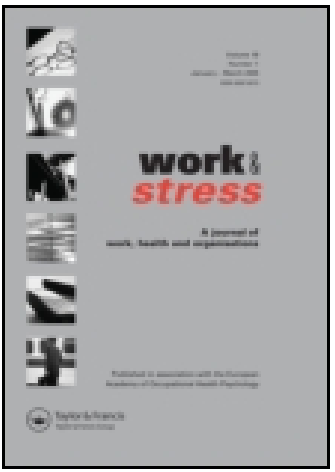

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Nurses' representations of the perceived causes of work-related stress: a network drawing approach

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This paper reports a study, involving a network drawing approach, that examined how nurses perceive the interrelationship between causes of workplace stress. Network analysis originated in sociology as a method of examining the relationship between people, objects or events. It has recently been adapted to examine participants' perceptions of the relationships between causes of a phenomenon, either by asking participants to complete a grid rating the strength of all the possible links between causes or by getting them to draw a diagram of the links that they think are important. The network drawing technique, in which participants are asked to draw a diagram indicating perceived causal links between nominated causes of stress and also to indicate the strength of these links, was employed in this study. The causes of stress were taken from a previous study in which nurses kept a diary for one week detailing stressful events and their causes. There were 48 participants in the present study and the main results confirmed the importance of staffing levels and inadequate support as perceived direct causes of stress. The study also revealed the importance of indirect links between staffing levels and other causes of stress. The networks illustrate how direct and mediating causes of stress are connected and lie largely outside nurses' control. The results are discussed in relation to other recent work on the causes and experience of stress by nursing staff.

1. Introduction

In the past few years there has been an increasing recognition of the importance and impact of job-related stress (Cox, and Griffiths, 1995). It has been recognized that work-related stress and depression are among the most important factors affecting the health of UK employees (Hodgson, Jones, Elliott, and Osman, 1993). There is also evidence that those employees who work in the health-related professions are suffering more than other

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workers (Charlton, Kelly, Dunnell, Evans, and Jenkins, 1993). A report commissioned by the Nuffield Trust has suggested that National Health Service (NHS) staff suffer more stress-related psychological morbidity than other professional sectors (Williams, 1989). A study of the mental health of National Health Service staff from 19 hospital trusts (Institute of Work Psychology, 1996) showed greater levels of stress than amongst workers generally. While it is true that doctors suffer higher levels of stress, there can be no doubt that nurses are also suffering (Wall, Bolden, Borrill, Carter, Golya, Hardy, Haynes, Rick, Shapiro, and West, 1997). Data on early retirements from the NHS (Moore, 1996) and the increase in nursing staff turnover (Snell, 1998) support this view. Although there have been few attempts to quantify the levels of stress, a clear picture of widespread negative experiences in nursing emerges (Kennedy, and Grey, 1997; Potts, Halliday, Plimley, Wright, and Cuthbertson, 1995; Power, and Sharp, 1988). It is also clear that stress has a strong negative relationship with nurses' job satisfaction (Blegen, 1993), and that this pattern of results is not limited to Britain and the USA (Piko, 1999; Trucco, Valenzuela, and Trucco, 1999).

The effects of stress on those in the health professions are important for three main reasons. First, the NHS is one of the larger employers in Britain. Second, there is evidence that stress can effect the efficacy of treatment and that medical personnel are less likely to acknowledge the effects of stress than other professionals (Sexton, Thomas, and Helmreich, 2000). Third, the nature of their jobs make it likely that nurses will experience factors that have been implicated in causing stress (role conflict, role ambiguity and work demands) more than other occupations, which makes them theoretically interesting (Haynes, Wall, Bolden, Stride, and Rick, 1999).

