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Full Length Research Paper

The Influence of Motherhood on STEM Women Academics' Perceptions of Organizational Support, Mentoring and Networking

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The lack of women in senior positions in STEM within higher education is an ongoing concern. Identifying the barriers that STEM women face to progress their careers remains an important area of research. While previous studies have explored some of challenges associated with the gendered culture within higher education, less is known about the additional barriers faced by women with children. Using a survey of STEM women in the UK this study examines the influence motherhood has on women's perceptions of organisational support, mentoring and networking and identifies that STEM women with children are found to have less opportunity to engage with mentoring or to benefit from formal or informal networks within the institution. The findings have significant implications for the career progression of women with children and suggest that review of HR policy and practice to facilitate greater organisational support and in particular mentoring and networking requires the institution to take a far more proactive approach.

Keywords: Women, STEM, networking, higher education.

Introduction

The under-representation of women in senior positions in higher education has been well reported in both academic (Howe-Walsh & Turnbull, 2016; Macfarlane, 2010; Rayner, Fuller, McEwen & Roberts, 2010; Smith, 2011) and popular press (Athena SWAN, 2011; Rigby, 2015; Tapping all our Talents, 2012). The imbalance of gender remains a key concern for higher education institutions in the United Kingdom (UK) with less than 20% of women in professorial posts (UCU, 2013). Areas of Science, Technology, Engineering and Medicine (STEM), in particular, have been identified as key areas of concern and the need to encourage women to reach seniority (such as Professorial and managerial positions) in these disciplines has been recognised by the UK Government as a priority (Women and the Economy, 2013). Initiatives such as the Athena SWAN (Scientific Women's Academic Network) Charter have been established in the last decade to look at ways to help address the gender imbalance in STEM. Established by the Equality Challenge Unit (ECU) a charity set up to support equality and diversity in higher education in the UK, Athena SWAN makes awards to institutions to recognise their commitment to gender equality (Athena SWAN Charter, 2015). A better understanding of the challenges women in STEM face in advancing their careers may provide a valuable insight into why so few reach senior positions in their institutions.

One key issue that has been highlighted in the literature regarding the underrepresentation of women in STEM is motherhood (Ceci, Ginther, Khan & Williams, 2014; Williams & Ceci, 2012). The impact of having children on women's careers is acknowledged as a significant challenge to career advancement (Fox, Fonseca, & Bao, 2011; Ward & Wolf-Wendel, 2012). The organisation's ability to support women with children in academia is relatively underexplored.

The purpose of this study is to extend understanding of the three key attributes that have been associated with career advancement in academia (see Baruch, 2013); organisational support, mentoring, and networking which have not previously been examined in this domain. Furthermore the research identifies whether having a baby influences these factors. The paper begins with a review of the extant literature which explains our existing knowledge of the challenges academic women in STEM face in their careers. We also discuss the wider career development literature in order to recognise the value attributed to organisational support, mentoring and networking. The methodology is then explained and the data collection and

analysis discussed. The findings and discussion of the study are presented, followed by conclusions. Finally, limitations of the study are noted and areas for further investigation are identified.

Work Challenges, Babies and Why Organisational Support, Mentoring and Networking Matter

There has been increasing interest in recent years over the challenges faced by women in STEM academia within the UK and Internationally (Freedman, 2012; Howe-Walsh & Turnbull, 2016; Nazemi, Mortazavi, & Borjalilou, 2012; Nguyen, 2013; Smith, 2011). Previous studies have explored the gendered nature and practices within higher education institutions (Barnard, Powell, Bagilhole & Dainty, 2010; Moss-Racusin et al., 2012; Roton, 2009; van den Brink, Benschop & Jansen, 2010). In addition, many have examined the caring responsibilities women STEM academics have that may influence their career progression (Adamo, 2013; Fox, 2010; Fox, Fonseca & Bao, 2011; Goulden, Mason & Frash, 2011; Nazemi, Mortazavi & Borjalilou, 2012). While several studies have explored the organisational culture and caring responsibilities, to date there has been no exploration of the exact influence motherhood has on perceptions of organisational support, mentoring and networking.

There is widespread recognition of the gendered culture within academic institutions (Bailyn, 2003; Priola, 2007; Probert, 2005) and the impact this has on women in STEM from a very early stage in their careers (Grove, 2013). Grant and Elizabeth (2015) noted from their research that women often felt not good enough and undervalued during their academic career. Howe-Walsh and Turnbull (2016) for example highlighted the gendered practices which occur from the beginning of an academic career starting with the recruitment stage, with direct and indirect discrimination being evidenced. Their study identified how the possibility of a candidate being a mother was an issue raised during the selection process highlighting the gendered nature of STEM academia and the negative association of having parenting responsibilities. Other studies have similarly highlighted discrimination (Mason, 2008) and gender inequality in the recruitment and selection process within STEM (Settles, Cortina, Maley & Stewart, 2006; van den Brink, Benschop & Jensen, 2010). Further evidence of continued discriminated is noted from the gender pay gap that persists amongst senior professors (Leake & Hamilton, 2015). Moreover the likelihood of STEM disciplines commanding higher salaries balanced in favour of men perpetuates the pay and gender gap (Evans, 2015).

