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Shiftwork, helplessness and depression

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Summary

Forty-three student nurses undertaking shiftwork for the first time participated in a study which tracked their perceptions of altered neurovegetative function, perceived criticism from others, sense of purpose and control and psychosomatic complaints. It was found that this first ever episode of shiftwork produced marked changes in all of the above. These findings have implications for circadian rhythm hypotheses of depression as well as for the methodology of future studies on cognitive or psychosocial variables in depression.

Key words: Shiftwork; Helplessness; Depression

Introduction

The phenomenon of learned helplessness was first described in 1967 (Overmeier and Seligman, 1967). While initially it was thought that this state might model 'neurotic' depression (Seligman 1975), subsequent work revealed that affected animals had motivational, affective and cognitive deficits characteristic of an endogenomorphic depression (Maier and Seligman, 1976; Maier 1984; Healy and Williams, 1988) and that the state was

reversible by antidepressants (Henn et al., 1985; Willner, 1986).

In 1978, the learned helplessness hypothesis was reformulated to provide a model more applicable to humans (Abramson et al., 1978). The reformulation incorporated evidence that individuals make attributions regarding events that have happened to them and that these attributions may be internal or external, global or specific, stable or unstable.

Aspects of this model have been investigated in healthy volunteers by inducing helplessness through the giving of insoluble anagrams or through the induction of 'depressed mood' states (Williams et al., 1988). The results of such procedures have mirrored to some extent findings from

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subjects with depression but inferences regarding the significance of this for depression must be treated with caution in that these procedures do not produce the neurovegetative changes associated with depression which may themselves be the focus of attributional processes.

In 1988, Healy and Williams proposed that the psychosocial disruptions that lead to depression might also produce states of circadian dysrhythmia and that the disturbances of neurovegetative functions consequent on this might be particularly likely to lead to helplessness-type cognitions. It was proposed that individual differences and tendencies to misattribute internal states would correlate with the likelihood that dysrhythmia would lead on to a clinical diagnosis of depression. It was also proposed that accurate information about underlying neurobiological abnormalities might help to correct misattributions and thereby promote recovery and prevent relapse.

In a series of reviews of possible dysfunctions of the circadian system in affective disorders, Healy and Waterhouse (1990, 1991, 1993) noted that there is clear evidence of a circadian disturbance in depression but that contrary to prevailing assumptions current evidence indicated a disturbance comparable to the kind of disturbance found in shiftwork rather than a dysfunction of the circadian clock.

They also noted that there are common core complaints in shiftwork and depression – disturbed sleep, disturbed appetite, lethargy, apathy and poor concentration; that neuroticism, as defined by instruments such as Eysenck's personality questionnaire, appears to enhance the likelihood of subjects having difficulties with both shiftwork and depression; and that as in depression, ongoing difficulties with shiftwork are associated with a perceived lack of social support (Healy and Waterhouse, 1991). On the basis of such findings they proposed that shiftwork maladaptation syndrome might act as a suitable model to investigate aspects of depression.

Attempts to validate a shiftwork model of depression, in either its cognitive, phenomenological or physiological aspects would ideally involve prospective studies of both shiftworkers and first ever episodes of affective disorder, as there is considerable evidence that both the affective dis-

orders and shiftwork have long-term physiological and cognitive effects. The present study was designed to address some of these issues where shiftwork was concerned.

A questionnaire had to be constructed for this purpose (see below). The first set of questions focussed on the occurrence of sleep, appetite, energy, interest and concentration disturbances in individuals exposed to shiftwork, followed by a set of subsidiary questions aimed at determining how helpless individuals became on shiftwork. A final set of questions dealt with perceptions of support and/or criticism from others, as the perceived level of criticism from others is a good predictor of the course of an affective episode (Hooley et al., 1986).

Methods

Volunteers

Forty-five student nurses, on their second year of nurse training, living and working in 2 local teaching hospitals were recruited in four separate groups at four separate times. They and their supervisors were told that we were investigating some aspects of their response to their first experience of nightwork. They were required to fill in a questionnaire (see below), in the week before beginning a block of 3 months of nightwork and again in the week after the block of nightwork ended. They were not told the exact purpose of the questionnaires nor how they would be assessed, nor that the same questionnaire would be given on a second occasion.

