

An Evaluation of the Effectiveness of Shift Work Preparation Strategies

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This study investigated whether workers who followed strategies for preparing and coping with the demands of shift work had more positive attitudes, and better physical and mental health. One hundred and twenty-two nurses completed a questionnaire measuring sleep, eating, fitness, and socializing strategies, as well as satisfaction with sleep, social life, shift work, and physical health and psychological well being. Nurses who followed the recommendations relating to socializing rated themselves more positively in terms of psychological well being, had fewer sleep problems, and were more satisfied with shift work and their social life. Physical fitness was also related to better health and psychological well being. In contrast, sleep and eating strategies did not significantly predict attitudes or behavior ratings. Explanations for the findings and their implications for shift workers are discussed.

Shift work is a way of life for millions of full and part-time workers around the world including a sizeable proportion of the New Zealand work force. Unfortunately, many problems can result from shift work including sleep disturbances (Akerstedt, 1984; Aschoff, 1981; Kogi, 1982; Monk, 1987; Rutenfranz, Colquhoun, Knauth & Gnata 1977; Rutenfranz, 1982; Tepas & Monk, 1987), dietary or digestive problems (Rutenfranz, 1982; Stewart & Wahlqvist., 1985), difficulties structuring family and social interactions (Knutson, Akerstedt & Orth-Gomer, 1986; Simon, 1987; Tepas, 1985; Walker, 1985; Weiss, 1981), and more frequent accidents (DeVries-Griever & Meijman, 1987). Various strategies have been offered which suggest ways to avoid and cope with the problems associated with shift work (e.g., Jung,

1988; Monk, 1988; Monk & Folkard, 1992; Simon, 1990; Siebenaler & McGovern, 1991; Wedderburn & Scholarios, 1993; Williams, 1995). However there has been relatively little empirical validation of the effectiveness of these strategies (Tepas, 1993). The objective of this study was to examine the effects of shift preparation and coping strategies on shift worker's attitudes and health.

A correctly set biological clock is arguably the single most important factor in ensuring a shift worker has good sleep and fewer jet-lag type symptoms (Monk & Folkard, 1992). Strategies designed to reduce disrupted sleeping patterns typically attempt to synchronize the body's biological clock as quickly as possible with the pattern of work activity and sleep required by a shift. Strategies suggested to aid adjustment of the biological clock to a night orientation include a routine of going to bed and rising at a set time for each particular shift (Jung, 1988; Monk, 1988; Simon, 1990; Siebenaler & McGovern, 1991; Williams, 1995), having meals at set times (Jung, 1988; Monk, 1988; Simon, 1990; Williams, 1995) and regular exercise (Jung, 1988; Simon, 1990). It is also recommended to have a 3 to 4 hour block of sleep time on days off which overlaps with the time the shift worker will be sleeping during the next working day (Siebenaler & McGovern, 1991). This strategy of 'anchor sleep' can stabilize the circadian rhythms (Minors & Waterhouse, 1981), and result in less desynchronisation of circadian rhythms (Raymond, 1988).

Shift workers should also ensure that their sleeping environment affords a good sleep by using curtains to ensure that the bedroom is as dark as possible (Monk, 1988; Simon, 1990; Shearer, 1991; Williams, 1995), that it is as quiet as possible (Monk,

1988; Simon, 1990; Siebenaler & McGovern, 1991; Monk & Folkard, 1992), and that the room temperature is cool but comfortable (Williams, 1995). To aid sleep onset, research suggests that the stimulant caffeine should be avoided within four hours of bedtime (Buysse, 1991). Sleeping pills should also be avoided wherever possible because they do nothing to rectify the chronic circadian misalignment problem which is the cause of sleeping problems (Smolensky & Reinberg, 1990). Furthermore, alcohol should not be used to help sleep onset because alcohol induced sleep tends to be light and disrupted (Yules, Freedman & Chandler, 1966).

Shift workers can also improve their physical fitness to help avoid and cope with shift work. Physically fit workers have been found to have significantly higher circadian rhythm amplitudes compared to unfit workers (Atkinson, Coldwells, & Reilly, 1993). People with high amplitudes in their circadian rhythms are potentially more tolerant to shift work because higher amplitudes result in a greater stability of circadian rhythms, which facilitates coping with the rhythm disturbances characteristic of shift work (Reinberg, Motohashi, Bourdeleau, Andlauer, Levi & Bicakova-Rocher, 1988). Fitness has also been found to be an important factor in promoting sleep, improving its quality (Urponen, Vuori & Partinen, 1988), and decreasing sleepiness during work hours (Harma, Ilmarinen, Knauth, Rutenfranz & Hanninen, 1988).

