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PHYSIOLOGICAL CONCOMITANTS OF AN "AUTONOMOUS DAY PROGRAMME" IN GERIATRIC DAY CARE

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ABSTRACT. Sixty-five geriatric patients with a mean age of 74 years (range 61–90) who were referred to the day care unit of a geriatric hospital were randomly allocated to an experimental and a control group in groups of 5–8 patients, respectively. Controls were cared for according to usual routines. Patients in the experimental groups were subject to a new organizational routine. These patient groups constituted a forum for discussion and definition of individual treatment goals. Patients in the experimental and control conditions were observed before as well as 6, 12 and 24 weeks after the start of the treatment, which lasted for twelve weeks. Patients in the intervention programme had significantly lower plasma prolactin levels following the initiation of the programme than patients in the control group. According to literature, an absence of a plasma prolactin elevation during a crisis period may indicate active coping. Such a conclusion was supported by other observations in the study which indicated a progressively more internalized locus of control in the experimental group.

Key words: **daycare, prolactin, leucocytes, cortisol, stress.**

Geriatric day care centers play an ever increasing role in the overall strategy of providing appropriate level care to elderly people and at the same time allowing them to live in their home. The programme structure offered to elderly day care participants generally focuses on traditional occupational and physical therapy aimed at optimizing physical independence and enhancing mental functions.

Such programmes are of immense importance to the elderly but also imply significant hazards. Thus, in recent years a number of studies suggest that elderly subjects are at risk of becoming "institutionalized" and progress through a series of events known as "the social breakdown syndrome" (1). This way of describing the process as well as other similar models, argues that staff take over more and more of every day decision making, rendering the individual increasingly dependent on the staff.

We have previously reported that institutionalization among geriatric patients in a senior citizen apartment building is associated not only with psychological factors but also with physiological processes and with changes in the transfer rate to geriatric hospitals (2). In that study we also found a tendency of decreasing leucocyte count over time among subjects participating in a social activation programme as well as metabolic and endocrine adjustment suggesting less physiologic stress among elderly participating in a social activation programme.

In the present study our observations included participants in geriatric day care. The purpose was to explore effects on the psychophysiological state following a controlled intervention aimed at enhancing autonomy among the elderly.

STUDY GROUPS AND METHODS

The study was performed at the day care unit in a geriatric hospital in the southern part of Stockholm, Sweden. The unit is located in modern facilities and considered to offer all the amenities necessary for geriatric rehabilitation.

Patients were recruited into the study during the period January 1987 through September 1988. To be eligible potential participants had to score 28 points or more on the Mini Mental State (3). They were also not to show clinical signs of current infectious diseases. Newly admitted elderly were consecutively allocated to the control and experimental groups in random fashion. In addition, a random sample of chronic cases, defined as those that had been offered more than 26 weeks of day care rehabilitation, were randomly allocated to control and experimental groups. A detailed description of the groups is given in Table I.

The diagnostic groups, based on ICD 9-CM, as well as gender and age are distributed equally between subgroups. The only exception is that the group of control among the chronic group has a lower mean age compared to the other groups. Cerebrovascular diseases usually with hemiplegia and aphasia constituted the largest groups.

Table I. *Characteristics of the experimental and control groups*

	Newly admitted		Chronic cases	
	Experim.	Control	Experim.	Control
Number	25	24	8	8
Males	12	14	4	3
Females	13	10	4	5
Mean age	76	74	78	71
Range	68–90	62–87	66–90	61–81
Cerebrovascular disease	13	16	4	3
Neurologic disorders	2	4	3	0
Musculoskeletal disorders	5	1	0	3
Other	5	3	1	2