All volunteers completed both questionnaires. Two provided answers that revealed severe family problems affecting their work and lifestyle, independently of any nightwork. They were eliminated from the sample. Of the remaining forty-three, 37 were between 18 and 20 years of age. The mean age of the group was 19. There were 39 female subjects and 4 males.

As the first giving of the questionnaire retrospectively covered experiences during the previous 3 months, the group of nurses acted as their own controls. It was hoped that any bias that might have been introduced by concurrent stressors other than nightwork would be minimised by giving the questionnaire to more than one cohort

of nurses and to cohorts at different stages in their training programme.

Nightwork

Nightwork consisted of variants of a 3-night duties/4-rest days/4-night duties/3-rest days system.

Questionnaire

Q1–5. Subjects were asked whether there had been any changes in their energy, level of interest, concentration, sleep or appetite recently. They could answer yes or no and were then given 5 lines with each question to outline how they accounted for any problems they were having. This free space and a similar space after questions 7 & 8 was offered in a covert attempt to elicit attributions relevant to depression and helplessness.

For each parameter three further questions were asked, “Will this change be temporary?”, “Can you help yourself?”, “Does it bother you?”. In each case subjects had to circle a number from 1 to 5, which were anchored: 1 = No; 2 = Possibly No; 3 = Don’t Know; 4 = Possibly Yes; 5 = Yes.

Q6. Was a checklist of items, including vague aches and pains/indigestion/mental confusion/constipation/poor or dry skin or hair/palpitations/irritability/physical tension/nervousness/

forgetfulness/headaches and subjects were asked to indicate whether these had recently been worse/unchanged/better.

Q7. Asked “Is your life going according to plan at the moment?” Possible answers were 5 = Yes; 4 = Possibly Yes; 3 = Don’t Know; 2 = Mostly Not; 1 = No

Q8. “Compared to the last 6 months, how will the next 6 months be?” Answers could be given on a 5 point score from 5 = Much Better, through 3 = Don’t Know to 1 = Much Worse.

Q9. “How critical of you have the most important people in your life been in the last few months?”

Q10. “How critical have they been for the last few years?”

Q11. “How supportive of you have the most important people in your life been in the last few months?”

For questions 9–11, a visual analogue scale of 120 mm was used with extremes between 0 = Not at all Critical/Not at all Supportive and 120 = Very Critical/Very Supportive.

(The full questionnaire is available from the authors on request)

Statistical analyses

Non-parametric descriptions of the data (median and interquartile ranges) and non-parametric tests (Chi-Square, Mann-Whitney, Wilcoxon, Spearman) were used for the statistical analysis.

TABLE 1
Changes for Q1–Q5 ($n = 43$)

| Question | Energy | | Enjoyment | | Concentration | | Sleep | | Appetite | |
|------------------------|--------------------------------|----|---------------------------------|----|-------------------------------------|----|----------------------------|----|--|----|
| | Response: ↓ | ↔ | ↓ | ↔ | ↓ | ↔ | ↓ | ↔ | ↓ | ↔ |
| Before | 11 | 32 | 8 | 35 | 10 | 33 | 17 | 26 | 8 | 35 |
| After | 40 | 3 | 33 | 10 | 36 | 7 | 39 | 4 | 31 | 12 |
| χ^2 | 37.8 | | 26.8 | | 29.2 | | 22.6 | | 22.7 | |
| P | < 0.001 | | < 0.001 | | < 0.001 | | < 0.001 | | < 0.001 | |
| Commonest Explanations | Apathy (12) Sleep loss (15) | | Lethargy (17) Tiredness (17) | | Tiredness (19) Forgetfulness (4) | | Quality (13) Noise (13) | | Apathy (14) Hungry at wrong times (4) | |
| (No of times) | Rest days (8) | | | | Confusion (4) | | Rest days (11) | | | |

↓ = Deterioration.

↔ = No change.