Shift workers should attempt to minimise diet related problems by paying particular attention to what they eat and when they eat it. It is recommended that shift workers should avoid foods high in fats and carbohydrates because of the possible digestive and elimination problems associated with this type of diet, rather they should eat 3 balanced meals a day (Akabas & Pirie, 1989; Jung, 1988; Monk, 1988; Simon, 1990; Williams, 1995).

Shift work can result in difficulties participating in social events. Normal social patterns often operate around a normal work day cycle which may exclude the shift worker. Special effort needs to be made where time is set aside to be with spouse and children (including taking long weekends and regular short holidays), and activities are undertaken with other shift working families (Monk, 1988; Monk & Folkard, 1992; Simon, 1990; Siebenaler & McGovern, 1991; Shearer, 1991). Shift workers should advise family and friends of their shift schedules so that plans for social events can be structured around their time off. Shift workers should attempt to engage in leisure activities (e.g., sports, hobbies) that suit their shift patterns, rather than

opting out because of scheduling difficulties.

Shift work preparation strategies may not only directly benefit the worker, but may also improve his or her attitude towards working shift work. There is evidence that attitudes towards shift work are more positive the longer that shift work has been established in an organisation (Brown, 1959; Griew & Phillip, 1969; Sergean, 1971). It has been suggested that this is because workers become accustomed to a particular shift schedule, and through trial and error develop effective coping strategies to meet its demands (Sergean, 1971). Similarly, there is also evidence that satisfaction with shift work varies with age, with older workers having more positive attitudes up until their late forties (Brown, 1959; Griew & Philip, 1969; Mott, Mann, McLouglin, & Warwick, 1965; Wedderburn, 1967).

In summary, this study examined the degree to which nurses followed shift work preparation recommendations and investigated whether use of the strategies was associated with evidence of a reduction in the negative aspects of shift work, and increased satisfied with shift work. Specifically, it was expected that shift workers who followed some or all of the sleeping, eating, and social interaction recommendations, and that maintained their fitness would have fewer sleep problems, fewer physical health problems, would rate their psychological well being more positively, and be more satisfied with their social life, and with shift work.

Method

Participants

One hundred and twenty two public hospital nurses working a number of different shift rosters ranging from a slow rotating rota (eg: 5 morning shifts with 2 days off, 5 afternoon shifts with 2 days off, and 5 night shifts two days off), to a self roster system where preferred hours were normally worked, participated in the study. Participant age ranged from 22 to 46 years for the 7 males, and from 21 to 60 years for the females in the sample (overall mean age = 35 years). The participant's experience at working shifts ranged from 2 months to 36 years 9 months (mean = 13.9 years, SD = 8.0).

Questionnaire

A questionnaire requesting information on demographic and contextual variables, shift preparation strategies, physical health, psychological well being, sleeping problems, satisfaction with shift work, and satisfaction with social life was prepared.

Demographic and Context Information

Age, gender, number of people living with the participant, shift work experience, the number of hours worked on an average week, and a rating of fitness level (1 = Low to 5 = High) were requested.

Shift Preparation Strategies

The behavioral statements on shift preparation strategies covered the four key areas identified in the shift work literature: sleeping strategies on work days; sleeping strategies on days off; eating strategies and socializing strategies (e.g., Jung, 1988; Monk, 1988; Monk & Folkard, 1992; Simon, 1990; Siebenaler & McGovern, 1991; Wedderburn, 1993; Williams, 1995). Table 1 shows a brief description of each statement used in this section of the questionnaire. Participants responded to each statement by rating the frequency (1 = Never and 5 = Always) with which they undertook each behavior.

Physical Health

The Physical Health Scale (PHS) was developed from the scale used by O'Connor (1992), and assessed appetite, indigestion, tiredness, headaches, shortness of breath, and dizziness which are health problems highlighted in the shift work literature (e.g., Torsvall & Akerstedt, 1978). Participants used a 5-point scale (1=Very Untrue, 5=Very True) to rate each question, and after appropriate reverse scoring ratings were summed to produce a PHS score where a larger score indicated less health problems.

