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How do young tenured professors benefit from a mentor? Effects on management, motivation and performance

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Abstract Do young tenured professors who receive mentorship differ from those without mentorship in terms of motivation, scholarly performance, and group management practice? We conducted a survey among research group leaders in the biomedical and health sciences in the Netherlands, to study the effects of mentorship. Our results show that mentorship practices leads to positive results. Young professors who receive mentorship on average have a more positive view on their work environment and manage their research more actively. Furthermore, young professors with a mentor on average perform better in terms of acquired grants. These findings indicate that it is important for universities to actively organize mentorship programs for young senior staff.

Keywords Mentorship · Academic careers · Research management · Human resources · Motivation · Performance

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Introduction

To become an academic more skills and qualities are required than only those that are research related, such as time management, communication, presentation, leadership, management, and networking skills. Kyvik (2012) distinguished six tasks related to the academic researcher role: networking, collaboration, managing research, doing research, publishing research and evaluation of research. Simply stated, having a considerable set of high quality papers is not enough to secure the job and to succeed in an academic career. In general, the academic system is highly competitive and many academics are overwhelmed by their workloads and the range of their responsibilities. There are considerable differences between research careers in different European countries (for an overview see "Appendix 1" in 'Harvesting talent: strengthening research careers in Europe', pp. 19–28, LERU 2010). Musselin (2010) showed that academic career differences (between France, Germany and the USA) are mainly caused by nation-specific university configurations. For example, differences are reported in autonomy, hiring processes, selection principles and incentive mechanisms. Nowadays, more universities are launching formal programmes, designed to assist in scientific career development, productivity and satisfaction for scientists (Kiopa et al. 2009). In the Netherlands, the introduction of mentoring programmes,[1] tenure track systems (Fruijtier and Brok 2007; Freijsen et al. 2011), and the Principal Investigators system[2] are the three most important new initiatives.

Mentoring academics

Research and researchers are increasingly vital resources in modern society. A powerful and internationally competitive research base depends fundamentally on strong cohorts of highly productive and creative researchers, and therefore on the capacity to attract some of the best minds in each generation from the global pool of talent (LERU 2010). Opportunities for intellectually stimulating work, passion for a field of study, and the opportunity to contribute to new knowledge attract people to the academic profession (Bexley et al. 2012). In this paper we focus on the mentoring of academics, especially of starting group leaders: young and recently tenured professors.

Mentorship is a "nurturing process in which a more skilled or more experienced person, serving as a role model, teaches, sponsors, encourages (…) a less skilled or less experienced person for the purpose of promoting the latter's professional and/or personal development" (Anderson and Shannon 1988, p. 40). In formal mentorship programmes, selected academic talents are supervised for a (sometimes fixed) period of time by an experienced professor or director who has already advanced through a similar career. Currently, universities develop and experiment with mentorship and coaching programs to sustain its talents in their job-related development and their upward mobility within their universities. Within these programs young staff members (mentees) have the opportunity to work at their career development with the support of a senior staff member (mentors). Approaches differ between universities. Next to the formal mentorship programs, scientists also develop informal mentoring relationships with colleagues outside any programmatic

[1] At least four Dutch universities introduced from 2011 onwards a formal mentoring programme.

[2] In the Netherlands, the scientific careers of talented researchers are stimulated by the 'Principal Investigator' system, which challenges them to take up leadership and develop their own lines of research (http://www.amc.nl/web/Research/ResearchAMC/Research-Institute.htm). Accessed 28 December 2013.

framework. Generally, mentees can learn from their mentor's experiences on for instance inter- and intra-organizational exposure, networking, building and managing a (diverse) research group, supervising staff, acquiring funds, setting research priorities, etc.[3] To streamline this process, mentees and mentors plan a series of meetings for discussing these topics. Mentorship programmes also help mentors gain a clearer understanding of the questions, problems, and needs that academic talents at universities may face, and preferably offer workshops to acquire the required skills. After obtaining tenure, one also gets a different position and role in the university system. Formal as well as informal mentorship could help young academic researchers to prepare for a (full) professorship. Although mentorship has been studied before, the effects of mentorship on young tenured scientists have hardly been studied. In the following section, we discuss previous studies on the effects of mentorship on academic careers in general, and more specifically on early career researchers. We then formulate the research questions addressed in this paper.

