RELATIONSHIP BETWEEN ACTIVATED EARLY MALADAPTIVE SCHEMAS AND WEAKENED IMMUNE SYSTEM

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Interest in psychoneuroimmunology (PNI), which studies the measurable interaction between psychological and physiological processes, has grown progressively since the 1980s, following the publication of the now-classic articles by Ader (1982, 1987) and Cohen (1991). In the last 10 years, the body of knowledge in PNI has flourished. A number of studies have clarified that two bi-directional pathways link the brain and the immune system: the autonomic nervous system and neuroendocrine outflow via the pituitary. Numerous reports have described immune alterations in the setting of bereavement and depression (Anderson, 1996; Corrican, 1998), thought suppression (Petrie, 1998), a tendency towards helplessness (Garssen, 1999), anxiety (Koh, 1998), and stress (Kiekolt-Glaser, 1995; Eriksen, 1999). The immune alterations usually include suppression of T-cell mitogenesis, decreased numbers of B lymphocytes, increased numbers of circulating CD8+ and natural killer cells, and a significant decrease in CD4+ and CD3+ T lymphocyte levels (Ader, 1995). This negative immune modulation can be associated with an increased morbidity and mortality (Cohen, 1998).

Nevertheless, some interactions between psychological factors and immune system have not been explored in detail. A few studies have investigated the interaction between immune system and cognition (Maier, 1998), but the relationship between specific cognitive schemas and immune function has not been surveyed at all. What would be the significance of that kind of survey? Most importantly, it could shed light on better understanding of the interaction between immune system and cognitive schemas. Consequently, this may induce some practical implications.

Schema Theory

In Beck's model, "a schema constitutes the basis for screening out, differentiating, and coding the stimuli that confront individual. He categorizes and evaluates his experiences through a matrix of schemas" (1979, p. 13). Beck notes that schemas may be inactive for a long period of time, and then "energized by specific environmental inputs" (1979, p. 13). In other terms, schemas are "the systems of expectancies"

(Millon, 1981) or "the belief systems" (Ellis, 1962) that "regulate the individuals behavior with respect to a changing environment" (Guidano, Liotti, 1983, p. 61).

Beck's colleague J. E. Young in the middle 1990s proposed a theory of Early Maladaptive Schemas (EMS). Young hypothesizes that EMS refer to "extremely stable and enduring themes that develop during childhood, are elaborated throughout an individual's lifetime, and are dysfunctional to a significant degree" (1999, p. 9). Young (1999) provides the following defining characteristics of EMS:

1. Most EMS are unconditional beliefs about oneself in relation to the environment, for example, "If I can please other people all the time, then I am worthwhile".
2. EMS are self-perpetuating, and therefore very resistant to change.
3. EMS are dysfunctional in some significant and recurring manner, and can lead to psychological distress.
4. EMS are usually activated by events in the environment relevant to the particular schema.
5. EMS are closely tied to high levels of affect when activated.
6. EMS are the result of previous dysfunctional experiences with parents, siblings, etc.

Young and colleagues (1994; 1999) have developed *Young Schema Questionnaire* and have identified several Early Maladaptive Schemas. A brief description of schemas is provided below.

Emotional deprivation (**ED**) schema refers to the belief that one's primary emotional needs (nurturance, empathy, affection, caring) will never be met by others.

Abandonment (**AB**) schema refers to the expectation that one will soon lose anyone with whom an emotional attachment is formed.

Mistrust / Abuse (**MA**) schema refers to the expectation that others will intentionally hurt, cheat, or put one down.

Social Isolation (**SI**) schema refers to the belief that one is isolated and different from other people.

Defectiveness / Shame (**DS**) schema refers to the belief that one is internally flawed, and that, if others get close, they will realize this and withdraw from the relationship.

Failure (**FA**) schema refers to the belief that one is incapable of performing as well as others in areas such as career or education.

Dependence / Incompetence (**DI**) schema refers to the belief that one is not capable of handling day-to-day responsibilities competently and independently.

Vulnerability to Harm and Illness (**VH**) schema refers to the belief that one is always on the verge of experiencing a catastrophe (financial, medical, criminal, etc.).

Enmeshment (**EM**) schema refers to the belief that at least one of the enmeshment individuals cannot survive or be happy without the constant support of the other.

Subjugation (**SB**) schema refers to the belief that one must submit to the control of others in order to avoid negative consequences.

