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Developing leadership in postdoctoral nurses: A longitudinal mixed-methods study

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ABSTRACT

Background: Postdoctoral nurses have an important role in advancing nursing by generating knowledge and building networks in research, practice, and education which requires effective leadership. Therefore, the Leadership Mentoring in Nursing Research programme for postdoctoral nurses was developed.

Purpose: This study was to evaluate expectations, experiences, and perceived influence of the leadership mentoring programme on leadership and professional development, professional identity, and research productivity of postdoctoral nurses.

Methods: A longitudinal mixed-method study with a concurrent triangulation design was used with data collected through semistructured interviews and online surveys.

Findings: The leadership mentoring programme was found to be valuable by the participants who described strengthened leadership and professional development and development of professional identities. Participants showed increased research productivity and many moved to new/higher positions.

Discussion: The leadership mentoring programme was found to enhance the leadership and professional development of postdoctoral nurses and support them in their academic careers.

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Introduction

Although nursing has been developing as a scientific discipline over the decades, the use of research and translation of evidence into clinical practice is still limited (Fink et al., 2005; Melnyk et al., 2018; Oostveen et al., 2017; Ozsoy et al., 2008; Profetto-McGrath et al., 2012; Squires et al., 2011). In many health care organizations, nurses do not see research as part of daily practice and have limited knowledge on evidence based practice (Melnyk et al., 2018), and strategic managers often have limited research knowledge resulting in a lack of commitment to support nursing research (Berthelsen et al., 2017; Richards et al., 2018). Therefore, in many countries the nursing research culture and infrastructure for nursing research is fragile and lacking essential elements of sustainability.

Postdoctoral nurses (PNs) are educated at the highest academic level (PhD degree) and have professional expertise in conducting research, translating evidence into clinical practice, co-lead patient outcome improvement initiatives, and teaching (Breslin, 2016; Broome, 2012; Aiken et al., 2014). PNs generally work in academic positions, combining different part-time positions and roles in research, education and/or clinical practice (Dreifuerst et al., 2016; Morin, 2004). They have an important role in advancing the empirical foundation of nursing, nursing science and nursing education by generating new knowledge and building networks in research, clinical practice, education, and policy (Achterberg et al., 2006; Dreifuerst et al., 2016; Potempa et al., 2008; Richards et al., 2018; Thompson & Schwartz Barcott, 2019). Although the exact number of PNs in European countries is not known, PNs in Europe are a small part of the nursing workforce (Institute of Medicine, 2010). Studies have shown that PNs experience difficulties with advancing their careers as they are faced with a lack of advanced positions and career pathways enabling the career advancement (Berthelsen et al., 2017; Dreifuerst et al., 2016; Drenkard, 2013; Heinrich, 2005; Lange et al., 2019; Rew, 2014; Segrott et al., 2006; Taylor & Cantrell, 2006; Wilson-Barnett, 2001). PNs operate in a competitive scientific world, usually alongside fulltime researchers, who are embedded in the structures of more traditional disciplines. Combing multiple part-time positions often creates high workloads, leading to stress as many experience a lack of time for engaging in research resulting in limited research productivity (Al-Nawafleh et al., 2013; Bittner & Bechtel, 2017; Bittner & O'Connor, 2012; Branden & Sharts-Hopko, 2017; Lange et al., 2019; Segrott et al., 2006; Smeltzer et al., 2015).

PNs need to develop strong transformational and relational leadership to be able to successfully navigate between the worlds of research, clinical practice, and education (Barry et al., 2019; Cummings et al., 2018; Lange et al., 2019; Long et al., 2013). Doctorally prepared leaders in nursing are important for realizing high quality research in health care as they bring unique expertise in research, innovative educational approaches, patient management knowledge, theoretical and statistical expertise, and political awareness (Broome, 2012). The need to provide leadership opportunities for PNs has been emphasized over the last decades (Branden & Sharts-Hopko, 2017; Hafsteinsdóttir et al., 2017; Hamers, 2012; Morin, 2004; Segrott et al., 2006; World Health Organisation, 2017). However, lack of leadership in nursing was identified by various reports calling for immediate action to strengthen leadership to ensure accessible, available, acceptable, qualitative, and cost-effective nursing care within a rapidly changing health care context (All-Party Parliamentary Group on Global Health (APPG), 2017; Sigma Theta Tau International, 2020; World Health Organisation, 2017). The first State of the World's Nursing Report (2020) urges governments to invest in massive acceleration of nursing education and infrastructure, to meet the pressing demands of health care and to strengthen leadership of nurses to ensure that nurses have an influential role in health policy formulation and decision-making and contribute to effectiveness of health care systems (World Health Organisation, 2020). Transformational relational leadership in nursing is associated with better patient outcomes, like higher patient satisfaction and lower mortality (Wong et al., 2013) and improves workforce and organizational outcomes (Cummings et al., 2018).

Mentoring is an appropriate method to enhance leadership and professional development of PNs. A systematic review that summarized the findings of studies investigating mentoring of PNs working in research, found that mentoring was associated with improved research productivity, improved research knowledge and skills, increased number of scientific peer-reviewed publications, increased number of grants submitted/funded, enhanced research collaborations and collaborative networks, and improved research career development. Mentoring was also associated with improved leadership knowledge and skills, improved health and well-being, stronger empowerment, lower faculty job-stress and higher job-satisfaction, as well as improved staff relationships, and enhanced culture of collaboration (Hafsteinsdóttir et al., 2017). Although mentoring in nursing and academia has strong tradition in some countries like in North America (Brodi et al., 2016), where different forms and types of mentoring are used (Brodi et al., 2016; McBride, 2017; Nolan et al., 2008), this is not the case in European countries where there is a limited tradition for mentoring. However, with the shortage of experienced faculty in nursing (Sorkness et al., 2017), there is a limited availability of faculty members to serve as mentor, often due to heavy research and teaching requirements and due to the limited tradition of mentoring in many countries. Therefore, establishing mentoring trajectories for PNs may be challenging (Hafsteinsdóttir et al., 2017).

