INFLUENCE OF THE LEVEL OF SELECTED SELF SYSTEM COMPONENTS ON DECISION MAKING IN THE EXPERIMENTAL PDG SITUATION[*]

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Abstract: We used the experimental no-zero sum Prisoner's Dilemma Game (PDG) to discover the regulatory function of self-esteem and self-efficacy in decision-making in regard to the cooperative and/or competitive behavior. The experimental sample consisted of 80 students from different types of secondary schools between the ages 16 - 19, AM = 17.00, SD = 1.15, who were administered the Rosenberg self-esteem scale, RSES (Rosenberg, 1965) and General self-efficacy scale, GSES (Jerusalem, Schwarzer, 1981) prior to the PDG implementation. 20 girl and 20 boy dyads, based on a voluntary selection, completed a set of 20 PDG games. We did not discover any significant relation between the selected self system concepts and decision-making in PDG. The result on the significance level p > 0.05 was also determined within the level comparison of L (cooperative)/P (competitive) choice in the whole PDG set between the groups of adolescents with a different level of self-esteem/self-efficacy. In accordance with the L and P choice frequency in the individual games we detected stabilization in the strategy choice during choices 10 - 19: in persons with high self-efficacy towards cooperation, in persons with low self-efficacy towards competitiveness. The preferred strategy corresponded to the initial choice. Also determined was decision-making stability in adolescents with high self-assessment, and that towards competitive strategy during choices 6 - 10. On the other hand, persons with low self-esteem level had a tendency to higher risk, and to search for optimal behavior strategy throughout the whole PDG set. We interpret the findings from the viewpoint of social-cognitive theory and conceptual self-esteem determination.

Key words: self-efficacy, self-esteem, Prisoner's Dilemma Game (PDG), decision-making, cooperation, competitiveness

The self system is generally considered a referential frame explaining social behavior. It became an important construct of psychological theory (Tafordi, Swann, Jr., 2001) in the second half of the 20th century. Despite a significant disunity in its perception, an agreement in opinions is perceptible - the self system is not only a reflection of behavior, but is also becoming its mediator and regulator (Páleník, 2004). It behaves as an active, dynamic component, organizing behavior and the experience sphere, which has strongly motivational consequences (Schlenker, 1985).

Self-Efficacy and Self-Esteem

Personal opinion on self-efficiency is important in the evaluation of abilities or eligibility requirements. The above also incorporates the term *self-efficacy*, pres-

ented by A. Bandura (1982, 1997) in the framework of the social-cognitive theory. A. Bandura (1994) defines self-efficacy as trust, belief in one's own ability to organize and realize the given process in order to solve a problem or complete a task. Whereas outcome expectancy involves perception of possible consequences of one's own behavior, self-efficacy expectancy involves personal control over the activity. Perceived self-efficacy concerns beliefs in one's own abilities to mobilize motivation, cognitive sources and methods necessary to fulfill situational demands. It works as a cognitive mechanism through which consciousness of mastery and controllability of the situation affects demanding situations. Belief in the ability to perform at the particular levels determines people's feelings, thinking, motivation and behavior - they prompt these consequences through four main mental processes: cognitive, motivational, affective and selective. A. Bandura regards the following as sources of change or stronger beliefs in one's success: mastery experiences, vicarious experiences, social persuasion, and physiological indicators - emotional and physical reactions. The research findings presented in F. Pajares' survey (2001) confirm present acceptance of the self-efficacy construct as an important component of personality structure and dynamics.

According to S. Coopersmith (1967), another important self system component - *self-esteem* is related to self-satisfaction and efficient activity demonstrated subjectively, as well as objectively in behavior - self-esteem, representing one of the basal characteristics of psycho-social maturity. M. Rosenberg (1965) understood self-esteem as a result of social comparison and self-assessment due to observation of one's own activity. Social comparison emphasizes that self-esteem is "partially a conse-

quence of individual comparison of ourselves with others and a positive or negative self-perception" (Hughes, Demo, 1989). Apart from the cognitive-anticipation side, self-esteem also represents motivational aspects that guide a person's actions. It includes an emotive-evaluative dimension of self-perception, it is the result of positive self-experience and self-esteem, it expresses the satisfaction level with one's own I. Self-esteem's regulatory function has an important influence on behavior and its level, and defines not only relation to one's self but also to others, influences attitudes towards life as well as the ability to solve life situations (Koubeková, 2004).

Cooperation and Competitiveness from the Viewpoint of Social Psychology and Game Theory

Scientific literature offers several definitions of cooperation and competitiveness, the most common being within pro-social behavior categorization.

J. Reykowski and Z. Smoleňska (1980) distinguish several types of social behavior according to vertical division (benefit rate of a particular behavior type for agent and recipient of behavior), whereas cooperative behavior is characterized by bilateral character and is beneficent for both the agent and the recipient. M. Deutsch and R.M. Kraus (1962), as well as J. Křivohlavý (2002), consider the following as the essential common characteristics of cooperation definitions: 1) emphasis on a mutual goal, 2) attractiveness of the goal to all participants, 3) ability of all participants to achieve the goal, behavior coordination (primarily social coordination). According to M. Nakonečný (2000), cooperative behavior is realized on the perspective of achieving mutual goals and demonstrated

by mutual support and trust. The relation between cooperation and trust is by no means linear, as proposed in the study of T. Yamagishi, S. Kanazawa, R. Mashima and S. Terai (2005), who discovered that cooperation leads to trust between participants of social interaction, but trust itself does not necessarily lead to cooperation.

Competitive behavior within the vertical division acquires several names - exploitative, egoistic, ipsocentric (Reykowski, Smoleňska, 1980); competitiveness, superiority (Kagan, Knight, 1981). M. Deutsch (1973) declares that in competitive situations there exists a negative mutual dependence between achieving the goal of all social interaction participants. In this context, perceptions of cooperation and competitiveness are opposite extremes of the same continuum (interpersonal relation characteristics).

Research into pro-social behavior operates situations where individual participants are mutually independent. Social independence results in the choice between pro-social and indifferent behavior's being made an individual's choice. The choice is voluntary, indifferent behavior has no consequences. On the other hand, choice of pro-social behavior is wasteful, only the other person profits. Cooperative behavior research operates situations of social dependence. Every participant's behavior has direct consequences for others and for himself. In this sense, the choice between cooperative and competitive behavior is cognitively and motivationally more difficult (Kusá, 1990).

