Morningness-Eveningness, Time-Oriented Body Functions, Shift Satisfaction and Anticipated Turnover in a Group of Rotating Shift Workers

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MORNINGNESS-EVENINGNESS, TIME-ORIENTED BODY FUNCTIONS, SHIFT SATISFACTION AND ANTICIPATED TURNOVER IN A GROUP OF ROTATING SHIFT WORKERS

By

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THESIS

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INTRODUCTION

Shift Work: A Definition

The term shift work, or shift systems, encompasses a wide variety of work schedules. According to Tasto and Colligan (1977) the most frequent starting and stopping times for shift schedules are from 7 a.m. to 3 p.m., 3 p.m. to 11 p.m., and 11 p.m. to 7 a.m.; with the next most frequent hours being from 8 a.m. to 4 p.m., 4 p.m. to midnight, and midnight to 8 a.m. With regards to types of shift systems, the literature (e.g., Benjamin, 1984; Tasto & Colligan, 1977; Walker, 1978) identify the following as the most common types:

- **Fixed Shifts** - Employees work the day, evening or night shift on a permanent basis.
- **Rotating Shifts** - the employees are required to work the day, evening and night shifts in sequential rotation.
- **Oscillating Shifts** - the employees alternate between the day and evening or evening and night shifts.
- **Split Shifts** - this type of schedule is characterized by a break in the middle of the work day. Employees are required to work a number of hours, then are released for a predetermined time period, and later return to complete the work day.
Relief Shifts - Employees on relief shifts are required to fill in during the absence of regular shift employees. Therefore, the actual shift worked varies according to the relative need for coverage on the regular shifts.

There is no doubt that increased industrialization is one of the key reasons for the widespread use of shift systems. With the advent of the Industrial Revolution it actually became an economic necessity (Tasto & Colligan, 1977). As stated by Agervold (1976), "With increasing investment in machines, automation, etc., economic demands are being made for a higher coefficient of utilization so that the investment can be written off in the shortest period of time. Moreover, much modern production equipment requires continuous operation on purely technical grounds" (p. 181). Certain industries such as glass, oil and steel require continuous operation because of the production process involved; others opt to use shift work as a way of increasing output (Benjamin, 1984).

In many cases the use of shift systems is linked to social rather than economic necessity. A significant number of shift workers are employed by organizations that provide services which are expected to be available around the clock. These include health care, law enforcement, fire service, transportation, telecommunications, postal service, etc. The entertainment industry is also known for employing large numbers of shift workers (Tasto & Colligan, 1977).

Considering the available evidence, the incidence of shift work seems to be increasing steadily. According to Philipp and Griew (1970), "All industrialized societies observe and report an increasing
amount of shift work in industry and forecast the more general probability that greater numbers of workers will be employed in this way" (p. 9). The National Institute of Occupational Safety (cited in Benjamin, 1984) estimates that 26% of North American workers are engaged in some form of shift work. In the United States, the number derived from that estimate is between 25 and 28 million workers. The number of employees working shift work has doubled in the last 20 years, and experts predict that shift work will continue to increase at a minimum rate of 6% per decade (Benjamin, 1984).

Problems Associated With Shift Work

The problems associated with shift work and resistance to this type of work schedule have been issues of concern for hundreds of years. Documented objections date back to the Thirteenth Century when European guilds protested against night work (Tasto & Colligan, 1977). Today, there is a general consensus among researchers that shift work is a problem because it disrupts circadian rhythms which, in normal life, coincide with the sleep/wake cycle (Walker, 1978).

It is generally recognized that circadian rhythmicity is exhibited by a great number of physiological, psychological and biochemical functions of humans which are regularly activated or intensified during a specific portion of the 24-hour day (Conroy & Mills, 1970; Gross, 1983; Kleitman, 1963; Wojtczak-Jaroszowa, 1977). Shift work interferes with the worker's physiological, psychological, as well as
social, 24-hour temporal patterns; specifically rhythms of physiological or psychological activation/arousal, metabolism and digestion (Akerstedt & Froberg, 1976).

Effects on Health and Well-being

According to Wedderburn (1975), the "nastiest effect of full-blooded shift work" is sleep disturbance, which is also the most common complaint among shift workers (Thiis-Evensen, 1958; Walker, 1978; Weitzman, 1976). In fact only one of the studies reviewed reported that sleep difficulties were not common among the shift workers interviewed (Taylor, 1967). When comparing night and day workers, large differences were found in the incidence of sleep problems. Thiis-Evensen (1958) found that 60% of the shift workers as compared to 11% of the day workers studied reported sleep disturbances. Aanonsen (1964; cited in Walker, 1978) reported that 89% of former shiftworkers had difficulties in sleeping while on the night shift; however, after transferring to day work only 16% still experienced sleep problems. In a study of New Zealand shift workers, Philipp and Griew (1970) also found that sleep disturbances were a major problem for those workers who were required to work nights. They found that lack of sleep was a difficulty for 18% of the afternoon workers, 52% of the nightworkers, 62% of those on discontinuous rotating shift, and 57% of those on continuous rotation.

The available evidence indicates that shift workers are faced with a reduction in the number of hours of sleep they receive. In a
Study of British factory workers, Wyatt and Marriott (1953) reported that only 58% of the shift workers were satisfied with the amount of sleep they received. They also found that 75% of the night workers interviewed had less than 8 hours of sleep per day, and that 37% reported having less than 6 hours. The findings of a Scandinavian study of shift workers (Bjerner, Holm & Swenson, 1948; cited in Tasto, Colligan, Skjei & Polly, 1978) lends support to Wyatt and Marriott's report. In this study, the researchers determined that rotating shift workers averaged 6.5 hours of sleep per day; however, when on the night shift these workers slept an average of 5.5 hours per day. On the other hand, Bjerner et al. found that the day workers in their sample averaged 7.5 hours of daily sleep. Walker (1966; cited in Walker, 1978) studied rotating shift workers and found that the amount and regularity of sleep was least satisfactory after the night shift. Mott, Mann, McLoughlin and Warwick (1965) in a study of American workers, and Ulick (1957; cited in Mott et al., 1965), in a study of German workers, also reported that a major complaint among shift workers was insufficient hours of sleep.

The quality of shift workers' sleep is severely affected as a result of the "unnatural" schedule they must keep. In a review of literature, Finn (1981) concluded that insufficient sleep or poor quality sleep resulting from trouble falling asleep, waking up during sleep and waking up early is widespread among shift workers. Even among the group of shift workers who were satisfied with the number of hours of sleep they received, Wyatt and Marriott (1953) found that many felt that it was less refreshing than night sleep, which seems to
indicate dissatisfaction with sleep quality. In a study of nurses and food processors, Tasto et al. (1978) examined the shift workers' satisfaction with the quality of their sleep. They found that in both samples night workers reported the least satisfaction with "general adequacy of their sleep patterns." Rotating shift workers also showed significantly greater dissatisfaction with their sleep than day or afternoon workers. Some of the specific complaints associated with sleep included difficulty falling asleep, frequent awakening after sleep onset and tiredness at work. Mott et al. (1965) also reported that rotating shift workers experienced more difficulties getting to sleep and staying asleep than day or afternoon workers. An objective assessment of the effects of changes in sleep times provides further support to the existence of sleep problems among shift workers. Weitzman (1976) reported a laboratory experiment in which subjects were forced to shift their sleep patterns. During the first week of sleep-wake reversal, sleep was found to be disrupted by frequent awakenings. An alteration of the REM non-REM pattern of sleep stages was also present and persisted after two weeks. These changes in the phasing of the different sleep stages are said to be related to poor quality of sleep (Walker, 1978).

