolve over time, while continually interacting (Heinz et al. 2009). On one side, socio-political and economic contexts influence post-PhDs' career paths (Ylijoki and Henriksson 2017) while work environments shape their experience of becoming or being recognised as researchers (Antony 2003). On the other side, on an ongoing basis, post-PhDs' work situations influence their personal lives, while personal aspects of their lives influence their work experiences and career decisions (Chen et al. 2015; McAlpine et al. 2013). These personal factors include: a) family relationships and responsibilities, such as elderly parents, children, desire to co-locating with partner; b) life goals, such as the desire for children; c) desire for work-life balance; d) actual well-being related to health issues, stress, anxiety and burnout; e) personal values, for instance, alignment of work with beliefs; and f) finally financial duress (McAlpine

and Amundsen 2016). Drawing on McAlpine and colleagues' (2013) identity-trajectory approach, we apprehend research career trajectories as complex ongoing processes comprising three distinct but interwoven work strands that develop through time: intellectual, networking and institutional. These strands represent complementary paths through which post-PhDs' careers and identities are developed and consolidated over the years.

In this paper, the *intellectual strand* refers to post-PhDs developing research expertise which comprises the past and current projects they conduct or collaborate in, the research niche (i.e., theoretical, methodological, disciplinary) they have been developing throughout these projects and the resulting artefacts (e.g., peer-reviewed papers, conference papers, citations, research reports). It is through this intellectual strand that post-PhDs establish their credibility as researchers and become recognised by their peers. The *networking strand* is related to post-PhDs developing academic/scholarly networks, which comprise local, national and international relationships with peers or colleagues, including supervisors, mentors and line managers. These relationships are established within research collaborations or memberships in scholarly organisations and journal boards and are developed at inter-personal (e.g., talking to scholars at conferences) or inter-textual (e.g., reviewing manuscripts for journals) levels. Overall, this networking strand constitutes post-PhDs' larger research community. The *institutional strand* refers to the formal affiliations (being employed) with specific institutions in which post-PhDs' research projects and expertise, as well as scholarly/academic networks, are developed (e.g., research institutes, universities). From a career trajectory perspective, it also refers to different levels of institutional resources that contribute to post-PhD researchers' networking or intellectual strands such as support from a host supervisor, access to departmental career development initiatives or fellowships and grants awarded by national funding agencies. It is through the interaction of these intellectual, networking and institutional strands that post-PhDs' researcher identity builds and consolidates.

Given the current complexity of the research career trajectories, our focus is also on how career uncertainty affects post-PhDs' identity development. Thus, we mobilized the concept of 'career uncertainty', defined here as a set of factors 'that make the individuals feel uncertain of their career future' (Tien et al. 2005, 164). Career uncertainty is different from and more subtle than the ideas of 'barriers' or 'difficulties' that might interfere with one's career development (Tien et al. 2005). It rather refers to post-PhDs' perceptions of an inability to control their academic/scholarly situation and their feeling of personal efficacy to cope with circumstances. As a contextual factor beyond their control, career uncertainty is likely to influence post-PhDs' agency, that is, their motivations, intentions and efforts to plan and persist despite constraints, whether expected or not (McAlpine et al. 2013). The term also highlights the role of luck as part of succeeding or not in academia (Brechelmacher et al. 2015; McAlpine 2016). By modulating the intellectual, networking and institutional strands that characterise post-PhDs' career trajectories, career uncertainty influences their experience of becoming researchers, their personal lives and thus their identity-trajectories.

Research method

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This study draws on data gathered in the UK and Switzerland, although it is part of a larger research project also conducted in Spain and Finland. This cross-national project aims to investigate early career researchers' identity development (RID) (http://www.fins-ridss.com) in these different national contexts. Based on a mixed methods design, the two-step research protocol was the same in each country. The first step consisted of an online survey, including both quantitative items and open-ended qualitative questions (McAlpine, Pyhältö and Castellò 2017), sent to PhD students and post-PhD researchers in different universities in the UK and Switzerland. The quantitative items were created in order to capture the respondents': 1) perceptions and experiences in research and publication activities; 2) social, academic/scholarly and institutional relationships and support; 3) career goals and 4) strategies to overcome difficulties. The qualitative open-ended questions were related to respondents': 1) most significant events that have marked their academic paths; 2) dropout intentions and interruptions and 3) work–life balance challenges. The last question of the survey was an invitation to participate in a subsequent individual research interview. As a second step, these one-hour semi-structured interviews were based on a multimethod approach integrating a) survey responses (quantitative and qualitative) and b) two visual methods: the *network map* (Sala-Bubaré and Castelló 2016) and the *journey plot* (McAlpine 2016) to explore in depth their perceptions and experiences.