The question of research method and the exact methodological grasp are a specific problem in the field of cooperative and competitive behavior research. The most common and best known research trend in this field is probably the socio-psychological approach through the games' theory, which blossomed at the turn of the 1950's and 60's. The games' theory distinguishes between two types of games: with a zero and no-zero sum. The total gain for all participants and all strategy combinations in the zero sum games equals zero. The winning player benefits at the expense of others and gains only as much as his opponents lose. Games more common in reality are no-zero sum games (to which PDG also belongs), because the gain for one player does not necessarily mean a loss for another - the results bring the total net profit higher or lower than zero.

In the context of no-zero sum games, the constructs "cooperation" and "competitiveness" are defined strictly operationalistically. They do not relate to the philosophical, ethical criterion, the socio-psychological concept but to the specific mathematical interaction model expressed by a matrix. Several authors (Solomon, 1960, Bixenstine, Chambers, Wilson, 1964, Komorita, 1965; In: Křivohlavý, 1974) define *cooperation* with emphasis on maximizing the common gain - common profit value. On the other hand, in the game terminology, *non-cooperation (competitiveness)* is definitely a choice maximizing the other side's loss and minimizing the combined gain of both sides at the same time.

Research Goals

Personality traits are co-determinative in the course of the experimental game and to a large extent influence the strategy choice. Several authors (Marlowe, 1963; Heister, Gahagan, Burrill, Tedeschi, 1967; In: Křivohlavý, 1972) confirmed the positive relation between cooperative choice and self-confidence. According to the research results of J. Křivohlavý (2000), self-confidence correlates strongly with cooperation perseverance. Against this, however, M.

Pilisuk et al. (1965) did not find a significant relationship between the self-esteem level and strategy choice within PDG.

Bearing in mind the disunity of research results, our research, arising as it does from the above mentioned regulatory function of self-efficacy and self-esteem in behavior (Bandura, 1994; Pajares, 2001; Coopersmith, 1967; Koubeková, 2004, and others), aims at determining the relation of these important self system components to situationally induced behavior - cooperative and/or competitive - in the social interaction participants modeled by the experimental no-zero sum PDG.

The first part of the analysis concentrates on determining the preferred behavior of the studied sample of adolescents in the course of 20 draws in PDG. The following indicators were observed (in-depth criteria characteristics are given in the Methods part):

- *individual direct choice criteria* (with the aim of comparing L - cooperative and P - competitive choice frequency),

- *combined direct choice criteria* (comparison of reciprocal choices frequency: cooperative - LL and competitive - PP choice; as well as determining the occurrence ratio of reciprocal choices to combined LP/PL),

- *direct first choice criteria* (comparison of L - cooperative and P - competitive choice frequency in first draw situation),

- *expectation criterion* (comparison of occurrence frequency of the expected cooperative (L') and competitive (P') draw on partner's side),

- detection of *player orientation on help or profit and cooperative behavior index values* with the aim of describing player behavior towards their partner in the course of 20 draws in PDG.

The aim of the second part was to determine:

- the relation between self-esteem, self-efficacy and the way of decision-making (cooperative or competitive behavior) in PDG,

- influence of high and low level of selected self system components in decision-making regarding the preference for cooperative or competitive strategy,

- the course of interaction in the set of 20 choices in PDG in the studied sample of adolescents.

METHOD

Sample

The experimental sample consisted of 80 students from different types of secondary schools (hotel academy, specialized sports grammar school, language grammar school, food industry technical college, building industry technical college) between the ages 16 - 19, AM = 17.00, SD = 1.15, (40 boys and 40 girls).

Methods

Participants were administered the following questionnaire instruments:

- *Rosenberg Self-Esteem Scale, RSES* (Rosenberg, 1965) to determine the self-esteem level. The scale includes 10 items, of which 6 are formulated positively and 4 negatively. The participants assess the individual items on a four-point scale from fully disagree to fully agree. The scales are devised so that a high score represents a high level of self-esteem. The scale was originally designed as one-dimensional. M. Blatný and L. Osecká (1994) identified a *two-factor* (I . assertion of positive statements about self, II. denial of negative statements about self) or a *three-factor* (I. assertion of the positive, II. comparison with others, III. denial

of the negative) solution by factor analysis.

- *General Self-Efficacy Scale, GSES* (Jerusalem, Schwarzer, 1981) for assessing the level of self-efficacy. The originally 20 items of the scale were reduced to 10 items (Jerusalem, Schwarzer, 1992) with internal consistency Alpha coef. 0.75. Participants were administered the abridged version of GSES, the Slovak version was translated and adapted by M. Košč and E. Heftyová (1993). The original version answers (Schwarzer, 1993) had the "yes - no" form. The Slovak version enables a more detailed scaling, within a 4-point range (1 not valid at all, 2 usually not valid, 3 partially valid, 4 valid) with a restricted central tendency occurrence. GSES makes it possible to determine the assessment level of one's own abilities to cope with different situations and stressors.

Following the RSES and GSES questionnaire administration, we used the experimental *Prisoner's Dilemma Game, PDG* (Deutsch, Krauss, 1962). The participants were administered a dyadic form of a symmetric matrix with positive values that meet the basic requirement of no-zero sum PDG games. Here the temptation to trick your opponent should be bigger than the cooperation reward, which again must be bigger than non-cooperation punishment; non-cooperation punishment should be bigger than the gain of a player who chose cooperation over his opponent's competitive choice. A simplified expression of this condition would be the formula T (Temptation) $> R$ (Reward) $> Pu$ (Punishment) $> S$ (Sucker's payoff). The PDG method distinguishes:

a) individuals focused on maximizing individual gain (competitive P choice), where maximizing individual gain within the game is only possible at your partner's expense,

b) individuals willing to choose the less advantageous, cooperative L choice that brings gain to both game participants.

The PDG is based on the decision between cooperative and competitive choice. Each player has to consider his partner's choice as well, because his own gain and loss depend on the combination of draws of both players. Ordinal and general values of the administered game matrix are shown in Figure 1.