The sleep difficulties encountered by shift workers have been implicated with other problems found in this population. Finn (1981) stated that, according to the literature reviewed, lack of adequate sleep and poor quality sleep seem to be associated with physical and nervous disorders, and deficits in mental and psychomotor performance. Many feel that fatigue resulting from lack of adequate sleep is at the
root of some of the problems experienced by shift workers, and argue that the fatigue which builds up after working several nights in a row is the most serious problem associated with shift work (Hood & Milazzo, 1984). Philipp and Griew (1970) propose that sleep problems and fatigue are at least contributors to the moodiness, loss of concentration, tension, nerves, anxiety, impatience and short-temperedness reported by 43% of the rotating shift workers in their sample. According to Walker (1978), the general feeling of malaise commonly found among shift workers may be a direct result of sleep disturbances and associated fatigue. Thiis-Evensen (1958) found that nervous disorders were more prevalent among the shift workers who reported sleep disturbances. He argued that the state of fatigue which builds up over a sequence of night shifts is associated with nervous disorders. Indirect support for the contention that sleep problems are implicated in other physiological problems is provided by Aanonsen (1959). He reported that of the 128 previous regular shift laborers who were removed from shift work for medical reasons, 90% had developed sleep disturbances. There is also some evidence to suggest that sleep difficulties and resulting fatigue may contribute to the shift workers' dissatisfaction with family and social lives. In a study of custodial workers described by Hood and Milazzo (1984), it was found that the workers who transferred to day shift reported that they were spending more time with their families because they were less tired. In another study, shift workers reported that loss of sleep had a negative effect on their social and family lives (Mott et al., 1965).
Next to sleep disturbances, appetite and digestion problems seem to cause shift workers the most discomfort (Tasto et al., 1978). Van Loon (1958; cited in Mott et al., 1965) found that 20% of the shift workers interviewed reported problems with their appetite. A later study by Mott et al. (1965) reported that the incidence of appetite problems appeared to be significantly higher for rotating shift workers than for day workers. Wyatt and Marriott (1953) also found that appetite was a problem for the rotating shift workers interviewed. Most of the 150 workers interviewed felt that night work caused loss of appetite and upset digestion; 73% said that they enjoyed their food more when working the day shift, while only 3.3% reported better appetites on the night shift. Along with appetite, digestion problems seem quite prevalent among shift workers. One of the studies reviewed reported that 43% of the shift workers interviewed took medication for digestive problems on a regular basis (Wyatt & Marriott, 1953). Digestion and appetite were some of the most common physiological problems, second only to sleep disturbances, reported by the rotating shift workers in a study conducted by Philipp and Griew (1970). Forty percent of their sample experienced difficulties with appetite, and some reported excessive weight gain or weight loss. Also 26% had such problems as constipation, indigestion and upset stomach. Tasto et al. (1978) found a higher incidence of complaints regarding trouble digesting food among the rotating shift workers than day workers. Thiis-Evensen (1958) also reported a higher incidence of digestive complaints among shift workers than day workers, and found a
relationship between nervous and digestive disorders. He proposed that the fatigue, irritability and restlessness resulting from the shift workers' sleep problems have detrimental effects on the workers' nervous and digestive systems.

Another time-oriented body function which seems to be affected by the disynchronized schedule of shift workers is that of elimination. As stated above, Philipp and Griew (1970) reported that 26% of the shift workers interviewed experienced problems with constipation, indigestion and upset stomach. Mott et al. (1965) found that complaints of constipation were more common among shift workers than day workers. Thiese-Evansen (1958) also found a high incidence of problems with elimination in a group of shift workers when compared to day workers. He reported that 30% of the shift workers had constipation or colitis, as opposed to only 9% of the day workers.

Investigations of the effect of shift work on general health are not all necessarily in agreement with each other. In fact, some conflicting results have been found, which make it very difficult to formulate any conclusive statement about the relationship between shift work and health. In noting the lack of attention given to shift work in discussions of employee wellness programs, Hood and Milazzo (1984) suggest that one of the reasons for this may be that "the research on the relationship between shift work and health is confusing and contradictory, leaving even the best informed reader unclear about what to believe and uncertain about which results apply to which worker" (p. 95). One thing that does seem clear is that the mortality rate of shift workers appears to be similar to that of the
general population. To date, results of the few studies carried out to investigate the effect of shift work on life expectancy have concluded that work hours seem to have no effect upon mortality (Taylor & Pocock, 1972).

Gastrointestinal and nervous disorders seem to be the most frequently found health problem among shift workers. Menzel (1962; cited in Walker, 1978) reviewed Scandinavian studies conducted during the 1940s and 1950s and concluded that there was a greater incidence of stomach disorders and peptic ulcers among shift workers than day workers. Thiis-Evensen (1958) found that 30% of the shift workers who transferred from shift work to day work reported gastritis as one of their problems. He also reported a higher frequency of nervous and digestive complaints in this group than regular shift workers or day workers who never worked shifts. In a study of the sick records of 370 shift workers and 270 day workers from years 1966 to 1977, Angersbach et al. (1980) found that shift workers experienced more frequent gastrointestinal disorders, including peptic ulcers, than day workers. Also, shift workers who transferred out of shift work were found to have more severe gastrointestinal diseases than the permanent shift workers. No differences in the incidence of cardiovascular problems between day and shift workers was detected. Koller, Kundi and Cervinka (1978) conducted a field study which included an investigation of the medical aspects of shift work. The researchers divided 270 workers from an Australian oil refinery into three groups (i.e., day workers, shift workers, and those who had "dropped-out" of shift work) and interviewed them to determine their state of health. They found that
80% of the day workers and 70% of the shift workers reported no health problems; with 30% of the shift workers in contrast to only 20% of the day workers reporting moderate to severe health problems. Shift workers also reported more complaints of gastrointestinal disorders than the day workers. Drop-outs had a higher percentage of severe disorders than the day workers, but less than the shift workers. One of the most comprehensive comparative studies of the effect of shift work on health was conducted by Aanonsen (1964, cited in Walker 1978). He studied 1,106 industrial laborers in three Norwegian electrochemical plants. The sample was divided into three groups (i.e., day laborers, shift laborers and previous shift laborers who had transferred to the day shift) and were given annual medical examinations from 1948 to 1953, with particular attention given to gastrointestinal, nervous and cardiovascular disorders. Results of the analysis of symptoms and incidence of disorders led to the conclusion that cardiovascular disease was not associated with shift work, and that the incidence of nervous and gastrointestinal problems was the same for day and shift workers; however, it was significantly higher among the shift workers who transferred to day shift for medical reasons. Among the ex-shift workers who transferred to day shift for medical reasons, the incidence of gastrointestinal diseases including peptic ulcers were twice as prevalent than among day or shift workers. The incidence of nervous disorders were found to be three times as prevalent among the ex-shift workers.
The apparent relationship between shift work and nervous or gastrointestinal disorders found in the studies described above is not substantiated by other investigations which either negate or contradict what has been reported to this point. In explaining the contradictory findings, these authors imply that a good deal of worker self-selection may have taken place; that is, those who develop health problems transfer to days, leaving a group of healthy and fit workers to deal with the rigors of shift work. The theory of self-selection has, in fact, been proven by some investigations (e.g., Aanonsen, 1964; cited in Walker, 1978) which found no differences in the health status of day and shift workers but reported higher incidence of health problems among the shift workers who transferred to the day shift. One such study with results somewhat contradictory to what was expected was conducted by Mott et al. (1965) who found that the average number of health complaints was greater among the day and afternoon workers than night or rotating shift workers. This included a higher incidence of ulcers among the day and afternoon workers. The authors felt that the unexpected results could be partly attributed to transfers of previous night and rotating shift workers to the less demanding day and afternoon shifts. Dirken (1966) had 600 shift workers and 1200 day workers complete a health questionnaire. Unlike most other studies that use questionnaires to collect data, the participants were not told that shift work was being studied. The investigator found that shift workers had no more health complaints than day workers, including gastrointestinal and nervous complaints which were found not to be
associated with shift work. In explaining these findings, Dirken suggests that shift workers are a highly selected group of individuals, and that those who experienced adjustment problems changed work schedules.

The state of the knowledge regarding the effect of shift work on health was best described by Thiis-Evensen (1958) and Aanonsen (1964; cited in Walker, 1978). They felt that no disease is caused by shift work, but that individuals who are prone to certain diseases, such as nervous and gastrointestinal disorders may develop the disorder since the rigors of shift work seem to have an "activating effect" on them.