While gendered institutional cultures present barriers for women in STEM to navigate their careers, having children is seen to present one of the biggest challenges women face (Ceci et al., 2014; Goulden, Mason & Frasch, 2011; Ward & Wolf-Wendel, 2012; Williams & Ceci, 2012). Several studies report on the difficulties women in STEM find balancing their careers with caring responsibilities (Darisa, Davidson, Korabik, & Desmarais, 2010; Fox, 2010; Fox, Fonseca & Bao, 2011; Nazemi, Mortazavi & Borjalilou, 2012; Pell, 1996). Since STEM careers are seen to be very competitive with the need to secure research funding, this makes having children even more challenging for women (Adamo, 2013; Goulden, Mason, & Frasch, 2011). Having children has also been found to influence women's tenure (De Welde & Laursen, 2011; Rosser & Lane, 2002). Howe-Walsh and Turnbull (2016) highlight the negative impact that taking a career break can have on women's career advancement. The study highlighted a number of issues associated with having a baby including: the impact on publication outputs, a key driver of career progression; informal work practices restricting women's involvement in decision-making such as informal meetings outside of normal working hours (Howe-Walsh & Turnbull, 2016). While previous studies have explored the challenges having a child presents, to date there has been no examination of the influence of having a child on women's perception of organisational support, mentoring and networking. Considering the challenges for women in STEM identified in previous literature this is disappointing and exploring how having a child influences these aspects of career development may provide greater insight into why women are underrepresented in senior positions in STEM.

The need to provide greater organisational support for academics has been highlighted in previous research (Kinman, 2014; Nikunen, 2012; Ren & Caudle, 2014). Nikunen (2012) highlights the different forms of organisational support that academic institutions can provide including line managers, supervisors, mentoring and networks. Furthermore, Nikunen suggests that reputation and recognition are connected to the support and patronage received from senior colleagues who further highlights the institution's role in individual career development (2012). Kinman (2014) highlights the need for institutions to consider the support they provide to academics and suggests institutions need to address academics long working hours and work-life balance to better support academics wellbeing. While the literature has explored the challenges of organisational support within academia more widely and to some extent in the context of women in academia (Pautasso, 2015), less is known about the perceived influence of organisational support for women working in STEM (Ceci, et al., 2015; Howe-Walsh & Turnbull, 2016). Howe-Walsh and Turnbull (2016) highlighted that women in STEM reported a lack of career guidance and institutional support and identified women's successes were less celebrated than their male colleagues, resulting in STEM women feeling marginalised in the institution. While issues associated with institutional support have been highlighted in such prior research, to date no study has explored the influence of having a baby on perceived organisational support. The wider career development literature suggests mentoring plays a significant role in supporting career development (i.e., Baruch, 2013; Bozionelos, 2004, Klasen & Clutterbuck, 2012). However, within higher education Baker (2015) argues that formal mentoring programs lack trained mentors precluding clear and consistent implementation to benefit the individual mentee. Furthermore she suggests the informal nature of mentoring arrangements may result in differing expectations between the mentor and mentee resulting

in dissatisfaction for all. While there have been no specific studies examining mentoring in the STEM field, the lack of women holding senior positions in academia more widely is seen to be problematic (Fox, 2005).

Similarly networking is seen to offer a number of career advantages (Bozionelos, 2003, 2008). In particular networks within institutions are considered to offer a number of benefits in the form of social capital and are seen to be advantageous to those who can access them (Ibarra, Kilduff & Tsai, 2005). Prior studies in STEM suggest that women are disadvantaged by not having access to male networks in higher education influencing their ability to get support for promotion to senior positions (van den Brink & Benschop, 2009). The gendered culture that exists in higher education institutions acts against women's career progression to seniority with old 'boys clubs' acting as a career barrier (Barnard et al., 2010). The lack of female role models is seen to be a key limitation perpetuating the male dominated networks within institutions (Ceci et al., 2015). Considering the gendered culture that prevails within STEM (Fisher, 2007; Fotaki, 2013), more female role models would be desirable.

Howe-Walsh and Turnbull (2016) similarly identified that formal and informal networks were dominated by men and that this prevented women asking for career guidance and support. Hence networks are seen to play an important role within STEM and career advancement relies heavily on access to these networks. To date there has been limited exploration of these networks (Barnard et al,. 2010; van den Benschop, 2009) and scant evidence of the influence having a child is seen to have on institutional networking.

This study seeks to redress this gap by analysing women in STEM with and without children by asking the following:

1. What are the perceptions of organisational support among women, with and without children, in STEM?
2. What are the perceptions of mentoring among women, with and without children, in STEM?
3. What are the perceptions of networking among women, with and without children, in STEM?

Methods

Sample

The Athena Scientific Women's Academic Network (SWAN) Charter was chosen as a source for developing our sampling frame, in line with prior work among academics in UK (i.e., Howe-Walsh & Turnbull, 2016). The Charter recognises the commitment made by higher education institutions to advancing and promoting women's careers in science, technology, engineering, maths and medicine (STEMM).