Mentoring as a strategy to improve academic careers?

Over the years several studies have shown the importance of mentorship. Ehrich et al. (2004) conducted a meta-review analysis of more than 300 research-based articles on mentoring in (mainly) education. Their analysis showed that mentoring offers, despite some shortcomings in lack of time and expertise, many far-reaching benefits for mentees as well as for mentors (see Table 1).

Quite a few studies have been done on the importance of mentorship with regard to future careers of mainly *early career researchers*. The benefits of mentorship in academia can be classified within three main categories: (increased) job satisfaction, network building, and (higher) performance. These are necessary conditions for academic career advancement. Firstly, mentors contribute to a higher self-confidence in professional development and satisfaction with the career (Nick et al. 2012) of the mentees. With regard to self-efficacy of (especially young) researchers, Gardiner et al. (2007) showed that the mentoring scheme had positive impact on participants' perception of their own ability to function and perform as members of the academic community. Secondly, from the introduction to the network of the mentors, mentees can obtain resources and establish collaboration. Studies (Kiopa et al. 2009) have shown that mentors may help their mentees to acquire human capital, social capital and resources, such as new knowledge or access to additional resources that otherwise would not have been accessible to the mentees. Furthermore, many academic researchers learn from their mentoring relationships how to collaborate and how to interpret social dynamics of collaboration (Mayer et al. 2008).

Mentorship and scholarly productivity

The mentor may also enhance scholarly productivity of the mentee. For example Steiner et al. (2002) showed that research fellows who had influential mentors were more productive in research early after their fellowship. Collaboration in publication appears to be the most influential role that mentors can play for the careers of early career scientists. Cameron and Blackburn (1981) found that early collaboration with senior faculty signals a social selection process that impacts significantly on publication rate. These indirect effects

[3] Many formal professional mentoring programs are aimed to support underrepresented populations, such as women, to help them to retain their positions and advance in organizations (Bland et al. 2011). However, in this paper we focus on the general effects of mentorship.

Table 1 Positive outcomes of mentorship in education and other professions

Positive outcomes for mentees
Support, empathy, encouragement, counselling, friendship
Helping with strategies, subject knowledge, resources
Discussion, sharing ideas, info, problems with, advice from peers
Feedback, positive reinforcement, constructive criticism
Reflection
Personal development
Positive outcomes for mentors
Collegiality, collaboration, networking, sharing ideas, knowledge
Reflection
Professional development
Personal satisfaction, reward, growth

Source: Ehrich et al. (2004)

of mentors operate not only through early productivity but also through highly rated academic placements (Long and McGinnis 1985). Both have a substantial influence on the later performance of the mentees. Based on their studies on scientific collaboration, Bozeman and Corley (2004) recommend female researchers to collaborate with scientists who act as a mentor, in order to enhance their scientific effectiveness and productivity. A longitudinal study on the mentoring of junior female academics showed that the mentees have also been more successful at receiving external grants than the ones who did not receive mentorship (Gardiner et al. 2007). In addition, mentored faculty are promoted more quickly (Nick et al. 2012).

Mentorship as a determinant of success in academic careers

In a recent exploratory study we compared the careers of 21 pairs of researchers that were considered as very talented in their early careers (van Balen et al. 2012). One of every pair continued his/her academic career, whereas the other had not. Our exploration did not reveal one deciding factor that determines which talents are preserved for the university. We actually found a wide variety of combining factors, in which mentorship is one of them. The study suggests that mentors play an important role, especially when it comes down to career development advice. Support of a mentor in a broader sense was mentioned by various interviewees: "You will not survive without the support of a mentor". And some of the interviewees reported that the absence of a coach or supervisor played a role in their departure from the university. Most interviewees in this study had a mentor and all four interviewees who indicated having been deprived of a mentor, left the university.