Treatment conditions

Patients in the control group were cared for according to usual routines such as occupational therapy individually and/or in groups, speech and activities of daily life, training as well as social activities. Patients in the experimental group were subjected to a new organizational routine. According to this routine, patients were admitted in groups of 5–8, all starting at the same time. The new routines began simultaneously for experimental patients. The groups were started jointly. Much attention was paid to goals and goals' achievement. These goals should be realistic, achievable, positive and internalized (the patient's own) (4). Feed-back was facilitated for every group member at each meeting, which was held twice a week on the patients' treatment days. The group meetings were monitored by a registered nurse, who made a conscious effort to remain somewhat in the background. The intention was to let the group steer its own dynamics. Each patient carried a personal card where all treatment were recorded and had also an individual planning card, where specific goals and follow-up activities were recorded. These patients were offered the same kind of treatments as the patients in the control group, but the planning and the goal setting of the treatments were different due to the social feedback and decision making taking place in the experimental group. The group therapy has been described in detail elsewhere (5).

Each patient underwent a comprehensive medical and laboratory examination at the start of the programme and after 6, 12 and 24 weeks. These included thorough patient history as well as a structured interview.

A physical examination was made, ADL was measured by means of Barthel's index (6, 7) and blood samples were taken. These were used for the analysis of routine health tests and endocrine factors.

The somatic examinations took place in the morning when the patients arrived at the unit at 9.00 a.m. The patients had been instructed not to eat nor to drink with the exception of water since midnight. Venous blood specimens were taken after ten minutes rest in the supine position. The blood sampling procedure was performed by a registered nurse, whom the patients knew very well in advance. The blood specimens were analysed with regard to leucocyte count, hemoglobin and erythrocyte sedimentation rate, serum albumin, serum cholesterol and triglycerides, serum liver enzymes (ASAT and ALAT), serum glucose and fructose amine (S-FAM). All these analyses were performed according to routine procedures in the regular hospital laboratory. In addition plasma was saved and frozen within an hour and stored at $-70°C$. These specimens were subsequently analyzed in the endocrinological laboratory at the Huddinge University Hospital. Cortisol and prolactin were analyzed in men and women by means of radioimmunoassay. Height and weight were measured.

Statistical procedures

Means and standard errors of means (SEM) were calculated for all variables on all occasions for the total groups and the newly admitted groups separately (experimental and control). Two-way analysis of variance was made using ratios calculated between initial values and each one of the subsequent observations. In this way differences in initial value could be adjusted for.

Follow-up procedures

Patients in the experimental and control conditions were observed before as well as 6, 12 and 24 weeks after the start of the treatment, which lasted for 12 weeks.

General hypothesis

The groups were expected to be comparable with regard to all the studied variables before the start of the treatment. During the course of the study and follow-up, patients in the experimental group were expected to show lower levels of physiological stress (lower cortisol and prolactin level as well as lower fructose amine) than the control group. Since eating habits were similar in the two groups, serum cholesterol was expected to decrease and serum albumin to rise in both groups. Leucocyte count was expected to decrease more in the experimental group as a consequence of a lowered level of physiological stress. Thus, for the parameters that have previously been established as "biological stress markers" (cortisol, prolactin, fructose amine and leucocytes) a hypothesis was formulated in advance. The remaining "background variables" were used in order to explore whether the groups were comparable.

RESULTS

Table II shows the means and standard errors of means of the experimental and control groups on all occasions with regard to "stress relevant" parameters. Background variables are presented in Table III. Before the treatment period the only difference with regard to such variables between the experimental and control groups, was the newly admitted experimental patients had a significantly higher erythrocyte sedimentation (ESR) level ($p=0.01$) than control patients. For the total groups, on the other hand, no significant differences with regard to ESR was found.

Table II. *Physiological stress parameters for "total" and newly admitted ("new") groups*

B-LPK = leucocyte particle conc., S-FAM = fructose amine, CORT = cortisol, PROL = prolactin. Means and standard error of means (SEM) for each group on each occasion

