

Original Articles

Quality of life, life satisfaction and happiness in shift- and non-shiftworkers

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Keywords

Shiftwork, psychology. Night work, psychology. Quality of life. Workers. Job satisfaction. Questionnaires. Social assistance.

Abstract

Objective

To investigate the quality of life, life satisfaction, happiness and demands of work in workers with different work schedules.

Methods

The survey was carried out on professional workers in social care. Some were shiftworkers whose schedule included night shifts (N=311), some were shiftworkers without night shifts (N=207) and some were non-shiftworkers (N=1,210). Surveys were mailed and the response rate was 86%. For the purpose of this study several variables were selected from the Survey: The Quality of Life Profile, which measures importance, satisfaction, control and opportunities in nine domains of life plus measures of happiness, life satisfaction and demands of work.

Results

While both groups of shiftworkers, compared to non-shiftworkers, reported needing more physical effort to complete their work, and reported 'being' more physically tired, no differences were found in reports of overall happiness, life satisfaction or total quality of life. However, night-shiftworkers reported greater percentage of time unhappy than the other two groups of workers. In analyses of the quality of life, night-shiftworkers were less satisfied with domains of spiritual 'being' and physical and community 'belonging' than day-shiftworkers and non-shiftworkers. They also reported having fewer opportunities to improve their physical 'being', leisure, and personal growth than the other two groups.

Conclusions

Quality of life in specific domains in night-shiftworkers was rated worse than in other groups of workers. Domain-based quality of life assessment gives more information regarding the particular needs of workers than overall or global measures of well-being.

Descritores

Trabalho em turnos, psicologia.
Trabalho noturno, psicologia.
Qualidade de vida. Trabalhadores.
Satisfação no emprego.
Questionários. Assistência social.

Resumo

Objetivo

Estudar a qualidade de vida, satisfação pessoal, felicidade e exigências do trabalho entre trabalhadores com diferentes horários de trabalho.

Métodos

Realizou-se uma pesquisa entre profissionais da área de assistência social. Alguns trabalhavam em turnos noturnos (N=311) e diurnos (N=207), e outros não

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trabalhavam em turnos (N=1.210). O questionário da pesquisa foi enviado por correio e a taxa de resposta foi de 86%. Para o estudo, foram selecionadas variáveis incluídas no Perfil de Qualidade de Vida, que mede a importância, satisfação, controle e oportunidades em nove domínios da vida, além de medir a felicidade, satisfação pessoal e exigências do trabalho.

Resultados

Em comparação com os trabalhadores que não trabalham em turnos, ambos os grupos de trabalhadores em turnos informaram precisar fazer um esforço físico maior para completar o trabalho e “sentir” um cansaço físico maior. Entretanto, não foram encontradas diferenças nos relatos de felicidade global, satisfação pessoal e qualidade global de vida. Os trabalhadores de turnos noturnos relataram, no entanto, passar um maior tempo infelizes em relação aos outros dois grupos de trabalhadores. As análises de qualidade de vida revelaram que os trabalhadores de turnos noturnos sentiam-se menos satisfeitos nos domínios de “ser” espiritual e “pertinência” física e comunitária que os trabalhadores diurnos e os que não trabalhavam em turnos. Também informaram ter menos oportunidades de aperfeiçoar o seu “ser” físico, lazer e crescimento pessoal em comparação com os outros dois grupos.

Conclusões

A qualidade de vida em domínios específicos em trabalhadores noturnos foi classificada como pior do que em outros grupos de trabalhadores. A qualidade de vida baseada em domínios proporciona maiores informações relativas às necessidades particulares dos trabalhadores se comparada a medidas globais do bem-estar.