An online survey was employed allowing participants to provide anonymous responses directly which were automatically added to a database. Overall, 153 fully completed surveys were received. The mean age of participants was 39.94 years (SD=9.902). In addition, Table 1 shows that 49% of the participants had at least one child, 59.5% declared themselves to be married/cohabiting and 51% were part of a dual-earner couple. Furthermore, the majority of respondents were lecturers (34%), followed by postdoctoral researchers (26.1%) and senior lecturers (13.1%) (see Table 1).

Table 1

Summary of women academics' characteristics (N=153)

Background Variables		Frequency	%
Dual Earners	Yes	91	59.5
	No	62	40.5
Number of children	0	78	51
	1	24	15.7
	2	43	28.1
	3	5	3.3
	> 3	3	2.0
Marital status	Married/ Cohabiting	91	59.5
	Non married/Divorced	62	40.5
Position	Lecturer /Teaching Fellow	52	34.0
	Postgraduate researcher	19	12.4
	Postdoctoral researcher	40	26.1
	Senior Lecturer (Assis. Professor)	20	13.1
	Reader (Assos. Professor)	4	2.6
	Professor	11	7.2
	Head of Department/School	7	4.6
Tenure	<5 years	74	48.4
	5-10 years	33	21.6
	10-15 years	22	14.4
	15-20 years	16	10.5
	>20 years	8	5.2

Measures

We measured perceived organisational support (POS) with seven of the highest loading items derived from the SPOS (Eisenberger, Huntington, Hutchinson & Sowa, 1986). Using fewer items from the original scale does not appear to be problematic due to the internal reliability of the scale (Rhoades & Eisenberger, 2002). Respondents were asked to indicate the degree of agreement to statements related with both valuing (i.e., 'The institution values my contribution to its well-being' and 'The institution takes pride in my accomplishments at work') and caring (i.e., 'The institution cares about my general satisfaction at work' and 'The institution really cares about my well-being') over a 7-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (7).

Mentoring received was assessed with six items on a 5-point response format (1: not at all, 5: to a great extent) from Dreher

and Ash (1990). Participants were asked to consider their career history since they started working in the university and indicate the extent to which a higher-ranking individual (this need not be limited to one person) from the university had given or recommended the participants for example to challenging assignments that present opportunities to learn new skills.

Institutional networking was assessed with the same response format, as mentoring, but with six items from Bozionelos (2003) (i.e., there are individuals within the institution with 'whom I share emotional support, feedback and work confirmation' and … 'whom I consider as best friends and I share any kind of issue, professional or personal').

Data Analysis

The data were analysed using the SPSS software (IBM Corp., Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The estimation of Cronbach's α values indicated strong evidence of internal consistency for each of the three measures (perceived organisational support, α=.89; mentoring, α=.88; network resources, α=.82, see tables 2, 3 and 4) in line with earlier recommendations by Nunnally (1978), of Cronbach's α value over the 0.70 threshold. Furthermore, a series of independent sample *t*-tests were conducted to examine whether significant differences existed between women academics' perceptions of organisational support, mentoring received and networking resources with regard to motherhood. The assumption of homogeneity of variance was examined with Levene's test for equality of variance. The *p* value of the Levene's test was insignificant ($p>.05$) for both perceived institutional support (F=.084, $p=.772$) and mentoring (F=2.69, $p=.103$) as well as network resources (F=356, $p=.552$). Therefore, for each variable under examination, the variances within both sub-samples, women academics with children and women academics without children could be assumed as equal. Nevertheless, following recent studies in higher education such as de Bruijn-Smolders, Timmers, Gawke, Schoonman and Born (2016) and Dancer, Morrison and Tarr (2015), for each obtained measure the mean difference was computed between the two sub-groups of women academics, divided by the pooled standard deviation. The result of this standardized mean difference is Cohen's *d* estimation of effect size (Cohen, 1992) which in almost all cases has been considered zero ($0.00 < d < 0.20$) or small ($0.20 < d < 0.50$) (see de Bruijn-Smolders et al., 2016).

Results

The results revealed significant differences in all three variables under investigation. In particular, the mean scores of the perceptions of organisational support was significantly lower ($t(151)= 2.76$, $p=.006$, $d=0.41$) for women academics with children (M=3.76, SD=1.24) than their counterparts without children (M=4.27, SD=1.19). Similarly, the mean scores of the perceptions of mentoring received was significantly lower ($t(151)= 2.42$, $p=.017$, $d=0.39$) for women academics with children (M=3.19, SD=. 99) when compared to those without children (M=3.55, SD=.84). Nevertheless, the mean scores of the perceptions of network resources for the women academics without children (M=3.75, SD=.69) was significantly higher ($t(151)= 2.49$, $p=.014$, $d=0.39$) than their counterparts with children (M=3.46, SD=.77).

In order to extract a better understanding of the above observed significant differences between the two subgroups of women academics, further t-tests were conducted. In particular, the means scores of each of the items included in the composite variables were examined. Table 2, 3 and 4 provide a more detailed analysis of the differences in the perceptions of women academics with regard to motherhood.