Recent studies have identified the following causes of nursing stress: inappropriate advice from junior and inexperienced staff; conflicts within the multi-disciplinary team; bureaucracy; inadequacies of nursing care by others; verbal abuse from patients and relatives; physical abuse from patients; dealing with death and dying; shift work; lack of emotional support; insufficient resources; responsibility without power; conflict with doctors and uncertainty due to political issues (Callaghan, Tak-Ting, and Wyatt, 2000; Farrington, 1997; Prosser, Johnson, Kuipers, Szmulker, Bebbington, and Thornicroft, 1997; Tyler, and Cushway, 1992, 1995; Tyler, and Ellison, 1994). Changes in the management of the health service have also been implicated. Some nurses, for example, have expanded their roles via *The Scope of Professional Practice* (United Kingdom Central Council for nursing, midwifery and health visiting, 1992) and the outcomes of this on patient care and nurses' stress experiences are unknown. Initiatives such as this, intended to reduce the stress on junior doctors, can thus be perceived as merely redistributing the pressure from one group of workers to another. Such added responsibilities may serve to exacerbate the multiple roles that are evident in contemporary nursing (Adomat, and Killingworth, 1994; Taylor, White, and Muncer, 1999). The effects of health policy on the working patterns of nurses, changing roles associated with reduction in junior doctors' working hours (Fish, 1995), the scope of professional practice and continuous changes in health policy are all potential causes of stress. However, it is worth remembering that nurses in systems other than the National Health Service also experience stress.

While many studies have established various factors as causally implicated in stress, few have looked at how these causes interact. Wheeler (1997) has argued that a model of stress in nursing that accounts for its complex nature has not so far been developed, and criticizes the lack of attention in research to the nurses' own constructions of stress (Wheeler, 1998a, 1998b). Others have argued more generally for the importance of understanding lay health beliefs (Furnham, 1988; Furnham, and Henley, 1988; Furnham, Wardley, and Lillie, 1992). More specifically Furnham (1997) has examined lay people's beliefs about the causes,

manifestations, consequences and alleviation of occupational stress using factor analysis. In that study, participants were presented with 27 items that dealt with proposed causes of stress and asked to rate each item for agreement on a scale of 1–7. For example, two of the items were; 'People who aren't very busy or challenged by their work cannot really experience stress' and 'Stress only affects people who aren't their own boss, i.e. have to take orders from others'. Factor analysis with varimax rotation identified five factors that were perceived to be causing stress: conflict and satisfaction; career development; demographic subgroups; danger and intimidation; and authority. The two items given as examples both loaded on the factor identified as career development.

We believe that the approach of Furnham (1997) to establishing lay beliefs is a useful and important contribution to the literature, but would argue that there may be other more appropriate methods for examining the perceived interrelationships between causes. Factor analysis can reveal consistent patterns of response or rating but it does not tell us about the importance of a given cause. In a recent study examining the perceived causes of health, for example, participants tended to rate the importance of the impact of supernatural powers consistently, so it came out as a factor; however the majority of the participants rated it as unimportant (Taylor, and Muncer, 1999). In Furnham's (1997) own study the majority of the items with the highest levels of agreement or disagreement, that is those with scores above 5 or below 2, had low loadings on the five factors that were identified. For example, the following items 'The risk of redundancy is a very stressful factor' and 'Lack of consultation creates an uncommunicative climate and this may lead to stress' were the most strongly endorsed items but both had loadings of less than 0.3 (which is the conventional cut-off point for the importance of factor loading (Kline, 1999)) on any of the identified factors. In other words, the factors that were identified do not include the most important perceived causes of stress.

In the past few years network analysis—a technique that involves the analysis of either a network grid or drawing—has been modified from its more frequent use as a tool for studying social relationships in sociology and anthropology, to investigating the causal models of various social phenomena that lay people have in their minds. It has been adapted to try to explain the process by which causal attributions are made, a process that has held a central place in social psychology (Kelley, 1967). In the early studies using this method, participants were presented with a grid with selected causes of the phenomena in question down the side and along the top. They were then asked to indicate whether there was a causal link between each of the causes, by putting a '1' in the appropriate cell if there was a link and a '0' if there was no causal link. This binary grid data collection technique has been used to investigate the perceived causal structure of examination failure (Lunt, 1988), personal debt (Lunt, and Livingstone, 1991; Muncer, and Gillen, 1992), crime (Campbell, and Muncer, 1990; Muncer, Gillen, and Campbell, 1996), drug use (Muncer, Sidorowicz, Epro, and Campbell, 1992), date rape (Gillen, and Muncer, 1995) and poverty (Heaven, 1994; Muncer, 1995).

These early network studies have been criticized for ignoring the importance of direct links between a nominated cause and the target social phenomena, and consequently overestimating the importance of indirect links (Green, and McManus, 1995; Green, McManus, and Derrick, 1998). In the previously mentioned studies only indirect links between causes have been examined, as the target (for example, loneliness) does not appear on the grid. These studies have also been criticized for using a binary 'yes' or 'no' scoring system rather than a more sensitive system in which participants can say how strongly they perceive the link to be between two causes (Lunt, 1991; Muncer, and Gillen, 1997). There is now clear evidence that if participants are given the opportunity to include direct links, these

play an important part in the network (Heffernan, Green, McManus, and Muncer, 1998; Taylor, White, and Muncer, 1999).