Self-Sacrifice (**SS**) schema refers to the belief that one must sacrifice one's own needs in order to help others.

Emotional Inhibition (**EI**) schema refers to the belief that one must inhibit emotions and impulses, especially anger, because any expression of negative feelings would harm others or lead to abandonment.

Unrelenting Standards (**US**) schema refers to the belief that whatever one does is not good enough, that one must always strive harder.

Entitlement (**ET**) schema refers to the belief that people should be able to do, say, or have

whatever they want immediately regardless of whether it hurts others or seems reasonable to them.

Insufficient Self-Control (**IS**) schema refers to the belief that any frustration in reaching goals, as well as an inability to restrain expression of impulses or feelings, is intolerable.

In Young's (1999) model, "schemas generate behaviors" (p. 75) and "emotional experiences" (p. 76). The questions, relevant to the above-discussed interactions between psychological factors and immune system, could be formulated as follows. Is there any relationship between Early Maladaptive Schemas and immune system? Could be there any evidence to support the premise that Early Maladaptive Schemas, which may lead to psychological distress, are the risk factors for immune alterations?

The main aim of this research was to evaluate the relationship between cognitive schemas and cellular immunity. We hypothesized that activation of more EMS would be related to a significant decrease in CD4+ and CD3+ T lymphocyte levels, and increase in CD8+ lymphocytes.

Methods

Participants. This research examined the relationship between Early Maladaptive Schemas and cellular immunity in the samples of healthy volunteers (n = 72) and cancer patients (n = 68). Ages of participants ranged from 28–52 years in the volunteers (M = 39,01) and the patients (M = 44,75) groups. The number of female participants (39 healthy women and 46 breast cancer patients) was slightly higher than that of males (33 healthy men and 22 lung cancer patients). All patients (*II–III stage* of cancer) were hospitalized for the first time, and all of them were informed about their diagnosis.

Measures. The Laboratory of Clinical Immunology at Lithuanian Cancer Center conducted the immunological survey. The *ABOTT CELL-DYN* was used to make the general analysis of blood. The immunological data were obtained by the method of indirect *immunofluorescence*. The functional transformation of lymphocytes was examined by the method of Ling.

Young Schema Questionnaire (1999) was used to identify the Early Maladaptive Schemas. This questionnaire is a 75-item self-report measure that evaluates the activation of 15 maladaptive schemas. Respondents are asked to express their agreement or disagreement with the various statements. Rating is on a 5-point Likert scale: 1 = "completely untrue of me"; 2 = "mostly untrue of me"; 3 = "I don't know"; 4 = "mostly true of me"; 5 = "describes me perfectly".

All the participants were asked to complete the questionnaires independently. On completion (mostly the same day, before 11.30 am), the general and immunological blood analyses were made.

Statistical analyses of the psychological and immunological data were performed with the statistical package SPSS.8. Cluster analyses were made to differentiate the data between groups. Multiple analyses of covariance (MANCOVA) were performed to identify the levels of interdependence between EMS and cellular immunity in healthy volunteers and cancer patients. Correlation analyses were performed to evaluate the relationship between Early Maladaptive Schemas and immune function.

Results and Discussion

Differences in activation of EMS. The mean self-ratings for the healthy participants and cancer patients in different groups are shown in Table 1.

It can be observed that in the group of cancer patients EMS are activated more than in the group of healthy participants, and significant differences are seen between the following schemas: a failure schema ($p < 0,05$), a vulnerability to harm schema ($p < 0,05$), a subjugationschema ($p < 0,05$), a self-sacrifice schema ($p < 0,05$), and an emotional inhibition schema ($p < 0,05$). However, among healthy individuals the abandonment schema is more activated than that among cancer patients ($p < 0,05$). Among healthy females a self-sacrifice schema is activated significantly more than that of healthy males ($p < 0,05$). Significantly more maladaptive schemas are activated in the group of male patients than in the group offemale patients: a schema of mistrust ($p < 0,05$), a schema of failure ($p < 0,05$), and a schema of emotional inhibition ($p < 0,01$). It was observed that cancer patients' tendency to the activated vulnerability to harm schema and the self-sacrifice schema does not depend on participants' age ($p < 0,05$).

Differences in immunity. The mean differences in immunity in healthy participants and cancer patients, and the results of cluster analysis are shown in Table 2.

As it can be observed, the immunity function is much better in the group of healthy persons than in the group of cancer patients, even though the patients are hospitalized for the first time. In the patients' group, there is a significant increase in CD8+ cells.