Table 2

Differences in perceptions of organisational support between women academics (with children vs. without children)

The University…	Having Children N=75		Not Having Children N=78			
	M	S.D	M	S.D	*t*-test	*d*
values my contribution to its well-being.	3.63	1.55	4.23	1.39	-2.54*	0.40
fails to appreciate any extra effort from me (R).	3.81	1.71	4.00	1.54	-0.71	0.11
really cares about my well-being.	3.44	1.57	3.88	1.55	-1.76	0.28
even if I did the best job possible, would fail to notice (R).	4.13	1.76	4.69	1.56	-2.08*	0.33
disregards my best interests when it makes decisions that affect me (R),	3.59	1.54	4.14	1.59	-2.19*	0.35
cares about my general satisfaction at work.	3.52	1.56	4.09	1.45	-2.34*	0.37
takes pride in my accomplishments at work.	3.96	1.66	4.86	1.46	-3.56***	0.57

Note: Equal variance assumed; *p<.05, **p<.01, ***p<.001; M=Mean; SD=Standard Deviation; (R)= Reverse scored; *d*= effect size; responses ranged from (1: Strongly disagree, 7: Strongly agree)

Perceived Organisational Support

In line with the above results, women academics with children scored lower than their counterparts without children, in all seven questions assessing the perceptions of institutional support (see Table 2). However, in this particular variable almost all items presented a significant difference. The item that presented the greatest significance difference measured women academics' perception of working in a university that takes pride to their accomplishments at work ($t(151)= 3.56$, $p=.000$, $d=0.57$). The item with the second greatest significant difference measured women academics' perceptions of being valued for their contribution in university's well-being ($t(151)= 2.54$, $p=.012$, $d=0.40$). Participants' perception of working in a university that cares about their general satisfaction at work presented the third greatest significant difference ($t(151)= 3.52$, $p=.021$, $d=0.37$). The perception of working in a university that disregarded their best interests when it made decisions that affected them followed in the level of significant difference ($t(151)= 2.19$, $p=.021$, $d=0.35$). The perception of working in a university which even when they did the best job possible, failed to notice was the fifth item that presented a significant difference ($t(151)= 2.08$, $p=.039$, $d=0.33$). This item was most highly rated by women academics with children (M=4.13, SD1.76). In terms of the lowest rated item of perceived institutional support, an agreement appeared to exist. The perceptions of working in a university that really cared about women academics well-being was the lowest rated by both women with children (M=3.44, SD=1.57) and women without children (M=3.88, SD=1.55).

The findings suggest a significant difference in the perceived support women with and without children receive from their institution. While the need for greater institutional support for all academics has been highlighted in previous studies (Kinman, 2014; Nikunen, 2012; Ren and Caudle, 2014) and women in STEM in particular (Ceci, et al., 2015; Howe-Walsh & Turnbull, 2016), until now there has been little evidence of the perceptions of support between women with and without children. The current study highlights women with children see their contribution as less valued and recognised for their achievements. The findings also suggest that women with children perceive the institution takes less pride in their work and fails to appreciate any extra effort made. The sense that women with children see their best efforts would fail to be noticed by the institution is a particularly significant finding. The findings provide a valuable insight into women with children perceptions' of the level of institutional support and recognition received; suggesting more care needs to be taken to ensure support is transparent and consistent.

Table 3

Differences in perceptions of mentoring received between women academics (with children vs. without children)

To what extent a higher-ranking individual (this need not be limited to one person) who had advanced experience and knowledge had……	Having Children N=75		Not Having Children N=78			
	M	S.D	M	S.D	*t*-test	*d*
Given or recommended you for challenging assignments that present opportunities to learn new skills?	3.25	1.15	3.94	1.04	-3.86***	0.26
Given or recommended you for assignments that required personal contact with academics in different parts of the institution?	2.91	1.34	3.10	1.28	-0.93	0.14
Conveyed feelings of respect for you as an individual?	3.69	1.09	3.83	1.02	-0.82	0.13
Shared personal experiences as an alternative perspective to your problems?	2.97	1.35	3.55	1.12	-2.89**	0.46
Discussed your questions or concerns regarding feelings of competence, commitment to advancement, relationships with colleagues and supervisors or work/family conflicts?	3.12	1.20	3.29	1.19	-0.91	0.14
Encouraged you to prepare for advancement?	3.20	1.27	3.47	1.26	-1.34	0.21
Served as a role model?	3.21	1.34	3.68	1.24	-2.23*	0.36

Note: Equal variance assumed; *p<.05, **p<.01, ***p<.001; M=Mean; SD=Standard Deviation; *d*= effect size; responses ranged from (1: not at all, 5: to a great extent)

Mentoring

Table 3 shows that women academics with children scored lower than their counterparts without children, in all seven questions assessing the extent of mentoring received. Among these seven

questions, three appeared to have significant differences in the reported responses. The item that measured the extent that a higher-ranking individual from the university had given or recommended the participants for challenging assignments that present opportunities to learn new skills demonstrated the greatest significant difference (t (151)= 3.86, p=.000, d=0.26). The second item with significant difference measured the extent that a higher-ranking individual from the university had shared personal experiences as an alternative perspective to participants problems (t (151)= 2.89, p=.004, d=0.46). The third item with significant difference assessed the extent that a higher-ranking individual from the university had served as a role model (t (151)= 2.89, p=.027, d=0.36).