Despite the various leadership and mentoring programmes existing, these are generally provided by organizations in North American countries, with limited opportunities in Europe and most of the programmes identified were not evaluated thoroughly (Hafsteinsdóttir et al., 2017). Based on this background the Leadership Mentoring in Nursing Research (LMNR) programme was established in the Netherlands with an overall objective to increase the cadre of nurse scientists, strengthening nursing research within nursing faculties, and improving the research productivity and career development of PNs (Hafsteinsdóttir et al., 2020). This paper reports on a longitudinal evaluation of how PNs experienced following the 2-year LMNR programme—and the perceived influence on their leadership, professional development, professional identity as well as their research productivity.

Methods

Design

A longitudinal mixed-methods study with a concurrent triangulation design was conducted. Data were collected through semistructured interviews and a survey to gain a comprehensive understanding of the PNs' expectations, experiences, and perceived influence of the leadership mentoring programme on leadership practices, professional development, professional identity, and research productivity (Creswell et al., 2013). Interview and survey data collected at the start of the programme (t0), after 1 year (t1), and after finishing the programme (t2) were analyzed separately, blended, and presented using the Kirkpatrick's Four Levels of Training Evaluation (Kirkpatrick & Kayser Kirkpatrick, 2016). The study was conducted from February 2016 to May 2018 in the Netherlands.

Sample and Setting

Of the 14 PNs that applied for participation in the leadership and mentoring programme, 12 PNs were selected for participation after a competitive selection procedure. Applications were reviewed by an independent National Advisory Committee including: three Professors, a Dean, and two leading nurse representatives. Selection was based on the scientific profile of the applicant and the quality of the intended line of research as well as the importance of the research for the clinical practice. PNs were eligible to apply for the programme if they: (a) had a nursing degree; (b) had doctoral or PhD-degree; (c) worked in research for at least 1 day per week at a University Medical Center (UMC), University of Applied Sciences (UAS) or Research Institute (RI); (d) worked in at least a 0,75 fulltime equivalent (75%) academic position in a nursing science faculty; (e) with no more than 5 years' experience as PN at the start of the programme; and (f) the institute where the applicant works supports the application, enabling the applicant to follow the programme. In this study PNs are defined as nurses who have finished a PhD who may work in wide range of positions with focus on research, teaching and clinical practice in various settings and organizations. We do not refer to PNs as having a "postdoctoral" position.

The Leadership Mentoring in Nursing Research Programme

The 2-year LMNR-programme aims to enhance PNs' leadership and professional development and to strengthen the participants' abilities to develop strong research programmes and to establish (inter)national research collaborations. The program includes four components: (1) Five 2-day gatherings interspersed with ten 1-day meetings, were fellows followed training, workshops and discussions with (international) experts on leadership and professional development, focusing on research, the development of successful research programs and research collaborations. (2) Individual leadership development plan based on a baseline leadership assessment using the Leadership Practices Inventory (Kouzes & Posner, 2013b) to identify their areas of improvement. The fellows work with the leadership development plan throughout the programme. (3) Individual mentoring trajectories with a leadership mentor and a research mentor which were senior faculty members were chosen by the fellows based on their knowledge and willingness to invest time and expertise into the fellow's development. Also they needed to be generous, resourceful, share his or her own network, and support the fellow with navigating the organizational, political structure, and culture of organizations and are open to new ideas and willing to take risks. At last, the mentors needed to show effective communication by being able to listen, provide constructive and critical feedback. In the programme we emphasized the importance to reach out to experts abroad who did research in the same area as the fellow, which would provide opportunities for collaboration. The participants selected and approached their mentors themselves. (4) Visit to a research center abroad to meet international research experts and to establish international research networks across countries. In addition, an underlying intent was to support the development and expansion of robust professional (inter)national networks between the fellows and leading experts in research, providing them with additional sounding board outside their home institutions.

Three guiding principles were used when developing the leadership mentoring programme. First, it was determined to be important to develop a program based on the evidence identified from the literature and earlier successful leadership and mentoring programmes. Second, it was determined to be important to identify and decide on theoretical underpinnings of

the programme. The model of Exemplary Leadership (Kouzes & Posner, 2013a) had a central place in the theoretical underpinning of the programme. Third, to ensure that the program would fulfill the intended need, input from key stakeholders was essential to establish the program's scope, format and operations (Hafsteinsdóttir et al., 2020). Details of the programme development are described in an earlier paper (Hafsteinsdóttir et al., 2020).

Data Collection

Data were collected at the start of the programme in 2016 (t0), after 1 year in 2017 (t1) and after finishing the programme in 2018 (t2). All participants were invited to this study and all agreed with participation. In-depth semistructured interviews explored participant expectations and experiences of following the programme. The interviews were conducted by two researchers not involved in the development or execution of the programme (MK/SC). The interviews were held at locations preferred by the participants with one of the interviews present. Interviews were mostly held at the academic workplace. For the interviews at t1, there was no fixed interview guide as the interviews were held based on principles of open interviews. Participants were invited to introduce themselves followed by hopes, fears and expectations regarding the LMNR programme. The interviews were narrative in nature, inviting participants to share whatever they felt was important about themselves, their expectations and experiences regarding the programme. A conscious effort was made for the interviewee rather than the interviewer to lead the interview. Peer review and feedback on interview technique between the researchers took place after the first interviews. Thematic analysis of the interviews at t0 provided themes for subsequent interviews at t1 and t2 (Braun & Clarke, 2006). The interviews remained open in nature, inviting participants to elaborate on the themes, as well as introduce new topics. All interviews were audio-recorded and an audit trail was maintained to explicate relevant impressions and decisions. The interviews lasted 51 min on average with a range between 24 and 80 min.