Research questions

Despite the growth of mentoring research in the management literature and the research on mentoring of early career scientists such as PhD students, there are relatively few empirical studies on the mentoring of academic leaders, especially young professors. De Janasz and Sullican (2004) reported key reasons for this. Firstly, academic leaders do not view mentorship as a priority ('no need, too busy'). Secondly, the separation of management and the (research) work floor is more permeable in an academic environment compared to

many business organizations. Because management and academic staff share professional (research) interests and experiences, one would expect fewer barriers to career advancement within academia than in business organizations. The few studies on academics show that mentorship plays a significant role in the personal and professional development of academic leaders, as well as on their productivity and performance (Cohen et al. 2012). However, the effects of mentoring on management and leadership activities of group leaders are still unknown. In our study we focus on the starting research group leaders; academic leaders who have up to five years' experience as group leader. Being less experienced, starting leaders may have different mentoring needs. Increasingly, universities offer academic leadership courses for this category of starting research leaders to enhance their leadership skills in a practical way. At the time the empirical data was collected for this paper (2010–2011) formal institutional organisation of mentorship hardly existed at Dutch universities.

In this paper we investigate the relation between mentorship for starting group leaders in biomedical and health disciplines and (1) differences in research management activities, (2) attitude and opinions about work environment, (3) motivation, and (4) differences in scholarly performance.

Data

The data were collected in 2010–2011 in a survey among biomedical and health research leaders (principal investigators) employed by University Medical Centres (UMCs) or by public medical research institutes in the Netherlands. Names and addresses were obtained from administrative records. To maximize the response rate, we used the tailored design method (Dillman 2000). A mail strategy was chosen to collect the data because principle investigators are difficult to reach by phone or in person and have limited access to the web due to heavy workload (including patient care duties). Eventually, 459 leaders[4] returned a completed questionnaire by post, resulting in an overall response rate of 25 %, which seems acceptable regarding target population and chosen strategy (the norm is 36 % ± 13, Baruch 1999). Among the 459 respondents there were 86 group leaders who could be classified as starting group leaders. Within this category 66 % (n = 57) were male, 34 % (n = 29) were female. We did a non-response analysis as far as possible: the respondents are evenly distributed over the various university hospitals, including public medical research institutes, and over the various research fields, suggesting the sample is representative for the population of biomedical and health research leaders.

The survey consisted of 38 questions about the structure and management of their research group, about the research leaders' activities, and about mentorship practices. Questions were asked about the research leaders' motivation (Pelz and Andrews 1966), work environment (Melkers and Welch 2009) and academic leadership practices (Verbree 2011). For most questions we used 5-point Likert scales, with answers ranging from 'totally agree' to 'totally disagree'. To measure performance, we asked the group leaders to indicate in the survey which personal grants they had obtained up to that point.

[4] More information of this survey study can be found in the report: 'A different style of leadership? Effects of career phase and gender on academic leadership practices' (Belder et al 2012).

Results

Prevalence of mentoring

First, we explored the extent to which starting group leaders[5] mentioned an individual whom they consider to be a mentor. In our dataset, 69 % of the starting group leaders have a mentor (Table 2). Next we distinguished between type of mentor: scientific or managerial. A little bit more than half of the starting group leaders receives from their mentor(s) both scientific content oriented advices and academic leadership and management advices.

Gender differences are small and non-significant. The total percentage of starting female leaders having a mentor from who they receive support and motivation (72.4 %) is somewhat higher than starting male leaders (66.7 %).This is in line with earlier studies on mentorship of faculty, suggesting that the frequency of mentoring relationships in academia is not gender biased (Tenenbaum et al. 2001; Green and Bauer 1995; Sands et al.1991; Kiopa et al. 2009).

However, age was found to matter in terms of having a mentor, as differences were found in age between the two groups. Starting P.I.'s who have a mentor (Median year of birth = 1968) are younger than starting leaders who did not receive mentorship (Median year of birth = 1964, U = 476.0). Whether older starting group leaders themselves think that they do not need a mentor or that their work environment (group) has this opinion could not be tested here. Further research on mentorship within different career phases, such as experienced and departing group leaders (Verbree et al. 2013a, b), is needed.