Taylor *et al*. (1999) provided participants with the opportunity to include direct links in their network grid study of nurses' perceived causes of stress and also asked participants to rate the strength of perceived connections on a scale of 1 to 5 (1=impossible to 5= highly likely). In that study, nurses were given grids with the following nominated causes down the side and along the top: inadequate support; multiple roles; patients and relatives' behaviour; patient suffering; powerlessness; interruptions; attitude and ability of staff; behaviour of managers; behaviour of doctors; and shift patterns. These causes of stress had been the most frequently nominated causes by the participants (Taylor *et al*., 1999). They were also provided with a brief sentence explaining each cause. For example, multiple roles were described as 'conflicting demands of different roles' and powerlessness as 'feeling that one has no influence on decisions'. Stress also appeared on the grid as a possible effect of all these causes so that perceived direct links and also a possible reciprocal cause could be investigated. For example, it is possible that stress could cause the behaviour of doctors or any of the other nominated causes.

The network that was produced showed three relatively clear systems in which there were perceived to be direct links to stress from patient suffering, manager's behaviour and staffing levels. Staffing levels were the distal cause in a system of causal links including multiple roles and inadequate support, which in turn caused stress and were also perceived as causing the attitude and ability of staff and feelings of powerlessness, which also led to stress. (These seven most important causes were those used in the current study.)

Green, and McManus (1995) used both a different method of data collection, in which they asked participants to directly draw the network of causes in a diagram, and use different kinds of analysis when appropriate (e.g. Item Response Theory). They have argued that one of the problems with the grid method is that there are theoretical problems about the threshold for deciding whether or not to include a causal link (which they call a path). They have also argued that the method confounds the issue of presence and strength of a path, as it is the mean strength of a path that determines whether it should be included, and this depends on both the number of participants including it and how strongly they rate it. Clearly it is possible to have a path which most people think exists but at low strength, or to have a path that few people think exists but that is believed to be very important by those who do include it. However, the grid method does not allow disentanglement of the presence versus strength of a path (Green, and McManus, 1995; Green *et al*., 1998). There is also evidence that the direct drawing method is less influenced by response factors than the grid method; this is because in the grid method causes appear in fixed positions and participants are asked to put a number in each cell (Wall, Gillen, Muncer, and Holmes, 1998; Heffernan *et al*., 1998), whereas in the drawing method they are asked to draw a network diagram. The drawing and understanding of such diagrams appears to be relatively easy for both academic (Hoc, 1989) and lay people (Green, and McManus, 1995). Indeed, Argyle, Furnham, and Graham (1981) have used similar diagrams to represent the goal conflicts experienced by nurses in different situations.

The present study thus ensured that participants were able both to nominate direct links to stress and to use the direct diagram drawing method advocated by Green and colleagues. This approach was employed as a method to corroborate previous studies and, in particular, to see if similar networks would be produced by using a different method of data collection. The causes that participants could put in the diagram were the seven most important of those that appeared on the Taylor *et al*., (1999) network. Participants were also given the same short definitions of each cause.

2. Method

2.1. *Participants*

There were 48 participants in this study. They were state registered nurses who were enrolled at an English university on a part-time post-registration degree programme. They participated voluntarily in the study during a research methods class. A total of 48 out of a possible 56 nurses completed the networks.

2.2. *Procedures*

Participating nurses first took part in an introductory session, which included a discussion of stress among nurses. They were then given a sheet of paper with the following instructions printed on it.

> The following seven factors have been identified as being the most important in causing stress: *patient suffering; inadequate support; attitude and ability of staff; feelings of powerlessness; staffing levels; multiple roles;* and *behaviour of managers*. We would like you to draw a diagram (on the sheet below) of how you think these causes are linked to stress and each other, using arrows to indicate the direction of the effect. We would also like you to rate the strength of the link on a scale of 1 to 100 and write the appropriate number onto the diagram. If you do not think a cause has an important effect leave it off your diagram. Only include those causes that you think are important.

In the diagram method the strength of a link has always been rated on a 100-point scale rather than a 5-point scale; this is to increase the sensitivity of the measure. If there are a large number of possible paths it enables individuals to express their discriminations between causal links more easily.