Effects on Family and Social Life

"There is a consensus in the literature that familial and social life are disturbed for many workers when management introduces shift work" (Gannon, Norland & Robeson, 1983, p. 94). As with social life, the problems that shift work poses on the workers' family life seem to center around difficulties in the scheduling of available time (Staines & Pleck, 1984).

Several studies (Bast, 1960; Philips Factories, 1958; Ulich, 1957) were reviewed by Mott et al. (1965), who concluded that shift work can have adverse effects upon family life since it tends to reduce the workers' opportunity for contact with family members. Ulich found that, of the workers who followed shift schedules that included night work, 74% of the married and 45% of the single men complained of disturbance in the family. Interference with family and home life was considered a major difficulty of shift work by the workers studied by
Philipp and Griew (1970). They found that 26% of the married men on afternoon shift and 46% of those on the night shift reported difficulties with the domestic routines which were created by the conflicting schedules. Similarly, approximately 35% of the rotating shift workers experienced a disruption of the household routine. Also, loss of family life was felt as a real deprivation by 38% of the married men on night shift, and by 40% of the afternoon workers. Resentment toward shift schedules seem present in the shift workers' families. Spencer (1970; cited in Dunham, 1977) reported that 64% of the married shift workers encountered unfavorable family reactions to shift work. In a later study conducted by Tasto et al. (1978), the families of shift workers were more dissatisfied than the families of day workers, specifically with the time they had available for family activities.

With regard to the specific effects of shift work on marriage, the most frequently mentioned difficulties in husband-wife relation concern the absence of the worker from home in the evening, sexual relations and difficulties encountered by the wife in carrying out the household duties (Bast, 1960, and Ulich, 1957; cited in Mott et al., 1965). More recent investigations lend support to those findings. Tasto et al. (1978) found that interference with sexual activity was experienced more often among the night and rotating shift workers than afternoon and day workers. Philipp and Griew (1970) also found that approximately 45% of the married rotating shift workers felt that their work hours presented hardships for their wives, while 28% of the afternoon and 69% of the night workers were very concerned about the
consequences of their shift on their wives, and complained about having to leave their wives alone at night. A more comprehensive examination of the effects of shift work on the relationship between, as well as the roles of, husband and wife was conducted by Mott et al. (1965). They asked shift workers and their wives about key activities of a marriage, including companionship, mutual understanding, sexual relations, housework, etc. Shift workers found it more difficult to provide for these activities adequately than if they had worked days; however their replies differed, depending on whether or not they wanted to transfer to day work. Those who wanted to stay on shift work were better adjusted in their family life than those who preferred to change to day work. Mott et al. (1965) also found a reduction in the marital happiness of shift workers which was related to the conflict between hours of work and the time usually given to family activities.

Another problem encountered by shift workers is their inability to fulfill their parental role. Bast (1960), Philips Factories (1958) and Ulich (1960), (cited in Mott et al., 1965) found that shift workers often complain of reduced opportunities for contact with their children, especially during evening work. Tasto et al. (1978) also found that shift workers were more dissatisfied with the amount of time they spend with their children than day workers. In the study conducted by Philipp and Griew (1970), 32% of the married afternoon workers, 53% of the night workers and 54% of the rotating shift workers reported significant loss of contact, companionship and association with their children, and were also concerned about their inability to discipline them. Even though shift workers have difficulties fulfilling their role as fathers, being
a shift workers' wife does not seem to affect the mother's role (Mott et al., 1965).

With respect to the effect of shift work on overall family adjustment the literature does not necessarily provide a congruent description of the problem. Mott et al. (1965) evaluated the relationship between shift work and family adjustment by comparing the marital adjustment of shift workers using marital happiness, avoidance of friction and coordination of family activities as indexes of adjustment. The findings led to the conclusion that adjustment was highest among the day workers in comparison to the shift workers. Another investigation of the impact of shift work on employees family adjustment, which supports the findings of Mott et al., was conducted by Mohan and Srivastava (1983). Sixty 2-shift-rotational and 60 day employees completed a questionnaire and were subsequently interviewed to identify specific family adjustment problems which emerged due to work hours. They found that shift employees experienced a significantly greater amount of family adjustment problems than day employees. On the other hand, Staines and Pleck (1984) basing the index of family adjustment on ratings of marital satisfaction, marital happiness and family satisfaction, determined that shift work is unrelated to level of family adjustment. They did find, however, that shift workers encounter more conflict between work and family life due to the problems they face in scheduling available time. In a study of 103 nurses, Hood and Milazzo (1984) found, unlike most other research, no direct link between shift work and the existence of work-family problems. They report that night and rotating shift systems were related to stress symptoms, and that
these symptoms, in turn, were related to work-family problems. Nurses with stress symptoms such as migraine headaches and gastritis were more likely than others to complain of trouble balancing work and family life. They also found that day workers complained of work-family conflicts as often as night workers; however, the latter saw fatigue and schedule conflicts as a major contributor to the problem.

If in fact shift work interferes with the workers' ability to fulfill their roles as parent and spouse, and to spend a sufficient amount of quality time with their families, it would be expected that more serious family problems would be found among shift workers than day workers (Mott et al., 1965). Considering this logical assumption, one would expect to find a higher divorce rate among shift workers than day workers, and lowered emotional adjustment among the shift workers' children. Divorce rate has been addressed in very few investigations and results are conflicting. Wyatt and Marriott (1953) found that some of the shift workers in their sample admitted to strained or broken marital relations, which were accentuated, if not caused by night work. Carpentier (1977; cited in Koller et al., 1978) also reported a tendency of higher divorce rates to occur among shift workers; while Andersen (1957; cited in Koller et al., 1978) did not find any relationship in divorce rates between shift and day workers. In their own investigation, Koller et al. (1978) reported that the divorce rate was lowest in the shift workers group and highest in the group that had dropped out of shift work. Only one study was found that dealt with the effect of shift work on the shift workers' children, with the conclusion
that no effect was apparent. The National Child Development Foundation in England followed the progress in 16,000 children of shift workers since birth in 1958. Based on the results, the researchers concluded that regardless of the effects shift work may have on the family, it does not impair school performance or emotional adjustment of the shift workers' children (Lambert & Hart, 1976; cited in Walker, 1978).

As with the 24-hour cyclical rhythm of bodily functions, the social functioning of most communities seem to be structured around the sleep/wake cycle. Considering this, it is to be expected that shift workers will often be out of phase with the rest of the community in which they live (Dunham, 1977). The problem arises as a result of the conflict between the workers' schedule and the distribution of social activities in the community. In general, the effects of unusual work hours on social life center around the workers' organizational membership and institutional activities, contact with friends and relatives and solitary or near solitary activities (Walker, 1978).

General dissatisfaction with social life seem to be present among shift workers. Tasto et al. (1978) found that in both food processor and nurse samples, shift workers were less satisfied than day workers with the time available for social activities. The shift workers studied by Philipp and Griew (1970) also reported concern for the loss of social life they experienced as a result of shift work. Approximately 75% of the fixed shift and 50% of the rotating shift workers expressed some dissatisfaction with the curtailment of social life. As one might expect, all single shift workers in Philipp and
Griew's sample felt that the reduction in social activities they experienced was a major difficulty. Walker (1978) has also reported that shift work is unpopular among young, single men since it interferes with dating and their normally active social life.

Evenings and weekends are the highlights of group social activity, and they are also the times when many shift workers must be at their jobs (Wedderburn, 1975). Organizational membership is limited among shift workers due to the fact that most organizations and social clubs schedule their activities around the free time of the majority of their members, which in most cases are non-shift workers. Mott et al. (1965) reviewed studies conducted by Bast (1960) and Blakelock (1960) and concluded that shift workers participate less in organizations, attend fewer meetings and are less likely to hold office than day workers. Bast also found that shift workers expressed a greater desire to increase participation than day workers, indicating that they were aware and maybe dissatisfied with the limitations imposed by their work hours. In their own investigation, Mott et al. (1965) also reported that shift work does interfere with the worker's opportunities for organizational participation; specifically, they found that a significantly higher percentage of day workers than shift workers belonged to two or more voluntary organizations, and that a higher proportion of day workers were officers and committee members. Frost and Jamal (1979) studied 400 workers from Canadian manufacturing companies and found that the day workers reported more social activity away from work, in terms of the number of hours spent participating in voluntary organizations. Even after joining an organization, the shift
worker runs into the frustrating reality of not being able to become an active member (Walker, 1978). Without a doubt, the problem centers around the conflicting schedules rather than the individual's desire or willingness to participate.