The choices T and S maximize the point difference at the expense of the L choice player, a 20 point difference arises. The payoff matrix (Figure 1a) indicates that the P choice is safe - it offers the possibility of a mutual loss and at the same time a chance of a 20 point advantage. The L choice is risky. The player has to take a 20 point loss into account which is highly possible in comparison with the safe P draw. In the case of the cooperative L choice, the player demonstrates a high level of trust and reliance on the partner's credibility.

PDG Implementation Process

Experiment participants formed pairs by their voluntary choice (20 homogeneous girl and 20 homogeneous boy dyads). Each player was given a sheet with the game matrix and two colored cards (red card with L sign and blue card with P sign). The outside conditions were so arranged that both participants sat at a table with no possibility of seeing each other's choices. Players presented their choices by covering the colored L (cooperative choice) or P (competitive choice) card with their hand. The first step determined and recorded their anticipations regarding their partner's choice in the record sheet and afterwards they were asked to express their own (real) choice. After each choice from the overall

a) game matrix with ordinal values:

		Person 2			
		L_2		P_2	
Person 1	L_1	20	20	5	25
	P_1	25	5	8	8

b) game matrix with general values:

		Person 2			
		L_2		P_2	
Person 1	L_1	R	R	S	T
	P_1	T	S	Pu	Pu

Where: R - *reward* for cooperation (both players gain 20 points if both choose L draw)

Pu - *punishment* for non-cooperation; value gained by players who are unable to get free of the *maximum own gain* view or *excessive caution*, in order not to lose more than necessary (both players gain 8 points if both choose P draw)

T - *temptation*; value to be gained after a one-sided breach of the cooperation agreement (gain for the player who breaks cooperation and chooses P draw is 25 points, the cooperating player with L choice gains 5 points)

S - *sucker's payoff*; gain for the player who chose cooperation, while his partner opted for the non-cooperative choice (cooperating player with L choice gains 5 points, non-cooperative player with P choice gains 25 points)

Figure 1. Values of the administered game matrix

20, players were informed about their result (points gained) in each draw. The aim of the game, presented to the participants, was to gain as many points as possible.

PDG Indicators

In the studied game indicators, describing mutual behavior of players in the course of 20 draws in PDG, we isolated 1) criteria concerning participant's own choice as well as 2) criteria concerning the preparatory phase of decision-making (criterion characteristics by J. Křivohlavý, 1971):

1) **Direct choice criteria**, also called "the measure of overt behavior" include:

a) *Individual direct choice criteria* - allows the understanding of what a game participant exhibits and in the decision-making process represents the player's own actual choice, his individual decision for L (cooperative) or P (competitive) choice in the given game.

b) *Combined direct choice criteria* - PDG gain is determined by the choice combination of both players. Combined choices are the demonstration of their mutual relationship. We distinguish reciprocal combined choices that represent an identical choice

of both partners, either cooperative (LL) or competitive (PP). The second type is combined mixed choices indicating the difference in motivation of interacting players (choosing cooperation over opponent's non-cooperative choice - LP and vice versa - PL).

c) *Direct initial choice criterion* has a unique position and in the PDG choice set (as well as in other experimental games) represents a no feedback situation, lacking the possibility of referring to the previous choice (either one's own or partner's). In initial choice the immediate effect of motives (maximizing individual gain motive represented by the competitive P choice, or mutual gain motive represented by the cooperative L choice) is demonstrated without the influence of the previous interaction.

2) **Anticipation criteria** assess the social perception of participants in the form of partner's cooperative (L') and competitive (P') choice sensitivity. Ratio combination of two anticipation criteria can follow the decision-making participants' tendency. The first criterion is about the prevailing *orientation on help*, the second about the prevailing *orientation on profit*. This approach considers not only partner's anticipated choice (prediction) but also one's own choice, in this context denoted by the term intention. By predicting partner's competitive P' draw, orientation on help represents a cooperative L choice for players. By predicting partner's cooperative L' draw, orientation on profit represents a real competitive L choice of a player. We determine the participants' orientation through the formula P'L (orientation on help): L'P (orientation on profit). If the value ratio is higher than 1.00, the orientation on help rather than on profit is dominant. If the value ratio is lower than 1.00, we talk about orientation on profit domi-

nance over the effort to help a partner towards cooperation.

For the interaction solution assessment in PDG, the relative indicator - *cooperative behavior index* (i_c), expressing the number of realized P choices to L choices ratio - has an informative value. If the ratio is higher than 1.00, an individual's (or PDG participant's) behavior is dominantly cooperative; if the ratio is lower than 1.00, the behavior is dominantly competitive (Páleník, 1984).

RESULTS

Characteristics of Decision-Making in the Studied Sample of Adolescents in PDG

To determine the preferred behavior (cooperative or competitive) of the studied sample in the course of 20 draws in PDG, the following criteria were used: *1) individual direct choice criteria, 2) combined direct choice criteria, 3) cooperative behavior index, 4) direct initial choice criterion, 5) anticipation criterion and 6) criterion to determine players' orientation on help or profit.*

1) By means of *individual direct choice criteria*, we determined that participants realized more P (56.68%) choices than L (43.31%) choices in the decision-making situations in the whole course of PDG. The difference in choice preference has a significant meaning ($t_{(39)}$ = 4.060; p < 0.001). Difference pragmatic relevancy value ES = 1.300 indicates that the difference in the mean value of L and P choice is big, up to 65.3% of the measured range did not overlap (Table 1).

2) *Combined choices* (we distinguish reciprocal LL/PP choices and mixed LP/PL choices) express the mutual relation between PDG participants. Table 2 de-

Table 1. Number, percentage and mean value of L and P choice in the set of 20 choices in PDG (Student t-test for two dependent samples)

ΣN	L choice				P choice				t	p
	N	%	AM	SD	N	%	AM	SD		
1600	693	43.31	8.66	2.94	907	56.68	11.33	2.94	4.06	0.000***

Note: L choice - cooperative choice, P choice - competitive choice, ΣN - number of realized individual choices, N - number of L/P choice occurrence, AM - arithmetic mean of individual L/P choice occurrence in the course of 20 choices, SD - standard deviation

*** p < 0.001

Table 2. Number, percentage and mean value of combined choice occurrence in the set of 20 PDG games

ΣN	LL				PP				PL/LP			
	N	%	AM	SD	N	%	AM	SD	N	%	AM	SD
800	161	20.1	4.05	2.24	264	33	6.6	2.79	375	46.8	9.37	1.94

Note: LL - reciprocal cooperative choice, PP - reciprocal competitive choice, PL/LP - mixed combined choice, ΣN - number of realized combined choices, N - number of combined choice occurrences, AM - arithmetic mean, SD - standard deviation

scribes the frequency of the individual combined choice types during decision-making in the course of all 20 games. Dominant choices in the studied sample (40 dyads) were mixed LP/PL choices (46.8%), 33% were reciprocal competitive choices and just 20.1% of the realized combined choices were reciprocal cooperative choices. Using the Student t-test for two dependent samples a significant difference between the mean values of reciprocal choice occurrence ($t_{(39)}$ = 3.481; p < 0.001; ES = 1.114) was determined. Participants preferred the competitive reciprocal choice. The difference between mean values of reciprocal choice occurrence is big, as 58.9% of the measured range did not overlap.