In terms of the highest rated item, challenging assignments presenting opportunities to learn new skills was most highly rated from women academics without children (M=3.94, SD=1.04). By contrast, women academics with children rated most highly the item that assesses the extent to which a higher-ranking individual from the university had conveyed feelings of respect for them as individuals (M=3.69, SD=1.09). In terms of the least rated item, there appears to be an agreement between the two-subgroups. The extent to which a higher-ranking individual from the university had given or recommended them for assignments that required personal contact with academics in different parts of the institution was least rated by both women academics with children (M=2.91, SD=1.34) and women academics without children (M=3.10, SD=1.28).

The differences between those with and those without children are an important finding considering the role attributed to mentoring in career development (Baruch, 2013; Bozionelos, 2004). In particular the findings suggest women with children perceive they have significantly less opportunities to learn new skills, participate in cross-faculty projects and receive less respect. The findings also indicate that perceptions of women with children are lower in terms of how more senior colleagues relate to them and encourage them in their careers. This highlights the differences in the mentoring experiences received by women and suggests women with children perceive their mentoring experience to be less positive than those without. Having a baby appears to have a significant effect on how women see this important aspect of career development.

While previous studies have identified the negative influence of caring responsibilities on STEM women's career advancement (Adamo, 2013; Fox et al., 2011; Goulden et al., 2011; Nazemi et al., 2012) to date there has been little evidence of the impact having a baby can have on STEM women's perceptions of mentoring. The findings suggests that institutions need to ensure the mentoring provided to women is consistent and offers women with children the same opportunities and experience as those without. Institutions may find it useful to provide training to mentors to ensure that they are conscious of any bias that may exist and provide a more homogenous mentoring system. How mentors are chosen and aligned with mentees requires careful consideration. The Human Resources function has to work closely with line managers to ensure that mentoring is a valued source of organisational support and consistently applied in practice.

Table 4

Differences in perceptions of organisational networking between women academics (with children vs. without children)

There are individuals within the institution I currently work for….	Having Children N=75		Not Having Children N=78			
	M	S.D	M	S.D	*t*-test	*d*
with whom I exchange information concerning what's happening in the institution.	3.81	1.02	4.08	0.91	-1.69	0.27
with whom I frequently talk about work related topics.	4.09	0.84	4.38	0.79	-2.20*	0.35
with whom I share emotional support, feedback and work confirmation.	3.53	1.13	3.88	0.99	-2.04*	0.32
I have direct access to people who occupy leadership positions in the institution.	3.64	1.06	3.81	0.91	-1.05	0.17
I have a network of friendships in the institution which can help to further my career progression.	2.55	1.12	3.03	1.14	-2.62**	0.42
I keep in touch with a number of people in the institution who are at higher levels than I am.	3.13	1.11	3.36	1.09	-1.27	0.20

Note: Equal variance assumed; *p<.05, **p<.01, ***p<.001; M=Mean; SD=Standard Deviation; d= effect size; responses ranged from (1: not at all, 5: to a great extent)

Organizational Networking

Similarly to mentoring, women academics with children scored lower than their counterparts without children in all six questions assessing the extent of available networking resources (see Table 4). Among these questions, three appeared to have significant differences in the reported responses. The item that measured the extent participants have a network of friendships in the institution to help further my career progression presented the greatest significant difference between the two subgroups ($t(151)= 2.62$, $p=.010$, $d=0.42$) even though this was the lowest rated item by both women academics with children (M=2.55, SD=1.12) and women academics without children (M=3.03, SD=1.14). The item with the second greatest significant difference measured the extent individuals within the institution frequently discussed work related topics with colleagues ($t(151)= 2.20$, $p=.029$, $d=0.35$). This was the highest rated item by both women academics with children (M=4.09, SD=0.84) and women academics without children (M=4.38, SD=0.79). The third item that presented a significant difference between the two subgroups assessed the extent individuals within the institution engaged with colleagues for emotional support, feedback and work confirmation ($t (151)= 2.04$, $p=.043$, $d=0.32$).

The findings suggest that women with children have less positive perceptions of networking than women without children. This is a significant finding considering the value attributed to networking for career development (Bozionelos, 2003, 2008; Ibarra et al., 2005). While prior studies suggest that women in STEM have less opportunity to access networks than male counterparts (van den Brink & Benschop, 2009). The current study suggests that there are perceived differences in networking opportunities afforded to women with children and those without. In addition the findings highlight that women with children see the networks they have within their institution provide less opportunity to discuss work related topics and access to more senior level members of the institution. Given the importance of networking for career development, the findings indicate that women with children lag behind their peers and require opportunities to develop greater networks. Suggesting a more proactive approach from the organisation and in particular HR to facilitate mentoring relationships.