Sample

A total of 143 post-PhDs were recruited by email, first in 2015-2016 in the UK (N=98) and then in 2016-2017 in Switzerland (N=45), both in humanities and social sciences (HSS) and science, technology, engineering, and mathematics (STEM). More than half of the respondents were female and from a European country; their average age was 33.7 years. They had been in a postdoctoral position for a mean of 3 years (UK) and 5 years (Switzerland) when they completed the survey. Table 1 shows their characteristics.

Table 1. Overall survey respondents' characteristics

Gender	Origine	Source of income	Career goal
65%Women 35% Men	75% Europe 6% Americas 5% Asia 5% Africa 4% Unknown	52.5% Contract at a university 34.2% Postdoc scholarship 5.0% Postdoctoral grant 5.0% Outside university 0.8% Unemployed 2.5% Other	32.7% Lecturer research-intens. university 32.0% Researcher in a university 6.0% Lecturer (non-research intensive) 6.0 % Postdoc fellowship 4.2% Researcher in government 2.5% Researcher in the private sector 16.6% Other
Disciplines			
61.3% STEM 38.7% HSS			

For the purpose of this paper, we focused on the 24 post-PhD respondents in the UK (n=11) and Switzerland (n=13) who also participated in individual semi-structured interviews. These interviews were conducted via Skype in the case of the UK and mostly face-to-face in Switzerland. At that moment, these participants were aged between 28 and 56 years (median 36), in a postdoctoral position for an average of 3.5 years and mostly from HSS. Table 2 shows their anonymised characteristics.

Table 2. Interviewees' characteristics

Pseudo	Country	Age	Gender	Discipline	Stage	Source of income	Career goal
Abbey	UK	28	F	Sport sciences	1st year	Contract at a university	Researcher at a university
Geri	UK	44	F	Education	1st year	Contract at a university	Other
Anne	UK	30	F	Sociology	1st year	Postdoctoral scholarship	Researcher at a university
Jake	UK	41	M	Sociology	1st year	Postdoctoral scholarship	Researcher at a university
Sue	UK	31	F	Psychology	2nd year	Unemployed	Lecturer (non research-intensive)
Gord	UK	40	M	Social work	2nd year	Contract at a university	Lecturer (research-intensive university)
Rob	UK	42	M	Education	2nd year	Contract at a university	Lecturer (research-intensive university)
Fred	UK	33	M	Sociology	3rd year	Postdoctoral scholarship	Lecturer (research-intensive university)
Kelsey	UK	36	F	Sociology	5th year	Postdoctoral scholarship	Lecturer (research-intensive university)
Sandra	UK	39	F	Life sciences	5th year	Postdoctoral scholarship	Other
Faye	UK	36	F	Molecular bio	7th year	Postdoctoral scholarship	Lecturer (non research-intensive)
Emma	CH	56	F	Education	1st year	Postdoctoral scholarship	Lecturer (non research-intensive)
Clara	CH	31	F	Social sci.	1st year	Postdoctoral scholarship	Researcher at a university
Mark	CH	38	M	Sociology	2nd year	Postdoctoral grant	Lecturer (research-intensive university)
Pio	CH	35	M	Natural sci.	2nd year	Contract at a university	Researcher at a university
Noah	CH	33	M	Education	3rd year	Contract at a university	Other
Juan	CH	30	M	Psychology	3rd year	Postdoctoral scholarship	Researcher at a university
Gaïa	CH	38	F	Humanities	4th year	Contract at a university	Self-employed
Céline	CH	36	F	Education	4th year	Contract at a university	Lecturer (research-intensive university)
Ian	CH	34	M	Psychology	5th year	Contract at a university	Other
Lloyd	CH	31	M	Engineering	5th year	Contract at a university	Lecturer (research-intensive university)
Joëlle	CH	34	F	Social sci.	7th year	Contract at a university	Researcher in government
Marta	CH	39	F	Life sciences	8th year	Contract at a university	Researcher at a university
Jada	CH	37	F	Neurosciences	8th year	Postdoctoral grant	Other

Data sources

Three primary data sources were mobilised for the analysis: 1) semi-structured interview accounts, 2) visual displays from the journey plot (McAlpine et al. 2013) and 3) responses to one open-ended survey question about dropout intentions from the survey.