Psychological Well Being

The 12 item version of the General Health Questionnaire (GHQ-12) (Goldberg, 1978) was used to measure psychological well being. Questions measured concentration, sleep loss over worry, feelings of usefulness, ability to make decisions, feelings of strain, ability to overcome difficulties, enjoyment of day to day activities, ability to face up to problems, feelings of depression, confidence, feelings of self worth, and happiness. Responses were given on a 4 point scale (0 = Never, 3 = Always), and after the appropriate reverse scoring ratings were summed across questions to produce a GHQ scale where a larger score indicated a higher level of psychological well being. The GHQ-12 is reported to have good internal consistency (e.g., Winefield, Goldney, Winefield & Tiggemann, 1989, $\alpha = .84$ with an Australian sample).

Sleep Problems

Sleeping problems were assessed using the Sleep Pattern Adjustment Scale (SPAS) developed by

O'Connor (1993). Based on the research of Torsvall & Akerstedt (1978), the SPAS assesses satisfaction with sleep quantity, the degree sleep is broken up into small sleep episodes, feelings of refreshness upon wakening, and tiredness upon going to work. Responses were given on a 5-point scale (1= Never, 5= Always), and after appropriate reverse scoring ratings were summed such that a larger SPAS score indicated more sleep problems. Test-retest reliability for the scale was found to be 0.76 ($p < 0.001$) (O'Connor, 1993).

Shift Satisfaction

Satisfaction with shift work was assessed using the Shift Schedule Satisfaction Scale (SSSS) developed by O'Connor (1993) which was based on the research of Wedderburn (1978; 1980). The scale has 7 statements (e.g., I like the hours that I work) which were responded to on a 5-point rating scale (1 = Very Untrue, and 5 = Always). Larger scores indicate more satisfaction with shift work. O'Connor (1993) found the test-retest reliability for the scale to be 0.77 ($p < 0.001$). O'Connor did not report Cronbach's alpha for the SSSS, however calculation of alpha using our sample ($\alpha = .83$, $n = 122$) suggests the SSSS has adequate internal consistency.

Social Life Satisfaction

Social Life Satisfaction (SLS) was measured using 8 statements adapted by O'Connor (1993) from the work of Torsvall & Akerstedt (1978), and Nachreiner's (1980) on social adjustment. Responses were given on a 5-point rating scale (1 = Very Untrue, 3 = Can't Decide, and 5 = Always). Larger scores indicate more satisfaction with ones social life. Test-retest reliability for the scale was found to be 0.54 ($p < 0.01$) (O'Connor, 1993). O'Connor did not report Cronbach's alpha for the SLS, however calculation of alpha using our sample ($\alpha = .73$, $n = 122$) suggests the SLS has adequate internal consistency.

Procedure

The questionnaire was distributed by ward supervisors to nurses in a large public hospital. Questionnaires were completed anonymously by nurses and returned by post.

Results

In order to examine the use of the shift work coping recommendations, the proportion of respondents that gave a rating of 2 (1 = they had never used the strategy) or greater was calculated. Inspection of the first column of Table 1 indicates that relatively large proportions of the sample had used many of the strategies at least once. The exception was for the sleep

Table 1. Distribution and mean ratings for each shift work preparation strategy.

Strategy Statements	Percentage That Had Used Strategy At Least Once	Mean Frequency Rating	Rating Standard Deviation
Sleep strategies on work days			
Ensure bedroom is cool	99.1	4.7	0.7
Ensure bedroom is quiet	97.5	4.5	0.9
Avoid using sleeping pills	95.9	4.1	1.1
Publicize sleeping hours	91.8	3.6	1.2
Go to bed earlier when working a morning shift	91.5	4.0	1.2
Develop a sleeping routine for particular shifts	88.5	3.4	1.3
Avoid using alcohol as a sleep aid	86.8	3.2	1.2
Ensure bedroom is dark	84.4	3.4	1.3
Sleep strategies on days off			
Go to bed at time close to that on next work day	61.4	2.1	1.1
Rise at a time close to that on next work day	50.0	1.8	1.0
3-4 hr sleep during the time will be sleeping during work	30.3	1.6	1.1
Eating strategies			
Avoid caffeine within 4 hours before bed	98.3	4.8	.66
Interrupt sleep to eat at regular meal times	94.2	3.6	1.2
Avoid fatty foods	78.6	2.5	1.1
Eat at regular meal times	77.0	3.0	1.5
Avoid snacking throughout the day	68.8	2.5	1.3
Avoid eating less than 1 hour before going to bed	61.4	2.4	1.4
Have 3 balanced meals per day	55.7	2.0	1.2
Socializing strategies			
Set time aside to be with friends and family	97.5	3.8	1.1
Advise family & friends of work schedule	95.9	3.5	1.1
Keep in touch with other shift workers	95.0	3.5	1.2
Participate in sports/hobbies each week	89.3	3.4	1.2
Frequently go away for long weekends or short holidays	86.8	2.8	1.3

strategies on days off where very low utilization rates are evident. Inspection of the 2nd column of Table 1, which shows the mean rating for each strategy, indicates that the frequency of use varies considerably across strategies, and again the sleep strategies for days off showed very low frequency of use. Finally, the standard deviations shown in Table 1, indicate that there is some individual variation in the frequency of strategy use.