3) Apart from L and P draw frequency evaluation, the relative indicator - *cooperative behavior index* (i_c) that expresses the realized L and P choice ratio - has informative value in the assessment of the cooperative behavior. The cooperative behavior index in the studied sample reached the mean value 0.8902 that indicates the dominance of competitive behavior since the i_c value is lower than 1.00. Of the overall number of participants (N = 80) 49 demonstrated competitive behavior (i_c > 1) and 31 PDG participants demonstrated cooperative behavior (i_c < 1).

4) The immediate effect of motives of the game participants without the influence of the previous interaction is demonstrated in the *initial choice*. The results show a higher frequency of competitive rather than cooperative choice among participants in the initial choice situation in PDG, in the ratio 44:36. The non-parameter χ^2 test used for occurrence number comparison of the initial L and P choice did not prove the significance of the difference (χ^2 = 0.800; p = 0.371).

Table 3. Number, percentage and mean value of L'/P' choice in the set of 20 choices in PDG (Student t-test for two dependent samples)

ΣN	L' choice				P' choice				t	p
	N	%	AM	SD	N	%	AM	SD		
1600	738	46.12	9.22	2.25	862	53.87	10.77	2.25	3.073	0.003**

Note: L' - anticipation of partner's cooperative choice, P'- anticipation of competitive choice, ΣN - number of realized predictions of anticipated individual choices, N - number of L'/P' choice anticipation occurrences, AM - arithmetic mean of partner's L'/P' choice occurrence in the course of 20 choices, SD - standard deviation
** p < 0.01

5) Information on the PDG participants' decision-making strategy is also given in the *anticipation criterion*, which offers the possibility of assessing the participants' social perception as sensitivity towards a cooperative (L') or competitive (P') choice of the partner. Experiment participants anticipated the P' choice of their partner more often than the L' choice (Table 3). The difference in the handed P' and L' choice mean value in the whole game set is significant ($t_{(79)}$ = 3.073; p < 0.01; ES = 0.69). The assessed ES value indicates a mean difference, where 38.2% of the measured range did not overlap.

6) Assessment of players' orientation on help or profit makes possible the description of a player's behavior towards his partner in the course of 20 draws in PDG. The mean value of the P'L (help oriented): L'P (profit oriented) ratio in the studied sample (N = 80) is 1.057 and indicates a close dominance of orientation on help rather than on profit, as the ratio value is higher than 1.00.

Our previous steps analyzed the manner in which participants joined the dyadic interaction (initial choice) as well as resultative indicators, which described the unraveling manner of interaction in PDG. The next aim of research was to assess the decidents' course of interaction in the individual games within the 20 draw set in PDG.

The participants' (N = 80) course of interaction is represented in the value graph that offers the percentage of L and P choice frequency in each of the 20 decisions (Figure 2). Choices 1 and 20 are specific, they cannot be considered as part of the interaction (decision-making in choice 1 cannot be based on a previous decision and choice 20 lacks the subsequent payback possibility). For this reason they are not included in the graph. Choices 1 - 6 could be presented as introductory, in the course of which participants get acquainted with the PDG game environment as well as with their partner's decision-making processes. A growth in competitiveness began between choices 6 and 9, reaching its maximum (68.8%) in choice 9, in the midpoint of the PDG set. We consider this point decisive in regard to the further application of either cooperative or competitive strategy. A decline in competitiveness followed in subsequent steps (choices 10 - 12). We observed an equal ratio of competitive and cooperative choice (50%:50%) in choice 12. This point could be marked as *the phase of cooperation offer* (a response to the extreme competitiveness in previous choices), or *the phase of a repeated search for optimal strategy*.
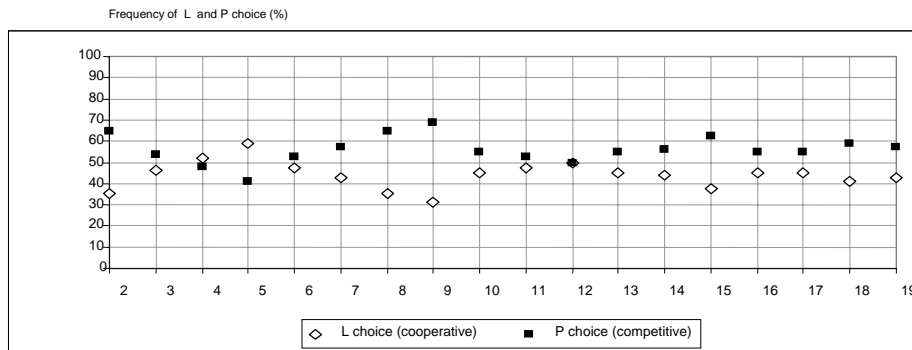
Frequency of L and P choice (%)

Figure 2. L and P choice frequency graph in the course of 20 game PDG

Table 4. Descriptive characteristics of the studied self system variables

Participants' number (N = 80)	Self-esteem	Self-efficacy
Arithmetic mean	30.12	30.35
Minimum	20	22
Maximum	38	38
Median	30	30.50
Standard deviation	4.30	3.47

Discrete values in the following choices 13 - 19 indicate that participants preferred competitive strategy, with a tendency to stabilize the selected strategy until the end of the game set.

Self-Esteem, Self-Efficacy and
Their Relation to Decision-Making in PDG

Basic descriptive characteristics of the studied self system variables are given in Table 4. For the *variable level description*, arithmetic mean, maximum and minimum value and median were used, for the *variable variability description* the standard deviation was used.