Interview accounts and journey plot

Semi-structured interview accounts from the 24 respondents (10 men; 14 women) were primarily examined. The interview protocol was designed to deepen their survey responses, which were reviewed prior to the interviews. During the interview, participants were also asked to use the journey plot (McAlpine 2016) to illustrate, on a time axis, the most significant events (positive or negative) they had experienced in the previous 12 months, which resulted in 24 visual displays. By capturing participants' own interpretations of their experiences (Buckingham 2009), this type of visual method is considered well-suited for researching complex, multifaceted and dynamic phenomena (Mazzetti and Blenkinsopp 2012) such as career uncertainty.

Survey open-ended question accounts

The open-ended question selected for the analysis was the following: *Have you considered dropping out of your post-doc work?* In this regard, 52 respondents out of 143 (36%) answered positively. In such cases, they were also asked to briefly explain why they had considered or were considering this option, which provided narrative accounts about reasons behind their intentions. While the principal data source remained the interview accounts, the visual displays and open-ended question responses brought more accuracy and completeness to the analysis.

Analysis procedure

The data were analysed through a procedure inspired by the consensual qualitative research approach (Hill 2012). Using MAXQDA 12, we followed an iterative four-step process:

1. Building the codebook. The general structure of the codebook used for analysing UK and Swiss data was developed based on the key constructs underpinning identity-trajectory: intellectual strand (research, writing, careers), institutional strand (work environment), and networking and agency (significant events).

2. *Coding.* To ensure that we shared the same definition of these themes, we started by using them to code two first UK participants data files (i.e., survey responses, interview accounts and visual displays). The four of us coded a large part of a transcript together, using a common computer screen to enable discussion and agreement; code definitions were developed as we proceeded. The same process was subsequently conducted in pairs and individually. We then compared our results, reconciled them, and assessed our intercoder agreement by calculating a Kappa coefficient. We reviewed any unresolved questions and modified the definitions when necessary. This process was repeated on one-third of the entire transcript set until we reach a Kappa coefficient of at least 0.75%. The remaining transcripts were coded independently. These general themes were finally broken down and divided into sub-themes. The final version of this codebook was eventually used to code the Swiss data.

3. *Searching for emerging themes*. While examining more especially the interview excerpts related to research, careers and work environment, we observed that uncertainty was a theme recurrently addressed by participants. A further analysis was conducted by the first author to get a better understanding of the importance of uncertainty in their overall post-PhD experiences. To that end, each of the 24 participants' journey plots, as well as the 52 narrative accounts from the survey open-ended question about dropout intentions, were analysed in depth. An emerging theme broadly defined as 'career uncertainty' firstly served to code the data. Then, this large theme was broken into two sub-themes: occupational uncertainty and intellectual uncertainty.

4. Reviewing and defining themes. In line with the collaborative consensus approach, these emerging theme and sub-themes were revised by the co-authors as well as an 'external auditor' (Hill 2012), who is a researcher with expertise on identity development theories. This review mainly led to the inclusion of 'personal life' as a supplementary sub-theme of 'career uncertainty'. Any disagreements or differences of opinion were reviewed, and the definitions of themes and sub-themes refined accordingly. Ultimately, the entire process allowed the examination of how career uncertainty influences post-PhDs' identity development.

Findings
In order to contextualise the answers to the research questions, a brief insight on what characterised post-PhDs' situations in the UK and Swiss contexts is first offered. Since the aim of this study is not comparative, we then present our findings by mainly considering common cross-cultural challenges while highlighting national specificities when necessary, focusing first on career uncertainty before turning to its influence on identity-trajectory.

Being a post-PhD researcher in the UK and Switzerland
The main differences between post-PhDs' situations in the UK and Switzerland lie in informal rules and expectations. For instance, in the UK, although there is an increasing tendency to engage in three to five years of post-PhD appointments before applying for permanent academic

positions, it is possible to obtain one directly after the PhD.[1] In contrast, in Switzerland, the tradition dictates that PhD holders need to spend 6 to 10 years in at least one other institution, ideally abroad, improving their skills and diversifying their work experiences before becoming eligible candidates.[2] In both countries, post-PhD research positions remain temporary, difficult to obtain and marked by uncertainty. In our interview sample, more than half of the journey plot visual displays (n=13), in which participants indicated the most significant events that have marked the previous year, were directly related to career uncertainty. Similarly, 37 of the 52 survey respondents (71%) who reported past or present intentions to quit their postdoc evoked career uncertainty as a central reason. Detailed findings, structured to address the three research questions, are presented in the following sections.