Regression analysis was used to determine whether demographic and contextual variables could account for individual variation in strategy use. First a composite score was calculated for each of the four preparation strategy categories by summing the ratings given for each strategy statement (e.g., the composite score for eating was the sum of the ratings given to the 7 eating statements). Four separate regressions were

performed in which age, number of others living with the participant, shift work experience, and hours worked per week were regressed onto each preparation strategy composite score. Table 2 shows the standardised regression coefficients from each analysis. Inspection of Table 2 indicates that none of the regressions produced a significant result. In general the standardised regression coefficients are very small and indicate that the demographic and contextual variable measured do not account for much variance in strategy use. A possible exception is hours worked per week. Although the overall regression model for sleep on work days was not significant, hours worked per week did individually account for a significant amount of variance in this model. Inspection of the scatter plot indicated that sleep preparation strategy use decreased as hours worked increased.

Table 2. Standardized regression coefficients for the demographic and contextual variables regressed onto each shift work preparation strategy.

Demographic and Contextual Variables	Preparation Strategies			
	Sleep on Work Days	Sleep on Days Off	Eating Strategies	Socializing Strategies
Age	.09	.10	.02	.04
# Living with Participant	.16	.07	.08	.03
Experience (months)	-.13	-.09	-.09	-.10
Hours worked per week	-.23*	.01	-.18	-.02
Significant Test of Model (F(4,117) =	1.999, ns	.3026, ns	1.4989, ns	.2126, ns

* p<0.05

In order to examine whether the preparation strategies were of benefit to the shift workers, the strategy composite scores and fitness level were regressed onto the physical health, psychological well being, sleep problems, shift satisfaction, and social satisfaction scores. First the inter-correlations between the composite scores were examined in order to check for multicollinearity: obtained correlation ranged from .04 to .29 and these were considered acceptable (see Darlington (1968) and Gordon (1968) for a discussion of multi-collinearity). Inspection of Table 3, which shows the regression analysis results, indicates that three of the five regressions produced an overall significant result and in general it was the social preparation strategy composite score which accounted for a significant proportion of the variance. Those who followed more of the socialising strategies tended to

rate themselves more positively in terms of psychological well being, rated themselves as having fewer sleeping problems, were more satisfied with shift work, and tended to enjoy their social life more. Fitness also contributed to the regression models with higher fitness ratings being associated with fewer physical and psychological problems.

Given that the latter analysis found that the social preparation strategy composite score had some predictive power, the remaining analyses focused on the individual components of this preparation strategy. The standardized regression coefficients for the other strategy composites, as shown in Table 3, are very small, and analysis of the individual components within these strategies yielded no significant results. The specific socialising strategies making up the social preparation composite score (see Table 4) were

Table 3. Standardized regression coefficients for preparation strategies in relation to measures of shift work coping and satisfaction

	Physical Health	Psychological Wellbeing	Sleep Problems	Shift Satisfaction	Social Life Satisfaction
Sleep on work days	.14	.03	.03	.07	-.04
Sleep on days off	-.14	-.14	.06	.02	.09
Eating strategies	.02	.02	-.08	.00	-.07
Fitness Level	.25**	.22*	-.16	-.13	-.04
Social strategies	.03	.27**	-.30**	.22*	.30**
Significant test of Model (F(5,116) =	2.1389, p = .06	4.295, p < .01	4.128, p < .01	1.461, na	3.139, p < .01
Adjusted R ²	.04	.11	.11	.01	.08

* p<0.05

** p<0.01

regressed onto psychological well being, sleep problems, shift satisfaction, and social satisfaction. Before the regressions were performed, inter-correlations between the individual social preparation strategy components were examined. The obtained coefficients (range .01 to .38) indicated no multicollinearity problems.

All four regression models accounted for a significant proportion of variance. Inspection of Table 4, which shows the results of each analysis, indicates that the pursuit of outside interests was associated with a reduction in psychological and sleep problems, and higher levels of shift and social satisfaction. Keeping in contact with coworkers, and taking regular long weekends and brief holidays, tended to reduce sleep problems.