Visiting friends and relatives does not seem to be a problem for shift workers. Mott et al. (1965) found no difference between day and shift workers in the frequency with which they visited their friends. However, shift workers reported that their work schedule made it difficult to make new friends and to attend formal family affairs such as weddings and reunions. Similarly, Walker (1978) reported that shift workers are able to maintain contact with friends, neighbors, and relatives as easily and frequently as day workers, but shift workers find it more difficult to make friends since they cannot provide companionship at specific times. Walker also reports that shift workers have difficulties attending set family occasions such as anniversaries. A recent literature review provides additional support to reports made by Mott et al. and Walker. Finn (1981) concluded that evening and night work does not interfere significantly with how often shift workers visit friends, but it does deprive at least some shift workers of extensive friendships due to their unusual schedule.

While shift work is known to interfere with leisure activities which involve formal or informal scheduling, it may be considered advantageous by those workers who prefer solitary activities (Mott et al., 1965). Shift workers have acknowledged having more time to themselves, and being engaged in more solitary activities than other workers (Mott et al., 1965; Walker, 1978). However, the increased
participation in this type of activity may be not the shift workers' idea. Wedderburn (1975) contends that given the choice, many of them would spend more of their free time with family and friends, and that those with memberships in clubs and organizations are frustrated by the interference of shift work. Dunham (1977) seems to agree with Wedderburn's contention. He stated that "the rise in number of solitary activities may largely be due to having more time available since other social interactions are difficult to arrange at odd hours." He further suggested that "solitary activities may not be a desired result of shift work but merely a poor substitute for those more highly desired activities" (p. 627).

**Workers' Attitude Towards Shift Work**

Considering the problems encountered by shift workers with respect to health, well-being, family and social life, it seems reasonable to expect that a high degree of dissatisfaction with work hours would be present in the shift worker population. Most of the studies that have probed into the shift workers' feelings about their work hours have found that either a majority or a large proportion of them have an unfavorable attitude towards shift work. Ulich (1957, 1964; cited in Agervold, 1976) found that 70-95% of the shift workers with different forms of shift schedules had a negative attitude towards shift work. Mott et al. (1965) reviewed studies conducted by Bast (1960), Mann and Hoffman (1960) and Philips Company (1958) and reported that, even though the results were not as marked as those found by Ulich, over
half of the workers in these investigations expressed dissatisfaction with their work hours. In a more current investigation, Mohan and Srivastava (1983) found that most of the shift workers studied preferred to work the fixed day shift. Koller et al. (1978) also reported that 51.5% of the shift workers in their sample stated that they would prefer to change to day work. In contrast, 96.5% of the day workers were satisfied with their work schedule. Among the shift workers studied by Tasto et al. (1978) those on rotating shift were less satisfied with their work schedule than any other shift; with day workers being the most satisfied. Similarly, Jamal (1981) found that rotating shift workers in a nurse sample showed lower job satisfaction than fixed shift workers; however, he found no difference in the manufacturing worker sample studied.

More positive workers' attitude towards shift work has been reported by a few investigations. Walker (1978) described two surveys carried out by the National Board for Prices and Income in England (1971) and Hoolwerf and Thierry (1976), which found that only 13% and 30%, respectively, of the shift workers were dissatisfied with their work hours. Wedderburn (1967; cited in Agervold, 1976) reported that about half of the workers in his study were satisfied with shift work. Of the 150 shift workers questioned by Taylor (1967), 114 said that they prefer shift work even if the pay was the same for day work. He also found that shift workers showed a higher degree of job satisfaction than day workers. In a study of oil refinery shift employees, Blakelock (1959; cited in Mott et al., 1965) reported that 57% of the workers said they liked shift work, 31% neither liked or
disliked it, and only 12% indicated that they disliked their work hours. In reviewing Blakelock's study, some authors have suggested that the positive attitude found in this group of shift workers is partly due to the fact that the study was conducted in a small Canadian town with a high proportion of shift workers. In this community, shift systems were an acceptable form of work schedule, the workers did not have problems finding companionship, and the community also arranged for recreational activities around the shift workers' schedules (Mott et al., 1965; Vroom, 1964). Thus it seems that the proportion of shift workers within a community may be related to the shift workers' satisfaction with work hours.

Those who prefer fixed day work, as opposed to shift work, justify their preference by saying that it is better for health, family and social life, and even output (Mohan & Srivastava, 1983; Wyatt & Marriott, 1953). Some of the same or related variables (i.e., health and well-being, and family and social life) have been found to be related to shift satisfaction by the few investigators who studied these relationships.

With respect to health and well-being, Bast (1960; cited in Mott et al., 1965) found that the night shift workers' satisfaction with their work hours decreased the more they reported that their shift was tiresome, that it made them nervous and caused them health problems. As previously discussed, these complaints seem to be connected with sleep disturbances and associated fatigue, as well as disruption of other time-oriented body functions. Mott et al. (1965) also reported that rhythmic functioning is one of the best predictors of shift
satisfaction. Statistical analysis of the relationship between difficulties with time oriented body functions and shift satisfaction resulted in a significant correlation coefficient of (-.33). It is interesting to note that the multiple correlation of both measures of physical well-being used by Mott et al. (i.e., rhythmic functioning and general health complaints) to shift satisfaction (-.34) did not increase the predictive power over that obtained using the index of difficulties with rhythmic functioning alone. As a matter of fact, when the investigators used a partial correlation to control for general health complaints, the relationship between rhythmic functioning and shift satisfaction was increased (-.42).

Mott et al. (1965) conducted the most comprehensive study of the relationship between shift satisfaction and family and social life. They found statistically significant, negative correlations between shift satisfaction and difficulties with husband roles (-.47), father roles (-.31) and social roles (-.49). The correlation between total role difficulty and shift satisfaction resulted in a significant coefficient of (-.56). Adding the effects of complaints about rhythmic functioning to this relationship, a multiple correlation coefficient of -.60 was obtained, which does not explain much more of the variance in shift satisfaction than total role difficulty alone. Mott et al. suggests that even though role difficulties seem to be a stronger predictor of shift satisfaction than rhythmic functioning, the problems encountered by the workers in performing their various roles may not be due entirely to conflicting schedules, but also due to physical inability to perform these roles. This implies that problems with
rhythmic functioning is not only related to shift satisfaction, but it also affects the workers' role performance which in turn impacts their satisfaction with work hours. In fact, they found that the higher the level of complaints about time oriented body functions, the greater the difficulty the workers experienced in performing their family and social roles. Family attitude towards shift work also seems to affect the workers' shift satisfaction. A positive relationship between shift workers' shift satisfaction scores and their wives' attitude towards shift work has been found (Philipp & Griew, 1970). Indirect support to the relationships described above, is provided by Tasto et al. (1978). They reported a significant correlation of (.56) between satisfaction with work schedule and an adaptation index which included scores of the worker's health status, psychological adaptation, sleep pattern, lifestyle and eating pattern. It should be noted that the variables included in that adaptation index are similar to those studied by Mott et al. (1965).

Of all the psychological variables considered in studies of shift work, neuroticism seems to have the strongest effect on shift satisfaction. Bast (1960; cited in Mott et al., 1965) found that complaints about shift work were concentrated among the workers showing high neuroticism. Tasto et al. (1978) also reported a significant correlation (.59) between neuroticism and their adaptation index. Both Mott et al. (1965) and Tasto et al. (1978) argue that the relationship should be considered cautiously since neuroticism could easily be viewed as an outcome variable, and that this affective state may be changed by the rigors of shift work. The relationship between shift
satisfaction and self-esteem, anxiety and conflict pressure have also been studied (Mott et al., 1965). Self-esteem was the only one of these variables that showed a rather moderate relationship with shift satisfaction.