Several strategies were used to strengthen the credibility, transferability, confirmability, and reflexivity, and thereby strengthening the trustworthiness of this study (Lincoln & Guba, 1985). To increase data credibility, study activities were performed collaboratively with researchers critically reflecting on the data and validating the findings. All members of the research team were experienced researchers who were familiar with the context in which the PNs are working as well as the leadership and mentoring programme. To enhance transferability, a detailed description was made on the context of the programme, sample, demographics, and the findings were supported with exemplary quotes. Confirmability was secured by field notes and an audit trail of initial interpretation and decisions. All authors agreed with the final themes and rapport.

Measures

The surveys focused on the development of leadership practices, professional group-identity, and research productivity.

a) *Leadership practices*. Leadership is described as "*the art of mobilizing others to want to struggle for shared aspirations*" (Kouzes & Posner, 2013a) and is seen as a process of social influence within and across groups toward achieving goals that reflect a common vision (Northouse, 2004; Shortell & Kaluzny, 2006). The theoretical model of Exemplary Leadership was used describing the five leadership behaviors shown by leaders: (1) Model the way; (2) Inspire a shared vision; (3) Challenge the process; (4) Enable others to act; and (5) Encourage the heart (Kouzes & Posner, 2013a). These leadership practices were measured with the Leadership Practices Inventory (LPI) (Kouzes & Posner, 2013b), a 360° instrument including a self-assessment (LPI-SA) and observer assessments (LPI-OA), filled in by managers and/or colleagues. The LPI measures the frequency of 30 leadership behaviors, categorized into the five aforementioned practices, each including 6 items scored on a 10-point Likert scale (range: 1 "almost never" to 10 "almost always") (Kouzes & Posner, 2013b). The LPI has shown strong internal reliability (Cronbach's alpha > 0.75) (Posner, 2016; Posner & Kouzes, 1993; Regelink & Hafsteinsdóttir, 2016). The LPI was translated and validated in Dutch and showed an item content validity index of 1.0 (20 items) and .8 (10-items) and a scale content validity index of 92% (Regelink & Hafsteinsdóttir, 2016).
b) *Professional identity*. Professional identity was defined as *one's professional self-concept based on attributes, beliefs, values, motives, and experiences in terms of which people define themselves in a professional role* (Ibarra, 1999). Professional identity was measured using the "In-Group Identification Scale" (Leach et al., 2008) with 14 statements in five components describing the extent to which the participants align with different identities using a seven-point Likert scale (range: 1 "strongly disagree" to 7 "strongly agree") (Leach et al., 2008). The construct validity of the In-Group Identification Scale is examined and showed strong correlations between the five components (Leach et al., 2008).
c) *Research productivity*. Research productivity was measured with the Tschannen-benchmark dividing scholarly productivity into accepted publications and presentations as well as funded grants, ranked in 5-year periods (Tschannen et al., 2014).

The participants received digital surveys by e-mail and were responsible for sending the survey to their observers for 360° feedback.

Data Analysis

Interviews were thematically analyzed guided by the steps of Braun and Clarke's (2006): (a) becoming familiar with the data; (b) generating initial themes; (c) searching for main themes; (d) reviewing main themes; (e) defining and labeling themes. All interviews were transcribed verbatim, coded using pseudonyms, and subsequently analyzed by two researchers (S.C./M.S.). Interviews at t0 were coded by each researcher separately, then themed during a critical dialog until consensus was reached on a thematic framework. The report with the themes derived from the interviews at t0 was initially presented to participants for member-checking. They were invited to read the report and identify whether they felt their personal narrative was sufficiently represented and if additions and/or corrections were needed. Amendments were made by the researchers before presenting the report to the research team. The thematic framework enabled a smoother analysis at t1 and t2 and did not inhibit the emergence of new themes. The thematic analysis, member-checking, and presentation of reports were repeated at t1 and t2. Dedoose was used to store and analyze data (Version 8.0.35).

The survey data were transferred into SPSS at t2. Individual participant LPI self-assessment scores (LPI-SA) scores per leadership practice were calculated for t0-2. Group average scores per leadership practice were also calculated for t0-2. Individual and group scores were compared between t0, t1, and t2. A similar approach was used to analyze observer assessments, with the average score of four observer scores being calculated first by the researcher (LvD).

The professional identities participants most strongly related to were described and compared across t0, t1, and t2 on an individual level and were presented in a descriptive manner. Research productivity was measured in terms of number of publications, presentations and grants. The research production was described per individual per year and the individual scores were added up to present the research productivity of the participants (L.D.). The Statistical Package for the Social Sciences (SPSS) was used for analysis and storage of the quantitative data (Version 25) (Field, 2013).

After analyzing the survey and interview data, the data were merged and reported using the Four-Level Training Evaluation of Kirkpatrick's Model (KM) (Kirkpatrick & Kayser Kirkpatrick, 2016). The first KM-level (reaction) describes satisfaction with the programme, the second level (learning) describes changes in participants attitude and skills, the third level (behavior) describes the participants ability to transfer new knowledge, skills, and attitude into working practices and the fourth level (results) describes results from the new knowledge, skills, and attitude (Kirkpatrick & Kayser Kirkpatrick, 2016).

Ethical Considerations

This study was conducted according to the Declaration of Helsinki (World Medical Association (WMA), 2019) and ethical approval was obtained from the Dutch Association for Medical Education Ethical Review Board (NVMO-ERB, #636). All participants signed an informed consent form before participation and anonymity was secured by means of: (a) data collection and analysis by researchers not involved in the programme; (b) transcribing of interviews by an external office with a code of confidentiality; (c) anonymously reporting of data and citations using pseudonyms (not gender-matched) and identification codes. T.H., M.S., and L.S., who were involved in the execution of the programme, only had access to the coded and aggregated data.