General Discussion

Participants indicated they adopted socialising and sleep strategies on work days to a high degree, diet related strategies were used somewhat less frequently, while sleeping strategies on days off were rarely used. Two possible explanations for the low usage of some shift preparation strategies are a lack of awareness of the strategies, or a reluctance to try them. The literature provides evidence to support both explanations. A New Zealand study by Molloy (1995) found that 70 percent of nurses reported that they had not been given formal education or training on the nature of shift work or how to deal with it. Furthermore, Wedderburn and Scholarios's (1993) survey of 120 shift workers found that the majority opposed several frequently suggested shift work preparation strategies. A more pessimistic explanation for a lack of preparation strategy use is that workers

find that the strategies are not useful and stop using them. However, we did not find a relationship between shift work experience (nor age) and strategy use which might have supported this explanation.

Of the preparation strategies investigated, the socialising strategies showed some effects. Socialising strategy use was positively associated with psychological well being, with fewer sleep related problems, and increased satisfied with shift work, and social life. In particular, these outcomes were most evident for those who ensured that they participated in outside interests such as hobbies and sports each week, and kept in contact with other shift workers. These findings provide support for the argument that the biggest negative impact of shift work is on the workers social life (Wedderburn, 1996), and justify the major emphasis on socialising strategies in the research literature (e.g., Monk, 1988; Simon, 1990; Siebenaler & McGovern, 1991; Shearer, 1991; Monk & Folkard, 1992).

Participation in sports and hobbies appears to be an important factor in our shift work sample. Arguably, individuals participate in sports, and pursue hobbies, because these activities satisfy their needs in such areas as creativity and achievement. This satisfaction of needs might be expected to have a positive influence on psychological well-being. Furthermore, participation in sports, undoubtedly contributes to an individuals fitness level, and as noted earlier fitness has been found to be an important factor in sleep quality (e.g., Urponen, et. al., 1988). Shift work may actually provide opportunities to pursue some hobbies and sports (e.g., surfing is generally a day time activity) and in so doing may make shift work more appealing to the individual. The positive aspects of sport and hobby

Table 4. Standardized regression coefficients for each social preparation strategy for the psychological well being, sleeping problems, shift satisfaction, and social satisfaction models.

Social Preparation Strategies	Psychological Well being	Sleep Problems	Shift Satisfaction	Social Satisfaction
Set aside time for family/friends	.05	-.04	.04	.09
Participate in sports/hobbies	.39**	-.29**	.27**	.27**
Publicize work schedules	-.01	.11	-.00	-.01
Keep in contact with co-workers	.05	-.19*	.06	.08
Take long weekends/short holidays	-.01	-.16#	-.05	.08
Significant test of Model				
(F(5,116) =	4.901, p < .01	4.853, p < .001	2.226, p = .056	3.5799, p < .01
Adjusted R ²	.13	.13	.04	.09

* p<0.05

** p<0.01

p = .06

participation might quite reasonably be expected to increase an individuals satisfaction with their social life.

Our data suggest that there may be benefits if shift workers establish and maintain contact outside of work hours. The apparent relationship with sleep problems might be evidence of shift workers being able to sleep at what is normally not the appropriate time (e.g., during the weekend or an evening) because their social needs are being met by contact with other shift workers. In other words, the shift worker may not need to compromise their sleep in order to allow for socializing with friends who do not work shift work.

In contrast fitness, and some of the socializing strategies, the eating and sleep strategies shows no significant effects. Arguably, there was sufficient variation in the use of these strategies across the sample to detect effects. Why then are these strategies not helping shift workers? One explanation is that the detrimental effects of shift work on sleep and the digestive system are simply not addressed by the strategies examined – they do not help. There may be some merit in this rather pessimistic interpretation. In relation to sleeping problems it may be necessary for sleep strategies to be finely tuned to the day to day behavior of the worker and their circumstances in order for them to be beneficial.

Overall, this study highlighted the role that shift workers themselves can play in facilitating adjustment to shift work. In particular, the findings point to the importance of educating shift workers about socializing strategies that can potentially aid shift work adjustment. In this regard organizational factors, such as induction and training programmes, need to be structured such that the potential for awareness and adoption of useful coping strategies is maximized. Future research should attempt to address why shift workers may be resistant to adopting potentially useful preparation strategies and why some strategies appear to be of limited value.

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