Other individual and job factors have been found to affect the shift worker's satisfaction with work hours. In analyzing the data from the Survey Research Center study of power plant employees Mott et al. (1965) found an inverse relationship between educational level, skill level and shift satisfaction. That is, the higher the education or skill level of the worker, the lower the satisfaction with shift work. Philipp and Griew (1970) also reported that shift satisfaction scores of longer-educated workers were significantly lower than those with fewer years of education. Job level is another variable which seems to have an effect on the workers' satisfaction with shift work. Supervisory workers have been found to be more satisfied with work hours than production workers (Philipp and Griew, 1970). Indirect support to this finding is provided by a study conducted by Bohr and Swertloff (1969) which showed that shift work has a greater effect on the workers' attitude at the lower-echelon than at the supervisory level. In their analysis of the Survey Research Center studies, Mott et al. (1965) also found a statistically significant correlation between shift satisfaction and satisfaction with wages and promotional opportunities; however, they found no relationship between shift satisfaction and workers' satisfaction with supervision, working conditions, fellow workers, work operations and general satisfaction.
Investigations of the relationship between shift work and turnover are particularly sparse; however, the available evidence seems to indicate that shift work does have a negative effect on employee turnover. A study conducted by the Industrial Fatigue Research Board in England (1928; cited in Mott et al., 1965) showed that turnover was higher in shift work departments. More recent investigations in this area were conducted by Frost and Jamal (1979) and Jamal (1981) who used measures of anticipated, as opposed to actual, turnover. Anticipated turnover has been reported to be highly correlated with actual turnover (Kraut, 1975). These studies found that day workers expected to stay with their present employers longer than shift workers. Jamal (1981) also found that anticipated turnover was higher for rotating shift workers than for workers in any of the other fixed shifts.

Morning-Evening Types and Shift Work

The existence of morning type and evening type individuals has become a matter of everyday observation. The morning types are said to be alert early in the day, work best during that time, and feel drowsy and lethargic in the evening; as for the evening types the converse applies (Walker, 1978). Kleitman (1963) identified the two diurnal types among students, distinguishing between those who preferred to study late at night and sleep late in the morning and those who liked to go to bed early and study early in the morning. Indirect support to Kleitman's findings is provided by the results of a study conducted by Mecacci and Zani (1983). They found significant differences in the
preferred, as well as actual, bed and rising time between morning and evening types; with the morning types being the first to go to bed and rise. Differences between diurnal types have also been found in the level of several variables at different times in the daily cycle, including body temperature (Kleitman, 1963; Ostberg, 1973a), subjective alertness (Patkai, 1971; cited in Colquhoun & Folkard, 1978) and food intake (Ostberg, 1973a).

In a review of the literature, Akerstedt and Froberg (1976) concluded that individuals differ in phase with regards to their physiological and psychological aspects of circadian rhythms. They further suggested that of the two major types identified in studies of human circadian rhythms (i.e., morning and evening types), the evening types may have less problems adjusting to shift work. A study of rotating shiftworkers which considered circadian pattern of activity, sleep, oral temperature, time estimation and food intake as adaptation indices in comparing three groups of workers (i.e., morning, middle and evening types), resulted in a significant interaction between group and shift (Ostberg, 1973b). The results obtained led the investigator to conclude that evening type subjects had the least difficulty adjusting to the rotating shift schedule, that the middle types adapted in an intermediate way and the morning types had the most difficulty when compared to the other two groups. Further support to the contention that evening types are more adaptable to shift work is provided by Breithaupt, et al. (1978), who studied the tolerance to shift of sleep of subjects classified as morning and evening types. Evidence of sleep deficiency after late bed times was noted in the morning but not in the
Evening types reacted to early bedtimes with longer sleep latencies; however they showed no significant reduction in sleep duration (i.e., sleep deficiency) since they were able to prolong their sleep into the morning hours. Lower subjective vigilance level was also evident in the morning types after late bed times, but not in the evening types. The investigators suggest that because the evening types exhibit a delayed circadian phase position, in contrast to the morning types' advanced phase, they are better able to adjust to the late bed times. However, it also seems that the evening types are more flexible with their sleeping habits as evidenced by their ability to sleep late and compensate for the longer sleep latencies that were present during early bed times, thus experiencing no sleep deficiency or reduction in vigilance level. It is interesting to note that a factor analytical study of a questionnaire developed to distinguish between individuals who differed in the degree of adjustment to shift work identified (1) rigidity/flexibility of sleeping habits, (2) ability/inability to overcome drowsiness, and (3) morningness/eveningness preference as the three main factors (Folkard, Monk, and Lobban, 1979). The evening types described in the study by Breithaupt et al., seem to possess the characteristics associated with adjustment to shift work; namely, (1) flexibility of sleeping habits which seems to have enabled them to obtain an adequate number of hours of sleep, regardless of bed time, (2) ability to overcome drowsiness, which can be inferred from their relatively unchanged vigilance level, and (3) eveningness preference. There is also some evidence to suggest that a relationship exists between diurnal types and the physiological
problems experienced by shift workers. Anonsen (1964; cited in Ostberg, 1973b) reported that a high proportion of the workers who transferred out of shift work for medical reasons were of the type "early to bed - early to rise," and suggested that studies on patterns of sleep and sleep types should be conducted in an effort to establish criteria for the selection of shift workers. Andersen (1970, cited in Akerstedt & Froberg, 1976) also found that morning types predominated in the group of individuals transferring out of shift work.

With respect to productivity, there is a fair amount of agreement in the literature that, in general, workers' job performance is higher during the day than the night shift (Folkard and Monk, 1979; Malaviya & Ganesh, 1976, 1977; Waytt & Marriott, 1953). However, individual differences have been found, which provided additional evidence to support the theory that evening types are better suited for shift work than morning types. Malaviya and Ganesh (1976, 1977) investigated individual differences in the productivity of weavers working the day or swing shifts. While the average productivity of the day shift was found to be significantly higher than that of the swing shift, marked individual differences were found. That is, many weavers produced more in the day shift, while others showed higher productivity during the swing shift. In a study of factory workers, Wyatt and Marriott (1953) reported that even though most workers produced more on the day than on the night shift, approximately one-third performed just as well or better on the night shift. They suggest that individual differences of this type should be taken into consideration in the selection of night workers. A more recent investigation conducted by Horne, Brass and
Pettitt (1980) compared the performance levels of evening and morning types. They studied the performance efficiency of both diurnal types at a simulated production-line inspection task, and found that morning types' performance was significantly better than the evening types in the morning, but worse during the evening. Furthermore, evening types showed a steady performance improvement throughout the day, while morning types showed a general decline. Another significant finding was that a "post-lunch dip" in performance was noted for the morning types, but not for the evening types.

**Purpose**

Based on the literature presented, the purpose of the present study is to examine and substantiate the relationships between diurnal types and degree of difficulty with time-oriented body functions, shift satisfaction and anticipated turnover in a group of rotating shift workers. Specifically, the following hypotheses will be tested:

1. The literature suggests that evening types, as compared to morning types, may be more adaptable to shift work due to their delayed phase position with regards to physiological aspects of circadian rhythms, apparent ability to adjust their time-oriented body functions and overall preference for evening versus daytime activity. This study will test the relationship between diurnal types and difficulty with the time-oriented body functions, to include sleep, appetite,
digestion and elimination. It is hypothesized that evening types will experience a significantly lower degree of difficulty with time-oriented body functions than morning types.

2. Shift satisfaction has been shown to be related to difficulty with rhythmic functioning by a few investigations. That is, as difficulty with time-oriented body functions increases, shift satisfaction decreases. Considering this, and assuming that hypothesis 1 is proven to be true, it is hypothesized that evening type individuals will show significantly higher shift satisfaction than morning types.