Differences in research management activities

Previous research (Verbree 2011) showed that academic leaders within different life cycle stages are characterized by different academic leadership practices. Starting research leaders, on which we focus in this paper, concentrate on the external positioning of their group. More specifically, starting academic leaders predominantly focus on (1) developing a research agenda and (2) building a reputation by finding a creative research niche (Verbree et al. 2013a, b). What are the effects of mentoring on these management activities? Mentor effects are summarized in Table 3.

To find a creative niche, starting group leaders need to set their own research agenda. In this process group leaders needs to draw on strategic considerations. Starting group leaders who are stimulated by a mentor more often invite external researchers to research strategy meetings of their group. In this way the development of the long-term policy of the group does not depend only on internal expertise, but also profits from the involvement of external experts. A second crucial activity is the acquisition of sufficient funding for the survival and development of the group. Starting group leaders with a mentor put considerably more emphasis on the quality control of research proposals compared to starting group leaders without a mentor. Internal evaluations of research proposals are very common in 66 % of these research groups, compared to 44 % in non-mentor groups. Another goal is to gain visibility in the scientific community. In research groups directed by group leaders with a mentor, the group leaders are always co-author on all the publications of the group members, which is not the case for the non-mentored group leaders.

[5] Most starting group leaders (88 %) are tenured and are employed in some form of professorship: 41 % as an associate professor, 26 % as a full professor and 21 % as an assistant professor.

Table 2 Percentage of starting academic leaders who received mentorship

	Both scientific and managerial mentor	Scientific mentor	Managerial mentor	No mentor	Total
Male	n = 21	n = 12	n = 5	n = 19 (33 %)	n = 57 (67 %)
Female	n = 13	n = 6	n = 2	n = 8 (28 %)	n = 29 (72 %)
Total	n = 34	n = 18	n = 7	n = 27 (31 %)	n = 86 (100 %)

Table 3 Engagement in research and management activities by starting group leaders (Mann–Whitney tests and Chi square tests)

Research management activities	Mentor	No mentor	U/*p* value
Research strategy meetings with external researchers	41 %	19 %	$p = .044$
Internal pre-evaluation of external grant proposals	66 %	44 %	$p = .058$
Co-author all publications of their group[a]			
Median	5.0	4.0	U = 590.0
			$p = .017$
Attending conferences[a]			
Mean	4.02	3.78	U = 648.5
Median	4.0	4.0	$p = .070$

[a] 1 = never, 5 = always

Finally, group leaders with a mentor are more active in sending group members to conferences in order to present their research results to the scientific community and promote the groups' research. Starting group leaders with a mentor more often provide conference attendance as a reward to motivate their group members.

Differences in work environment

We investigated whether starting group leaders who have a mentor have different perceptions of their work environment compared to starting leaders without a mentor. We used a factor analysis (PCA using a varimax rotation) of the items on the work environment, yielding a four-factor solution, which explained 73 % of the variance. More information about the survey questions can be found in the "Appendix 1".

Factor 1 measures how supportive respondents find their work environment for their 'personal development' ($\alpha = .68$). It consists of items like my work environment supports me *'to use my current knowledge and skills to the fullest', 'to acquire new knowledge and skills',* and '*to build my professional reputation'*. Factor 2 measures how strong respondents view their research environment supportive for the development of science ($\alpha = .64$). It consists of items like my work environment supports me *'to work on complex and challenging problems', 'to work on problems that affect society', and 'to make a contribution to my field'*.

The third factor measures how the respondents value the quality of their colleagues and managers ($\alpha = .65$). It consists of items like *'I work with technically competent*

Table 4 Perceptions of the work environment of starting group leaders (Mann–Whitney tests)

Factors	Median[a]		U/*p* value
	Mentor	No mentor	
Personal development	4.00	3.67	U = 552.5/*p* = .009
Research development	4.00	4.00	U = 718.5/*p* = .313
Quality of people	3.67	3.33	U = 608.5/*p* = .075
Rewards	3.50	3.50	U = 758.5/*p* = .408

[a] 1 = strongly disagree; 5 = strongly agree

colleagues', 'I work under technically competent managers' and 'I associate with the top management in my organisation'. The fourth factor represents the respondents' satisfaction with the rewards, such as salary ($\alpha = .59$). Two items were discarded as both loaded high on two factors.