Results

The responses to the questions on sleep, appetite, energy, interest and concentration follow a similar pattern. There was a much greater frequency of loss of energy, loss of interest etc. – after nightwork (see Table 1). These differences were statistically significant. It is also notable that there was a considerable amount of baseline disturbance for each of these functions, presumably reflecting the ordinary stresses of nurse training.

In those cases where explanations of the changes after nightwork were offered, the most common are summarised in Table 1. Of note here is the interplay between energy, interest, concentration and sleep factors. Thus apathy was cited as being a contributor to apparent lack of energy and conversely lethargy was seen as bringing about a loss of interest and enjoyment in things.

When the checklist of minor complaints (Q6) was considered, there was a significant increase in the number recorded after nightwork (Table 2). The median increase in the number of symptoms was 3, with individuals varying between a decrease of 2 and an increase of 9. All items on the checklist showed an increase with constipation, poor or dry skin and forgetfulness showing the largest increases.

With regards to Qs 7, 8, 9 & 11, in all cases nightwork produced a significant change (Tables 2 and 3). Thus nightwork appeared to alter perceptions as to whether life was going according to plan or not (Q7) and perceptions of level of support from others (Q11) or recent criticism from others (Q9) – although not perceptions of levels of criticism in the past (Q10). The group as

TABLE 3

Q9–Q11.

| Question | 9 Criticism | | 10 Criticism | | 11 Support | |
|-------------------------|--------------|-------|--------------|-------|-------------|-------|
| | When: Before | After | Before | After | Before | After |
| UQ | 59 | 90 | 62 | 60 | 118 | 106 |
| Median | 35 | 60 | 39 | 40 | 98 | 90 |
| LQ | 17 | 35 | 18 | 15 | 80.5 | 65 |
| Difference ^a | $P < 0.001$ | | NS | | $P = 0.021$ | |

UQ = Upper quartile.

LQ = Lower quartile.

^a Wilcoxon Test.

a whole predicted that the future would be better after nightwork, even though more criticism and less support were believed to exist at that time and even though life appeared not to be going as according to plan as it had been beforehand (Q8).

Attributions

The free space responses to Qs 1–5 and Qs 7–8 indicated that volunteers spontaneously divided into 2 groups. In the space offered for explanations, one group volunteered the information either that the future looked less good *because nightwork was about to begin* or that it looked better specifically *because nightwork had ended*. For the sake of convenience we will call this group the complainers (C) and the rest non-complainers (NC). The C group numbered 20 and the NC group 23. (The division of subjects into complainers and non-complainers was made before the data were further analysed).

There were no significant differences between the groups on Q 1–6 before nightwork (Tables 4

TABLE 2

Scores for Q6–Q8 ($n = 43$).

| Question | 6 Minor Complaints | | 7 Life Plan | | 8 Next 6 Months | |
|-------------------------|--------------------|-------|---------------|-------|-----------------|-------|
| | When: Before | After | Before | After | Before | After |
| UQ | 6 | 8 | 4 | 4 | 4 | 4.5 |
| Median | 4 | 7 | 4 | 4 | 4 | 4 |
| LQ | 2 | 5 | 4 | 2 | 3 | 3 |
| Difference ^a | $P \leq 0.001$ | | $P \leq 0.01$ | | $P \leq 0.01$ | |

UQ = Upper quartile.

LQ = Lower quartile.

^a Wilcoxon Test.

TABLE 4

Changes for Q1–Q5, divided into C, NC.

| Question | Response: | Energy | | Enjoyment | | Concentration | | Sleep | | Appetite | |
|----------|-----------|--------|----|-----------|----|---------------|----|-------|----|----------|----|
| | | ↓ | ↔ | ↓ | ↔ | ↓ | ↔ | ↓ | ↔ | ↓ | ↔ |
| Before | C | 8 | 12 | 5 | 15 | 5 | 15 | 8 | 12 | 4 | 16 |
| | NC | 3 | 20 | 3 | 20 | 5 | 18 | 9 | 14 | 4 | 19 |
| | χ^2 | NS | | NS | | NS | | NS | | NS | |
| After | C | 20 | 0 | 18 | 2 | 19 | 1 | 20 | 0 | 17 | 3 |
| | NC | 20 | 3 | 15 | 8 | 17 | 6 | 19 | 4 | 14 | 9 |
| | χ^2 | NS | | NS | | NS | | NS | | NS | |

↓ = deterioration.