3. The relationship between work hours and turnover has been considered by few investigators. However, from the three studies reviewed which addressed this relationship, it could be inferred that organizational units staffed with shift workers will experience higher turnover than those not using shift systems in their operation. With respect to diurnal types, it has been reported that morning types predominate in the group of individuals who transferred out of shift work for physiological or health reasons. Considering these reports and apparent ability to adapt to shift work, it is hypothesized that evening types will expect to stay within their present organizational unit significantly longer than morning types. Note that a measure of anticipated, as opposed
to actual, turnover will be used. This measure has been found to be highly correlated with actual turnover (Kraut, 1975), and has been used by some investigators who studied the relationship between shift work and turnover (Frost & Jamal, 1979; Jamal, 1981).
METHOD

Subjects

The subjects in the study were 38 rotating shift workers employed by a law enforcement agency. These workers are required to rotate every 28 days in the following sequence: day shift (7:00 a.m. - 3:00 p.m.), night shift (11:00 p.m. - 7:00 a.m.), evening shift (3:00 p.m. - 11:00 p.m.) and swing shift. When on the swing shift the workers are assigned to work 2 days (7:00 a.m. - 3:00 p.m) and 2 evenings (3:00 p.m. - 11:00 p.m.) per week for 4 weeks. All subjects were non-supervisory civilian personnel assigned to the same organizational unit and performing the same or similar jobs. There were 27 female and 11 male subjects in the sample.

Questionnaire

A 34-item questionnaire was used to collect the data. Diurnal type was assessed with the Morningness-Eveningness questionnaire (items 2-20) developed and validated by Horne and Ostberg (1976). The morning-evening type score for each subject was computed using the
scoring instructions prescribed by the authors of the questionnaire, resulting in 5 categories:

1. Score 70 - 86: definitely morning type
2. Score 59 - 69: moderately morning type
3. Score 42 - 58: neither type
4. Score 31 - 41: moderately evening type
5. Score 16 - 30: definitely evening type

Anticipated turnover was measured with a single question (Item 21) such as that used by Frost and Jamal (1979) and Jamal (1981). The remainder of the questions were similar to those used by Mott et al. (1965) and Tasto et al. (1978) in measuring shift satisfaction (Item 1), difficulty with time-oriented body functions (items 22-29), and demographic data (items 30-34) including sex, marital status, age and educational level. A copy of the questionnaire is included in the Appendix.

Procedure

The questionnaire was administered by the researcher at the beginning of each shift, which required four separate sessions. Each subject was given a copy of the questionnaire and asked to read the instructions. At that point, the researcher provided answers to questions the subjects had regarding the proper completion of the questionnaire. Subjects were asked to complete their questionnaires
and remain seated until everyone was finished and all questionnaires had been collected. The same procedure was followed for each of the four sessions.
RESULTS

Pearson Product - Moment Correlation coefficients were computed to determine the degree of relationship between the variables under study. Correlation coefficients were obtained between morning - evening type scores and shift satisfaction scores (.065), morning - evening type scores and anticipated turnover (-.119), morning - evening type scores and difficulty with time-oriented body functions (-.265), shift satisfaction scores and anticipated turnover (-.201), shift satisfaction scores and difficulty with time-oriented body functions (-.233), difficulty with time-oriented body functions and anticipated turnover (.066). None of the correlations was significant at the .05 level; Table 1 summarizes these results.

As a second step in the data analysis two subgroups (i.e., morning types and evening types) were formed, based on the subjects' scores on the Morningness - Eveningness questionnaire, with the purpose of comparing them on the dependent variables. Estimation of the internal consistency of the questionnaire, using the responses obtained from the present sample, resulted in a reliability coefficient of .87. It must be noted that of the 38 subjects, 7 scored in the definitely to moderately morning type ranges, 7 scored in the definitely to moderately evening type ranges, and 24 scored in the neither type range. Since a relatively small number of subjects scored at the extremes, it was decided that those scoring at either end of the neither type range would be included in the subgroups. After reviewing
the distribution of scores, it was determined that subjects scoring 42 (2), 43 (3), 44 (2) would be included in the evening group; and those scoring 53 (1), 54 (1), 55 (1), 56 (1), 57 (1), 58 (1) would be included in the morning group. The resulting groups were composed of 14 and 13 subjects for the evening and morning types respectively.

The demographic data collected were analyzed to determine the comparability of the two groups. The results are presented in Table 2. Only one of the demographic characteristics, namely mean age, was found to be significantly different ($38.769 > 30.071; p < .05$) between the groups; with the morning type group having the older subjects. Table 3 presents the group means for difficulty with time-oriented body functions, shift satisfaction and anticipated turnover. The t-values calculated between these means were not significant at the .05 level.

To further investigate the relationships between morningness - eveningness and the dependent variables, considering the apparent relationship between morning - evening type scores and age, three partial correlation coefficients were computed between morning - evening type scores and shift satisfaction scores, anticipated turnover and difficulty with time-oriented body functions, with the effect of age removed. The results of this analysis are presented in Table 4, which shows that none of the partial correlation coefficients was significant at the .05 level.
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>r**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning - Evening Type Scores and</td>
<td>.065</td>
</tr>
<tr>
<td>Shift Satisfaction Scores</td>
<td></td>
</tr>
<tr>
<td>Morning - Evening Type Scores and</td>
<td>-.119</td>
</tr>
<tr>
<td>Anticipated Turnover</td>
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<td>Morning - Evening Type Scores and</td>
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<tr>
<td>Difficulty with Time-Oriented Body Functions</td>
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<tr>
<td>Shift Satisfaction Scores and</td>
<td>-.201</td>
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<tr>
<td>Anticipated Turnover</td>
<td></td>
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<tr>
<td>Shift Satisfaction Scores and</td>
<td>-.233</td>
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<tr>
<td>Difficulty with Time-Oriented Body Functions</td>
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<tr>
<td>Difficulty with Time-Oriented Body Functions</td>
<td>.066</td>
</tr>
<tr>
<td>Anticipated Turnover</td>
<td></td>
</tr>
</tbody>
</table>

* N = 38

** None of the correlations was significant (p = .05)
### TABLE 2: COMPARISON OF DEMOGRAPHIC CHARACTERISTICS OF THE MORNING GROUP VERSUS THE EVENING GROUP

<table>
<thead>
<tr>
<th>DEMOGRAPHIC CHARACTERISTIC</th>
<th>MORNING GROUP ( (n = 13) )</th>
<th>EVENING GROUP ( (n = 14) )</th>
<th>COMPARISON STATISTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>( \bar{X} = 38.769 )</td>
<td>( \bar{X} = 30.071 )</td>
<td>( t = 2.264^* )</td>
</tr>
<tr>
<td></td>
<td>( S = 11.27 )</td>
<td>( S = 8.606 )</td>
<td></td>
</tr>
<tr>
<td>Highest Grade Completed in School</td>
<td>( \bar{X} = 13.154 )</td>
<td>( \bar{X} = 12.357 )</td>
<td>( t = 1.617 )</td>
</tr>
<tr>
<td></td>
<td>( S = 1.463 )</td>
<td>( S = 1.362 )</td>
<td></td>
</tr>
<tr>
<td>Length of Time in Organizational Unit</td>
<td>( \bar{X} = 4.244 )</td>
<td>( \bar{X} = 4.482 )</td>
<td>( t = -.192 )</td>
</tr>
<tr>
<td></td>
<td>( S = 2.6 )</td>
<td>( S = 2.876 )</td>
<td></td>
</tr>
<tr>
<td>Proportion of Male and Female Subjects</td>
<td>Male = 23.08% ( \chi^2 = .106 )</td>
<td>Male = 28.57% ( \chi^2 = .106 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female = 76.92%</td>
<td>Female = 71.43%</td>
<td></td>
</tr>
<tr>
<td>Proportion of Single and Married Subjects</td>
<td>Single = 53.846% ( \chi^2 = .304 )</td>
<td>Single = 64.286% ( \chi^2 = .304 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married = 46.154%</td>
<td>Married = 35.714%</td>
<td></td>
</tr>
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</table>

* \( p < .05 \)
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>MORNING GROUP (n = 13)</th>
<th>EVENING GROUP (n = 14)</th>
<th>t-VALUE *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty With Time-Oriented Body Functions</td>
<td>$\bar{X} = 12.846, S = 7.392$</td>
<td>$\bar{X} = 17.071, S = 6.604$</td>
<td>-1.568</td>
</tr>
<tr>
<td>Shift Satisfaction</td>
<td>$\bar{X} = 2.846, S = 1.405$</td>
<td>$\bar{X} = 2.429, S = 1.342$</td>
<td>.788</td>
</tr>
<tr>
<td>Anticipated Turnover</td>
<td>$\bar{X} = 2.462, S = 1.198$</td>
<td>$\bar{X} = 2.571, S = 1.158$</td>
<td>-.24</td>
</tr>
</tbody>
</table>