The word 'Stress' was printed in the middle of the page so that participants were able to draw direct links to it if they wished. Participants could, therefore, include in their drawing both direct links such as that between Inadequate support and Stress, and also indirect links such as that between Behaviour of managers and Inadequate support. Participants were provided with the same definitions of the causes as were used in the study by Taylor *et al.* (1999). Participants completed their diagrams and handed them in anonymously.

3. Results

A composite diagram was prepared by examining the separate paths between any two factors for each of the 48 participants. Most participants represented both direct paths from a possible causal factor to the target factor (stress) and indirect paths that interconnected these possible causal factors. Four participants included only direct paths from causes to stress, with no indirect paths. Figure 1 shows the composite diagram for all of the paths that were drawn by at least 5 (10%) of the participants. The various proportions of individuals (10–39%, 40–69%, 70–100%) who included a particular path are shown by lines of different types.

We also calculated for each path its mean strength, using the scores given by those who included it. The mean strength of each path is represented by different types of arrowhead. Thus we are able to separate path frequency, which is the proportion of participants who included a particular path, and path strength. For simplicity's sake (see also below) we excluded seven paths that were drawn backward from the target factor (i.e. stress) to the possible causal factors. It is, however, worth noting that participants who included backward paths from stress usually had a higher number of paths on their diagrams; this was significantly the case for 6 out of 7 paths on two-tailed t tests.

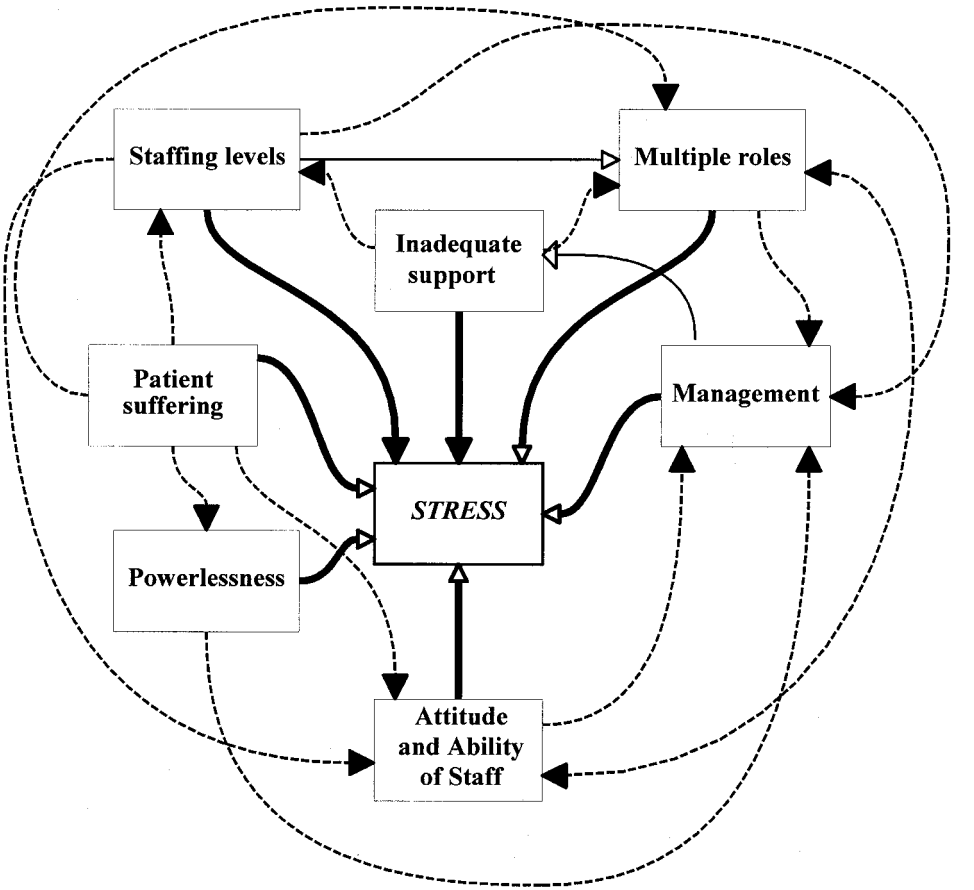

Figure 1. Composite network diagram of the perceived causes of stress in nurses, derived from causal paths drawn between up to seven possible causes and directly from those causes to stress. The diagram shows directions of each path, the mean strength of each path (as scored by the nurses) and frequency of inclusion of that path. Only paths drawn by more than 5 (10%) of nurses are included.