↔ = no change.

and 5). Both were affected by nightwork similarly (Tables 4 and 5).

The groups differed on Qs 7, 8, 9 and 11 (Tables 6 and 7). The difference in their responses to how the next 6 months would be is notable in that C were pessimistic before night work and optimistic after it, whereas NC's expectations fell between the 2 values of C. This and the effects on the supplementary questions to Q 1–5, outlined below, appear to provide confirmation of the differences in attitudes which were the basis of the original division of the two groups.

Helplessness

A feature across these questions is an increase in feelings of loss of control. While, in response to the vegetative changes in Q1–5, on the supple-

mentary question "Will this change be temporary", averaged across Q 1–5 the median value was 4.4 (where 5 = yes and 4 = possibly yes, in response to the question "Can you help Yourself?" the group as a whole recorded a median reply of only 4.00.

For the supplementary question "Does it bother You", the median reply was 4.80, indicating clear distress with the complainers having a mean score of 5.0 and the non-complainers a score of 4.23 ($P \leq 0.01$, *t*-test).

In addition on Q 7, "Is your life going according to plan?", there was a shift from 3.93 (4 = Mostly Yes) to 3.25 (3 = Don't Know) for the group as a whole, which was significant ($P \leq 0.01$). Both complainers and non-complainers were affected (Table 6).

TABLE 5

Scores for Q6, divided into C, NC.

| Group | | C | NC |
|--------|--------|-----|-----|
| Before | UQ | 2 | 2 |
| | Median | 4 | 4 |
| | LQ | 5 | 5 |
| After | UQ | 5 | 4.5 |
| | Median | 8 * | 7 * |
| | LQ | 8.5 | 8 |
| Change | UQ | 2 | 1 |
| | Median | 3.5 | 3 |
| | LQ | 5.5 | 5 |

* $P < 0.01$ compared with before nightwork (Wilcoxon).

UQ = Upper quartile.

LQ = Lower quartile.

TABLE 6

Q7–Q8, for groups C and NC.

| Question | Group: | 7 Life Plan | | 8 Next 6m | |
|----------|--------|-------------|----------------|--------------------|----|
| | | C | NC | C | NC |
| Before | UQ | 4 | 4 | 4 | 4 |
| | Median | 4 | 4 | 3 | 4 |
| | LQ | 4 | 4 | 2.5 | 3 |
| After | UQ | 4 | 4 | 5 | 4 |
| | Median | 4 | 3 ^c | 4.5 ^{a,b} | 4 |
| | LQ | 2 | 2 | 4 | 3 |

^a $P < 0.01$ compared with Before (Wilcoxon).^b $P < 0.05$ compared with NC (Mann Whitney).^c $P < 0.05$ compared with Before (Wilcoxon).

UQ = Upper quartile.

LQ = Lower quartile.

TABLE 7
Q9 and Q11, for groups C and NC.

| Question | Group: | 9 Criticism | | 11 Support | |
|----------|--------|-------------------|-----------------|---------------------|-------|
| | | C | NC | C | NC |
| Before | UQ | 71 | 43.5 | 118 | 118 |
| | Median | 49.5 ^c | 33 | 99 | 98 |
| | LQ | 17 | 9.5 | 89 | 77 |
| After | UQ | 99.5 | 75 | 99.5 | 111.5 |
| | Median | 76 ^a | 45 ^a | 85.5 ^{a,b} | 95 |
| | LQ | 24.5 | 38.5 | 49.5 | 79.5 |

^a $P < 0.01$ compared with before (Wilcoxon Test).

^b $P < 0.10$ compared with non-complainers.

^c $P < 0.05$ compared with non-complainers.

UQ = Upper quartile.

LQ = Lower quartile.

Criticism and support

Perceptions of recent criticism increased significantly after nightwork in both groups (Table 3 – Q9). Perceived criticism was also significantly greater before nightwork in C than in NC (Table 7). The NC group perceived no change in support after nightwork; by contrast, although group C started off the same as NC, they perceived a drop in support after nightwork so that they differed significantly from NC (Table 7).