No significant relations between the studied self system concepts and decision making in PDG were determined (Table 5) by means of bivariant analysis, using Pearson correlation coefficient.

With the aim of a more detailed analysis of self-esteem and self-efficacy influence on the decision-making in PDG, participants were divided into extreme groups due to their score in RSES and GSES scales (division criterion: group median $\pm$ 1 sigma). No significant differences (U = 118.50; p = 0.402) were observed in the comparison of L/P choice level in the whole set of 20 PDG games between adolescents with a high and low self-esteem. A significance level p > 0.05 was also observed in the case of group comparison of adolescents with a different level of self-efficacy (U = 174.50; p = 0.558) (Table 6).

Table 5. Correlation coefficients between selected self system components and decision-making strategies in PDG (Pearson correlation coefficient)

		RSES	SE	L CHOICE	P CHOICE
RSES	Pearson Correlation	1.000	.431**	-.101	.101
	Sig. (2-tailed)	.	.000	.371	.371
	N	80	80	80	80
SE	Pearson Correlation	.431**	1.000	.031	-.031
	Sig. (2-tailed)	.000	.	.782	.782
	N	80	80	80	80
L CHOICE	Pearson Correlation	-.101	.031	1.000	-1.000**
	Sig. (2-tailed)	.371	.782	.	.000
	N	80	80	80	80
P CHOICE	Pearson Correlation	.101	-.031	-1.000**	1.000
	Sig. (2-tailed)	.371	.782	.000	.
	N	80	80	80	80

**   Correlation is significant at the 0.01 level (2-tailed).

Note: RSES - self-esteem (Self-Esteem Scale), SE - self-efficacy (Generalized Self-Efficacy Scale), L choice - cooperative choice, P choice - competitive choice

Table 6. Comparison of L and P choice occurrence in the course of 20 PDG games between adolescents with high and low self-esteem and self-efficacy (Mann-Whitney U-test)

	SELF-ESTEEM				Mann-Whitney U-test	p
(N = 80) Mdn ± 1σ	Low score N = 15		High score N = 19			
	AM	Mdn	AM	Mdn		
L choice	8.60	9.20	7.94	8.00	118.5	0.402
P choice	11.40	10.80	12.05	12.00		
	SELF-EFFICACY					
(N = 80) Mdn ± 1σ	Low score N = 17		High score N = 23			
	AM	Mdn	AM	Mdn		
L choice	7.70	8.33	8.26	8.90	174.5	0.558
P choice	12.29	11.66	11.74	11.10		

Note: L choice - cooperative choice, P choice - competitive choice, AM - arithmetic mean, Mdn - group median

Our next step focused on the analysis of the preferred manner of decision-making in adolescents with a different self-esteem and self-efficacy in the indi-vidual choices in the set of 20 PDG games (Figure 3A, 3B, 3C, 3D). The process of graphic display is the same as in Figure 2.

According to the L and P choice frequency in the individual games, adolescents with a low self-efficacy preferred competitive strategy. Cooperative strategy in the individual games was preferred more by persons with high self-efficacy. We can observe the strategy choice stabilization process in persons with high as well as low self-efficacy in the course of choices 10 - 19. In the course of the choices, participants with a different self-efficacy level preferred a behavior strategy that corresponded with their initial choice. Number ratio of the initial L and P choices in persons with low self-efficacy (N = 17) is 7:10, in persons with high self-efficacy (N = 23) it is 17:6.

Strategy in decision-making and perseverance in the preferred behavior in the course of PDG can be observed in adolescents with high self-esteem also. This group preferred competitive strategy in choices 6 - 19. On the other hand, as shown in Figure 3B, persons with low self-esteem displayed a tendency towards higher risk in decision making and searching for optimal behavior strategy in the course of the 20 PDG games.

Figure 3. Frequency graphs of L - cooperative and P - competitive choice in the 20 PDG games in adolescents with different levels of self-esteem and self-efficacy
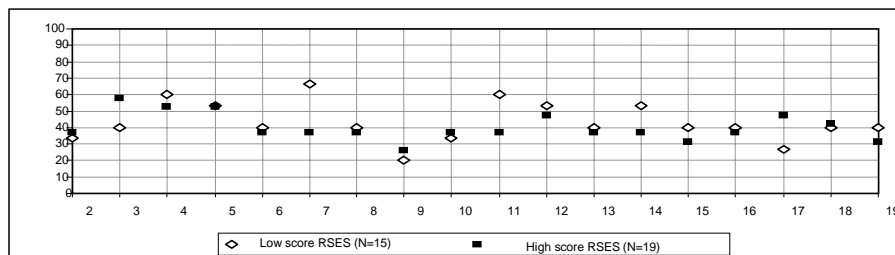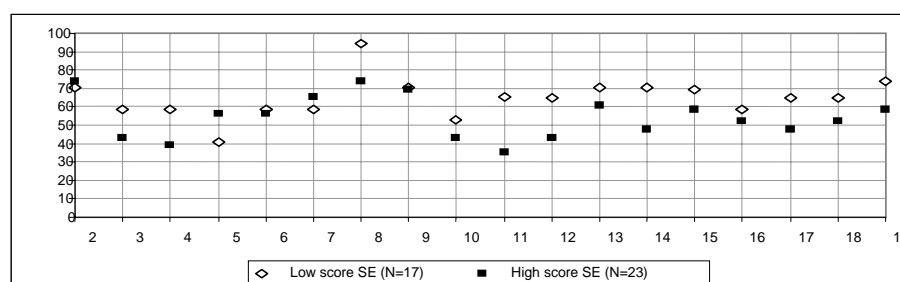