Findings

Description of Sample

All participants of the LMNR programme were included in the study and these were nine women and three men with a median age of 44 years (range 30–54 years). All 12 participants had a research position and nine participants combined this with another position in teaching, clinical practice and/or management. The participants were employed at an UMC (n = 12), some also at an UAS (n = 5) and they had positions as postdoctoral researcher (n = 6) and/or senior researcher (n = 4) and teacher (n = 7). Of those working (part-time) in an UMC, the majority worked in research and were employed as senior researcher, postdoctoral researcher, or assistant professor. Those working (part-time) at an UAS were appointed as teacher and postdoctoral researcher. The median time from receiving a PhD-degree was 3.5 years (range 2–8 years; Table 1).

Missing Data

After 1 year, two participants withdrew from the programme because of personal circumstances, but both took part in the interviews at t0 and one at t1. Their experiences are included in the findings but no quotations were used. No quantitative data were available from these two participants at t1 and t2.

Of the 10 participants who completed the programme, in total, two LPI self-assessments were not returned at t1, one LPI observer-assessment was not returned at t1 and six LPI observer-assessments were not returned at t2.

Expectations and Experiences With Following the LMNR-Programme (KM-Level 1)

Prior to the leadership mentoring programme, all participants saw participation in the programme as a valuable opportunity to strengthen their

Table 1 – Demographic Characteristics

Variables	Frequency	Median (Min–Max)
Gender		
Female	9	
Male	3	
Age, years		44 (30–54)
21–30	1	
31–40	3	
41–50	3	
51–60	5	
Living situation		
Living together no children	4	
Living together with children	7	
Living alone	1	
Age, PhD received		39 (26–51)
21–30	2	
31–40	5	
41–50	4	
51–60	1	
Years since PhD received		3.5 (2–8)
0–2	2	
3–5	7	
6–8	3	
Combined (part-time) position		
Yes	9	
No	3	
*Positions**		
Clinical nurse	2	
Manager	1	
Teacher	7	
Policy offer	2	
Senior researcher	4	
Postdoctoral researcher	6	
Assistant professor	2	
Associate professor	0	
Professor	0	
Areas of work		
Research	1	
Research and teaching	3	
Research and clinical practice	1	
Research, teaching and clinical practice	2	
Research, teaching and management	3	
Research, teaching and other	2	
Time working in research (days/week)		
1–2 days	3	
3–4 days	8	
*Type of organization**		
University Medical Centre	12	
University of Applied Science	5	
Mental health organization	1	
Previous experience as mentee		
Yes	6	
No	6	

* Participants worked in more than one position and/or organization.

leadership and professional development. They hoped that the programme would give them an opportunity to step out of their everyday routines and strengthen their professional development as researchers.

These expectations were met since all components of the programme were positively evaluated. The programme created opportunities to reflect on own behavior as well as their working context. The various programme components enhanced leadership and professional development: The group workshops were highly valued as they were informative, innovative, and relevant for the achievement of personal goals. *"I gathered a lot of new knowledge, but not only in a passive way, but also on how to apply what I learned. For example how you can use this new knowledge in your work setting" (Inez, t1)*. The "meet the expert" sessions, where leading experts talked about their leadership development and other topics were also highly appreciated. They shared inspiring stories of their career paths, which participants could easily relate to. *"It was impressive how open the experts talked about themselves, their own pathways, experiences, successes as well as their struggles. Their vulnerability was very impressive" (Brent, t1)*. Participants worked on own personal leadership development plans based on the results of the LPI-assessments at t0, with personal goals, which enabled conversations with mentors. Although the mentoring trajectories varied widely, all were highly valued. All participants had two mentors and most had at least one mentor from abroad. One participant described it as: *"Mentoring is really beneficial. It has broadened my view. Reflecting with mentors from outside my organization was really helpful, because they are more objective. They have no conflicts of interest and it was really interesting and helpful to learn more about other universities" (Sarah, t1)*. Mentoring was perceived particularly valuable when the mentee took the lead on the topics discussed and the mentor acted as a critical companion. One participant described this as: *"My mentor was the one who triggered me, asked critical questions in a way that challenged me to step out of my comfort zone" (Joan, t2)*. All participants visited a research center abroad and described this as a positive experience in terms of acquiring new knowledge, perspectives and establishing international collaborations.

The participants referred to the learning environment as a critical factor contributing to the success of the programme. A safe learning culture, with openness and equity, was established. One participant phrased this: *"The safety in the group was very important. It was really empowering. There was much space to share things that were difficult and look for a solution together" (Joan, t2)*. Some participants described how this learning community helped them feel less isolated in their work. *"Most of the time I work alone. My area of research is different from other scientists in my organization. For me it is really helpful to discuss and reflect with other nurse scientists" (Dora, t1)*.

The participants also expressed some critical comments. Paying more attention to translating new leadership knowledge into daily work was important. One participant said: *"Translate the theoretical knowledge into concrete actions. You can gain information for years, learn more, but I'm interested in how to translate this knowledge into my own work. How can I use this knowledge?" (Inez, t1)*.

Influence of the Programme on Leadership Perspectives and Practices (KM-Level 2 and 3)

The participants described a nurse leader as someone with a strong vision, who is able to articulate this vision to a wider public. Nurse leaders are reliable, credible, courageous, and positive. This contrasted with initial views of leadership, generally associated with hierarchical position, not resonating with their own situation. Views on leadership, however, evolved, as evidenced by the participants accounts describing leading self, leading a research programme, and leading others.

