

CHANGES IN STRESS LEVEL DURING PREOPERATIVE AND POSTOPERATIVE PERIOD

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The aim of this investigation was to find out the effects of so called preoperative and postoperative stress on some psychophysiological variables on a group of patients. It is reasonable to assume that by the approach of a surgical operation, the level of anxiety, high activation, pulse rate and patient's assessment of the gravity of his operation, will increase, which could be taken as an indication of the stress increase.

A group of 10 patients, 42 to 69 years of age, expecting an operation of hernia or gall bladder, took part in this investigation, which included measurements of anxiety, high activation (stress), pulse rate and the assessment of gravity of his/her operation, seven days before, one day before and two hours before the operation, as well as seven days after the operation. The measurements were taken by standard procedures, while the patients assessed the gravity of the operation on Borg's scale.

The results showed changes in all the variables, i.e. the preoperative stress together with the patients' assessment of the gravity of operation were increasing as the day of the operation approached. Contrary to this, during the postoperative period, the level of these variables showed a decrease, which was associated with a feeling of "relief" and a decrease in stress.

This study showed that the used variables were good indicators of preoperative and postoperative levels of stress. Nevertheless, these

variables could not be used as predictors of postoperative recovery, because of the lack of a reliable definition of the criterion variable.

KEY WORDS: stress, surgical operation, psychophysiological variables, postoperative recovery

Introduction

A surgical operation is a threatening event for patients, who often show a whole range of emotional symptoms such as anxiety, fear, anger and depression during the period before surgery. The sources of stress may be worries about the anaesthesia and the final outcome of the surgery. Postoperative period is also stressful, because of postoperative pains, fear of death and postoperative complications, which also may result in anxiety, anger or depression (Cohen, 1980). Preoperative and postoperative stress can produce an increase in sympathetic-adrenomedullary activity, as well as suppression of the immune functions, which lead to an increase in the risk of postoperative complications (Boeke et al., 1991a). Kiecolt-Glaser et al. (1998) consider that surgical stress can influence postoperative recovery in several ways. Emotions, for example, have direct effects on "stress" hormones, and they can modulate immune functions. The patient's emotional reaction to surgery can affect the amount of anesthetics needed, which has some effects on the immune and endocrine systems. Certain kinds of behavior (alcohol intake, smoking), resulting from stress, may have direct effects on immune functions and postoperative recovery of patients.

Some researchers have focused their research on the effects of patient's emotional states during the period before surgery and postoperative recovery. Results of their studies showed that the postoperative recovery was related to their preoperative state. Groot et al. (1996; 1997a; 1997b) investigated the relationship between the level of preoperative anxiety and some aspects of postoperative recovery on 126 patients undergoing lumbar surgery. The indicators of postoperative recovery were postoperative anxiety, fatigue and pain, somatic complaints and the surgeon's assessment of the patient's recovery. Preoperative anxiety, fatigue and back pain were found as good predictors of postoperative anxiety (Groot et al., 1997b), while specific anxieties (worries about surgery and anaesthesia, as well as difficulties in concentrating) were good predictors of somatic complaints such as headaches, dizziness and nausea, during the postoperative period (Groot et al., 1996). The number of analgetics taken by females and their preoperative anxiety explained

a significant proportion of the variance of the surgeon's assessment of patients' recovery three days after the operation (Groot et al., 1997a).

A number of studies investigated the relationship between changes in the observed preoperative variables and the postoperative recovery during the first week after surgery. It was found that many patients felt "relieved" after surgery, i. e. feeling better, which was accompanied by changes in some psychophysiological variables. In the studies by Groot et al. (1996; 1997a) the assessments of state anxiety, fatigue and pain significantly decreased three days after the lumbar surgery, compared with the preoperative levels.

Some other authors (Boeke et al. 1991a; 1991b; 1992) used the length of the postoperative stay in the hospital together with the assessment of postoperative pain by patients', who underwent gall bladder operation, as indicators of postoperative recovery. Longer periods of hospitalization after operation in male patients were related to the number of previous operations, postoperative complications and the level of anxiety (Boeke et al., 1991a). On the other hand, preoperative anxiety level did not relate to the length of postoperative hospitalization. This was not in agreement with the results obtained by Groot et al. (1996; 1997a; 1997b).