INTRODUCTION

The disruptive effects of shiftwork on the social and domestic lives of workers are well documented.^{7,8,13,18,20} Working in shifts creates difficulties in family life and tends to restrict worker's social and leisure activities.¹⁰ Not only are shiftworkers affected by working in shifts, but their spouses reported significant disruption of social and domestic lives, as well.¹⁹ Particularly, working at night, either on permanent or rotating shifts, often produces discordance with the spouse's working hours and free time.⁴ Also, specific shift systems are more disruptive than others. Workers in 12-hour shifts reported less social and domestic disruption than workers in 8-hour shifts.^{8,6}

To better understand worker's well-being, it is important to know about aspects of their lives besides work, such as social and domestic life. There are different approaches to the concept and measurement of quality of life. A single measure of happiness or life satisfaction could describe in general how “life is good” for an individual. In this study we used a multifaceted approach to quality of life assessment developed by Renwick et al^{16,17} (1994; 1996) who emphasized physical, physiological, and spiritual functioning. According to these researchers quality of life (QOL) can be defined as “the degree to which a person enjoys the important possibilities of his/her life” (p. 232.).¹⁵ There may be specific domains of QOL in which shiftworkers are particularly affected by their work schedule. However, there are only few investigations dealing with these aspects.

The aim of this research was to examine how different work schedules affect reported quality of life with respect to specific domains of workers' lives. Particularly, we were interested in the subjective well ‘being’ of workers, i.e., overall happiness and life satisfaction. Additionally, we examined the relationship between different work schedules and workers' estimates of physical, mental and social demands that work settings puts on them. Also, we examined differences in quality of life of nine specific subdomains between groups of workers, as well as the estimates of control and opportunities to enhance each of subdomain. In general, we predicted that work including night shifts would be associated with poorer quality of life. We were also interested in which of the domains quality, control and opportunities were better or worse within each group of workers.

METHODS

Subjects

Subjects were professionals in social care settings (i.e., retirement homes) from 75 cities in Croatia. Three groups were examined, shiftworkers working in weekly rotating 8-hour schedules including night shifts (N=311), day-shiftworkers working weekly rotating 8-hour morning and afternoon shifts (N=207) and non-shiftworkers (N=1210). Subjects were recruited for the purpose of broader research on well-being of the professionals in social care. Surveys were mailed and the response rate was 86%. All subjects

worked similar job, but in different shift schedules.

Average age of the respondents was 41.7 years. The night-shiftworkers were significantly younger (M=39.7 years) than day-shiftworkers (M=42.8 years) and non-shiftworkers (M=42.0 years), so age was controlled in all analyses. About 16% of subjects were male and 84% were female.

Procedure and instruments

All subjects completed a survey consisting of several questionnaires measuring different aspects of workers' life and subjective well-being.

The quality of life

Quality of life (QOL) was measured by The Quality of Life Profile questionnaire.¹⁴ There are three major domains of QOL: '*being*', '*belonging*' and '*becoming*', each of them having three subdomains. '*Being*' is concerned with 'who people are' as individuals. It consists of *physical 'being*', described by physical health, nutrition, fitness, and general appearance; *psychological 'being*' defined by psychological health, cognitions, feeling, and personal evaluations; and *spiritual 'being*', defined by personal values, standards and spiritual beliefs. '*Belonging*' is concerned with individuals' fit with their environment. It consists of *physical 'belonging*', described by links with home, workplace, neighbourhood, and community; *social 'belonging*' defined by links with family, friends, co-workers, and neighbours; and *community 'belonging*', defined by access to resources in the community. '*Becoming*' focuses on the activities in which individuals engage to achieve goals, aspirations and hopes. It consists of *practical 'becoming*', defined by domestic activities, school, volunteer work, and using health services; *leisure 'becoming*', defined by leisure and recreational activities; and *growth 'becoming*', defined by activities that maintain or improve individuals' skills and knowledge. QOL is a function of the relative importance of a particular area and the extent of the individual's satisfaction with it.¹⁵ QOL is also moderated by the degree of control that an individual perceives to have, and by opportunities for improvement in the specific areas of life.

The first part of the questionnaire consisted of 54 items, 6 items per each domain. Subject rated the perceived importance and satisfaction with each of the domains on 5-point scales, with scores ranging from 1= 'not at all important' or 'not at all satisfied' to 5=

'extremely important' or 'extremely satisfied'. To produce the basic Quality of Life Scores (QOLS), the average satisfaction ratings for each nine subdomains, as well as for three domains, are weighted by the corresponding average importance ratings, according to formula:

$$QOLS = [(Importance\ Score / 3) * (Satisfaction\ Score - 3)]$$

The scores can range from -3.33 to 3.33. The individual who might not be at all satisfied with extremely important items could get low QOLS (i.e. the lowest score -3.33). Or, very important areas of life which individual rates as very satisfying would contribute to high QOLS (i.e., the highest score 3.33). If an item is less important, then it contributes less to the QOL score.*

Descriptively, QOLS above '0' indicate positive quality of life and those below '0' negative quality of life. Overall, a score of >1.50 is considered excellent; .51 to 1.50, very acceptable; -.50 to .50, adequate; -.51 to -1.50, problematic; and <-1.50 very problematic. Finally, total quality of life score was obtained as a mean of all QOLS for each domain.