Leading Self

An important element of the programme were reflection sessions aiming to support participants in becoming more conscious of who they were, how they behaved and what they stood for. *"The LMNR-programme provided insight into my barriers, pitfalls and perspectives and forced me to look at the bigger perspective of what I was doing. This helped me to gain self-confidence" (Sarah, t2)*. Deep reflections on their own behavior and difficulties in relation to their development were experienced as empowering, helping them move forward into new phases in their career.

The participants reported growth in self-confidence and ability to make decisions based on personal goals. *"I think I'm more confident now and I'm able to articulate myself better. I'm able to say what I want and what I don't want, and make choices on this" (Brent, t1)*. The empowering impact was also evident in how participants articulated their vision to others. *"I have learned that it is okay to think about what is important to me. My view is important as well. Before I used to go with the views of others. I have made steps in this and I want to continue this" (Gerry, t1)*. The participants indicated that the programme helped them to take initiative, follow their own paths and make decisions based on their values and beliefs. Increased awareness of political aspects of academia was acknowledged by some. *"These political games, you witness them and think,—this is about university-politics, not about the content. I recognize these situations better and I think that we as nurse scientist should be present at the policy table" (Dora, t1)*.

Leading Own Research Programme

The participants described the value of the programme in strengthening their research programme. *"I strongly focused on defining and developing my research programme. Together with my mentors I decided which actions were essential and which actions were not" (Gerry, t1)*. This meant making challenging decisions like changing research focus, promoting themselves as principle investigator, or even not agreeing with their professor.

The participants shared that the programme helped them to position themselves as researchers and their research more effectively. Multiple methods and media were used to share visions to the national and international community. *"I have found my voice, I talk with others more freely now about my views. I have grown in this" (Sarah, t2)*. Consequently, the participants felt better able to make strategic decisions and to strengthen networks and collaborations at various levels: (inter)national and within private and public sector organizations. *"Now I'm talking with professionals from all kinds of organizations to strengthen my line of education and it's position by looking for opportunities to collaborate and apply for funding together" (Eric, t1)*.

Leading Others

Participants described becoming more competent in leading others, like being less controlling and willing to take a step back to give others an opportunity to grow. This was particularly visible when supervising PhD-students. *"Two weeks ago I had an evaluation with one of my PhD-students and she said: "I don't know what happened but I feel like you have changed and I'm allowed to do more. You say: "Go and try," but earlier you were more protective." I don't know exactly what happened but I think this had to do with my personal growth" (Joan, t1)*. Some also described leading others on a higher level and beyond own team by having a vision extending further than own research and sharing this with others. *"A leader is someone with a vision, with a dot on the horizon, a vision about the nursing discipline and is able to carry this vision through together with others, by enthusing and encouraging them" (Sarah, t1)*.

Development of Leadership Practices

Of the LPI self-assessments, eight participants had a higher total score on the LPI self-assessment at t2 compared to t0, one participant had a lower score whereas one participant's total score remained the same at t2 (Table 2). Nine participants scored higher on the subscales "Encourage the heart" at t2 compared to t0; eight scored higher on "Inspire a shared vision" and "Challenge the process" and six participants scored higher on "Model the way " and "Enable others to act". The relative subscale patterns also changed. At the start of the programme, the highest average scores were for "Enable others to act" and "Encourage the heart" and lowest average scores for "Challenge the process." By the end of the programme, the highest

Table 2 – Total LPI-Scores Per Participants

Part. No.	T1, 2016	T2, 2017	T3, 2018
1	230	240	258
2	249	205	212
3	256	214	267
4	172	205	234
5	231	259	240
6	232	244	232
7	229	240	251
8	215	250	256
9	229	257	257
10	272	278	278
11	198		
12	210		

Table 3 – LPI Self-Assessment Scores Per Leadership Practice

Leadership Practice *Self-Reported Scores**	2016, t0 Median (Range) (*n* = 12)	2017, t1 Median (Range) (*n* = 10)	2018, t2 Median (Range) (*n* = 10)
Model the way	46.5 (34–54)	50 (42–54)	48.5 (44–54)
Inspire a shared vision	43.5 (30–54)	48.5 (36–55)	48.5 (43–46)
Challenge the process	42 (29–55)	47 (41–56)	49.5 (40–58)
Enable others to act	48 (39–58)	51 (39–58)	52 (43–58)
Encourage the heart	47.5 (36–55)	50.5 (41–57)	50.5 (41–57)

* Scores on the LPI practices range between 0 and 60 with higher numbers indicating more frequently shown leadership behaviors.

average scores remained "Enable other to act" and "Encourage the heart" but the lowest average scores were for "Model the way" and "Inspire a shared vision." The largest growth was seen on the practice "Challenge the process" (Table 3).

When comparing the observer assessments scores of t0 to t2, all participants received higher average scores from their observers on the subscale "Enable others to act," nine participants improved their scores on "Model the way," seven scored higher for "Encourage the heart" and six received higher scores on "Inspire a shared vision" and "Challenge the process." The average observer scores for all subscales improved between t0 and t2. At the start of the programme, the observers rated the participants highest on "Challenge the process" and lowest on "Inspire a shared vision" and "Enable others to act." At the end of the programme, participants scored highest scores on "Enable others to act" and "Model the way" and lowest on "Inspire a shared vision." The largest growth was seen on "Enable others to act" (Table 4).

In the interviews, participants described improved leadership in leading self, leading own research programme and leading others, which is supported by improved scores on the LPI-assessments. Improved scores on the observer assessment indicate that the participants were successful in translating their improved leadership into their workplace setting.