Path inclusion frequency. Proportion of nurses who included a particular path in their drawing (out of 48).

High (70–100%) Medium (30–69%) Low (10–39%)

Mean path strength. Scored by nurses out of a possible 100:

High (70–100%) Medium (40–69%) Low (0–39%)

Arrow type:

High frequency + High path strength
High frequency + Medium path strength
Medium frequency + Medium path strength
Low frequency + High path strength

The proportion of participants who drew a particular line is indicated by line type, as above. The mean path strengths are depicted by type of arrowhead. For the sake of clarity, paths included by a low proportion of participants were only included if they had a high path strength.

The composite diagram indicates that the majority of nurses considered staffing levels and lack of support to be important direct contributors to stress. Both of these paths were present on over 70% of participants' diagrams and had an average path strength of over 70. Five other direct paths were also included by over 70% of participants, but with a somewhat lower (i.e. medium) mean strength (behaviour of management, multiple roles, attitude and ability of staff, feelings of powerlessness and patient suffering). Two indirect paths were included by a medium proportion of nurses, between staffing levels and multiple roles, and behaviour of management and inadequate support; these paths had a medium mean strength. It is noteworthy too that there were a number of indirect paths that were included by relatively few individuals but that were considered to have a strong impact. For example, the paths from powerlessness to management, from attitude to management, and from patient suffering to powerlessness were included by a low percentage of participants but had a high path strength. These are the links that are likely to be missed by the grid method using inductive eliminative analysis (Taylor *et al*., 1999).

Previous work has already gone some way towards establishing both the reliability and validity of models derived from both types of network analysis (Muncer, 1995; Muncer, and Gillen, 1997; Green, and McManus, 1995; Green *et al*., 1998; Heffernan *et al*., 1998). We can provide a weak check of the reliability of the findings by randomly splitting the sample into two and comparing the scores of the two groups on all of the possible causal paths. If the sample is performing consistently we should not expect significant differences between the two groups. In this case two randomly selected groups were not significantly different ($p<.05$) for scores on any of the paths. Furthermore, for those paths that appear on the network they showed no significant differences at $p<.2$.

In this study it is also possible to calculate an agreement index (Muncer, 1995) between the present results and those produced by a different sample using a different method. The agreement index is calculated by dividing the number of common paths between networks by the total number of paths. In this case the directional agreement index, which takes the direction of the causal path into account, is 0.78 (a score of 1 would indicate total agreement and 0 total disagreement). The agreement index for this present study is considerably better than that found in some previous studies where similar groups were compared using the same grid data collection method for both groups. For example, the agreement index for right-wing voters on networks of the causes of poverty in Heaven's (1994) research was only 0.43 and for left-wing voters only 0.38 (Muncer, 1995). The non-directional agreement index in the present study was extremely high at 0.87, which is important, as previous work has suggested that the direction of the path may be less significant than the fact that a path exists (Green *et al*., 1998; Wall *et al*., 1998).

4. Discussion

How should this composite diagram be interpreted? Our view is that inclusion of any path in the diagram is a probabilistic process. The likelihood of an individual including a path that nurses endorsed with relatively low frequency will tend to reflect the tendency of that individual to include paths in his or her diagram. We have shown elsewhere by using item response theory (Green *et al*., 1998) that people tend to have a single representation of the causes of social phenomena and sample probabilistically from it. That is, there is a shared representation of paths that will unfold in sequence, and the more paths an individual includes in his or her diagram then the more of the shared representation will be revealed. This view is also supported in this case, by the finding that participants that included the backwards paths from stress included more paths in their diagrams overall.

The agreement between the present drawing study and the network grid study (Muncer, 1995) suggests that a reliable and transferable explanation of the perceived causes and relations between the causes of workplace stress in nursing, may be emerging. This present study allows a more holistic explanation to emerge by including paths that may not have been revealed by the grid method of data collection and analysis. This explanation is one that is more able to account for the complex relationships between the potential causal factors of stress. This methodological triangulation between studies has enhanced the degree to which we feel that the causes and the relationships between the causes of stress have been validly represented. This is manifested via the participants' nominated causes of stress; their network ratings of causes of stress and the personally drawn diagrams of the causes of stress, many of which probably show the consequences of imposed working practices and organizational constraints.