The Mann–Whitney tests (Table 4) revealed that the two groups differed on the factor 'support for personal development'. Starting group leaders with a mentor experience a working environment that is more supportive regarding their own development as a researcher. Secondly, compared to those without a mentor, group leaders with a mentor are more positive (at .075 significance) about the competence of their colleagues over various ranks and in both the group and the organization as a whole.

Performance differences

Do group leaders with mentors perform differently than those who do not have a mentor?

Securing a personal career grant is important – and increasingly necessary – for a successful academic career. In order to receive this type of research funding, researchers have to compete with each other. Universities and research councils have to select the most talented researchers and the excellent research proposals using explicit and also often implicit criteria (Van Arensbergen and Van den Besselaar 2012). In the Netherlands, the Innovational Research Incentive Development (VI) Scheme of the Netherlands Organisation of Scientific Research (NWO) is such a career grant scheme. It aims at encouraging talented, creative researchers to develop their own research line, and stimulates those researchers to enter and remain committed to the scientific profession (NWO 2013). In our sample, 37 % of the PI's with a mentor obtained one (or more) personal grant(s) from NWO during their academic career (see Table 5). Interestingly, for the PI's who have no mentor, this was only the case for 22 %. The differences are important but not statistically significant. This may be due to the relative small size of the sample. Further research is needed here.

Mentorship: support or motivation?

As group leaders with a mentor value their work environment better for their personal development than those without a mentor, mentorship may lead to higher job satisfaction, resulting in higher motivation, and through this in better performance. If that is the case, the effects of mentorship may be motivational, more than informational and supportive. We tested therefore whether starting research leaders with a mentor are more motivated

Table 5 Personal career grants of starting group leaders by mentorship (Chi square tests)

	Mentor	No mentor	Chi squares/*p* value
Personal career grant	64 %	56 %	Chi square = .614/*p* = .433
Innovational research incentive development grant (VI)	37 %	22 %	Chi square = 1.915/ *p* = .166

Table 6 Motivation of starting group leaders by mentorship (Mann–Whitney tests; see "Appendix 2" for the survey questions)

	Median[a]		U/*p* value
	Mentor	No mentor	
Job Involvement	5.0	5.0	U = 720.0/*p* = .525
Job is interesting and stimulating	5.0	5.0	U = 734.0/*p* = .383
Identification with own research	5.0	5.0	U = 140.0/*p* = .140
Job is challenging	5.0	5.0	U = 750.0/*p* = .405

[a] 1 = strongly disagree; 6 = strongly agree

than those without a mentor. This proved not to be the case, and motivation did not correlate with mentorship (Table 6).

Discussion

In this paper we showed that starting group leaders who receive mentorship are more committed to group management, have a more positive attitude towards their research work environment and obtained more personal career grants compared to those who do not. Mentoring offers many far reaching benefits for mentees as well as for mentors. Mentorship, being a mentor or mentee, could be a way to help scientists to survive in academia. As the career opportunities within academia are scarce and universities are dealing with limited resources, obtaining external funding or personal career grants becomes more important. Mentors could play a valuable role in stimulating researchers to apply for these grants. While the competition is very strong and the success rate rather low, mentors could support their mentees in writing and presenting the grant proposal, in order to increase their chances for funding (Van Arensbergen et al. 2013). In this way we suggest that mentorship could stimulate and speed up the career development of scientists. As research by Steiner et al. (2004) showed that individuals who were strongly influenced by their mentors also more often provided research mentorship to others, mentorship seems to be also an important catalyst in the career development of future scientists.