While previous studies have suggested that the gendered culture within higher education and the old boy's networks are a barrier to women' career advancement (Barnard et al., 2010) the findings suggest that women with children may be more adversely affected than those without. The male dominated informal networks which women find challenging to access (Howe-Walsh & Turnbull, 2016) may in part explain the difference in perception between women with and without children, as women with children have less flexibility outside of their normal working hours, thus impacting upon informal meetings. The findings that women with children perceive their networking opportunities are less than those with children is important for institutions that need to address women's career development in STEM (Freedman, 2012; Nguyen, 2013).

Conclusions

This paper set out to explore three key attributes associated with career advancement; perceived organisational support, mentoring and networking. It adds to the growing body of literature on the challenges of women in STEM that enable us to better understand why so few reach leadership positions in these disciplines (Ceci et al., 2014; Freedman 2012; Howe-Walsh & Turnbull, 2016; Nazemi et al., 2012; Nguyen, 2013). This study makes a contribution to our understanding of three valuable areas of women's career development; organisational support, mentoring and networking received in STEM and importantly distinguishes between the challenges women face with children.

While gendered practices are well recognised as a significant barrier to women in STEM attaining senior posts in higher education (Moss-Racusin et al., 2012) and previous research has highlighted the perceived differences between men and women in terms of networking opportunities (Barnard et al., 2010; Howe-Walsh & Turnbull, 2016) and mentoring (Fisher, 2007), to date there has been little examination of the differences between women with and without children. Prior research has identified the challenges STEM women have balancing their careers and their work (Goulden et al., 2011), but has not explored how having children influences areas of organisational support. The findings therefore make a key contribution to our knowledge of the differences which exist between women with and without children and extend our understanding of the impact of motherhood on women's career progression in STEM.

With regard to mentoring the study highlights motherhood influences perceptions of the mentoring received. Since previous studies have identified the negative impact that taking a career break is seen to have on women in STEM's careers (Howe-Walsh & Turnbull, 2016) this is an important finding. Institutions need to ensure that return to work schemes provide women returning from career breaks with adequate mentoring opportunities to ensure they are given the chance to learn skills and gain advice regarding raising their profile to take part in cross-faculty assignments etc. to develop their careers. A key finding of the study is the difference in how women with children and without perceived the mentoring they received in terms of how personal experiences were used, discussion of work/family conflict and whether the mentor had served as a role model. This would suggest the increased importance for institutions to provide mentoring support from other women who have had to balance their own careers with having children and are therefore able to offer advice based on their own experiences. Furthermore the study highlights the need for institutions to recognise more STEM women with children as role models.

The finding that differences between women's perceptions of networking opportunities exist is another key finding of the study. Women with children saw their experiences as less positive than those without. As previous studies have highlighted the importance of networking for career advancement (Barnard et al., 2010) is an area that needs to be addressed by institutions need to ensure that both formal and informal networking does

not conflict with childcare responsibilities. Previous studies have identified that many informal networks occur outside working hours (Howe-Walsh & Turnbull, 2016) and institutions need to ensure that such practices are reviewed to prevent women with children being excluded from valuable networking opportunities. Provision of appropriate mentoring from women role models with children could provide a valuable guide to other women trying to navigate their careers with children.

Both mentoring and networking are related to overall organisational support. The findings suggest that significant differences exist in perceptions between women with and without children in relation to organisational support. It is here that institutions have the greatest opportunity to improve STEM women's perceptions of the support given. The study identified women with children see themselves as less valued and recognised by the institution and perceive their wellbeing is less cared about. Institutions need to be mindful of the impact these factors can have on women's career aspirations. For institutions wishing to support women's career development in STEM and encourage more women to gain leadership positions (Athena SWAN, 2011) a number of issues need to be addressed. Greater transparency in reporting and celebrating achievements would improve women's perception of how institutions recognise success. This would work equally well for all women, but in particular may address the imbalance in perceptions between women with and without children. Furthermore, ensuring flexible working hours are available and take into account access to networking would also provide a sense that the institution is taking wellbeing into account. Finally, return to work schemes need to ensure that institutions check levels of support regularly for mothers returning to work.

Limitations and Future Research

While the study makes a valuable contribution to women in STEM literature, the methodological limitations need to be acknowledged. First, due to the cross-sectional nature of the study, caution should be placed when inferring to the causality among the variables under investigation. Future studies, should therefore empirically assess the relationships under investigation through a longitudinal design, using repeated measures over time. Second, our sample included women employed in STEM across universities in the UK, we therefore suggest extending the research to include additional countries.

Implications

Engagement with Human Resources (HR) policies developed to support women, and in particular women with children, need to go further to redress the negative perception of organisational support during all stages of career development. It is important to have a clear policy to enable mentoring to take place for all employees; however, ensuring the mentoring relationship is consistent requires greater facilitation from HR to ensure appropriate mentors are identified and trained. In addition the HR function with line management can facilitate greater opportunities to develop events to support positive networking taking care to consider the formal and informal nature of networks.

References

Adamo, S. A. (2013). Attrition of women in the biological sciences: Workload,

Motherhood and other explanations revisited, *BioScience*, *63*(1), 43-48.

Athena Swan. (2011). Annual Report. Equality Challenge Unit. London.