Cluster analyses of the immunological data helped to identify cluster centers in the healthy participants' and cancer patients' groups. They were labeled as "negative immunity cluster" and "positive immunity cluster". In the "positive immunity cluster" of healthy persons, there are significantly bigger numbers of lymphocytes, CD3+ and CD16+ cells, and CD4+/CD8+, while in the "negative immunity cluster" the numbers of CD8+ are significantly increased ($p < 0,05$). In the "positive immunity cluster" of cancer patients, there are significantly more lymphocytes, CD3+, CD4+, and CD16+ cells, while in the "negative immunity cluster" of patients, the numbers of leukocytes and trombocytes are increased ($p < 0,05$).

Relationship between EMS and immunity. The mean differences in activation of EMS among different immunity clusters in healthy persons and cancer patients groups are shownin Table 3.

As is evident from Table 3, the significant tendency of more activated EMS in the "negative immunity clusters" can be observed in the both groups of participants (healthy persons and cancer patients). In the "negative immunity cluster" of healthy persons, there are significantly more activated EMS than in the "positive immunity cluster" of healthy persons: a schema of abandonment ($p < 0,05$), and a schema of unrelenting standards ($p < 0,05$). Similarly, in the "negative immunity cluster" of cancer patients, significantly more activated EMS can be observed than in the "positive immunity cluster" of cancer patients: a schema of mistrust ($p < 0,05$), and a schema of emotional inhibition ($p < 0,05$).

However, correlation analysis of EMS and immunity variables has not revealed strong relationship between these factors, and only slight significant tendencies were discovered. To demonstrate it, in Table 4 the results for the cor-

Table 1. ***Mean Self-Ratings on the*** **Young Schema Questionnaire** ***(Early Maladaptive Schemas, EMS); T test***

EMS	*Healthy PERSONS M n = 72*	*Cancer patients m n = 68*	*Healthy female m n = 39*	*healthy male m n = 33*	*female Patients m n = 46*	*Male Patients m n = 22*	*Healthy Age 28–39 m n = 38*	*Patients Age 28–39 m n = 31*	*Healthy Age 40–52 m n = 34*	*Patients Age 40–52 m n = 3?*
ED	11,9	10,8	12.3	11,3	11,2	8,8	12,4	9,7	11,3	11.1
AB	14,9*	12,7	15,3	14,0	13,0	11,3	15,4	13.2	14.3	12.6
MA	13,4	13,6	12,8	14,2	13,0	16,2*	13,2	14,1	13,6	13,5
SI	10,4	9,6	9,8	11,2	9,4	10,8	10,6	8,3	10.2	9,9
DS	8,5	8,7	8,5	8,6	8,5	9,8	8,5	7,1	8.6	9,2
FA	10,1	12.0*	10,4	9,8	11,5	14,2*	10,2	11.5	10.0	12,1
DI	9,4	9,9	9,2	9,6	9,4	12,0	9,8	8,9	8,9	10.2
VH	10,0	13,9*	10,0	10,0	13,9	14,2	9,8	13,8*	10,3	14.0*
EM	12.4	13,9	12,8	12,0	14,0	13,5	12,5	14,6	12,4	13,7
SB	9,9	11,7*	10,0	9,8	11,5	12,3	10,1	10,8	9,8	11,9
SS	17,1	20,2*	18,2*	15,8	20,6	18,4	16,6	20,1*	17.8	20,3*
EI	12,0	14,3*	11,6	12,6	13,4	18,5**	11,9	12,5	12,2	14,8
US	16,7	17,9	17,2	15,7	18,2	16,7	16,0	16,5	17,4	18,3
ET	12,1	13,2	12,2	11,9	13,2	13,3	12,6	11,7	11,6	13,6
IS	12.2	12,8	11.8	12,6	13,0	11,9	12,5	13,4	11.9	12,7