The second part of the questionnaire consisted of 9 items corresponding to the nine life domains. Subjects rated the degree of *control* and the range of *opportunities* for improving each of nine subdomains. Ratings were on 5-point scales, with scores ranging from 1= 'almost no control' or 'almost no opportunity' to 5= 'almost total control' or 'a many opportunities'. Separate Control and Opportunities scores were obtained for each of the domains and subdomains.

Happiness

The Fordyce scales were used as measures of overall happiness.⁵ In part one, the subjects rated their global happiness on a 10-point scale, ranging from 9= 'extremely happy' to 0= 'extremely unhappy'. In part two they rated the percent time they were happy, unhappy, and neutral, with these three estimates summing to 100%.

Life satisfaction

As a measure of global life satisfaction, The Satisfaction with the Life Scale was used.³ It consists of five items (e.g., 'In most ways my life is close to my ideal.'). Subjects used 6-point scales, ranging from 1= 'strongly disagree' to 6= 'strongly agree', to report how much they agreed with particular statements.

*For example, an individual who rates an item as 'not at all important' (1) with high satisfaction (4) has QOLS of 0.33. Also, satisfaction score of 3 lead to QOLS of 0, regardless of importance score. According to authors¹⁵ moderate enjoyment of an aspect of life results in a neutral QOLS, regardless of its importance.

Table 1 - Descriptive statistics for Quality of Life Score* of the nine subdomains and three domains for shiftworkers with the night shift (N=311), day-shiftworkers (N=207) and non-shiftworkers. (N=1210)

	Night- shiftworkers M (SD)	Day- shiftworkers M (SD)	Non- shiftworkers M (SD)
Physical being	.9 (.88)	1.1 (.73)	1.0 (.78)
Psychological being	1.3 (1.01)	1.3 (.78)	1.3 (.91)
Spiritual being	1.2 (.88)	1.3 (.86)	1.3 (.83)
All being items	1.1 (.77)	1.2 (.66)	1.2 (.72)
Physical belonging	1.1 (1.02)	1.2 (.96)	1.2 (.93)
Social belonging	1.3 (.82)	1.3 (.77)	1.3 (.77)
Community belonging	.5 (.98)	.6 (.80)	.6 (.87)
All belonging items	1.0 (.79)	1.1 (.68)	1.0 (.71)
Practical becoming	.9 (.83)	.9 (.72)	.9 (.74)
Leisure becoming	.4 (.96)	.5 (.87)	.4 (.90)
Growth becoming	.7 (.95)	.9 (.84)	.7 (.86)
All becoming items	.7 (.81)	.8 (.72)	.7 (.73)

*Theoretical range of QOLS are -3.33 to 3.33

The score was calculated as the sum of the items. Higher scores mean better life satisfaction.

Demands of work

Physical, mental and social demands of work were assessed in terms of the subjects' reports of effort required by the work and tiredness resulting from the work. The items were taken from the Survey of Health Care Professionals.¹ How much effort workers need to expend to meet the physical, mental and social skills of the work were estimated on 4-point scales, with answers ranging from 1= 'none at all' to 4= 'a great deal'. The physical and mental tiredness and tension at the end of the workday were rated on 4-point scales with answers ranging from 1= 'not at all' to 4= 'extremely'.