Some investigations on coping behaviour showed that an avoidant coping (not thinking) about the operation was associated with faster postoperative recovery (Cohen, 1980). Contrary to this, Groot et al. (1997b) found that the coping variables were not associated with indicators of postoperative recovery (postoperative anxiety, somatic complaints).

These investigations suggest that the patient's level of preoperative anxiety, fatigue and pain could help in a better understanding of the postoperative recovery.

A number of authors prefer physiological indicators of stress because of the unreliability of subjects reports. Another reason for this preference is the availability of rather simple to use electronical instruments for measurements of physiological reactions. It ought to be said, however, that in spite of realibility of the measurement of changes of physiological variables their interpretation is not always simple because of the effects of other variables besides stressors. It seems, therefore, that physiological data should be compared with the subject's reports and opinions on his own state and his evaluation of the situation (gravity of the operation, for example).

In some stress models trait anxiety is very often related to stress, which is treated as an input variable within the stress process itself. This variable can modify the stress reactions, perception of stress, as well as the coping strategies of an individual in stress situations. State anxiety, however, can be considered as an interaction of various situational factors and trait anxiety. Individuals

with a higher trait anxiety have also a higher state anxiety in stress situations, compared with individuals with lower anxiety.

The aim of this investigation was to find out the effects of so-called preoperative and postoperative stress on some psychophysiological variables which are known as indicators of stress level. It is reasonable to assume that by the approach of a surgical operation subjectively experienced stress level would increase, which would cause changes in anxiety, high activation, pulse rate and patient's assessment of the gravity of his operation. According to what was said earlier, it is reasonable to assume that trait anxiety could affect the experienced level of stress during preoperative and postoperative periods. Because of the lack of such an evidence in the literature, one of the aims of the study was also to check such an assumption.

Method

The procedure included measurements of pulse rate, activation level, state anxiety, activation level and patient's assessment of the gravity of expected operation on 10 patients (42 to 69 years of age), expecting operations of hernia (N=6) and gall bladder (N=4), for the first time.

Standard procedure was used to measure the pulse rate by the use of a pulse meter.

Thayer's Activation-Deactivation Adjective Check List (AD-ACL) was used for the assessment of high activation, which is taken as the state of stress (Mackay et al., 1978). Proroković (1996) assessed the factor structure of the adapted AD-ACL list in Croatian language, where the internal consistency coefficient (Cronbach alpha) for high activation was 0.85. This was in agreement with the validation of the same scale done by Manenica (1987).

Anxiety (state and trait) was assessed by standardized Spielberger's Questionnaires on Croatian population. The internal consistency coefficients were 0.90 for trait anxiety and 0.92 for state anxiety (Spielberger et al. (1970, prema Anastasi, 1982).

The gravity of the operation was assessed on Borg's scale by the patients. According to Borg (1973) this scale has characteristics of ration scales, therefore it has some advantages in comparison with other scales of similar kind.

The measurements were taken seven days before, one day before and seven days after the operation in the surgery, as well as two hours before the operation in the surgical department. Apart from this, trait anxiety was assessed

seven days before the operation. The surgeon also assessed the recovery of each patient, on a three point scale, seven days after the operation.

Results and discussion

Changes of the observed variables during preoperative and postoperative period are shown in Figures 1-4. As can be seen, all the variables significantly changed during the preoperative and postoperative period, as indicated by the F-ratios.

Figure 1. *Changes of pulse rate during preoperative and postoperative period*
 $F(3,27) = 8.76; p > 0.01$