Influence of the Programme on Professional Identity (KM-Level 2 and 3)

In both surveys and interviews, participants described a strong professional nursing identity. One participant stated: *"In the past I used to say: I'm just a nurse. I changed this habit. I'm not just a nurse! I am happy to be a nurse and I am proud of it and I am proud of what I have learned over the years and I do not want to hide this" (Brent, t1)*. The strong nursing identity experienced, which was not limited to nurses working in clinical practice, even grew stronger throughout the programme.

At the start, the In-Group Identification assessments demonstrated that most participants described themselves as a postdoctoral researcher, nurse scientist or nurse researcher which had not changed at the end of the programme. However, many participants described having different priorities in when describing their identities after changing positions. The participants talked about how they became more aware on how to present themselves and their professional identity throughout the programme. One said: *"As a nurse I avoided the spotlight, but now I have learned to put myself in the foreground in a positive way, which is very functional. I have become less modest. This has also impacted my identity as a nurse" (Eric, t1)*. Although the participants had a better understanding of their identities, many still had to deal with unfamiliarity or misunderstandings by others. One participant said: *"I still struggle with how I present myself. Am I a nurse, researcher, nurse researcher or epidemiologist? How I present myself depends on the context. Sometimes, when I present myself as nurse researcher, I have the feeling that others do not take me seriously. Once a physician asked me if I was going to collect data for his research. Another time someone asked me if I was a nurse or epidemiologist. I thought about this and said I was both. A physician, however, would never have to answer this question" (Dora, t1)*. Throughout the programme the participants became more equipped to

Table 4 – LPI-Observer Scores Per Leadership Practice

Leadership Practice *Observer Scores**	2016, t0 Median (Range) (*n* = 48)	2017, t1 Median (Range) (*n* = 39)	2018, t2 Median (Range) (*n* = 34)
Model the way	46.8 (36.3–50.5)	46.6 (44.5–51.3)	50.8 (43.3–51.3)
Inspire a shared vision	45.6 (41.8–51.5)	45.3 (34.8–50.8)	47.8 (43.5–52.3)
Challenge the process	49.5 (41.3–51.3)	45.5 (40.8–53.3)	49.8 (44–52.3)
Enable others to act	45.6 (41.8–51.5)	50.5 (43.3–53.3)	52 (46.8–55.8)
Encourage the heart	47.1 (36–50.5)	48.6 (45.3–54)	49.8 (46–55.33)

* Scores on the LPI practices range between 0 and 60 with higher numbers indicating more frequently shown leadership behaviors.

deal with this as they became more aware of their different identities and the importance of integrating these during the programme. *"The programme had most impact on my identity as a researcher, but I'm always aware of my identity as a nurse and lecturer as well". The programme helped me to understand that these identities can be combined and help me to become a stronger researcher" (Sarah, t2).*

Together all participants wrote a position paper on the Quality of Nursing Care and the importance of nursing research. Writing this position paper contributed to the development of their group identity as a group of PNs who all had were passionate about nursing and had the ambition to improve nursing which. This group "feeling" was strengthened throughout the programme.

Influence of the Programme on Visibility, Positions, and Research Productivity (KM-Level 4)

Participants described how the programme helped them become more visible within the (inter)national nursing (science) community. One aspect strongly contributing to the nationwide visibility of the participants was a position paper they wrote as a group. This paper expressed their vision on nursing science and emphasized the importance of research for strengthening the quality of patient care and the need to invest in the infrastructure for nursing research. The position paper was signed by important national stakeholders and handed over to the minister of Health. One said: *"It is good to see that the manifest generates attention and action. Many important people talked about it. It's good to see and experience this" (Brent, t2).*

Throughout the programme eight participants advanced their career by moving into positions with greater responsibility and influence and three participants advanced to assistant or associate professor. More participants made critical career decisions such as ending positions in teaching or patient care, to focus more on their research. Only two participants remained in the same position.

During the programme the participants showed large and varied research productivity (Table 5). Ten participants wrote 26 successful grant applications, (co)authored 92 publications in scientific journals, and presented 187 times at (inter)national congresses after they started with the programme. In the interviews, participants shared that they were convinced that this research output was related to participation in the leadership programme.

Discussion

This longitudinal mixed-methods study evaluated the 2-year leadership mentoring programme for PNs and provides insight on how such a programme can positively influence leadership and professional development, professional identity, research productivity, and visibility of PNs. With regard to reaction (KM-level 1), participants highly valued all components of the programme which was found to meet their expectations. With regards to learning (KM-level 2), participants described how a safe learning culture combined with workshops, expert sessions, reflection sessions, and mentorship enabled leadership and professional development. With regards to behavior (KM-level 3), participants' descriptions and LPI scores demonstrated transfer of new leadership skills into daily working practices. They became better equipped at leading themselves, others and their research programme. Awareness of a nurse researcher identity grew, as did the possibility of integrating multiple identities when presenting themselves. With regards to results (KM-level 4), the participants showed high research productivity, increased visibility as well as career development through successful applications for new positions. At all aforementioned levels (KM), the PNs descriptions of their leadership and professional development, professional identity, research productivity and visibility of PNs were supported by the findings of the survey.