Bailyn, L. (2003). Academic careers and gender equity: Lessons learned from MIT1, *Gender, Work & Organization*, *10*(2), 137-153.

Baker, V. L. (2015). People Strategy in Human Resources: Lessons for Mentoring in Higher Education, *Mentoring & Tutoring: Partnership in Learning*, *2*(1), 6-18.

Barnard, S., Powell, A., Bagilhole, B., & Dainty, A. (2010). Researching UK women professionals in SET: A critical review of current approaches.*International Journal of Gender, Science and Technology*, *2*(3), 361-381.

Baruch, Y. (2013) Careers in academe: the academic labour market as an eco-system, *Career Development International*, *18*(2), 196 – 210.

Bozionelos, N. (2003). Intra-organizational network resources: Relation to career success and personality, *The International Journal of Organizational Analysis, 11*(1), 41-66.

Bozionelos, N. (2004). Mentoring provided: Relation to mentor's career success, personality, and mentoring received, *Journal of Vocational Behavior, 64*(1), 24-46.

Bozionelos, N. (2008). Intra-organizational network resources, *Personnel Review*, *37*(3), 249-263.

Ceci, S. J., Ginther, D. K., Kahn, S., & Williams, W. M. (2014). Women in Academic Science A Changing Landscape, *Psychological Science in the Public Interest, 15*(3), 75-141.

Ceci, S. J., Ginther, D. K., Kahn, S., Williams, W. M. (2015). Women in science: The path to progress, *Scientific American Mind*, *26*(1), 62–69.

Cohen, J. (1992) A Power Primer, *Psychological Bulletin, 112*(1), 155–59.

Dancer, D., Morrison, K., & Tarr, G. (2015). Measuring the effects of peer learning on students' academic achievement in first-year business statistics, *Studies in Higher Education*, *40*(10), 1808-1828.

Darisa, T., V. J. Davidson, K., Korabik, & Desmarais, D. (2010). Commitment to Graduate Studies and Careers in Science and Engineering: Examining Women's and Men's Experiences, *International Journal of Gender, Science and Technology, 2*(1), 47-64.

de Bruijn-Smolders, M., Timmers, C. F., Gawke, J. C., Schoonman, W., & Born, M. P. (2016). Effective self-regulatory processes in higher education: research findings and future directions. A systematic review. *Studies in Higher Education*, *41*(1), 139-158.

De Welde, K. and Laursen, S. (2011). The Glass Obstacle Course: Informal and Formal Barriers For Women Ph.D. Students in STEM Fields, *International Journal of Gender, Science and Technology, 3*(3), 571-595.

Dreher, G. F., and R. Ash. (1990). A comparative study of mentoring among men and women in managerial, professional, and technical positions, *Journal of Applied Psychology*, *75,* 539–546.

Eisenberger, R., Huntington, R., Hutchison, S., & D. Sowa. (1986). Perceived organizational support, *Journal of Applied Psychology, 71*, 500–507.

Evans, L. (2014). A changing role for university professors? Professorial academic leadership as it is perceived by 'the led'. *British Educational Research Journal, 41*(4), 666–685.

Fisher, G. (2007). You need tits to get on round here. Gender and sexuality in the entrepreneurial university of the 21st century. *Ethnography*, *8*(4), 503-517.

Fotaki, M. (2013). No Woman is Like a Man (in Academia): The Masculine Symbolic

Order and the Unwanted Female Body, *Organization Studies, 34*(9), 1251–1275.

Fox, M. F. (2005). Gender, family characteristics, and publication productivity among

Scientists, *Social Studies of Science*, *35*(1), 131-150.

Fox, M. F. (2010). Women and men faculty in academic science and engineering:

Social-organizational indicators and implications, *American Behavioral Scientist*, *53*(7), 997-1012.

Fox, M. F., Fonseca, C., & Bao, J. (2011). Work and family conflict in academic science: Patterns and predictors among women and men in research universities,

Social studies of science, *41*(5), 715-735.

Freedman, S. (2012). Perspectives on Collegiality Matters, *The Journal of Academic*

Librarianship, 38(2), 108-114.

Grant, B. M., & Elizabeth, V. (2015). Unpredictable feelings: academic women under research audit. *British Educational Research Journal*, *41*(2), 287-302.

Goulden, M., Mason, M. A., & Frasch, K. (2011). Keeping women in the science

Pipeline, *The ANNALS of the American Academy of Political and Social Science*,

638(1), 141-162.

Government Equalities Offices. (2013). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255595/1270-B_Women_WEB.PDF

Grove, J. (2013). Glass ceiling remains in place for female academics, Global

Gender Index, 2013, London: *Times Higher Education*.

Howe-Walsh, L., & Turnbull, S. (2016). Barriers to women leaders in academia: tales from science and technology. *Studies in Higher Education*, *41*(3), 415-428.

Ibarra, H. (1995) Race, Opportunity, and Diversity of Social Circles in Managerial

Networks, *The Academy of Management Journal 38*(3) 673-703.

Ibarra, H., Kilduff, M., & Tsai, W. (2005). Zooming in and out: Connecting individuals and collectivities at the frontiers of organizational network research, *Organization science*, *16*(4), 359-371.