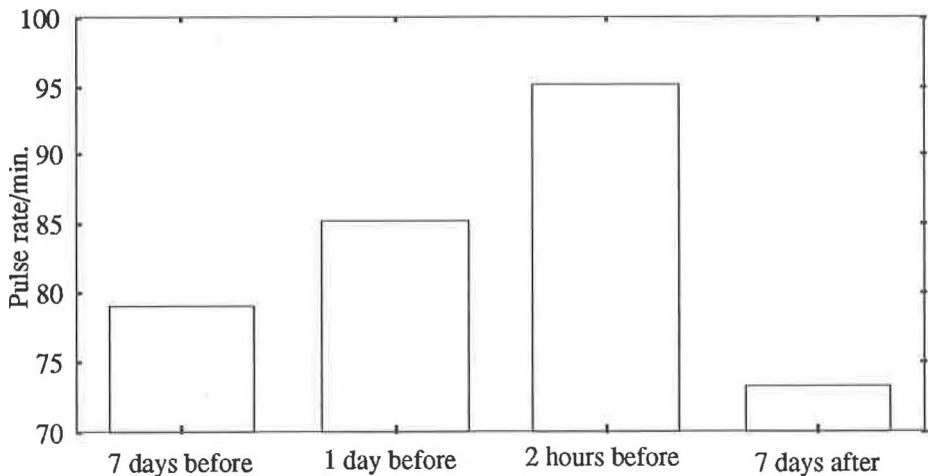


Figure 2. *Changes of state anxiety during preoperative and postoperative period* $F(2,18) = 40.50; p < 0.01$

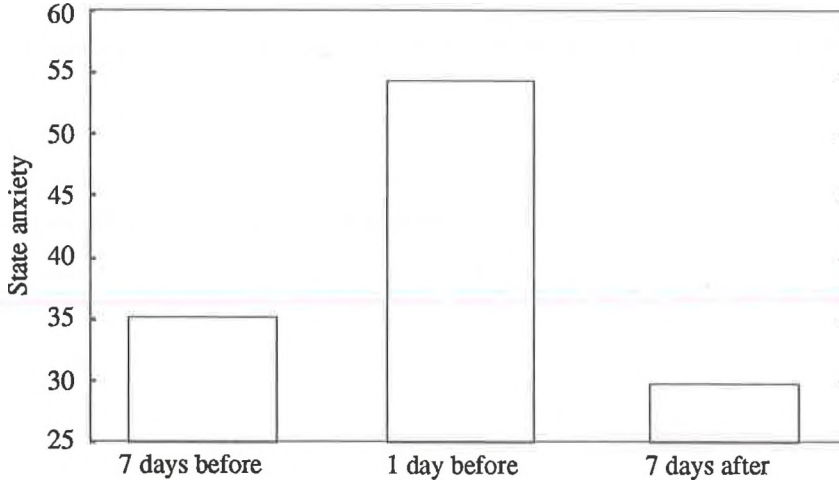


Figure 3. *Changes of high activation during preoperative and postoperative period* $F(2,18) = 49.04; p < 0.01$