* – $p < 0,05$; ** – $p < 0,01$

Table 2. ***Mean Differences in Immunity and Immunity Clusters; T test***

Immunity variables	Healthy PERSONS N = 72 M	CANCER PATIENTS *N = 68* m	P	HEALTHY PERSONS N = 29 *NEGATIVE IMMUNITY CLUSTER M*	HEALTHY PERSONS N = 43 *POSITIVE IMMUNITY CLUSTER M*	P	CANCER PATIENTS N = 42 *NEGATIVE IMMUNITY CLUSTER M*	CANCER PATIENTS N = 26 *POSITIVE IMMUNITY CLUSTER M*	P
LEUKOCYTES	5.9	6.1	> 0,05	6,1	5,8	> 0,05	**7,8**	5,9	< 0.05
LYMPHOCYTES	**34 %**	30 %	< 0,05	34 %	**36 %**	< 0,05	27 %	**30 %**	< 0.05
LYMPHOCYTES (abs.)	2,0	1.6	> 0,05	2,0	2,1	> 0,05	2.1	1,5	> 0.05
GRANULOCYTES	57 %	61 %	> 0,05	58 %	56 %	> 0,05	62 %	61 %	> 0.05
GRANULOCYTES (abs.)	4.4	3.8	> 0,05	3,6	4,9	> 0,05	5.0	3.7	> 0,05
T LYMPHOCYTES (CD_3^+)	**62 %**	56 %	< 0,05	60 %	**63 %**	< 0,05	58 %	56 %	> 0.05
(CD_3^+) (abs.)	**1.3**	0.9	< 0,05	1,2	1,3	> 0,05	1,0	0.9	> 0.05
T HELPERS (CD_4^+)	**25 %**	22 %	< 0,05	25 %	25 %	> 0,05	24 %	**26 %**	< 0,05
(CD_4^+) (abs.)	0.5	0.3	> 0,05	0,5	0,5	> 0,05	0,4	0,4	> 0,05
T SUPRESORS (CD_8^+)	23 %	**26 %**	< 0,05	**25 %**	23 %	< 0,05	24 %	26 %	< 0.05
(CD_8^+) (abs.)	0.4	0.4	> 0,05	0,5	0,4	> 0,05	0,5	0,4	> 0,05
B LYMPHOCYTES (CD_{20}^+)	**10 %**	8 %	< 0,05	9 %	9 %	> 0,05	7 %	8 %	> 0.05
(CD_{20}^+) (abs.)	**0.2**	0.1	< 0,05	0,2	0,2	> 0,05	0,1	0.1	> 0,05
NK (CD_{16}^+)	**15 %**	12 %	< 0,05	13 %	**15 %**	< 0,05	10 %	**12 %**	< 0,05
(CD_{16}^+) (abs.)	0.3	0.2	> 0,05	0,2	0,3	> 0,05	0,2	0.2	> 0.05
CD_4^+ / CD_8^+	1.1	0.8	> 0,05	1,0	**1,1**	< 0,05	1,0	1.0	> 0.05
TROMBOCYTES	243	270	> 0,05	304	201	> 0,05	**487**	238	< 0,05
TRANSFORMATION OF LYMPHOCYTES	**45 %**	41 %	< 0,05	44 %	45 %	> 0,05	39 %	41 %	> 0,05

Table 3. ***Activation of EMS among different immunity clusters; T test***

EMS	*HEALTHY* PERSONS POSITIVE IMMUNITY CLUSTER *M*	*HEALTHY* ***PERSONS*** *NEGATIVEI MMUNITY CLUSTER M*	*P*	*Cancer patients* POSITIVE IMMUNITY CLUSTER *M*	*CANCER PATIENTS* NEGATIVE IMMUNITY CLUSTER *M*	*P*
ED	12,37	11,42	> 0,05	11,56	9,83	> 0,05
AB	14,25	**15,89**	< 0,05	13,34	12,83	> 0,05
MA	13,35	13,42	> 0,05	13,90	**16,08**	< 0,05
SI	10,05	10,67	> 0,05	9,34	11,16	> 0,05
DS	8,12	8,89	> 0,05	8,59	9,58	> 0,05
FA	9,6	10,92	> 0,05	12,50	12,33	> 0,05
DI	9,42	8,85	> 0,05	9,97	10,66	> 0,05
VH	10,05	9,67	> 0,05	13,06	14,58	> 0,05
EM	12,85	11,85	> 0,05	14,27	12,00	> 0,05
SB	9,60	10,17	> 0,05	11,79	11,50	> 0,05
SS	16,97	17,57	> 0,05	20,45	20,08	> 0,05
EI	11,57	12,28	> 0,05	13,90	**16,50**	< 0,05
US	15,52	**18,64**	< 0,05	18,06	18,25	> 0,05
ET	12,17	11,89	> 0,05	13,63	14,33	> 0,05
IS	12,45	11,46	> 0,05	13,11	11,41	> 0,05

Table 4. ***Significant Correlations of EMS and Immunity Variables in Cancer Patients; n = 68; Pearson Correlation***

IMMUNITY VARIABLES	EI	IS	DI	MA	SB
TROMBOCYTES	0,373**				
GRANULOCYTES		0,290*	0,286*		
LYMPHOCYTES				-0,326*	
CD8+		0,295*			
CD8+ (abs.)					0,316*

* – $p < 0,05$; ** – $p < 0,01$

relation analysis of EMS and immunity variables in cancer patients group are presented.