3A. Frequency graph of L choices in the course of 20 games in PDG in adolescents with high and low self-esteem (%)
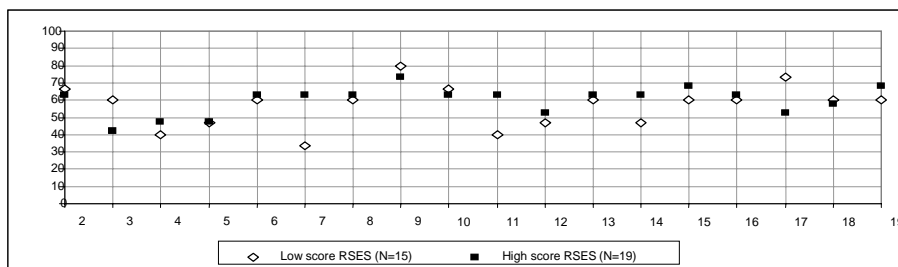
3B. Frequency graph of P choice in the course of 20 games in PDG in adolescents with high and low self-esteem (%)
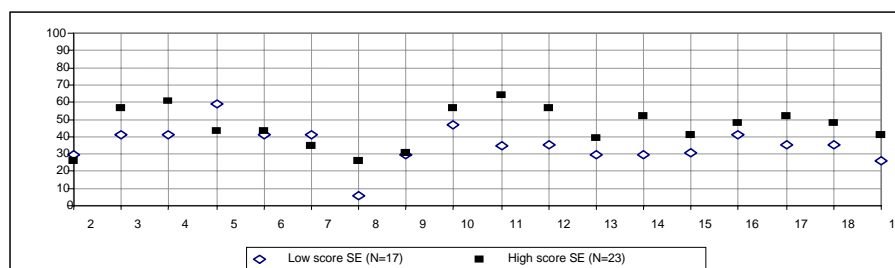
3C. Frequency graph of L choices in the course of 20 games in PDG in adolescents with high and low self-efficacy (%)

3D. Frequency graph of P choice in the course of 20 games in PDG in adolescents with high and low self-efficacy (%)

DISCUSSION AND CONCLUSION

Despite the advantageous cooperative choice that maximizes the mutual profit in the long-term perspective, the experimental group adolescents made more competitive than cooperative choices in the PDG situation and at the same time expected competitiveness from their partner. Competitiveness orientation is also confirmed by the detected average value of the cooperative behavior index. In the factor of 20 choices in conflict situations, adolescents made more competitive reciprocal choices than cooperative. The dominance of reciprocal behavior in the studied sample points to the reactive strategy TIT FOR TAT (TFT) among the participants of the modeled social interaction.

The participants' behavior according to competitive strategy corresponded with the conditions of the traditional game theory model, which is the principle of complete rationality, where each participant behaves as a rational egoist. The term egoist expresses individual intentions and goals of both players, whereas rational describes the players' capacity for rational calculus (to evaluate the consequences of their

choices) and attempt to maximize their own profit (Németh, 2001). Despite the statistically significant dominance of competitive behavior in the studied sample, the competitive (dominant) to cooperative strategy ratio 70%:30% given in the literature (Fülöp, 1995) corresponds only partially with our results, which show a more balanced ratio 57%:43% in the choice of strategies. In the following points, we will try to list the conditions which could have influenced the determined ratio:

A) *Influence of possibility of communication during PDG.* In the context of experimental games we talk about explicit, outer communication and implicit, inner communication. While the first type means exchanging messages, letters and conversation, implicit communication can be found in the choice itself, in the bearer of information. According to J. Křivohlavý, the cooperation level is higher when participants have the possibility of exchanging information. To trigger the rise of trust and cooperation during the experiment, the participants 1) discovered their mutual choices and thus the gain of the game - our sources were the works of V. Bixenstien and E.F. O'Reilly, Jr. (1966), who state that the knowledge of combined choice has a positive influence on the development of cooperation and 2) to lessen the subjective insecurity that accompanies decision-making in a "simulated" situation of an experimental game, besides the so called "allowed" communication the participants were allowed to solve a series of conflict situations in direct contact, so that they could see each other - according to the research of U. Pareek and N. Dixit (1977; In: Křivohlavý, 1971) this condition increases the willingness to cooperate. Despite trust-evoking and cooperation-evoking conditions built into the PDG organization, participants inclined more towards competitive strategy in their decisions. Several findings support our result:

- The existence of the communication channel itself does not imply improvement of the relationship between partners. K.W. Terhune (1968) says that communication offers more possibilities and opportunities for cooperation, but this possibility need not be exploited. It can be used ineffectively as well or with the sole purpose of deceiving, misinforming the partner.

- M. Deutsch (1958; In: Křivohlavý, 1970) detected a different influence of communication on participants with a different orientation in PDG. In couples focused on cooperation, communication increased from 13% to 59%. In couples focused on competition, cooperation increased from 6% to 17%. This tells us that possibility of communication increases the willingness to cooperate, depending on the original motives of the participants. In this regard, the preference for competitive strategy could have been influenced by the structure of the experimental group. 25% of participants attended a sports grammar school where students are focused as well as encouraged to achieve maximum results.

- Several authors (Wilson, Bixenstine, 1962; Pilisuk et al., 1965, and others) remind us of the importance of the information content of choices in the game series. From the viewpoint of implicit information mediation, the situation before the initial choice is one of the highest insecurity. The participant has to make a decision when he knows that the result does not depend on his own decision but on the choice of his partner as well. J. Křivohlavý (2002) says that the initial choice is usually cooperative and the initial choice situation is accompanied by a stronger friendship than any other choice. Participants in the experimental groups made in the initial choice

more competitive decisions than coopera-tive ones but the difference in the L and P choice frequency was not significant. We explain the ambiguity in preferring a par-ticular choice by the primary disorientation of participants and their lack of experience with decision-making within PDG. The initial choice situation creates the greatest problems in decision-making as it implies a level of empathy, the ability to assess your partner. Participants in their late teens and adolescence do not necessarily have the same level of the aforementioned quality.

- J. Křivohlavý (2002) mentions that the more strategic information is contained in the mediated information, the higher is the cooperation level through commu-nication. R.M. Krauss and M. Deutsch (1966, In: Křivohlavý, 1970) distinguish within explicit communication 1) *manda-tory,* defining the information's content and 2) *allowed communication,* where participants give any information they want. Participants could use this type of communication. The participants of the interaction exchanged information non-verbally (through gestures and mimicry). Although the partners were allowed to talk to each other, they used this possibility only to express emotions and subjective reactions after announcing their partner's choice to the researchers. If the adolescents scored higher, they expressed joy and passion for the game. If they scored only a few points, they expressed disappointment and anger which was manifested in their effort to minimize loss and maximize indi-vidual gain in further games. No strategic information, e.g. in the sense of mutual agreement, and cooperation proposal, occurred. In the case of multiple combined reciprocal choice (cooperative or competi-tive) the participants lost interest in solving conflict situation and in the further prog-

ress of the game made static decisions (same choice). More exciting for them were combined mixed choices, introducing a maximization of their own gain but also the hazarding of their minimum gain.