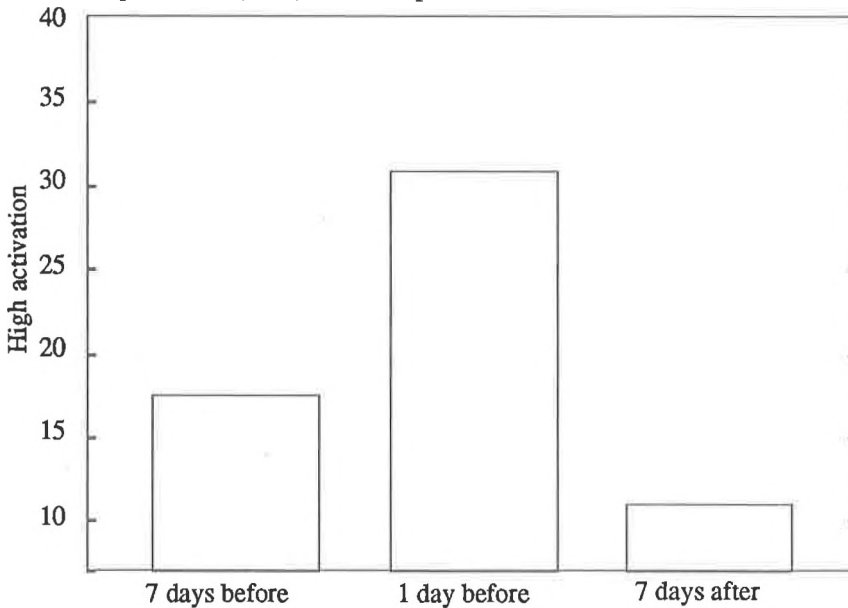
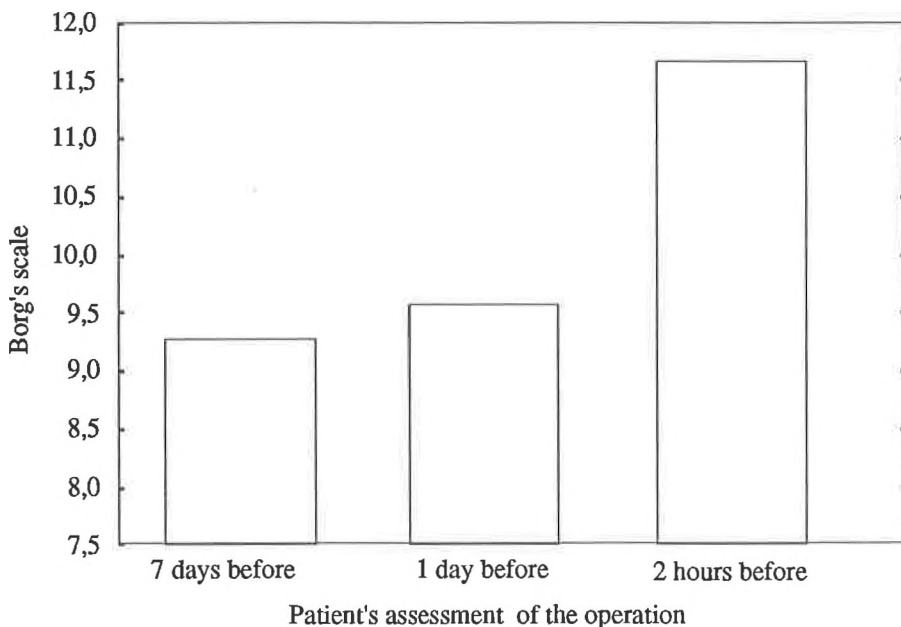


Figure 4. *Patient's assessment of gravity of the operation*

F (2,18) = 9.29; p<0.01



- 1 - preoperative measurement (7 days before)
- 2 - hospital (1 day before)
- 3 - 2 hours before operation

During the preoperative period a significant increase of stress level was indicated by the increase in pulse rate, anxiety and high activation, as well as the patient's assessment of the gravity of operation, as the operation approached. Results obtained by Groot et al. (1996; 1997a) on patients undergoing a lumbar operation showed that the state anxiety increased a day before the operation, which is in agreement with the changes of state anxiety in this investigation.

During the postoperative period, however, the level of stress decreased, which resulted in a fall of anxiety, high activation, and pulse rate. Similar results were obtained by Groot et al. (1996; 1997a), who showed that the state anxiety, fatigue and pain decreased three days after the operation, compared to the preoperative level. Results obtained in this study could be explained on the

basis of "relief" after the operation, which was accompanied by a decrease in anxiety, high activation and pulse rate seven days after the operation.

The three measurements of the variables (seven days before, a day before and seven days after the operation) were taken as the triads of measurements in calculations of cross-correlations amongst the variables (Table 1.). Although this procedure yields somewhat higher correlation coefficients, due to a reasonable expectation that results within the triads are correlated, it was used because of higher reliability of the correlation coefficients. The obtained correlations suggest a high relationship amongst three variables (state anxiety, high activation and patient's assessment of gravity of the operation), which were used as indicators of stress level. Furthermore, significant correlations were found between trait anxiety and other three variables (state anxiety, high activation and patient's assessment of gravity of the operation), suggesting that trait anxiety predetermined the magnitude of reactions to stress, to a certain extent. This was also supported by significant differences between the group of patients with a lower trait anxiety (below the mean) and the group with a higher level of trait anxiety (above the mean) (trait anxiety $t = 5.40$ $p < 0.01$; state anxiety $t = 2.15$ $p < 0.05$; patient's assessment of gravity of the operation $t = 2.12$ $p < 0.05$).