Mentorship could also contribute to closing the gender gap in science. It is obvious, but important to note that the high number of women leaving the academic profession still constitutes an unnecessary waste of talent and could have negative implications for the knowledge economy. At various universities mentoring programmes for female scientific staff members have been developed to promote the advancement of women in science. Although there is a growing share of women throughout all phases in academic careers (Gerritsen et al. 2012), women are still significantly underrepresented in higher ranking

positions. This lack of women in senior positions in science, the so called 'leaky pipeline' (Weber 2009) has been a well-known aspect of gender equality debates in higher education in European countries for many years. An earlier study (Van der Weijden et al. 2011) showed that gender performance differences disappeared in the younger generation of researchers (Van Arensbergen et al. 2013). In order to stimulate the current gender gap debate in science and higher education and to the speed up the process of closing the gender gap in science, we especially recommend female scientists to search the support of a mentor. Already tenured female scientists could also act as a role model mentor for female early career scientists as there are some expectations in the literature that under-represented groups are better served with mentors or role models with similar characteristics of life experiences (Kiopa et al. 2009).

We are aware that mentoring is certainly not the only factor that counts. Academic careers of talented researchers are stimulated or inhibited by an accumulation of (dis)advantages and coincidences (Van Balen et al. 2012). Mentorship, institutional career systems and labour market opportunities are examples of factors that affect academic careers. However, mentorship is a 'tool' that has a dual advantage: it can be stimulated and implemented by both the HRM career policy of the department, institute or university and by the scientists themselves.

Conclusion

Human resources are recognised to be the key to the creation, diffusion, and commercialisation of innovation (Auriol et al. 2010). It is crucial that some of the best intellects in each generation continue to be attracted to research careers, and are given every opportunity to grow in confidence, capacity, ambition and creativity (League of European Research Universities 2010). In this quantitative study among biomedical and health research leaders we explored mentorship as a strategy to improve the standing, shape and excellence of academic careers. Our comparison of 58 starting group leaders who received mentorship with those 28 who not have a mentor seems to confirm the importance of developing mentorship relations in the competition for an academic career. Starting PI's who have a mentor are stronger at managing their research, have a more positive attitude towards their work environment and have a higher scholarly performance with regard to obtained personal career grants. These effects cannot be ascribed to motivational differences, as starting group leaders in general were found to have a very high motivation.

Future Research

This paper aims to study the effects of mentorship on the career of group leaders, in biomedical research. We did find several career aspects that positively correlate with mentorship. However, the question remains whether one may conclude causality in the relationships under study, as it may work partly in the other direction: the better starting group leaders more easily find a dedicated high quality mentor. This may in turn reinforce the career differences.

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Appendix 1

See Table 7.

Table 7 Work environment

Factors	Questions: The environment in which I work enables me to…
Personal development	use my current knowledge and skills to the full
	grow and acquire new knowledge and skills
	build my professional reputation
Research development	work on complex and challenging problems
	work on problems that affect society
	make a contribution to broader technical knowledge in my field
Quality of people	work with technically competent colleagues
	work under technically competent managers
	associate with the top management in my organization
Rewards	earn a good salary
	achieve a higher status in the administrative hierarchy

Five point scale; 1 = strongly disagree, 5 = strongly agree

Appendix 2

See Table 8.

Table 8 Motivation

Items	Questions
Job involvement	Some people are completely absorbed by their work. They are consumed by it day and night. For others it is only one of their interests. To what extent do you feel involved in your work?
	1 = not very involved
	6 = completely absorbed; it is the most important thing in my life
Job is interesting and stimulating	How interesting and stimulating is your current job?
	1 = barely interesting at all
	6 = continually interesting or stimulating
Identification with own research	Perhaps your research is labour of love with which you closely identify; it is like a part of you, your own brainchild. Or it might be just a job that you regard in a more dispassionate and impersonal way. What is your general feeling towards your research?
	1 = I do not identify with my research at all
	6 = I identify completely with my research; it is part of me
Job is challenging	How challenging do you find your current work? Does it demand a lot of you, do you have to concentrate hard, does it stimulate your intelligence?
	1 = barely challenging at all
	6 = extremely challenging; it takes all I have to give

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