B) *Influence of the instruction's formula-tion.* According to J. Křivohlavý (1974), when the instruction labels the participant in the experimental situation as "player" and encourages him to maximize his indi-vidual gain at the expense of his "partner", the interaction participants have little faith in entering the path of cooperation and the possibility of communicating does not increase cooperation. Similarly, when the instruction encourages cooperation be-tween participants, they will cooperate despite their possibility of communicating (Fülöp, 1995). In our effort to offer neutral instructions we excluded such terms as "game, player, victory, defeat" that would provoke a particular behavior strategy in participants (we used the terms situation, person, participant).

C) *Influence of partner understanding and their mutual relation.* The partici-pants' cooperative decisions are deter-mined by a mutual relation, the level of understanding of partner and the quality of information about him (Oskamp, Perlman, 1965; Schoeninger, Wood, 1969; In: Kři-vohlavý, 1970). Information about the partner's low self-esteem leads to higher trust and willingness to cooperate. In-formation about partner's high self-esteem evokes opposite reactions and leads to competitiveness (Křivohlavý, 2002). The perceived social status similarity inhibits competitive tendencies between partners. The tendency can also be encouraged through the influence of the perceived higher social status of one partner, whereas the lower status partner expects a long-term perspective of their contact (often fear of threatening and dominance from

the higher status partner is present). With regard to the development of cooperation, with different statuses this can also happen if the socially higher status participant sees the situation as short-term (Mack, 1976; In: Fülöp, 1995). J. Křivohlavý (2002) mentions as well that a higher level of cooperation between experimental game participants can be reached not only by mutual friendship and sympathy but also through information about partner's similar moral values (personality similarity). We have expected the influence of mutual understanding, relation, as well as similarity to prompt cooperation (all participants were secondary school students, lived in the same dormitory, classmates, friends, couples were created according to the participants' own choice - often roommates). Between the PDG participants in our experimental group though, cooperation was not the dominant strategy.

We believe the results are connected to the above-mentioned influence of situation factors as well as the age of participants. According to J. Křivohlavý (2002), cooperative decisions within PDG mean to *"voluntary abandon the hope of maximum gain and from the beginning settle for something that is not 'the best'. From the ethical viewpoint we could talk about voluntarily abandoning the egoistic motivation in its extreme form and accepting altruistic orientation. During cooperation in PDG, we both voluntarily abandon the egoistic effort to maximize individual gain ... in the interest of maximum mutual gain."* The aforementioned understanding of cooperation does not chime with the beliefs of young people in their late teens and adolescence about their own effectiveness, because for them performance and success are an important motive and part of life. Success with prestige and admiration, preferably from peers (achieved on the basis of social comparison) is very important for adolescents. Our findings correspond with the words of the above-quoted author, who says that young people at this age are the least willing to cooperate and come to an agreement - to trust other people and act reliably in a conflict situation.

The second part of the study surveyed the influence of selected personality concepts (self-esteem and self-efficacy) on the decision-making in interpersonal conflicts modeled in PDG, as personality traits are another group of co-determining factors in strategy choices.

A statistically significant relation between the selected self system components and decision-making in PDG was not observed. Similarly, the comparison of adolescents with high and low self-esteem/self-efficacy in the mean value of L and P choice in the series of 20 PDG choices did not show significant differences. We expected the opposite, as our research originated from the presently accepted self-system understanding as a dynamic representation mediating the majority of intrapersonal processes (information processing, regulation of affective states, motivation, and social interaction) and a whole range of interpersonal processes (Markus, Wurf, 1987; In: Páleník, 2004). The following points will provide some pointers to at least partially clarify the factors influencing our achieved results:

- *Interaction specificity.* Experimental games are not about the general presentation of an individual, whose character was determined in psychological examination (e.g., through questionnaires), but about a specific relation between two persons. The resulting choices do not characterize two individuals but a specific interaction of two different personalities. To be able to compare the influence of personality dif-

ferences, all participants would have to be put into a constant situation in the experiment series, e.g. according to L. Solomon experimental tests (Herkner, 2001) using a partner with strictly defined strategy.

   - *Monofactor vs. polyfactor approach.* K.W. Terhune (1968) points out the idea that the decision making of participants in interpersonal conflict situations is influenced not by individual relative isolated personality traits but by their configuration. The self system is not a unitary, monolithic entity, its functions depend on self-motives (self-development, personal growth, and self-actualization) as well as on the configuration of the actual social situation. Behavior as a whole is not to be accepted as a dependable variable of the self system, but its individual components are represented in the partial demonstration of behavior (Páleník, 2004).

Although the significant relations between the selected self system components and decision-making in PDG were not confirmed, it is impossible to definitely reject the influence of self-esteem and self-efficacy on the solutions of conflict situations modeled in PDG.

The influence of high and low self-efficacy levels on the strategy choice and interaction progress in PDG games corresponds with its conceptual definition within the social-cognitive theory. The cooperative behavior stabilized in the individual games in the second half of the 20 choices series in PDG in adolescents with high self-efficacy is mutually the most advantageous strategy from a long-term viewpoint. At the beginning of the series of choices this requires trust, and certainty in one's own abilities to realize and maintain the process so as to achieve cooperation. According to A. Bandura (1982) the higher the self-efficacy perception level, the more difficult the goals the individual sets himself. Self-efficacy expectancy, which is belief that behavior necessary to reach one's goal will be used, and outcome expectancy have a mutual functional relationship and are considered the main intentions' predictors. According to R. Schwarzer (2006), given that the individuals have no experience of the contemplated behavior, the outcome expectancy can have a stronger direct influence on the realized behavior than self-efficacy expectancy. Since adolescents in the experimental group had no previous experience of decision-making in experimental games, it can be assumed that upon entering the series of conflict situation solutions, persons with high self-efficacy set themselves maximizing mutual gain as a goal (in the initial choice that mirrors the immediate effect of the motives of game participants without the influence of previous interactions, they opted for the L choice more frequently) and participants with low self-efficacy opted for maximizing individual gain (in the initial choice decided for P choice more often).