The participants in our study described how following the programme improved their leadership and professional development, in leading self, leading research programme and leading others which was supported

Table 5 – Research Productivity

Part. No.	T1, 2016–2017			T2, 2017–2018		
	Articles	Grants	Presentations	Articles	Grants	Presentations
1.	11	3	11	6	3	3
2.	Unknown	Unknown	Unknown	2	0	4
3.	0	0	8	6	1	26
4.	6	0	7	5	1	1
5.	Unknown	Unknown	Unknown	2	1	20
6.	1	0	7	4	1	8
7.	5	1	10	6	3	20
8.	11	2	4	9	2	10
9.	6	0	18	5	4	7
10.	5	2	5	5	2	18

by the improved leadership scores of the LPI self and observer assessment. They also described strong leadership development in each of the five leadership practices of the model of Exemplary Leadership (Kouzes & Posner, 2013) based on the interviews and supported by the LPI scores. Regarding "model the way" the participants described that the deep reflection made them see the bigger picture of what they were doing and that they felt better equipped to articulate themselves and their research better. Regarding "Inspire a shared vision" the participants were able to share develop vision for their career and research and discuss this with their colleagues. Regarding "Challenge the process," the participants searched for opportunities to improve their performances within their various positions and developed the confidence to take risks and experiment with new approaches or behavior. Regarding "Enable others to act," the participants became more aware of their own positions and felt more confident on how to present themselves within the team and used more strategies to give other team members the opportunity to grow. Regarding "Encourage the heart," participants felt the importance to create of spirit of the community to get others involved.

The current leadership programme focused primarily on PNs' leadership and professional development and on strengthening their abilities to develop strong research programmes and to establish national and international research collaborations and networks. The participants developed various academic competences that are required for PNs to build a sustainable career in nursing science. These competences were among the competences identified by Numminen et al. (2019) and include self-management, team management, career management and having a future vision. Although earlier educational programmes aimed at leadership development and mentoring of nurses (Hafsteinsdóttir et al., 2017), only two included PNs and both focused on research skills development rather than leadership development (Cumbie et al., 2005; Gennaro et al., 2007), which makes it difficult to compare our results with these studies. These studies did, however, report significant improvement in research productivity and improved research and network abilities (Cumbie et al., 2005; Gennaro et al., 2007), as do our findings. Another multifaceted 1-year programme for PNs working in cancer nursing focused on training in research and career planning was found to be highly valued by the participants, resulting in improved research production (Reid Ponte et al., 2015), which is similar to our findings. The seven participants (co)authored 45 articles, presented 57 times, and were awarded with nine grant applications (Reid Ponte et al., 2015), which is considerably lower than the research production of the participants in our programme. The difference in the findings may be explained by the fact that the programme of Reid Ponte et al. (2015) focused on research methods and skills while our programme focused on developing and leading a research programmes and the research output of participants. Also, the programme of Reid Ponte et al. (2015) was 1-year program, whereas our programme is a 2-year programme. Further, we expect considerable cultural differences in the nursing science communities and differences in the level of competition regarding securing research (grants) between the countries.

Our study showed that the participants improved leadership practices in terms of leading themselves, their research programme and leading others. On average, self-assessed total LPI-scores improved over time, with somewhat variations in the scores observed. Some participants rated their leadership lower at t1 compared to t0, but scores improved substantially at t2. While the interviews offered no explanation for the lower scores at t1, this might be a result of the participants becoming more aware of what the content of leadership and the leadership practice model of Exemplary Leadership entails, resulting in a more critical self-assessment at t1. No study, however, was identified investigating the impact of a leadership program on PNs using the LPI. The participants in our study showed somewhat higher LPI scores than clinical managers participating in a leadership program which also focused on the model of Exemplary Leadership (Martin et al., 2012). Although, this leadership programme targeted all areas of leadership, the participants worked on their individual leadership development plans based on outcomes of their LPI-assessments, which may have resulted in the variance in leadership practices developed. The leadership trajectory of PNs is generally not described as a linear process and they often describe how the leadership path emerges over time with two foci: developing own leadership and identity and becoming an experienced and competent researcher (Lange et al., 2019). The LMNR-programme demonstrated its ability to support personal leadership development as well as becoming a more experienced and competent researcher. The critical discussions with experts and mentors strengthened the participants competences in leading their own research programmes.

The participants in our study described how their nursing identity grew stronger and became more integrated throughout the programme. Most participants started their careers as clinical nurses and over time they moved into other and often more complex, combined positions. Earlier studies describe how fulfilling different roles has impact on professional identities, stressing the importance of developing an integrated meta-identity as "knowledge brokers." Knowledge brokers are able to move from one context to another to transfer and synthesize new knowledge, advance innovation and enhance collaboration (Duffy, 2013; Kluijtmans et al., 2017; Long et al., 2013; Rosenblum et al., 2016). A striking finding of our study, however, is that this strong nursing identity was not dependent on the PNs working in clinical practice. Although at first they did not pay much attention to their nursing identity, during the programme their nursing identity became more central. Many PNs did

not work in clinical practice anymore—but they did work in various positions related to clinical nursing and had the opportunity to fulfill a broker role between these contexts. Therefore, having a strong nursing identity was not dependent on the roles and/or positions they fulfilled since the participants work in various setting and context—which were all related to nursing as they focused on improving clinical nursing or strengthening nursing student education. To this day, there are limited formal joint clinical academic positions or "knowledge broker" positions for nurses in health care organizations, to support translation of evidence into clinical practice and education (Darbyshire, 2010; Oostveen et al., 2017; Kluijtmans et al., 2017).

With little possibility of holding one position which entailed clinical as well as scientific work, some participants in our study chose to stop working in clinical practice to be able to focus more on research work. This may be related to the fact that the scientific reward system of universities focuses on research outputs, while nursing is a practice-based discipline which traditionally is founded on a system that rewards advancement in nursing education (Segrott et al., 2006). Another explanation may be the tension experienced when combining functions in research, clinical practice and education (Morin & Ashton, 2004; Poronsky et al., 2012; Steinert et al., 2012). PNs experience tension from fulfilling different positions and roles in different contexts (and sometimes different employers) with high workloads, often resulting in challenges and pressures in keeping healthy work-life balance (Lange et al., 2019). Excessive workloads and lack of institutional support have been linked to poor work-life balance and exhaustion among PNs working in faculty (Smeltzer et al., 2014b, 2017). Interestingly half the PNs surveyed in The Netherlands stopped working in research after completing their PhD (Oostveen et al., 2017). The reasons for this may be the working pressure experienced by PNs working in different part-time positions as well as limited academic positions and advanced career opportunities. More studies are needed investigating the working conditions and wellbeing of PNs in European countries.