Statistical methods

For analyses of within group comparison in QOLS domains (i.e., 'being', 'belonging', 'becoming') analy-

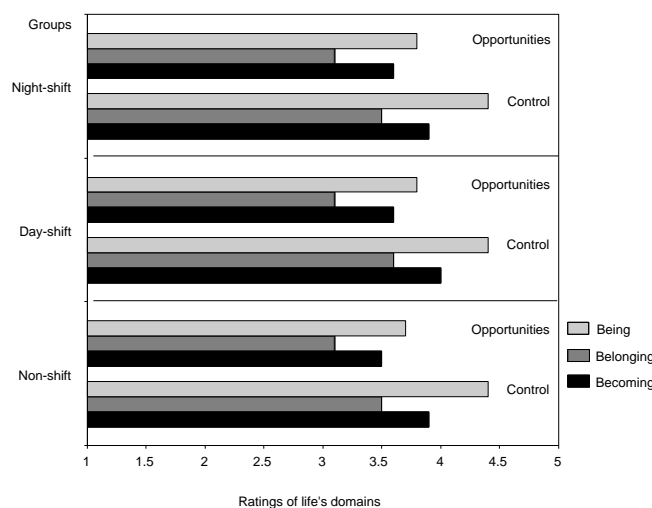
ses of covariance (ANCOVAs) with repeated measures were used. Those analyses were done separately for night shiftworkers, day-shiftworkers and non-shiftworkers, with age included as covariate. We reported the Greenhouse-Geisser corrected values of the degrees of freedom when sphericity was violated.

To examine the relationship between different work schedules (i.e., night shift, day shift, non-shift) and QOLS, control, opportunities in nine subdomains, the two happiness percentage measures, and demands of work, separate multivariate analyses of covariance (MANCOVAs) were used with age as a covariate. Reported total QOLS, overall happiness, and life satisfaction were the dependent variables for three separate ANCOVA models, with work schedule (i.e., night shift, day shift, non-shift) as the independent variable, with age as a covariate. Whenever age emerged as a significant covariate, follow-up analyses clarified the age effect by stratifying each groups by age (i.e., in two groups of ≤ 40 years and ≥ 41 years) and analyzing interactions between work schedules and age.

RESULTS

The mean scores and associated standard deviations for QOLS of nine life subdomains are presented in Table 1. Average ratings of Control and Opportunities Scores of life domains (i.e. 'being', 'belonging', 'becoming') are presented in Figure.

Within the group of night-shiftworkers, mean QOLS were in the range of 0.4-1.3 indicating adequate to very acceptable quality of different life domains. Particularly, they rated quality of life in the 'being' domain highest and in the 'becoming' domain lowest ($F_{2,584}=118.83$, $p<.01$). Also, workers showed the highest control over the 'being' domain and the lowest one over the 'belong-



*Theoretical range for control scores is 1 to 5.

**Theoretical range for opportunities scores is 1 to 5.

Figure - Average ratings of control* and opportunities** scores of three life domains for shiftworkers with the night shift (N=311), day-shiftworkers (N=207) and non-shiftworkers (N=1,210).

ing' domain ($F_{2,562}=183.09, p<.01$). The lowest opportunities for improvement were seen in the 'belonging' domain, while the highest opportunities were seen in the 'being' domain ($F_{2,574}=154.75, p<.01$).

Within the group of day-shiftworkers, mean QOLS were in the range of 0.8-1.3 indicating very acceptable quality of different life domains. Ratings of QOLS paralleled the findings seen within the group of night-shiftworkers. QOLS was the highest in 'being' domain and it was the lowest in 'becoming' domain ($F_{2,408}=3.45, p<.05$). Once more, the subjects showed the highest control over the 'being' domain and the lowest over the 'belonging' domain ($F_{2,408}=5.75, p<.01$). The lowest opportunities for improvement were seen for the 'belonging' domain, while the highest opportunities were seen for the 'being' domain ($F_{2,408}=5.43, p<.01$).

A similar pattern of results was found within the group of non-shiftworkers. The mean QOLS were in the range of 0.7-1.2 indicating very acceptable situation in different life's domains. Again, quality of life in 'being' domain was rated highest and in 'becoming' domain lowest ($F_{2,2324}=16.56, p<.01$). The subjects showed the highest control over the 'being' domain and the lowest over the 'belonging' domain ($F_{2,2329}=68.70, p<.01$). The lowest opportunities for improvement were seen for the 'belonging' domain, while the highest opportunities were seen for the 'being' domain ($F_{2,2209}=73.42, p<.01$).