At the same time, R. Schwarzer (2006) emphasizes that perceived self-efficacy influences the volitional process and thus influences the achievement of voluntarily accepted goals. We presume that adolescents with high self-efficacy adapted their decision-making in PDG to the initially set global aim. Equally, a high self-efficacy level mirrors the individuals' faith in their ability to control challenging environmental demands through adaptive activity (Bandura, 1995). (Note: The PDG situation is specific in this regard. The result of the realized adaptive activity does not have to have the desired effect, as achieving a particular goal is in this setting jointly dependent on both partners' decisions.)

In the games of the second half of PDG we observed competitive strategy prefer-

ence in adolescents with low self-efficacy. As mentioned before, the decision for cooperation in PDG (despite mutual advantages) requires trust, and belief in one's own abilities to realize and maintain the process so as to achieve cooperation. According to R. Schwarzer (2006) persons with a weak faith in their own abilities tend more frequently to anticipate failure scenarios, to worry about possible deficiencies in behavior and so to abandon their efforts too soon. Establishing mutual cooperation is a long-term process of creating trust, frequently with no immediate effect and reciprocal cooperative choice on the side of the partner. On the other hand, competitive choice can bring an immediate expected effect (maximizing individual gain, or in the "worst" case ensuring the same gain value for both participants), but at the expense of the partner's trust.

While adolescents with high self-efficacy preferred cooperative behavior during the individual PDG games, adolescents with high self-esteem demonstrated strategic decision-making and preference for competitive behavior. From the given choices, this behavior corresponds better with their personality orientation, which is characterized by higher problem solving activity, more frequent and bolder upholding of their own ideas and lower vulnerability (Seiffke-Krenke, 1990; Medveďová, 1996; Belinčák, 2000).

Decision-making of participants divided according to the self-esteem level (especially in persons with low self-esteem) did not show as much focus on one type of behavior as in the case of self-efficacy level differentiation. Cognitive processes - especially thinking and information processing - necessary for optimal decision-making are emphasized in the self-efficacy concept. From the viewpoint of effectively achieved results, this concept proves to be

more useful than self-esteem, which has a more general character (Páleník, 2004; Kováčová, 2005; Kováčová, Sarmány-Schuller, 2006). M. Blatný, L. Osecká, M. Hrdlička (1999); E. Koubeková (2004) understand self-esteem as the result of social comparison and self-assessment based on observation of one's own activity and definition of the level of satisfaction with one's own I. From the point of view of duration, self-esteem does not have the same stability as self-efficacy, since self-esteem is a partial consequence of individual comparison of oneself with others. The announcement of partner's choice (or the point value) to the researcher can be a trigger for the social comparison process leading to modification of the self-esteem level and applied strategy. The aforementioned information is in agreement with our findings about the behavior of adolescents with low self-esteem who had a tendency towards higher risk and to search for optimal behavior strategy throughout the PDG series. M. Tyszkowa (1990), too, points out that in demanding situations (e.g., need to reach a specific performance) individuals with insufficient inner integrity and low self-esteem more quickly arrive at the feeling of personal threat, growth of negative emotions, the focus on defense and continual disorganization of their activity and behavior, possibly even tendencies to behave socially desirable.

Despite reservations about experimental games and their laboratory character that are frequently mentioned in scientific literature, the PDG instrument enabled a view into the interpersonal behavior of the studied sample of late teen and adolescent youth. Although the results did not prove any significant relations between the measured self system components and decision making in PDG situations, indicated tendencies of the different strategy prefer-

ences and behavior in persons with a different level of self-esteem and self-efficacy are considered inspirational for further research. A higher number of participants in the specific levels would be needed for more general conclusions about the influence of the studied self concept level on the preference for cooperative or competitive behavior and to support the indicated course of social interaction in persons with different levels of self-esteem and self-efficacy to increase the number of choices in the series.

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VPLYV ÚROVNE VYBRANÝCH PRVKOV SYSTÉMU SELF NA ROZHODOVANIE V EXPERIMENTÁLNEJ SITUÁCII PDG

E. K o v á č o v á, I. S a r m á n y - S c h u l l e r

Súhrn: Za účelom zistenia regulačnej funkcie sebahodnotenia a sebaúčinnosti v oblasti rozhodovania v zmysle kooperatívneho resp. súperivého správania sme realizovali experimentálnu nenulovú hru Prisoner's Dilemma Game (PDG). Experimentálnu skupinu tvorilo 80 študentov rôznych typov stredných škôl vo veku 16 - 19 rokov, AM = 17,00, SD = 1,15, ktorým sme pred realizáciou PDG administrovali Rosenbergovu škálu sebahodnotenia, RSES (Rosenberg, 1965) a Škálu všeobecnej účinnosti, GSES (Jerusalem, Schwarzer, 1981). 20 homogénnych dievčenských a 20 chlapčenských dyád, vytvorených na základe dobrovoľného výberu riešilo sériu 20 hier PDG. Medzi vybranými konceptmi systému self a rozhodovaním v PDG sme nezistili signifikantný vzťah. Výsledok na hladine signifikancie p > 0.05 sme zistili aj pri komparácii úrovne podania L (kooperatívnej)/P (súperivej) voľby v celej sérii hier PDG medzi skupinami adolescentov s rozdielnou úrovňou sebahodnotenia/sebaúčinnosti. Na základe frekvencie podania volieb L a P v jednotlivých hrách sme v priebehu 10. - 19. voľby zistili stabilizáciu vo výbere stratégie: u osôb s vysokou sebaúčinnosťou v zmysle kooperácie, u osôb s nízkou sebaúčinnosťou v zmysle súperivosti. Preferovaná stratégia sa zhodovala s ich iniciálnou voľbou. Stabilitu v rozhodovaní sme zistili aj u adolescentov s vysokým sebahodnotením, a to v preferencii súperivej stratégie v priebehu 6. - 19. voľby. Naopak, osoby s nízkou úrovňou sebahodnotenia mali tendenciu k zvýšenému riskovaniu, hľadaniu optimálnej stratégie správania v priebehu celej série hier PDG. Zistenia interpretujeme z pohľadu sociálno-kognitívnej teórie a konceptuálneho vymedzenia sebahodnotenia.