Table 1. *Cross-correlations amongst the changes in the variables*

	SA	PA	HA	TA	Age	AR	PS
PR	0.43*	0.01	0.46*	0.05	-0.66**	0.53**	0.55**
SA		0.46*	0.95**	0.55**	0.05	0.31	0.31
PA			0.40*	0.64**	0.30	0.51**	0.43*
HA				0.46*	0.02	0.28	0.27
TA					0.41*	0.29	0.37*
Age						-0.51**	-0.48**
AR							0.89**

** $r = 0.463$; $p \leq 0.01$

* $r = 0.361$; $p \leq 0.05$

PR - pulse rate

SA - state anxiety

PA - patient's assessment of gravity
of operation

HA - high activation

TA - trait anxiety

Age - patient's age

AR - surgeon's assessment of recovery

PS - postoperative hospital stay

The two indicators of postoperative recovery (the surgeon's assessment of the patient's recovery and the length of postoperative stay in the hospital) were highly correlated, which could be expected, because patient's postoperative stay in the hospital depended on the surgeon's assessment of the recovery ($r = 0.89$; $p < 0.01$). The patient's assessment of the gravity of his own operation was also correlated with the surgeon's assessment of the recovery, as well as with the length of the postoperative stay in the hospital. As was indicated by the results of this study, the postoperative recovery should be better defined in terms of variables which are not directly dependent on each other, such as the surgeon's assessment of the recovery and the length of postoperative stay in the hospital. This may be the reason why the results of this study do not entirely agree with results obtained by Boeke et al. (1991b; 1992).

In conclusion it could be said that the used variables were good indicators of preoperative and postoperative level of stress. Nevertheless, these variables could not be used as predictors of the patient's recovery because of the lack of a reliable definition of the criterion variable.

Further investigations in this field, with clearer definitions of some relevant variables are needed to establish good predictors of postoperative recovery. As the results indicated, one such variables could be trait anxiety. Future investigations should also include other types of operations, and variables such as social support and coping strategies of patients during preoperative and postoperative period.

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PROMJENE U RAZINI STRESA TIJEKOM PREDOPERATIVNOG
I POSTOPERATIVNOG PERIODA

S a ž e t a k

Cilj ovog ispitivanja, bio je utvrditi efekte predoperativnog i postoperativnog stresa na neke psihofiziološke varijable skupine od deset pacijenata, dobi 42 do 69 godina, koji su očekivali operaciju hernia ili žuči, po prvi put. Za očekivati je bilo da se približavanjem operacije povećava anksioznost, visoka aktivacija, frekvencija pulsa, te pacijentova procjena težine operacije, kao reakcija na subjektivni doživljaj stresa.

Ispitivanje je uključivalo mjerenja anksioznosti, visoke aktivacije (stresa), frekvencije pulsa i pacijentove procjene težine operacije sedam dana prije, dan prije, te dva sata prije operacije, kao i sedam dana poslije operacije. Razine ispitivanih varijabli su mjerene standardnim metodama, dok su težinu operacije pacijenti procjenjivali na Borgovoj skali.

Promjene u ispitivanim varijablama (stanje anksioznosti, visoka aktivacija, frekvencija pulsa) indicirale su porast stresa približavanjem dana operacije. Činjenica da se pacijentova procjena težine predstojeće operacije povećava njenim približavanjem, također potkrepljuje pretpostavku o povećanju subjektivnog doživljaja stresa u predoperativnom periodu. U skladu s očekivanjem, u postoperativnom periodu došlo je do smanjenja anksioznosti, visoke aktivacije i frekvencije pulsa, što se može objasniti osjećajem "rasterećenja" pacijenata, tj. smanjenjem razine stresa.

Rezultati ovog ispitivanja pokazuju da su ispitivane varijable dobri indikatori predoperativne i postoperativne razine stresa. Unatoč tome, rezultati ovog istraživanja ne dozvoljavaju korištenje navedenih varijabli kao prediktora pacijentovog oporavka, zbog nedostatka pouzdanih definicija kriterijske varijable, koja je u ovom slučaju bila dužina boravka u bolnici i liječnikovo mišljenje o oporavku pacijenta. Kako se moglo očekivati, ove dvije varijable korelirale su vrlo visoko, jer je dužina postoperativnog oporavka u bolnici zavisila o mišljenju liječnika o pacijentovom oporavku.

KLJUČNE RIJEČI: stres, operacija, psihofiziološke varijable, postoperativni oporavak