		Intervention							
		Before		6 weeks		12 weeks		24 weeks	
		Exp.	Cont.	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
B-LPK, 10^9/l									
Total	Mean	6.61	6.33	6.42	6.30	5.70	6.20	5.69	6.18
	SEM	0.35	0.36	0.31	0.37	0.31	0.26	0.25	0.31
New	Mean	6.35	6.63	6.15	6.39	5.23	6.32	5.48	6.31
	SEM	0.42	0.43	0.35	0.39	0.37	0.26	0.29	0.37
S-FAM, mmol/l									
Total	Mean	2.64	2.75	2.71	2.76	2.69	2.71	2.63	2.67
	SEM	0.07	0.08	0.07	0.10	0.09	0.10	0.10	0.10
New	Mean	2.71	2.73	2.76	2.75	2.75	2.68	2.71	2.67
	SEM	0.08	0.11	0.08	0.12	0.12	0.12	0.14	0.12
S-CORT, nmol/l									
Total	Mean	62.3	55.5	59.5	57.8	56.6	54.8	61.8	56.3
	SEM	30.4	27.6	40.7	35.0	30.3	37.7	44.0	38.5
New	Mean	61.5	55.0	57.1	58.5	54.9	56.8	60.8	54.9
	SEM	36.0	33.3	50.6	44.1	34.6	44.2	51.9	48.7
S-PROL, ng/l									
Total	Mean	8.95	8.87	7.96	9.73	7.99	10.13	8.57	10.64
	SEM	0.80	0.71	0.46	0.72	0.46	0.71	0.58	0.92
New	Mean	9.10	9.41	8.55	9.81	7.55	9.66	8.50	10.01
	SEM	0.97	0.89	0.52	0.87	0.46	0.83	0.70	1.01

The total experimental group ($p=0.02$) as well as the newly admitted experimental patients ($p=0.01$) had a significantly higher glucose level than corresponding control groups. None of these differences persisted during treatment or follow-up. The latter finding did not correspond to any difference in fructose amine level and was therefore regarded as a temporary phenomenon.

After twelve weeks a significantly lower leucocyte count ($p=0.02$) was observed in the newly admitted experimental group than in the control group. These longitudinal trends were not statistically significant (analysis of variance), however.

Plasma prolactin was significantly lower in the total experimental group than in the control group both after six ($p=0.04$) and twelve weeks ($p=0.02$). An almost significant trend ($p=0.06$) was observed also after 24 weeks. When the same comparison was confined to the newly admitted groups, the statistical significance was retained only after twelve weeks ($p=0.02$).

Table IV shows the result of the analysis of variance using ratios of plasma prolactin levels (treatment and follow-up levels, respectively, divided by initial levels) for the total groups. The analysis shows that there is a significant difference between the groups, the experimental group shows a consistently lower level in relation to the initial level. A logarithmic transformation of the ratio was also tested in analysis of variance. This showed a very similar result (F 4, 30; $p=0.04$).

DISCUSSION

The patients participating in the project are representative of patients of the same age group in the area from where they are recruited. The programme was offered to the different groups throughout 20 months. Thereby we minimized the effect of seasonal variation.

As the day care unit is known as a strict somatic one, no patients with heavy psychotropic drugs were referred. Nor were there any untreated patients referred as the day care unit focuses on rehabilitation and maintenance. This could also be seen from the interviews. These showed that neither total medication/day nor kind of drugs were changed over time. In

Table III. *Physiological background parameters for "total" and newly admitted ("new") groups*

Hb = hemoglobin, ESR = sedimentation rate, ALB = albumin, CHOL = cholesterol, TRIG = triglycerides, GLU = glucose
Means and standard error of means (SEM) for each group on each occasion.