The change in perception of criticism from others appears to be confined to recent criticism. In response to the question of whether others had been generally critical over the past few years, the pre-shiftwork median value was 39.0 and this hardly moved being at 40.0 after shiftwork. Those who were complainers shifted from 48.0 to 34.5, while the NC group shifted from

36.0 to 43.5. None of these changes were significant.

Correlations

There was an expected negative correlation between perceived criticism after nightwork and support that was significant and a positive correlation between perceived criticism after nightwork and the number of minor complaints experienced (Table 8). When these correlations were investigated for C and NC separately, C retained statistically significant results, while NC showed similar trends but no longer reached statistical significance.

Discussion

Perhaps surprisingly, this study is the first to demonstrate the occurrence of neurovegetative symptoms in a young and healthy group of individuals exposed to shiftwork for the first time; hitherto such symptoms have only been demonstrated for individuals working shift routines chronically. It might be argued that in the absence of a control group, it is not possible to interpret the data in terms of altered circadian functioning. However, given the use of different cohorts of nurses, given the lack of any reporting of other stressors in the self-report sections of the questionnaire and given the scale of the changes from established baseline values, it is difficult to see an alternative explanation.

In addition to producing neurovegetative changes typical of depression, this study indicates that shiftwork may induce a certain amount of 'helplessness', which supports the contention that

TABLE 8
Correlations between Q6, 8, 9 and 11.

| | All Subjects | | | | Group C | | | | Group NC | | | |
|---------------------|--------------|----|-------|-------|---------|----|-------|-------|----------|----|----|---------|
| | Q6 | Q8 | Q9 | Q11 | Q6 | Q8 | Q9 | Q11 | Q6 | Q8 | Q9 | Q11 |
| Q6 Minor complaints | × | + | +0.52 | – | × | + | +0.80 | – | × | + | + | + |
| Q8 Next 6 months | | × | + | – | | × | + | | | × | + | + |
| Q9 Criticism | | | × | –0.53 | | | × | –0.56 | | | × | (–0.40) |
| Q11 Support | | | | × | | | | × | | | | × |

All correlations by Spearman rank correlation. Sign of correlation indicated. If $P < 0.05$ that correlation equals zero, then numerical value of coefficient shown; if $P < 0.10$, then coefficient bracketed.

shiftwork induced disturbances may provide a useful model for the affective disorders. It would be of interest to find out if shiftwork differentially activates global self-devaluative concepts in those who have been previously depressed, in the way that insoluble anagrams and Velten procedures appear to do.

Findings from such studies might form the basis for predictive tests of suitability for shiftwork. At present it is not possible to predict who will have problems with nightwork (Monk and Folkard, 1985; Rutenfrantz et al., 1985; Verhaegen et al., 1987). Conventionally, it has been assumed that difficulties with shiftwork arise by a gradual accretion of disadvantages over months or years (Haider et al., 1981; Herbert 1983; Knutsson and Akerstedt 1990; Rutenfrantz et al., 1985; de Vries and de Vries-Griever., 1990) but the present findings cast some doubt on this.

What is not revealed by this study is whether those who have early difficulties are the same group as those who preferentially drop out of shiftwork later in their careers. One possibility is that some of both the complainers and the non-complainers might develop coping strategies in the course of further shiftwork. Indeed, if shiftwork has any validity as a model for the affective disorders, further prospective studies that would map the interplay between cognitive, psychosocial and physiological factors occurring in later spells of shiftwork may be of considerable interest to researchers in depression.

As noted, shiftwork induced a certain amount of 'helplessness'. There were clear shifts in perception of control of both symptoms and lifeplan and in some subjects an associated emotional response. However, the finding that the intensity of emotional responses and frequency of psychosomatic complaints was greatest in subjects who apparently made the external attribution to the temporary stress of shiftwork as the determinant of their changed state (the complainers) is superficially at odds with what might be expected from helplessness theory (Abramson et al., 1978).