In between group analyses, separate QOLS for each nine subdomains were submitted to MANCOVA. A significant multivariate main effect for work schedule was found ($F_{18,3372}=2.51, p<.01$). Univariate tests revealed that this effect was significant for the subdomains of physical ($F_{2,1694}=3.45, p<.05$) and spiritual 'being' ($F_{2,1694}=2.90, p<.05$), and community 'be-

longing's' ($F_{2,1694}=2.95, p<.05$). Shiftworkers with night shifts had lower scores on physical 'being', and community 'belonging's' than other two groups of workers. Furthermore, they had lower score on spiritual 'being' subdomain than non-shiftworkers.

In analyses of Control and Opportunities scores for the nine subdomains there were no significant effects of work schedule on Control scores, while MANCOVA on Opportunities scores yielded a significant main effect for work schedule ($F_{18,3348}=2.50, p<.01$). Univariate tests revealed differences for physical ($F_{2,1682}=5.49, p<.01$) and psychological 'being' ($F_{2,1682}=3.60, p<.05$), practical ($F_{2,1682}=4.44, p<.01$), leisure ($F_{2,1682}=8.43, p<.01$) and growth 'becoming' ($F_{2,1682}=8.06, p<.01$). In summary, the group of shiftworkers with night shifts reported having fewer opportunities to improve their physical 'being', leisure and personal growth than the other two groups. Moreover, shiftworkers with night shifts reported having fewer opportunities to improve their psychological 'being' than day-shiftworkers. Compared to non-shiftworkers they also reported having fewer opportunities for improvement in their practical 'becoming' subdomain.

Table 2 summarizes the descriptive statistics for total QOLS, overall happiness, percentage of time in happy, unhappy and neutral mood, life satisfaction, and the demands of work for the three groups of workers. Generally, all groups rated themselves more often in a happy than neutral or unhappy mood. On average, all groups estimated that they need 'quite a bit' of effort to meet the physical, mental and social demands of their work. They were 'quite a bit' physically and mentally tired, and on average felt 'quite a bit' of tension at the end of the workday.

Concerning total QOLS, overall happiness, and life

Table 2 - Descriptive statistics for total QOLS*, happiness*, life satisfaction*, percentage of time happy, unhappy, and neutral, and demands of work for night-shiftworkers (N=311), day-shiftworkers (N=207) and non-shiftworkers (N=1210).

	Night-shiftworkers M (SD)		Day-shiftworkers M (SD)		Non-shiftworkers M (SD)		Range
	(≤40 years) M (SD)	(≥41 years) M(SD)	(≤40 years) M (SD)	(≥41 years) M(SD)	(≤40 years) M (SD)	(≥41 years) M(SD)	
Total QOLS	.9 (.73)		1.0 (.63)		.96 (.65)		-3.33-3.33
Age groups	.8 (.69)	1.1 (.77)	1.1 (.54)	.9 (.67)	1.0 (.67)	.9 (.64)	
Overall happiness	6.7 (1.51)		7.0 (1.24)		6.8 (1.43)		0-9
Age groups	6.6 (1.58)	6.9 (1.43)	7.2 (.92)	6.8 (1.45)	6.9 (1.40)	6.8 (1.45)	
Life satisfaction	18.3 (4.93)		18.9 (4.39)	1	8.9 (4.65)		5-30
Age groups	18.0 (5.02)	18.9 (4.76)	19.1 (3.78)	18.2 (4.83)	19.2 (4.68)	18.6 (4.59)	
% happy	53.2 (23.36)		56.4 (21.75)		55.1 (23.51)		0-100
% neutral	28.7 (19.51)		27.3 (17.84)		29.0 (19.44)		0-100
% unhappy	18.1 (14.99)		15.9 (11.89)		16.0 (12.73)		0-100
Physical efforts	3.2 (.70)		2.9 (.66)		2.7 (.76)		1-4
Mental efforts	3.3 (.61)		3.3 (.54)		3.2 (.63)		1-4
Social efforts	3.2 (.63)		3.2 (.61)		3.2 (.66)		1-4
Physical tiredness	2.9 (.73)		2.8 (.70)		2.8 (.71)		1-4
Mental tiredness	2.9 (.78)		2.9 (.69)		3.0 (.72)		1-4
Tension	2.6 (.83)		2.6 (.77)		2.6 (.76)		1-4