The findings of the present study confirms most of the perceived causes of stress as being related to issues that impede nurses in the performance of their role; these are primarily inadequate staffing levels and lack of support. Staffing levels were perceived as a direct cause of stress, with high frequency of inclusion and also high path strength. They were also perceived of as leading to the adoption of multiple roles, which was viewed as causing stress, with a high inclusion frequency and medium path strength. This situation had also been seen in the study using the grid network method of data collection (Taylor *et al*., 1999). It seems that nurses perceive increased job demands to be an important stressor (Karasek, and Theorell, 1990).

It was hoped that this study, by focusing on the nurses' personal drawings of the causal networks of stress would clarify and confirm the links previously found between managers' behaviour and stress. Taylor *et al*. (1999) found that the behaviour of managers was initially identified as one of the three distal causes of stress. In the present study the behaviour of managers is viewed as both a direct and an indirect stressor. The indirect path is to inadequate support. The impact of inadequate support on stress is however placed as one of two key causes of stress, the other being staffing levels, both with high frequency and strength levels. The significant issue here is that the behaviour of managers is the only nominated cause of inadequate support. We consider this to be a crucial antecedent in the causal process.

The qualitative data from which were derived the list of possible causes of stress used in the present study (Taylor *et al*., 1999) presented a strong image of nurses working with a lack of support. In that study, the more comprehensive diary entries highlighted how the interplay of excessive demands on nurses, to perform their roles without adequate staff and support from management and other staff, created feelings of isolation as they had to cope alone (Taylor *et al*., 1999). The present study shifts the nominated causes of stress to causes that are overtly present in nurses' day-to-day work: staffing and inadequate support. While behaviour of managers has a substantial degree of endorsement from nurses as a cause of stress, it remains on a day-to-day basis distant yet integral to their working practices. When asked to represent what they considered to be the causes of stress, these nurses focused on visible and direct causes rather than their antecedents.

It is likely that the way in which the changes to nurses' working lives have been pushed through, taking only a management perspective into account, have exacerbated stress levels (Obholzer, and Roberts, 1994). It has been suggested elsewhere that different perspectives on the management of waiting lists, staff and skill mix and the management of patient throughput should have been sought (Firth-Cozens, and Moss, 1998). It has also been shown that taking into account the wishes and beliefs of staff members can significantly reduce stress levels and increase performance (Sonnetag, 1996).

The other direct paths to stress not thus far discussed included patient suffering, attitude and ability of staff, and powerlessness, all of which had high frequency of inclusion and medium path strength. These findings fit with other work performed in this area that suggests that it is not the nature of caring work that is stressful but the barriers that impede nurses in this role (Adomat, and Killingworth, 1994). The dangers of 'controlled care' have been described by Benner, and Wrubel (1989). Such care is delivered from a distance, in a mechanistic mode rather than in a manner that focuses on what is important to the person receiving care. The barriers to such care have been outlined in the literature on stress and burnout in nursing. Adomat, and Killingworth (1994) suggest that it is not 'caring' that is stressful but the organizational pressures of the caring environment. The need to be able to offer safe care at a high standard may explain the links between powerlessness and stress, patient suffering and stress, and multiple roles and stress. One cause of concern emerging from this study is that external pressures and organizational issues were key causes of stress.

In this study, the paths with low frequency of inclusion need particular consideration as some of these paths were not on the network produced in the earlier study using the grid method (Taylor *et al*., 1999). These paths indicate that the nurses in the present study were perhaps somewhat more understanding or insightful of a manager's predicament. Powerlessness was considered to impact on a manager's behaviour, as was the attitude and ability of staff, staffing levels, and multiple roles. These links, although not included with high frequency, were rated strongly. This positions managers in the middle of a complex network of causes of stress; they can be considered either as causing stress or as having to respond to situations that cause stress. Thus, while simplistically managers can be viewed as causing stress, this is perhaps somewhat naïve. The direct antecedents of stress indicated by the respondents were also considered to impact on the behaviour of managers. Those respondents who drew complex paths were expressing, via their networks, an awareness of a complex work situation. They acknowledged the external issues that impact on their stress experience (including the behaviour of managers) yet they were simultaneously aware that the behaviour of managers shares some of the same antecedents. Thus a main antecedent in the experience of work-based stress is also an effect of the working practices.