What form does career uncertainty take within post-PhD researchers' work experiences?

Our analysis showed that, in the course of post-PhDs' work experiences, career uncertainty seems to come in two recognisable forms: 1) intellectual uncertainty and 2) occupational uncertainty, which are related to different strands of identity-trajectory. When considering research careers, post-PhDs experience intellectual uncertainty in the same manner as do more senior researchers, in relation to their intellectual and networking strands. In contrast, occupational uncertainty is mostly related to the development of post-PhDs' institutional strand and is likely to affect more especially early career researchers. Both forms of uncertainty have a strong impact on participants' agency and comprise two different aspects tightly related to the perception of an inability to control their work situation or a feeling of personal efficacy to cope, or not, with circumstances (Tien et al. 2005).

Intellectual uncertainty
The first aspect of intellectual uncertainty directly influences the development of participants' research expertise and thus their intellectual strand. It refers to their doubts or questioning of their capacities for developing original, valuable ideas that are in line with their field's criteria or the more general fear of not being intellectually recognised in their research communities. In the following quote, Ian recounts a situation that happened a few days after he started his postdoctoral fellowship abroad. During a meeting, his ideas were publicly discredited by his hosting supervisor, a world authority in his field. This situation had destabilised his intellectual self-confidence:

> He told me: 'Hey! Regarding your project: I read it and found it completely trivial' […] This project was important to me. It was the very first project for which, based on the knowledge that I had developed throughout my PhD, I had a strong enough theoretical background to say: 'Okay, there is a gap here, I can develop and work on this'… and then my idea was born, with some feedback from my colleagues, and this idea was accepted and developed… and recognised in Switzerland. Because I received a postdoctoral grant for this idea, and those

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[1] Source : European University Institute
https://www.eui.eu/ProgrammesAndFellowships/AcademicCareersObservatory/AcademicCareersbyCountry/UnitedKingdom
[2] Source : Forum Relève Académique http://www.releve-academique.ch/releve/en/home/au-dela-doctorat.html

grants are highly difficult to get. […] It was very, very hard. It was a complete denial of my researcher identity. (Ian, 5th year, Psychology, Switzerland)

The second aspect of intellectual uncertainty, which is closely related to the development of post-PhDs' networking strand, entails the difficulty of finding peers who share one's ideas or the feeling of intellectual isolation. As Jake, appointed to a temporary position, explains in the following quote, this form of uncertainty tends to hinder the feeling of being part of an intellectual community:

> At the beginning, of course, you expect to be isolated. You expect to spend some time finding your feet and getting to know people. But after three or four months… It's four months now, when I still feel that I haven't found this community. I haven't found this intellectual inspiration or community which enables me to…to find some kind of joy in the research I'm doing, some kind of… It's not just feedback. It's more than feedback. It's support and intellectual discussion, and it's becoming more and more difficult. (Jake, 1st year, Sociology, UK)

Occupational uncertainty
The first aspect of occupational uncertainty refers to individuals' doubts or questioning of their opportunities and capacities to find satisfying positions within or outside academia, and thus to develop their institutional strand. The following quotes, from the survey's open-ended question about dropout intentions, represent examples of how post-PhDs from both the UK and Switzerland talked about occupational uncertainty:

> Continued uncertainty of funding... [I] can't live in limbo forever, and moving every few years is getting tiresome. (Female, 9th year, Health science, UK)

> Because there is no possibility to go further. I need to stay here for family reasons, and there are few professor positions available, and the competition is high. And, it's the fifth time that I have to move since I got my PhD. And I can't. What's the point of keeping going? (Female, 6th year, Natural science, Switzerland)

The second aspect of occupational uncertainty relates to the necessity of constantly thinking about and searching for the next job position. Many participants considered this situation unbearable, as Geri explains here:

> Well, I've just finished a six-month postdoctoral project, and although I was asked to do some other research for a month, still at the same faculty, at the same department, it's just a month. So I don't know what's going to happen next month. So, in March, I may end up unemployed, and this is a very stressful situation. And I'm being interviewed, so I'm also applying for new jobs, and I get interviews, but last week, for example, I was notified that I didn't pass an interview. It's very stressful, and the uncertainty just is killing me, you know, because I'm just not sure whether I will even have a job or not, even though I invest so much and I'm doing everything that I can. I work on my networks, I

publish, I engage in very high-level research, but still, it just doesn't come up to a permanent job, and it's really, really stressful. (Geri, 1ˢᵗ year, Education, UK)

The following figure represents the journey plot of Sue, a post-PhD researcher from the UK in her second year. This visual display, in which she mapped the most significant events that marked her previous year, illustrates more concretely how occupational uncertainty took form in most participants' career paths, whether they were in the UK or Switzerland. As Sue explains, 'It's all about getting a job, and keeping a job, and getting my next job.'
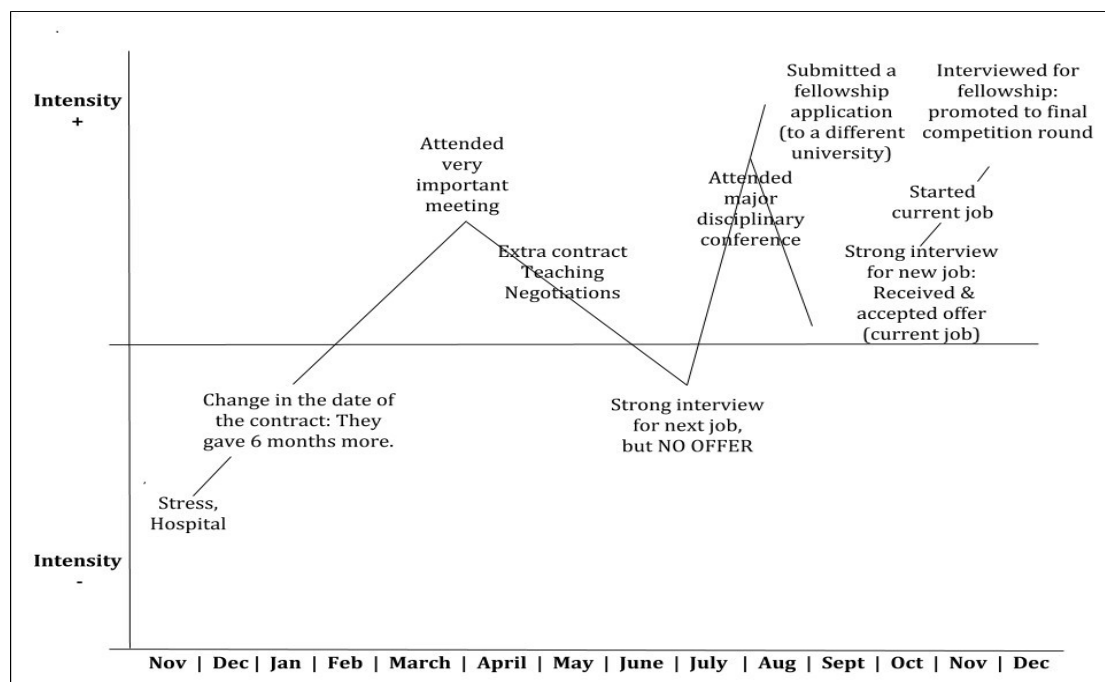
Figure 1. Sue's journey plot

While some participants tended to talk more especially about one or the other form of uncertainty, in most cases both forms seem to be intimately interwoven as they manifest throughout their daily work experiences.

How does career uncertainty manifest on a daily basis?

Based on our analysis, career uncertainty seems to concretely impact participants' day-to-day work lives while also interacting with their personal lives. This career uncertainty manifests more especially through 1) struggles to plan for the future, 2) difficulty in developing one's research, 3) missed opportunities and 4) precarious work–life balance. Often, occupational and intellectual uncertainties are concomitant.