* No t-value was significant (p = .05)
TABLE 4: PARTIAL CORRELATIONS BETWEEN INDEPENDENT AND DEPENDENT VARIABLES WITH THE EFFECT OF AGE REMOVED *

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>$r_{12.3}$</th>
<th>t-VALUE**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning - Evening Type Scores and Shift Satisfaction Scores</td>
<td>.009</td>
<td>.053</td>
</tr>
<tr>
<td>Morning - Evening Type Scores and Anticipated Turnover</td>
<td>-.082</td>
<td>-.488</td>
</tr>
<tr>
<td>Morning - Evening Type Scores and Difficulty with Time-Oriented Body Functions</td>
<td>-.175</td>
<td>-1.054</td>
</tr>
</tbody>
</table>

* N = 38

** No t-value was significant (p = .05)
DISCUSSION

According to previous research, the problems encountered by shift workers appear to come about as a result of the disruptive effect shift work has on the workers' physiological, psychological and social 24-hour temporal patterns. Accordingly, it has been suggested that all studies focusing on shift work problems should center, directly or indirectly, on circadian rhythms (Akerstedt and Forberg, 1976). Considering this, the present study examined the relationship between the two major circadian rhythm types (i.e., morning and evening types) and difficulty with time-oriented body functions, shift satisfaction and turnover. It was felt that this investigation would provide much needed evidence regarding the relationships between these variables.

The results of this study should be considered with caution in that the number of "real" morning and evening types included in the groups was rather small. Nevertheless, based on the results of the t-tests computed between the group means, on the dependent variables, which showed no significant difference between them (see Table 3); and in the absence of significant correlations between the variables (see Table 1), the following conclusions can be drawn:

1. The hypothesis that evening types would experience a significantly lower degree of difficulty with time-oriented body functions than morning types was not supported.
2. The hypothesis that evening types would show significantly higher shift satisfaction than morning types was not supported.

3. The hypothesis that evening types would expect to stay within their present organizational unit significantly longer than morning types was not supported.

The fact that none of the six correlations between the variables in question was significant indicates that there is no direct relationship between them, at least when dealing with subjects engaged in the type of rotating shift schedules described in this study. Furthermore, the t-tests calculated between the group means of morning and evening types on difficulty with time-oriented body functions, shift satisfaction and anticipated turnover showed no significant difference between the groups. This indicates that circadian rhythm type, by itself, is not a good predictor of adaptation to rotating shift as measured by a physiological variable, satisfaction with work hours and the workers' intention to remain in the shift-working organizational unit.

The partial correlation coefficient between the independent and dependent variables, with the effect of age removed, confirmed the absence of a direct relationship between the variables. Age was found to be highly correlated with morning-evening type scores ($r = .572; p < .01$), but unrelated to the dependent variables.

It is interesting to note that the correlation between morning-evening type scores and difficulty with time-oriented body functions, despite the fact that it did not reach significance, showed an unexpected negative relationship between the variables. This
correlation and the group means indicated that evening types were experiencing a slightly higher degree of difficulty with time-oriented body functions than the morning types. These findings not only caused the rejection of the first hypothesis, but may also be viewed as contradicting previous research. A possible explanation for the unexpected results centers around the theory that subjects' previous experience with shift work results in better adjustment (Philipp & Griew, 1970). Based on the fact that the morning type group was found to be significantly older than the evening type group, it seems logical to assume that they have been part of the work force much longer and had more chances to be employed as shift workers than the younger evening type group. Had the older workers, in fact, been exposed to the rigors of shift work prior to their present job, the results could be explained based on this theory. However, the current knowledge regarding the relationships between these variables, and the fact that prior experience with shift work was not considered in this investigation, do not warrant any type of conclusive statement.

Another noteworthy finding of the present study is that, even though the correlation between shift satisfaction scores and difficulty with time-oriented body functions did not reach significance, its direction showed the expected inverse relationship; that is, as difficult with time-oriented body functions increased, shift satisfaction decreased. Mott et al. (1965) reported a significant negative correlation between the same variables. These results suggest that a relationship between the variables may exist in varying degrees depending on the population being studied, and imply the need for further investigation.
There are other factors which may have had a direct or indirect effect on the results of this study, and should be given more attention in future research. These include the sexual composition of the sample, the type of shift system and the job itself. Unlike the studies reviewed, most of which used male subjects, the majority (71%) of the individuals in the present study were female. This means that the evidence used in formulating the hypotheses may not be equally applicable to the present sample if sex were determined to play a role in physiological adaptation to shift work, shift satisfaction and turnover. The types of shift systems seem to vary from study to study; even rotating shift schedules may vary in the order or direction of the rotation. Considering that different work schedules present different adjustment problems for the worker, it may be unrealistic to expect that the same variables be equally related to adaptation across all types of shift systems. The type of job (e.g., repetitive versus varied tasks) and the degree of physical effort required to perform (e.g., mental tasks versus manual labor) have been reported as relevant factors which influence adaptation to shift work (Wojtczak-Jaroszowa, 1977). The workers in this study perform complex mental tasks and are sedentary most of the work day. Unlike this group, a great number of the investigations reviewed described their subjects as blue collar workers engaged in manual type tasks. In light of these facts, the applicability of the literature reviewed to the sample studied may depend on the degree to which different job characteristics affect adaptation to shift work.
As previously discussed, worker self-selection may influence the results of many shift work studies. This phenomenon has been used to explain unexpected or contradictory findings by some investigators who contend that shift workers having difficulties transfer to the less demanding day shift, leaving behind those individuals who are able to reach an acceptable level of adaptation. It seems reasonable to expect that once workers self-selection has taken place, variables such as eveningness preference would lose the predictive power that they may otherwise have since the workers that stayed may have reached a similar level of adjustment regardless of whether they are morning or evening types.

The notion that rigidity/flexibility of an individual's behavior is a key factor which contributes to adaptation to shift work was introduced by Folkard, Monk and Lobban (1979). Even though they presented this notion in relation to sleeping habits, it seems reasonable to say that flexibility of behavior, in general, would be a desirable characteristic for shift workers to have since their work schedules require that they readjust their personal habits on a regular basis. Again, as with all other variables discussed, thorough investigations of this factor must be conducted before any conclusive statements can be drawn.

Besides the many variables that have been identified as critical in the study of shift work, there is a basic problem inherent in the literature since many of the investigations have been conducted in European countries. This poses the question of whether it is proper to generalize their findings to United States workers. Considering possible
differences in work habits between American and European workers, as well as differences between countries with respect to relevant socio-economic factors, it was surprising not to find literature reviews that addressed this very important problem. In general, it is appropriate to conclude that adaptation to shift work appears to be a very complex issue. The current lack of conclusive evidence and increasing use of shift systems suggest a great need for research in this area.
APPENDIX
SHIFT WORK STUDY QUESTIONNAIRE

The purpose of this questionnaire is to gather information to be used in a study of shift work. As a shift worker, your feelings, opinions and experiences are of extreme importance in furthering our knowledge about the effects and use of this type of work schedule. For these reasons we ask that you take a few minutes to answer each question as honestly as possible.

Participation in this project will not affect your job in any way. Your response will be kept in strict confidence. Your supervisors and co-workers will not have access to the information you provide. The responses from all participants will be combined and a summary will be presented in a report, but your individual responses will not be identified or disclosed.

Instructions

1. Please take your time and answer each question to the best of your abilities. Keep in mind that this is not a test, so there are no right or wrong answers.
2. Answer all questions on the questionnaire itself.
3. Each question should be answered independently of other questions.
4. Answer questions in numerical order. Do not skip around.
5. For each question, select the answer that fits or is closest to your case. For the questions that have a scale instead of a selection of answers, place a cross at the appropriate point along the scale.

6. Feel free to write any comment or explanation right on the questionnaire.
1. How satisfied are you with your work schedule, that is, with the arrangement of your hours for work? (Check one)

- Very dissatisfied with my work schedule
- Dissatisfied a little
- Don't care what my work hours are
- Satisfied a little
- Very satisfied with my work schedule

2. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?