Some support for our model (as shown in figure 1) can be found in a recent study that attempted to evaluate and quantify work characteristics as causal factors of stress within the National Health Service. Haynes *et al*. (1999) surveyed 9000 staff from the seven major occupational groups within the National Health Service. The sample included 3441 nurses who were asked to fill out a questionnaire designed to measure eight constructs that were deemed from prior research and theory to be implicated in stress (Warr, 1987; Karasek, and Theorell, 1990; Arnold *et al*., 1991). These were autonomy/control, feedback on work performance, influence over decisions, leader support, role clarity, role conflict, peer support and work demands. Each of these constructs was measured by a minimum of four or a maximum of six items. For example, in the work demands section participants were asked 'How often do you find yourself meeting the following problems in carrying out your job?' and then given six items to respond to such as 'I am asked to do work without adequate resources to complete it'. The importance of support, which is clearly highlighted by our research, is acknowledged in the questionnaire of Haynes *et al*. (1999), which includes items dealing with both peer support and managerial support. Interestingly, as our model would predict, in that study nurses believed that they received significantly more peer support ($M=3.77$ and $SD=0.87$) than managerial support ($M=3.32$ and $SD=1.02$; $t=19.69$, $p<.001$).

Although, Haynes *et al*. (1999) argue that the nine dimensions they are trying to

measure are separate, they acknowledge that there will be some overlap. Indeed, some of the items appear to fit into more than one category. For example, 'Lack of clarity/ agreement about the different responsibilities of doctors and nurses' is in the professional compromise category but could clearly be in the role clarity or role conflict sections, which contain items such as 'I know what my responsibilities are' and 'Professionals make conflicting demands on me'. However, the importance of multiple roles suggested by our network is supported by this research. It is particularly noteworthy that individuals with higher role clarity show greater psychological well-being in the study by Haynes *et al.* (1999) and also in other studies (Fang, and Baba, 1993; Revicki *et al.*, 1993).

As one may expect, in the study by Haynes *et al.* (1999) there were significant correlations between many of the nine domains. From our model of nursing stress we would expect there to be links between staffing levels and multiple roles, which are most nearly represented as work demands involving role clarity, role conflict and professional compromise. Work demands in the study by Haynes *et* al. (1999) were indeed significantly positively associated with role conflict ($r=.48$) and professional compromise ($r=.48$) and significantly negatively associated with role clarity ($r=-.24$). We would also expect, as the study by Haynes *et al.* (1999) found, multiple roles as measured by professional compromise ($r=.29$), role clarity ($r=-.3$) and role conflict ($r=.39$) to be significantly related to stress as measured by job-related anxiety. Job anxiety had its highest correlation with work demands ($r=.44$). While the pattern of correlations show some similarities with our model, it should be recognized that their correlations come from the whole sample and not specifically from the nursing group.

It is also noteworthy that while our participants believed that powerlessness is a cause of stress, in the study by Haynes *et al.* (1999) autonomy and control, which are most like powerlessness, were not significantly associated with job-related anxiety ($r<.005$). This is surprising, given the continued evidence in support of the job-demand-control model of stress (Van der Doef, and Maes, 1999). This could be because autonomy as measured by Haynes *et al.* (1999) was concerned with the amount of choice a person has on the job, rather than their ability to control events. Given that some of our participants drew a path from patient suffering to powerlessness it seems likely that they were using it in a wider sense. Having said that, we believe that it is important to acknowledge the effect that patient suffering may have on nurses, and would argue that it is a weakness of the approach by Haynes *et al.* (1999) that it was not included in the questionnaire.

It is worth noting in this respect that other scales designed to measure the stress experienced by nurses have included items on dealing with patients (Gray-Toft, and Anderson, 1981; Harris, 1989). The Nurse Stress Index, for example, includes items on dealing with patients and relatives, managing workload, organizational support, home and work conflicts and competence in the role (Harris, 1989).

Green, and McManus (1995) have argued before that their diagram method reveals cognitive structural models with 'formal similarity to covariance structural models' but that 'their origins are in individual cognitions rather than in data per se'. Clearly, it would be possible to use structural equation modelling (Bentler, 1988) on the sort of data provided by Haynes *et al.* (1999) to compare it to the individual cognitions of our participants. We would argue that the examination of correlations mentioned suggests that such a procedure may well produce a similar picture to the network produced by our participants. We would also argue, however, that network analysis as described in the present paper can provide important explanations of perceived causes of stress and relationships between potential causes as identified from individual cognitions.

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