		Intervention							
		Before		6 weeks		12 weeks		24 weeks	
		Exp.	Cont.	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
B-HB, g/l									
Total	Mean	142.3	141.7	141.9	141.7	142.9	142.7	139.7	142.4
	SEM	2.6	2.4	2.6	2.4	2.7	2.6	2.7	2.6
New	Mean	141.3	144.5	140.2	144.3	140.1	146.0	138.8	145.4
	SEM	3.4	2.2	3.3	2.1	3.4	2.6	3.6	2.6
B-ESR, mm									
Total	Mean	23.4	16.3	22.3	17.4	21.9	18.7	20.6	21.1
	SEM	3.3	1.9	3.7	2.4	3.6	2.6	2.9	2.0
New	Mean	24.9	12.9	22.0	13.5	20.8	14.2	20.9	16.0
	SEM	4.1	1.5	4.5	1.7	4.4	2.6	3.4	2.5
S-ALB, g/l									
Total	Mean	40.1	39.4	40.0	39.6	40.0	39.8	41.7	40.5
	SEM	0.6	0.5	0.6	0.6	0.7	0.5	1.9	0.8
New	Mean	40.2	39.3	39.8	40.0	39.9	40.3	42.6	41.6
	SEM	0.8	0.5	0.8	0.6	0.9	0.6	2.5	0.6
S-CHOL, mmol/l									
Total	Mean	6.0	5.8	6.0	6.0	5.9	6.0	5.9	6.2
	SEM	0.2	0.2	0.3	0.3	0.3	0.2	0.3	0.2
New	Mean	5.9	5.9	5.9	6.0	5.8	6.2	5.8	6.4
	SEM	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.2
S-TRIG, mmol/l									
Total	Mean	1.8	1.7	1.6	1.8	1.5	1.7	1.6	1.9
	SEM	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2
New	Mean	1.8	1.6	1.6	1.7	1.4	1.6	1.6	1.8
	SEM	0.3	0.2	0.1	0.2	0.1	0.2	0.2	0.2
S-ASAT, kat/l									
Total	Mean	0.40	0.45	0.38	0.44	0.39	0.42	0.40	0.47
	SEM	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.07
New	Mean	0.42	0.46	0.41	0.43	0.42	0.40	0.45	0.42
	SEM	0.02	0.04	0.02	0.03	0.02	0.03	0.03	0.03
S-ALAT, kat/l									
Total	Mean	0.32	0.41	0.31	0.39	0.32	0.37	0.31	0.38
	SEM	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.05
New	Mean	0.33	0.41	0.32	0.40	0.34	0.33	0.33	0.36
	SEM	0.04	0.05	0.03	0.05	0.04	0.03	0.04	0.03
B-GLU, mmol/l									
Total	Mean	5.1	6.5	5.4	6.5	5.2	5.8	5.5	6.2
	SEM	0.2	0.5	0.1	0.6	0.2	0.4	0.2	0.4
New	Mean	5.1	6.8	5.4	6.7	5.2	5.9	5.5	6.4
	SEM	0.2	0.7	0.1	0.8	0.2	0.5	0.2	0.6
Weight, kg									
Total	Mean	67.2	69.5	67.6	69.6	67.9	69.9	67.6	70.8
	SEM	2.0	2.2	2.1	2.2	2.2	2.2	2.4	2.2
New	Mean	65.7	69.0	66.1	69.1	66.8	69.5	66.6	70.9
	SEM	2.2	2.5	2.3	2.5	2.4	2.7	2.8	2.5
Height, cm									
Total	Mean	167.3	168.4	167.2	168.4	167.5	168.4	167.6	169.1
	SEM	1.6	2.0	1.6	2.0	1.6	2.0	1.7	1.9
New	Mean	166.5	169.4	169.4	169.4	166.6	169.4	166.6	170.4
	SEM	1.7	2.3	1.7	2.3	1.8	2.3	1.8	2.1

Table IV. *Ratios between initial values and subsequent observations of plasma prolactin of total groups*

	6 weeks	12 weeks	24 weeks
Experimental group	0.99	1.02	1.06
Control group	1.20	1.27	1.28

$F_{group}=5.22$, $p=0.03$.
$F_{time}=0.89$, $p=0.41$.
$F_{interaction}=0.089$, $p=0.91$.

fact, all patients had been subjected to thorough medical examination before referral. Necessary medication had been prescribed. Home care personnel or hospital personnel had had the responsibility of distributing medication every day. Accordingly there was no need for the day care personnel to change medication or to introduce new medication. No new medical diagnosis were made (such as diabetes) during the study period. Other studies have described the difficulty of changing medication of the elderly (8) as well as changing their eating habits (9). The patients were instructed to be in a fasting state at least from midnight the day before the blood samples were drawn.