*Means for these three variables are given stratified by two age groups (i.e., ≤40 years and ≥41 years) as age emerged as significant covariate. Follow-up analyses were performed on these variables analyzing interactions between work schedules and age group (i.e., younger and older).

satisfaction, results of ANCOVAs yielded no significant main effects for work schedules. However, age emerged as a significant covariate for these three variables, and so interactions between work schedules and age were subsequently examined. Means for each of the three variables are presented separately for the two age groups in Table 2, younger and older. These analyses showed that, among night shift workers, the younger workers had less total QOLS ($F_{2,1714}=4.01, p<.05$), were less happy ($F_{2,1686}=3.81, p<.05$), and less satisfied ($F_{2,1602}=3.41, p<.05$) than the older workers. This was reversed in day-shiftworkers, with the younger day-shiftworkers reporting higher levels of satisfaction, happiness, and total QOLS.

For the Fordyce happiness percent measures, percentage of time being in neutral mood was not analyzed due to multicollinearity in the percentage measures. There was a multivariate trend for percentage of time happy and unhappy to be different between the groups ($F_{2,1678}=1.92, p<.10$). Univariate tests confirm that night shiftworkers reported more time unhappy than dayshift workers ($t=1.97, p<.05$) and non-shiftworkers ($t=2.53, p<.01$).

Analyses on the demands of work measures yielded a significant effect for work schedule (multivariate $F_{12,3308}=11.88, p<.01$). Univariate tests revealed that this effect was significant for physical effort ($F_{2,1659}=55.77, p<.01$), physical tiredness ($F_{2,1659}=4.01, p<.01$) and mental tiredness ($F_{2,1659}=3.95, p<.05$). Compare to non-shiftworkers, shiftworkers needed more physical effort to complete their work. Moreover, shiftworkers with night shift reported 'being' more physically tired by their work than non-shiftworkers. On the other hand, non-shiftworkers reported 'being' more mentally tired at the end of the day than shiftworkers with night shift.

DISCUSSION

Shiftwork was shown to have negative consequences on social and domestic life. This research brought additional answers to questions about how working in shifts affect workers' lives, by examining the quality of specific domains of workers' lives and subjective well-being.

In our study we were interested in nine areas of life, which are grouped around three domains: 'being', 'belonging' and 'becoming'.^{14,15} The most important and satisfying area of life, as rated by all three groups, was 'being': how they feel about their physical and psychological health, personal values and spiritual beliefs. Taking care of themselves appears to be a priority in workers' lives. Besides that, workers felt to have the most control and opportunities for improve-

ment in that domain. On the other hand, workers in each group found the 'becoming' area least important and least satisfying. This area refers to activities they do in everyday life to achieve personal goals, aspirations and hopes. However, the lowest quality of life in the 'becoming' domain did not match the lowest ratings of control and opportunities in that domain. The least control and opportunities were found in the 'belonging' domain for all groups of workers. It seems that workers' connection with the environment, either physical or social, provides less control and fewer opportunities compared to other areas of life.

The relative position of the different domains of QOL as well as potential for control and range of opportunities was similar across groups. However, when comparing the ratings across groups the picture changes. Particularly, shiftworkers with night shifts rated their quality of physical 'being' lower compared to other workers. That area deals with physical health, including nutrition and fitness. It could be that night shiftworkers have problems maintaining a healthy diet and physical fitness, compared to the other groups of workers.² Additionally, they reported lower QOL in spiritual matters than non-shiftworkers. They found less enjoyment in satisfying their personal values and standards. Due to their arrangement of working hours it is likely that night shift workers have problems in fulfilling this area of life, as most of the activities in that domain happen in the daytime, when shiftworkers are sleeping or feel too tired to attend. This, also, could be one of the reasons why community 'belonging' was rated lower in night shiftworkers than in the other two groups of workers. That area includes availability of health and social services, educational and recreational programs and other community events where, due to work time constrains, night workers have difficulties in participating. In another study it was shown that average time spent in social activities, such as theatre, visiting friends, dining out etc., was shorter for night shifts workers compared to day workers.¹⁸ The availability of those kinds of activities is still very limited for night shift workers.