Struggling to plan for the future

The difficulty in planning for the future is the most salient manifestation of career uncertainty that emerged from participants' accounts. At a first level, this issue is related to their institutional

strand while intimately embedded in their personal life by influencing their life goals or inducing financial duress. As the characteristics of our sample indicate, post-PhDs are generally at a crucial life stage where most people have or think about having children and aspire to a stable occupational career situation. Like Faye expressed, many participants considered this issue as central in their current lives:

> Not being able to [make] any plans for the future, not being able to aspire to a permanent position or a higher salary to get a mortgage or stable situation to think about having a family. […] And the fact that you work so hard and you are not…it's not sure that you will get something proportional in return. These are the main problems. (Faye, 7th year, Molecular biology, UK)

For some participants, struggling to plan for the future also manifests at an expertise level, which affects their developing intellectual strand. Jada, who holds a prestigious postdoctoral grant that makes her a PI for five years, explained how she must anticipate her next potential funding:

> So, yes, it's doing research while anticipating future research. Not over a 10-year period, but you need pilot data for your next proposal. So, I must carry on my current research and, at the same time, plan for the next 3-4 years based on what I wish to work on, and collect some pilot data for that. And it's really… planning according to which funding I potentially can obtain. (Jada, 8th year, Neuroscience, Switzerland)

Unlike Jada, who was amongst the only two interviewees awarded a postdoctoral grant, most participants were hired under a non-permanent contract that left them few opportunities to develop their own research expertise.

Difficulty developing one's research

If it seems theoretically possible to reconcile developing one's research expertise and working on a parallel project as part of a post-PhD contract, the reality is different from the participants' perspective. As Abbey expresses in the following, a gap between one's expertise and the research for which one is hired has the potential of transforming into an intellectual uncertainty issue:

> Trying to balance sort of progressing my own research career as well as doing this current job, which is part of the career, but it doesn't focus on my PhD area. That's difficult. When I've discussed it with my line manager, it is supposed to work out that I have a day every week which is my own writing time, but it never works out like that, and I should plan better, and I do try to block out every Friday so it's my own writing day, but then things always come up […] There's just…my work for my managers has to come first because that's what I'm paid to do. (Abbey, 1st year, Sport science, UK)

In the case of participants hired to work on topics very close to their own expertise, some of them rather reported that their temporary contracts implied a lack of liberty that made them feel they were not developing or felt uncomfortable with the project at an intellectual level:

So, I was doing this part-time postdoc, and it was more or less in my subject area. They were looking at [topic 1] and [topic 2]. This is a very interesting area for me, very important area, and I was working on this project, and so I was doing some…I was doing lots of reading; I was helping with some analysis…You know, it was okay, it was fine, but I wasn't developing. It was good for my CV, and I was earning money, but it wasn't…it wasn't intellectually fascinating in many ways. (Rob, 2nd year, Education, UK)

Actually, I no longer have any interest in the research problem on which I'm working… even though I was willing to explore it at the beginning. Now, I find that it's more imposed on me since I have discussed several methodological and theoretical issues of the project [with his supervisor]. I have suggested stopping it, but, I'm asked to continue despite of this. So now, I work on a topic to which I don't feel committed. (Noah, 3rd year, Education, Switzerland)

While trying to reconcile their own research with the tasks they were hired for, some participants also reported how their precarious situations interfered with their career development.

Missing opportunities

Also emerging from our analysis is that career uncertainty manifests through missed opportunities, with an impact on both networking and institutional strands. In some cases, the short-term aspect of many participants' contracts, when it was not simply their post-PhD status, was limiting their possibilities to benefit from career development initiatives or training offers:

 […] one example is that staff members at my University, they can study for [Postgraduate Certificate X] for free, and this is part of the continuous development for staff members. In principle, I'm eligible for that as well because I am a staff member. But in practice, I can't really do it because this is a one-year program, and I'm not sure that I will be here for the whole duration of that. So, you know, it's just something that shows me that, yes, you are eligible, but in practice, you can't really take advantage of this option. (Geri, 2nd year, Education, UK)

[Someone] that I know… she asked for participating in some training workshops that are usually intended for employees, and they told her: 'No, you can't; you're a postdoc.' (Joëlle, 7th year, Social sciences, Switzerland

Furthermore, as Geri highlighted, missing opportunities due to career uncertainty manifests also through a difficulty in developing strong scholarly/academic networks:

I think, again, it all comes down to having a permanent or a more permanent role that enables me to nurture specific relationships within the network because, at the moment… I feel that I have to cultivate so many different relationships because I don't know where will I end up, rather than really focusing on a smaller amount of relationships and really investing in these relationships. (Geri, 1st year, Education, UK)

Apart from the above-mentioned consequences of career uncertainty on professional development, opportunities and networks, it also appeared to create complicated personal and family situations.