Differences in gender have been checked. Males and females were analyzed separately and no differences were observed neither with regard to levels nor with regard to longitudinal changes. Accordingly, the tables have grouped men and women together.

No significant changes were observed in body weight, blood lipids, current disease or carbohydrate metabolism. Nor were there any changes in liver enzyme concentration during the studied period. Thus, it is not likely that observed changes could be due to changes in eating habits or alcohol consumption.

A 5 year follow-up of institutionalized elderly, offered a psychosocial intervention programme, actually supports such a notion since transfer rates to geriatric hospitals tended to be higher among those with higher physiologic stress levels (2). In a long term study of the psychophysiological concomitants of unemployment, it was found that unemployed subjects tended to have elevated levels of circulating lymphocytes compared to employed controls (10). In addition, a study by our group of institutionalized elderly subjects detected a tendency (albeit non-significant) of lowered circulating leucocyte count among elderly offered a psychosocial intervention programme, compared to those in whom no changes were implemented in the daily living routines (11). Decreasing leucocyte counts might reflect a decreased stress level and a reduction in the body's overall readiness to combat invading microbes. Longlasting elevation of leucocytes indicates a fight or flight response in the body.

The leucocyte count difference in the present study should be regarded only as very tentative, since the analysis of variance did not give conclusive results and no difference at all was established when total groups were compared.

Plasma prolactin concentrations started on the same level in the experimental and control groups. During and after treatment, however, the plasma concentration was significantly higher in the control group than in the experimental group, and two-way analysis of variance indicated that there was a constant significant difference in level between the groups during and after treatment.

Plasma prolactin has been shown in several studies to be sensitive to psychosocial processes (12, 13). This hormone is also known to be of relevance to the immune function and the blood pressure regulation. A recently published longitudinal study on relatives of cancer patients showed that those who were offered participation in a special support programme which activated them to take part in the patient's care, tended to have lower prolactin levels than relatives who had not been offered such a programme (14). Another study performed by our group, showed that men with depressive tendency had markedly rising plasma prolactin levels during periods of increased job strain (15). All of these studies seem to indicate that active coping during a crisis situation may be associated with a lowered plasma prolactin level, whereas an elevated level may be found in subjects who have given up their efforts to cope with the situation. Finally, a comparison between morning plasma prolactin levels in men representing six different service occupations indicated that those who had small possibilities to influence decisions and a bad work environment had high levels (in particular waiters) whereas those who claimed that they had good possibilities to influence decisions had low levels (in particular physicians). Thus, although the interpretation of this is not yet clear, there are indications that an elevated plasma prolactin is associated with a feeling of powerlessness in a difficult situation (16). This may also be the case in the present study since psychological observations in the same study (17) indicate that subjects in the experimental group experienced less de-

pression and more activity than those in the control group. By using indices based on questions from Rotter's locus of control scale (18) measuring external versus internal control, we also found a significant difference between the two groups after 12 weeks of intervention and an even stronger significant difference another 12 weeks after the intervention had ended (17). Locus of control was on the same level in the two groups before treatment. In the experimental group, however, it became successively more internalized during and after treatment. The experimental patients estimated their perceived health as successively better over time.

Life satisfaction improved in the experimental group showing that improved subjective feelings could result from this minor intervention in a day care unit within the ordinary framework.

In the present study no significant change in one important parameter of physiological stress, plasma cortisol, was found. Analysis of variance was used with the same technique as for prolactin and did not show any differences. Plasma cortisol has been extensively documented as an indicator of psychological distress. Accordingly, one interpretation of the negative findings in the present study may be that the day care programme did not induce marked alterations in the level of psychological distress of this kind (neither in the experimental nor in the control conditions).

CONCLUSION

The present study has shown that the psychosocial climate offered to elderly people, might influence plasma prolactin levels—which may mirror active and passive coping patterns. We suggest that day care for elderly people, by and of itself an important treatment option, should better address individual need for autonomy and encourage individual goal setting. This is likely to not only enhance psychological well-being but also to benefit physiological state.

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