Regardless of the working schedule, all groups of workers reported the same level of control over the different areas of life. However, the opportunity for change or enhancement in each of the nine areas showed differences between groups. Shiftworkers with night shifts reported having fewer opportunities to improve their physical 'being', leisure and personal growth than the other two groups. In other words, they perceived less chance to change or improve their physical health and fitness, to be involved in fun activities and hobbies, or in activities that promote their knowl-

edge and skills. Moreover, night shift workers reported fewer opportunities to improve their psychological 'being', i.e. individuals' feelings, cognitions and evaluations concerning themselves, than day-shiftworkers. Compared to non-shiftworkers, shiftworkers with night shifts also reported having fewer opportunities for improvement in the practical 'becoming' subdomain. That domain refers to activities that are typically done on a regular basis, such as domestic activities and visits to health and social services.

According to the framework applied, QOL is moderated by two factors, control and opportunity. Those two factors refer to the environment where the individuals live, and its possibility of providing a range of opportunities and choices. Thus, it is reasonable to combine the findings and define which particular area seems most critical for each specific group of workers. For night shiftworkers, the area of physical 'being' has the lowest QOLS combined with the lowest perceived opportunities to change, as compared to the other groups of workers. As this area is mainly concerned with physical health, including nutrition and fitness, it is not surprising that night shiftworkers were the group with lowest ratings. It is well documented that shiftworkers have more health problems and poorer diets than non-shiftworkers.^{2,11} Moreover, this study reveals, through the ratings of QOL, that night shiftworkers see physical 'being' as the most critical area in their life.

We also used measures of total quality of life, overall happiness,⁵ and life satisfaction.³ None of them yielded significant differences between groups of workers. However, because age emerged a significant covariate, follow-up analyses clarified the age effect by examining the interactions between work schedules and the two age groups, younger and older. Among night shiftworkers, the younger workers had less total quality of life, were less happy, and less satisfied than the older workers. This was reversed in day-shiftworkers, with the younger workers reporting higher levels of total QOLS, happiness and satisfaction. This implies that night shift work has a more negative impact on younger than older subjects, when it comes to overall measures of happiness, life satisfaction, and quality of life. One of the reasons for this finding may be the process of self-selection which occurs among night shiftworkers, resulting in the fact that older workers are those who better dealt with night shifts ("healthy worker effect"). On the other side, it could be assumed that the disruptive effect of shiftwork on social and domestic life was more pro-

nounced in younger workers who are more occupied with such activities during the day and thus perceive their quality of life less satisfying than older workers.

It is worth mentioning that, when asked about percentage of time they are happy and unhappy, shiftworkers with night shifts reported a higher percentage of time unhappy than non-shiftworkers. However, they did not differ in the percentage of time happy. That could be explained by the structure of affective space having two independent components, positive and negative affect.²¹ It seems that working night shifts is associated with more negative than positive affect.

Although workers fulfilled the same tasks, the groups differed in their estimates of demands at work. Compared to non-shiftworkers, shiftworkers needed more physical effort to complete their work. Moreover, shiftworkers with night shift found the same work more physically tiring than non-shiftworkers. This finding supports the results from a previous study.⁹ However, non-shiftworkers reported 'being' more mentally tired at the end of the day than shiftworkers with night shift. One explanation could be that 'end of the day' has different meanings for different groups of workers. It is possible that the end of the day for night-shiftworkers refers to either the end of their working day (i.e., if they are in day shift) or the end of their day-off. Thus, on average, they might not perceive it as more mentally tiring as workers who work only daily.

In general, results suggest that shifts, particularly night shifts, play an important role in workers' QOL assessments and that specific domains are more affected than others. However, it should be emphasized that the cross-sectional nature of the present study cannot support any conclusions on causality. Rather, results could be used in applied contexts, i.e. to identify areas for improvement, change or intervention, which are associated with particular working schedules. Several authors have suggested that night shifts should be reduced as much as possible.¹² Also, there are other ways of compensating for the negative impact of night shifts, such as improving areas of life which are most affected by work schedules. The results of our study showed, first, that complex QOL assessment of separate areas of life gives more information of particular needs than overall measures of well-being. Second, the study showed that intervention may be best targeted on areas of physical health in night shiftworkers, furthermore, on the areas of participation in community activities, and providing more opportunities in practical, leisure and growth area of life.

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