Kinman, G. (2014). Doing More with Less? Work and Wellbeing in Academics, *Somatechnics. 4*(2), 219-235.

Klasen, N. and Clutterbuck, D. (2012). Implementing Mentoring Schemes: A Practical Guide to Successful Programs, Elsevier Butterworth & Heinemann, Oxford.

Leake, J. and Hamilton, C. (2015). Female scientists' £5,000 pay gap, *The Sunday Times*. London (28th June 2015) 14.

Macfarlane, B. (2010) Professors as intellectual leaders: formation, identity and role, *Studies in Higher Education, 36*(1), 57-73.

Macfarlane, B. (2012) Whisper it softly, professors are really academic developers too, *International Journal for Academic Development 17*(2), 181-183.

Mason, M. A. (2008). Do babies matter in science? *Chronicle of Higher Education*, 17.

Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J.

(2012). Science faculty's subtle gender biases favor male students, *Proceedings of the National Academy of Sciences*, *109*(41), 16474-16479.

Nazemi, S., S. Mortazavi, S., and S. Borjalilou. (2012). Investigating factors influencing women's inclination in adopting managerial positions in Iranian higher education, *Interdisciplinary Journal of Contemporary Research in Business 4* (7), 722-732.

Nikunen, M. (2012). Changing university work, freedom, flexibility and family, *Studies in Higher Education*. *37*(6), 713-729.

Nunnally, J.O. (1978) *Psychometric Theory*, New York: McGraw-Hill.

Nguyen, T. L. H. (2013). Barriers to and facilitators of female Deans' career advancement in higher education: an exploratory study in Vietnam. *Higher Education*, *66*(1), 123-138.

Pautasso, M. (2015). "The Italian University Habilitation and the Challenge of Increasing the Representation of Women in Academia, *Challenges*, *6*(1), 26-41.

Pell, A. N. (1996). Fixing the leaky pipeline: women scientists in academia, *Journal of Animal Science, 74*(11), 2843-2848.

Pifer, M. J., Baker, V. L., & Lunsford, L. G. (2015). Academic departments as networks of informal learning: faculty development at liberal arts colleges, *International Journal for Academic Development*, *20*(2), 178-192.

Powell, G. N. (2000). The glass ceiling: explaining the good and bad news, *Women in management: Current research issues*, 2, 236-49.

Powell, A., B. Bagilhole, & Dainty. A. (2009). How women engineers do and undo gender: Consequences for gender equality, *Gender, Work and Organisation* 16, (4), 411-428.

Priola, V. (2007). Being female doing gender. Narratives of women in education

Management, *Gender and Education*, *19*(1), 21-40.

Probert, B. (2005). I just couldn't fit in: gender and unequal outcomes in academic careers, G*ender, Work and Organisation, 21*(1), 50-72.

Rayner, S., Fuller, M., McEwen, L. and Roberts, H. (2010). Managing leadership in the UK university: a case for researching the missing professoriate? *Studies in Higher Education, 35*(6), 617-631.

Ren, X. and Candle, D. (2014). Walking the tightrope between work and non-worklife: strategies employed by British and Chinese academics and their implications, *Studies in Higher Education,* 1-20.

Rhoades, L., and Eisenberger. R. (2002) Perceived organizational support: a review of the literature, *Journal of applied psychology*, *87*(4), 698-714.

Rigby, J. (2015). Is there any science behind the lack of women in science? http://www.telegraph.co.uk/women/womens-health/11401344/STEM-Is-there-any-science-behind-the-lack-of-women-in-science.html

Rosser, S.V. and E. O. Lane. (2002). Key Barriers for Academic Institutions Seeking to Retain Female Scientists and Engineers: Family-unfriendly policies, low numbers, stereotypes and harassment, *Journal of Women and Minorities in Science and Engineering*, 8, 161-189.

Settles, I. H., Cortina, L. M., Malley, J., & Stewart, A. J. (2006) The climate for women in academic science: The good, the bad, and the changeable, *Psychology of Women Quarterly*, *30*(1), 47-58.

Smith, E. (2011). Women into science and engineering? Gendered participation in higher education STEM subjects. *British Educational Research Journal*, *37*(6), 993-1014.

Tapping all our Talents (2012). *Women in science, technology, engineering and*

mathematics: a strategy for Scotland, The Royal Society of Edinburgh: Edinburgh.

UCU 2013. *The position of women and BME staff in professorial roles in UK HEIs*.

London.

van den Brink, M., Benschop, Y., & Jansen, W. (2010). Transparency in academic recruitment: a problematic tool for gender equality? *Organization Studies*, *31*(11) 1459-1483.

van den Brink, M., & Benschop, Y. (2012). Gender practices in the construction of academic excellence: Sheep with five legs, *Organization*, *19*(4), 507-524.

Ward, K., & Wolf-Wendel, L. (2012). *Academic motherhood: How faculty manage work and family* (Rutgers University Press).

Williams, W. M., & Ceci, S. J. (2012). When Scientists Choose Motherhood A single factor goes a long way in explaining the dearth of women in math-intensive fields. How can we address it? *American Scientist*, *100*(2), 138.