Any attempt to replicate these findings would ideally employ additional questionnaires such as the attributional style questionnaire (Peterson et al., 1982), the symptom interpretation questionnaire (Robbins and Kirmayer, 1991) or the health

locus of control questionnaire (Wallston and Wallston, 1978) to tease out the meaning of this discrepancy and to provide some external reference for the distinctions drawn between complainers and non-complainers.

Despite the shortcomings in our methods of dividing subjects into complainers and non-complainers, the distinction we drew does appear to be supported by answers given across a number of questions. What is not clear from this study is whether the complainers are 'vulnerable' to shiftwork. If they are, the question arises as to how this vulnerability arises and how it interacts with neurovegetative change and perceptions of others. Based on the findings of apparently altered perception regarding criticism and support from others, it is not impossible that responses on the attributional style and other questionnaires might themselves be altered by shiftwork.

A finding that was not predicted was the altered perception of criticism by and support from others. This perception of increased levels of criticism was true of both complainers and non-complainers but individuals who were complainers began with a higher baseline level of perceived criticism than those who were non-complainers. This finding is of interest as the question used was drawn from work by Hooley et al. (1986) which suggested that this question more than any other predicts chronicity of a depressive episode.

There would appear to be two possible explanations. One is that by virtue of being on shiftwork there was an increased level of criticism from others toward the subjects concerned, perhaps by virtue of their making unusual demands, such as insisting on excessive quiet in the house by daytime. It may also be that a decreased level of support was perceived by some because effectively they were out of contact with those who would be providing them with support and social contact.

An alternative explanation, however, is that a dysphoric state engendered by nightwork led to an increase in irritability and sensitivity. This explanation seems equally plausible in that this group of individuals were young and single nursing staff living in nursing accommodation for whom nightwork was not likely to produce a set

of conflicts with spouses and/or parents or children. Furthermore, they were operating in circumstances in which there would have been implicit understanding of the difficulties caused by nightwork and, one might hope, of the rights of passage associated with a first term of nightwork. The loss of social contact associated with a first spell of nightwork, which is something new and in some respects might be considered interesting, would be unlikely to have the same effect as the repetitive loss of contact associated with regular nightwork.

If the second hypothesis is correct it would be of importance as a demonstration that a relatively simple psychosocial manoeuvre can produce significant endogenomorphic changes and that these can encompass a shift in perceptions of support and criticism as well as perceptions that life is not going according to plan. Of interest here would be the issue of any possible relation between an increase in perceived criticism and loss of support and concurrent levels of expressed emotion.

Whatever the origins of the altered perception, if such alterations can be produced reliably, they might provide a model situation in which to test out remedial procedures aimed at establishing whether certain individuals need more support in times of stress or whether an appropriate educational package can alter perceptions helpfully.

In so far as these findings for shiftwork actually resemble, as opposed to merely model what happens in the affective disorders, they offer a possible explanation for part of the efficacy of cognitive and behavioural procedures in the management of endogenomorphic depressive disorders. It has been argued by Teasdale (1988) that common to all demonstrably effective psychotherapeutic interventions for the affective disorders are programmes of motivated activity. Healy and Waterhouse (1991, 1993) have argued that such programmes are comparable to those used in the management of jetlag and shiftwork maladaptation syndrome.

This interpretation perhaps could be tested by an experiment in which interventions for depressive disorders involving thought catching and attribution testing were kept constant while the degree of routine and level of motivated activity that patients were exposed to were varied. A

similar set of experiments could be conducted in the case of antidepressant drug treatment. On this point, there is some evidence that chronicity of affective disturbances in response to life events is proportional to the disruption of social routines that these events bring about (Ehlers et al., 1988).

Whether or not a disorder akin to shiftwork maladaptation syndrome lies at the core of the affective disorders, it seems clear that the psychosocial dislocations that depression brings about also produce a dysrhythmia (Souetre et al., 1991; Tsujimoto et al., 1990). Even if these changes are epiphenomena of depression, our findings suggest this dysrhythmia may in its own right produce emotional reactions as well changes in the perception of control and criticism from others. Any attempt to determine underlying cognitive or physiological factors in depression would therefore seem to need to take this into account.

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