- 11:00 AM - noon time
- 9:45 AM - 11:00 AM
- 7:45 AM - 9:45 AM
- 6:30 AM - 7:45 AM
- 5:00 AM - 6:30 AM

3. Considering only your own "feeling best" rhythm, at what time would you go to bed if you were entirely free to plan your evening?

- 1:45 AM - 3:00 AM
- 12:30 AM - 1:45 AM
- 10:15 PM - 12:30 AM
- 9:00 PM - 10:15 PM
- 8:00 PM - 9:00 PM

4. If there is a specific time at which you have to get up in the morning, to what extent are you dependent on being woken up by an alarm clock?

- Not at all dependent
- Slightly dependent
- Fairly dependent
- Very dependent

5. Assuming adequate environmental conditions, how easy do you find getting up in the mornings?

- Not at all easy
- Not very easy
- Fairly easy
- Very easy
6. How alert do you feel during the first half hour after having woken in the mornings?

Not at all alert .................................................. 1.____
Slightly alert .................................................. 2.____
Fairly alert .................................................. 3.____
Very alert .................................................. 4.____

7. How is your appetite during the first half hour after having woken in the mornings?

Very poor .................................................. 1.____
Fairly poor .................................................. 2.____
Fairly good .................................................. 3.____
Very good .................................................. 4.____

8. During the first half-hour after having woken in the morning, how tired do you feel?

Very tired .................................................. 1.____
Fairly tired .................................................. 2.____
Fairly refreshed .......................................... 3.____
Very refreshed .......................................... 4.____

9. When you have no commitments the next day, at what time do you go to bed compared to your usual bedtime?

Seldom or never later ......................................... 4.____
Less than one hour later .................................. 3.____
1 - 2 hours later ........................................... 2.____
More than two hours later ................................ 1.____

10. You have decided to engage in some physical exercise. A friend suggests that you do this one hour twice a week and the best time for him is between 7:00 - 8:00 AM. Bearing in mind nothing else but your own "feeling best" rhythm, how do you think you would perform?

Would be on good form .................................... 4.____
Would be on reasonable form ............................ 3.____
Would find it difficult .................................... 2.____
Would find it very difficult .............................. 1.____
11. At what time in the evening do you feel tired and as a result in need of sleep?

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00 AM - 3:00 AM</td>
<td>1.</td>
</tr>
<tr>
<td>12:45 AM - 2:00 AM</td>
<td>2.</td>
</tr>
<tr>
<td>10:15 PM - 12:45 AM</td>
<td>3.</td>
</tr>
<tr>
<td>9:00 PM - 10:15 PM</td>
<td>4.</td>
</tr>
<tr>
<td>8:00 PM - 9:00 PM</td>
<td>5.</td>
</tr>
</tbody>
</table>

12. You wish to be at your peak performance for a test which you know is going to be mentally exhausting and lasting for two hours. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the four testing times would you choose?

<table>
<thead>
<tr>
<th>Time Range</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 10:00 AM</td>
<td>6.</td>
</tr>
<tr>
<td>11:00 AM - 1:00 PM</td>
<td>4.</td>
</tr>
<tr>
<td>3:00 - 5:00 PM</td>
<td>2.</td>
</tr>
<tr>
<td>7:00 - 9:00 PM</td>
<td>0.</td>
</tr>
</tbody>
</table>

13. If you went to bed at 11:00 PM at what level of tiredness would you be?

- Not at all tired .......................... 0.____
- A little tired ................................ 2.____
- Fairly tired ................................ 3.____
- Very tired .................................. 5.____

14. For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning. Which ONE of the following events are you most likely to experience?

- Will wake up at usual time and will NOT fall asleep .......................... 4.____
- Will wake up at usual time and will doze thereafter ........................ 3.____
- Will wake up at usual time but will fall asleep again .................... 2.____
- Will NOT wake up until later than usual ......... 1.____
15. One night you have to remain awake between 4:00 - 6:00 AM in order to carry out a night watch. You have no commitments the next day. Which one of the following alternatives will suit you best?

Would NOT go to bed until watch was over......1.
Would take a nap before and sleep after......2.
Would take a good sleep before and a nap after ........................................3.
Would take ALL sleep before watch ..........4.

16. You have to do two hours of hard physical work. You are entirely free to plan your day and considering only your own "feeling best" rhythm which ONE of the following times would you choose?

8:00 AM - 10:00 AM .........................4.
11:00 AM - 1:00 PM ........................3.
3:00 PM - 5:00 PM ..........................2.
7:00 PM - 9:00 PM .........................1.

17. You have decided to engage in hard physical exercise. A friend suggests that you do this for one hour twice a week and the best time for him is between 10:00 - 11:00 PM. Bearing in mind nothing else but your own "feeling best" rhythm how well do you think you would perform?

Would be on good form .......................1.
Would be on reasonable form ................2.
Would find it difficult ........................3.
Would find it very difficult ...................4.

18. Suppose that you can choose your own work hours. Assume that you worked a FIVE hour day (including breaks) and that your job was interesting and paid by results. Which FIVE CONSECUTIVE HOURS would you select?

19. At what time of day do you think you reach your "feeling best" peak?
20. One hears about "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?

Definitely a "morning" type .................. 6.____
Rather more a "morning" than an "evening" type .................. 4.____
Rather more an "evening" than a "morning" type .................. 2.____
Definitely an "evening" type .................. 0.____

21. If you have your own way, will you be working for this section of the Department 2 years from now?

Certainly ........................................ 1.____
Probably ........................................... 2.____
Not sure one way or the other .................... 3.____
Probably not ..................................... 4.____
Certainly not .................................... 5.____

22. In general, how often do you have trouble falling asleep?

Almost never ..................................... 0.____
Less than once a month .......................... 1.____
Once or twice a month ........................... 2.____
About once a week ............................... 3.____
Two or three times a week ........................ 4.____
Most of the time .................................. 5.____

23. How often do you wake up after a few hours of sleep and have trouble going back to sleep?

Almost never ..................................... 0.____
Less than once a month .......................... 1.____
Once or twice a month ........................... 2.____
About once a week ............................... 3.____
Two or three times a week ........................ 4.____
Almost daily ...................................... 5.____

24. How often do you usually wake up tired or sleepy?

Almost never ..................................... 0.____
Less than once a month .......................... 1.____
Once or twice a month ........................... 2.____
About once a week ............................... 3.____
Two or three times a week ........................ 4.____
Almost daily ...................................... 5.____
25. How would you rate your sleep pattern (amount and quality) in general?

Excellent ........................................... 0.
Good .................................................. 1.
Fair ................................................... 2.
Poor ................................................... 3.
Very Poor ............................................ 4.

26. How good would you say your appetite is?

Excellent ........................................... 0.
Good .................................................. 1.
Fair ................................................... 2.
Poor ................................................... 3.
Very poor ............................................. 4.

27. How satisfied are you with your eating habits?

Completely satisfied .................................. 0.
Satisfied ................................................ 1.
Not satisfied or dissatisfied ......................... 2.
Dissatisfied .......................................... 3.
Very dissatisfied .................................... 4.

28. How often do you experience trouble digesting your food, or such stomach problems as acid indigestion, heartburn, acid stomach and bloated feelings?

Almost never ........................................ 0.
Less than once a month .............................. 1.
Once or twice a month .............................. 2.
About once a week .................................. 3.
Two or three times a week .......................... 4.
Almost every day .................................... 5.

29. How often do you suffer from constipation or other difficulties with your bowel movements?

Almost never ........................................ 0.
Less than once a month .............................. 1.
Once or twice a month .............................. 2.
About once a week .................................. 3.
Two or three times a week .......................... 4.
Almost every day .................................... 5.
30. What is your sex?
   Female _____  Male _____

31. What is your marital status?
   Single _____  Married _____

32. How old were you on your last birthday? (fill in the blank) __________

33. What was the highest grade you completed in school? (fill in the blank) __________

34. How long have you worked in this section of the Department (fill in the blank) __________
REFERENCES