Balancing a post-PhD position with personal life

Whether they were parents or not, most participants reported work–life concerns related to career uncertainty. For many participants, having to change workplaces and the assumed mobility that comes with short-term positions had concrete implications for their personal lives, particularly regarding their family relationships or responsibilities. Such was the case of Gord, who found a new temporary position at the same time that his pre-term baby was born:

> […] I'd only just started my new job, and things were really, really difficult, trying to like find my way as a lecturer, with a new child, and my job is also miles away, so it was four hours commuting every day. (Gord, 2nd year, Social work, UK)

Especially amongst participants from Switzerland, occupational uncertainty also manifests through dual-career issues. As illustrated in the following quote, when both partners are researchers, their career trajectories might be hardly reconcilable. Sometimes, the success of one partner might even negatively impact the career opportunities of the other:

> My problem is that my husband just got a professor position [in Switzerland] and he will never quit this position to go elsewhere. […] Of course, I'm happy for him: It was his ultimate goal. But from now, in terms of mobility, my own options are restricted. (Jada, 8th year, Neuroscience, Switzerland)

Ultimately, in both its occupational and intellectual forms, career uncertainty appeared to impact participants' identity development concretely.

How does career uncertainty influence their developing researcher identities?

Our findings revealed two main effects of career uncertainty on post-PhDs' identity development related to the three work strands of identity-trajectory: 1) dealing with a blurred status and 2) clinging to the academic researcher identity. While the first one appeared to be a direct effect of career uncertainty, the second one was more subtle and must be seen as a side effect.

Dealing with a blurred status

Whether they were considered to be employees or held a postdoctoral grant, some participants highlighted the ambiguity that characterised their temporary post-PhD status. On one side, as illustrated in the following quote, the challenges of such a blurred status had an impact on the institutional strand since they were related to their integration within the institution to which they were affiliated:

> What I find hard is that I actually don't have any status. I mean, I'm here but not 'part of it'. It's very destabilising. For example, a few months ago, the university was hosting a reception for the newly hired staff. Then I thought: 'I must go there because I'm a new staff'. So, I went there and…I wasn't on the list! I don't care to

be on the list or not, but where do I belong? What is my status? (Jada, 8th year, Neuroscience, Switzerland)

On the other side, this blurred status appeared to impact participants' perceptions of themselves as researchers and, above all, their feeling of being recognised and respected in their research community, which seems to exacerbate intellectual uncertainty. In the following, Geri explains how her post-PhD status made her feel that she was not part of a research community yet:

> […] as a postdoctoral experience, my feeling is that I am still very much judged on my performance, so, in a way, I still feel like I felt when I was a PhD student. So I'm still judged. I am not really there yet. I'm not really part of the research community. I don't feel like that. I haven't been accepted yet. I am still a Class B researcher here. (Geri, 1st year, Education, UK)

Similarly, Noah reported that because he was collaborating closely with his supervisor, he was often labelled as 'the Professor [X]'s postdoc' by his peers and colleagues. He felt that, as a result, his own contributions were underestimated in his research community:

> I have been feeling more like a subordinate since I'm [a postdoc] than when I was a [doctoral research assistant] […] Since I got my PhD, I'm often reduced to [being the subordinate of professor X]. But, I also have my own expertise and even more than him in certain domains. I would like to be recognised minimally. (Noah, 3rd year, Education, Switzerland)

Clinging to the academic researcher identity

Another interesting effect of career uncertainty on participants' identity development was a tendency to cling to the academic researcher identity. As we reported previously, more than third of participants from both the UK and Switzerland have already thought of quitting their postdoc. For 71% of them, the reason was explicitly related to career uncertainty. In this regard, the idea of becoming an academic researcher appeared for many of them as a powerful motivation to keep going. Especially amongst more advanced post-PhDs, some admitted that, after so many years in academia, they found it difficult to imagine themselves as anything other than academic researchers. Such was the case of Jada:

> I am a researcher: I don't have any other training. And, because I don't have any clinical experience either, I don't have any plan B. So, either I am a researcher or…that's it! (Jada, 8th year, Neuroscience, Switzerland)

Even those who tried to concretely quit academia expressed to what extent the academic researcher identity had remained strongly embedded in their perception of themselves:

> Last year, I tried to change jobs, so I tried not to do a postdoc anymore—to do something different—and it was very hard on me, for multiple reasons. For example, because I realised that it was very difficult to reinvent myself in a different position, as I've always been a researcher since I left university […] (Faye, 7th year, Molecular biology, UK)