The PNs in our study showed high level of research productivity, with on the average 9 scientific papers per participant across the 2 years which is considerably higher than the one to five papers published across 2 years by PNs in the United States (Smeltzer et al., 2014a, 2014b). The studies evaluating postdoctoral programmes reported increased number of competitive funded grants (Gennaro et al., 2007; Heinrich, 2005; Rawl & Peterson, 1992; Reid Ponte et al., 2015). The participants in our programme were awarded with 26 grants in the 2-year period, with all obtaining at least one grant, which is somewhat higher compared to the findings of Smeltzer et al. (2014) where 25% of the faculty members were unable to obtain one grant.

Based on the findings of our study we feel that there is a need to strengthen PN leadership practices as they have an essential role in the further development of nursing as a profession and scientific discipline (Achterberg et al., 2006; Dreifuerst et al., 2016; Potempa et al., 2008; Thompson & Schwartz Barcott 2019; Richards et al., 2018). However, PNs and the scientific nursing community need supportive measures to improve and to strengthen its doctoral researchers' scientific career development tracks (Hafsteinsdóttir et al., 2019). To address this issue and to provide leadership development opportunities for nurse researchers in Europe, The Nursing Leadership Educational Program for Doctoral Nursing Students and Postdoctoral Nurses (Nurse-Lead) was launched as the first of such measures. It was carried out in collaboration between universities in six European countries aiming to direct doctoral researchers into an academic career by expanding their educational, research and leadership competences (Nurse-Lead, 2018).

However, at present, there is a lack of national career frameworks for PNs and there is a pressing need to develop advanced academic career pathways and profiles for different types of positions for PNs so that they can use their expertise to their full potential (Bittner & Bechtel, 2017; Darbyshire, 2010). The LMNR-programme demonstrated its value in enhancing the leadership and professional development of PNs working in various contexts and can prepare PNs for a sustainable academic career impacting nursing and health care. Although funding for a second cohort of the LMNR-program was secured, structural monetary funding for such programs in European countries remains an issue. Therefore, incorporating such a program into doctoral nursing education to build strong and resilient leaders in nursing science crossing boundaries between academia clinical practice and education and optimizing quality care for patients.

Limitations

There are several limitations to the study. First, the sample size was small and limited to the small number of participants following the programme. Although our study shows improvement in leadership practices, it is important to consider the limited sample size and that minor changes in scores that occur over time, as well as increased awareness due to self-assessments, are likely to induce bias toward the results. The mixed methods design used, however, allowed for extensive qualitative exploration, with findings strengthened by thorough triangulation, providing in-depth and nuanced insight into leadership and professional development. Second, the program was limited to high performing early stage PNs with strong scientific background and therefore there is limited knowledge of if and how the programme may influence the leadership development or experiences of a broader group of PNs. Third, although the LPI is commonly used for evaluating leadership practices within research, its primarily

value was for educational purposes as it stimulates self-discovery and self-awareness (Kouzes & Posner, 2013b). The interrater-reliability becomes problematic when LPI observer assessments are missing or are obtained from different observers across time. Changes in leadership scores may reflect different observer perspectives rather than actual leadership development. Although some LPI observer assessment were lacking, we do not expect this to impact the results of the study as the missing data were distributed among the different participants and rather than complete observer assessments lacking for participants. Therefore, we feel that the development of the participants is presented adequately.

This study is one of the first mixed method study that evaluates the outcomes and experiences of a leadership and mentoring programme for PNs and based on our experiences, we would advise to strengthen the research design by introducing the perspectives of mentors, managers, and colleagues into the qualitative part as they are expected to contribute to the in-depth understanding of the leadership and professional development of the participants. Also, it would be recommended to search for innovative approaches to explore the influence of such programmes on patient and organizational outcomes.

Conclusion

Participating in the Dutch LMNR-programme was highly valued by the participants since it provided them with opportunity to strengthen their leadership and professional development. The findings demonstrate that participants were successful in transferring new knowledge, skills, and perspectives into their daily practices as they worked in various areas of health care. Leadership practices strengthened, they made positive career choices, they became more successful in developing own research programmes, they established international collaborations and demonstrated high level of research productivity. They developed a stronger voice and were better equipped to position themselves on a national and international level within nursing and health care. Although the programme focused on individual leadership development, the group mobilized themselves into a group of experts in nursing science within a national and international context, demonstrating the value of nursing science to a wider scientific community. The programme's potential for strengthening leadership development of academic nurses has been demonstrated. Continuation of such a programme will result in the development of resilient future nurse leaders in research, clinical practice, and education for the advancement of nursing science to impact the quality and safety of health care worldwide.

Authors' Contributions

L.D.: Analysis and interpretations of quantitative data, Integration of quantitative and qualitative data, Writing of the original Draft. S.C.: Conceptualization and design; acquisition of data qualitative data, or analysis and interpretation of qualitative data, critically revising the manuscript. M.K.: Conceptualization and design, acquisition of data qualitative data, or analysis and interpretation of qualitative data, critically revising the manuscript. L.S.: Conceptualization and design, Critically revising the manuscript. J.H.: Conceptualization and design, Critically revising the manuscript. M.S.: Conceptualization and design, critically revising the manuscript, Funding acquisition. T.B.H.: Funding acquisition, Conceptualization and design, Acquisition of quantitative data, Analysis and interpretations of quantitative data, Critically revising the manuscript, Project coordination.

Availability of Data

All data generated during this study are included in this article. Data are available from the corresponding author on reasonable request.

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