Thus as shown in Table 4, a significant correlation can be observed between trombocytes and a schema of emotional inhibition ($r = 0,373$; $p < 0,01$), granulocytes and schemas of insufficient control ($r = 0,290$; $p < 0,05$) and dependence ($r = 0,286$; $p < 0,05$), lymphocytes and a schema of mistrust ($r = -0,326$; $p < 0,05$), CD8+ cells and a schema of insufficient control ($r = 0,295$; $p < 0,05$), CD8+ absolute numbers and a schema of subjugation ($r = 0,316$; $p < 0,05$).

It is well known that correlation analysis cannot demonstrate the direction of relationship between variables. Therefore, multiple analyses of covariance were performed. Some of the results are shown in Table 5.

As evident from Table 5, the CD4+/CD8+ and EMS are significantly related. Consequently, the initial question about the EMS as risk factors for immune alterations could be modestly

Table 5. MANCOVA Analysis Predicting Interaction between CD4+/CD8+ and EMS in Cancer Patients

CD4+/CD8+ RELATION TO **EMS**	Standartized value *F*	Significance *p*
AB	2,3	0,05
SI	4,0	0,008
DS	3,3	0,018
FA	2,3	0,05
VH	2,7	0,036

validated, and additionally raised as follows. Can the immune dysfunctions be risk factors for activation of EMS? To answer this question, some additional researches are required.

Conclusions

The present study was designed to examine the relationship between Early Maladaptive Schemas and immunity. The study revealed significant interactions between the psychological and immunological variables, and is consistent with works of many psychoneuroimmunology authors (Anderson, 1996; Corrican, 1998; Petrie, 1998; Garssen, 1999; Koh, 1998; Kiekolt-Glaser, 1995; Eriksen, 1999; Ader, 1995; Cohen, 1998; Maier, 1998). The following conclusions can be drawn from the above-presented results of the study:

1. A significant tendency of more activated EMS in the "negative immunity clusters" was observed in the both groups of participants (healthy persons and cancer patients).

2. In the "negative immunity cluster" of healthy persons, there are significantly more activated EMS than in the "positive immunity cluster" of healthy persons: a schema of abandonment, and a schema of unrelenting standards.

3. In the "negative immunity cluster" of cancer patients, significantly more activated EMS can be observed than in the "positive immunity cluster" of cancer patients: a schema of mistrust, and a schema of emotional inhibition.

4. In cancer patients group, a significant correlation can be observed between trombocytes and a schema of emotional inhibition, granulocytes and the schemas of insufficient control and dependence, lymphocytes and a schema of mistrust, CD8+ cells and a schema of insufficient control, CD8+ absolute numbers and a schema of subjugation.

5. There is interdependence between CD4+/CD8+ and the schemas of abandonment, social isolation, defectiveness, failure and vulnerability to harm.

To sum up, the present study provides some insight into the relationship between EMS and immunity. The results suggest that this relationship might be bi-directional. Future research needs to examine more accurately the effects of EMS on immunity, and the effects of immunity on activation of EMS.

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ANKSTYVŲJŲ NEADAPTYVIŲ SCHEMŲ AKTYVACIJA IR SUSILPNĖJUSI IMUNINĖ SISTEMA

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Santrauka

Straipsnyje analizuojamas imuninės sistemos ir kognityvinių schemų ryšys. Teorinėje dalyje aptariama schemų teorija, ypatingas dėmesys skiriamas J. E. Youngo teoriniam modeliui, kuriuo remtasi atliekant psichoneuroimunologinį tyrimą. Straipsnyje supažindinama su kai kuriais šio tyrimo rezultatais. Rezultatų analizė rodo, kad silpnesnė imuninė sistema yra susijusi su ankstyvųjų neadaptyvių schemų aktyvacija. Visgi, norint geriau suprasti šį ryšį, reikia papildomų tyrimų.

Įteikta 2002-03-08