Every time I tried to postulate outside academia—I've had two job interviews so far—it's been extremely hard: I felt like torn a part of myself away, as I would abandon so many things. (Joëlle, 7th year, Social sciences, Switzerland)

Discussion and conclusions

This study examined how career uncertainty influences work experiences and identity development amongst post-PhD researchers from the UK and Switzerland. Our findings show that, in both countries, career uncertainty takes two different forms through the course of their work experiences. *Intellectual uncertainty* refers to post-PhDs' doubts regarding their capacities for developing original, valuable ideas that are in line with their field's criteria or the more general fear of not being intellectually recognised in their research communities. It also entails the difficulty of finding peers who share one's ideas or the feeling of intellectual isolation. *Occupational uncertainty* refers to post-PhDs' doubts of their ability to find satisfying institutional positions within or outside academia. It includes a continuous job-searching situation that implies constantly thinking about and searching for the next job position, but largely only in academia. Such feelings were also evident in McAlpine and Amundsen (2016). Those who had been in post-PhD research situations for many years experienced tension between their intrinsic motivation for doing research and their occupational uncertainty. They were anxious, due to the occupational uncertainty yet did not actively seek other career options.

On a daily basis, both forms appeared to strongly impact participants' work and personal lives by limiting their ability to plan for the future, impairing their developing research expertise and scholarly networks and inducing tension as they tried to reconcile work and personal lives. Concerning identity development, participants reported having to deal with a blurred status, which impacts their perceptions of themselves as competent researchers and their feeling of belonging to their research community. However, many of them 'hang tough' despite their precarious situation by clinging to the academic researcher identity. Overall, as Sigl (2016) argued, dealing with career uncertainty appears as a more encompassing challenge than simply seeking to secure a position or outputs; it also fundamentally affects individuals' self-perception and their ability to project themselves into the future.

Several concerns were raised from these findings. First, our analysis shows that work and personal lives are closely intertwined and must be not considered separately when addressing post-PhDs' career issues. In other words, the impact of this uncertainty is expressed in the fullness of each individual's identity-trajectory (McAlpine and Amundsen 2016). For instance, take the case of dual-career couples, when one partner's success may negatively impacts the career opportunities of the other, regardless of the strength of their respective investment in the process. Moreover, while precarious employment prospects often involve adverse financial circumstances (Brechelmacher et al. 2015; McAlpine and Amundsen 2016), post-PhDs with family responsibilities and those who are unable to afford income insecurity are especially disadvantaged in the pursuit of an academic career (Sig, 2016; McAlpine and Amundsen 2016). Second, while access to institutional resources, support from the research community and a broader network promote post-PhDs' positive experiences (Chen et al. 2015; Scaffidi and Berman 2011), the consequences of the blurred status reported by some participants show to what extent career uncertainty might impede establishing oneself as a recognised researcher. Finally,

given the current lack of tenure-track positions, it is surprising to find that some participants reported clinging to the academic researcher identity as a way to maintain their motivation and persist. This difficulty to imagine oneself as anything other than academic researchers is in line with the contradiction observed by Wöhrer (2014) amongst post-PhDs repeatedly declaring intentions to leave academia due to career uncertainty while continuing to apply for academic jobs. One possible explanation is the enduring belief that with enough work, devotion and sacrifice, most talented researchers will find academic positions (Skakni in press). If obstinacy and a willingness to take risks (Brechelmacher et al. 2015) are considered assets when pursuing an academic career, this belief of 'the survival of the fittest' overshadows the actual role of luck as part of succeeding or not in academia (Brechelmacher et al. 2016; McAlpine 2016) and likely contributes to the high levels of stress and anxiety observed amongst post-PhDs (Gloria and Steinhardt, 2016).

While individuals have some responsibility for planning and taking action as regards their career development, it is also true that both doctoral students and post-PhDs still need to be better informed about existing non-academic careers, including those in universities (McAlpine and Amundsen 2016), and better supported in preparing for these types of careers. Since the early 2000s (Golde and Dore 2001), studies internationally have consistently shown that students want more career advice. In light of the preceding, career development should be a core institutional concern and formally integrated into doctoral programs and postdoctoral support schemes. More systematic tracking of post-PhDs' paths also appears necessary to better understand the challenges that mark the different stages of their career.

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