ORIGINAL RESEARCH PAPER

DEPENDENCE BETWEEN THE LEVEL OF MOTIVATION AND THE ASSESSMENT OF REHABILITATION EFFICIENCY AND SPORTS-ACTIVITY AFTER THE INJURY AT BASKETBALL AND HANDBALL PLAYERS

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Abstract

The aim of the study was the assessment of the dependence between the type and level of motivation, and the assessment of rehabilitation efficiency and sports-activity after the injury. 207 male and female competitors training basketball and handball participated in the study. There were 111 women (46 basketball and 65 handball players) and 96 men (48 basketball and 51 handball players) studied. The investigative tools were: the Carver and White's questionnaire (measuring the activity level of the BAS and BIS system in three measurements), the author's survey taking into account the information concerning training-methods, number, types and circumstance of experienced injuries, methods of their treatment and the visual analogue pain intensity scale (VAS). Those surveyed evaluated also the efficiency of physiotherapeutic treatments in the 1-10 scale. The statistical tools were as follow: the arithmetical mean together with the standard deviation and the simple correlation. At training men there was some negative dependence between the time of break in trainings after sustained injury and one of the measurements according to the questionnaire: BAS Drive ($p<0.05$). In the above-group there also appeared some positive dependence ($p<0.05$) between the declared level of felt pain and the results on the BAS Fun Seeking scale. The studied women attained noticeably higher ($p<0.05$) results of the BAS Reward Responsiveness and BIS scale than men. At women there also appeared some positive dependence between the time of break in trainings after sustained injury and

the intensification of the BIS activation ($p<0.05$). 1. Some strong relationship between the levels of different forms of motivation in chosen aspects of rehabilitation of sportsmen was shown. 2. At men, high level of goal oriented motivation was connected with the negative assessment of rehabilitation efficiency, what could evidence the frustration resulting from inability to train. Strong goal orientation may therefore shorten the period of convalescence.

Key words: *motivation, injury, rehabilitation, team sports*

Introduction

Sports injuries influence not only the competitor's organism but also his or her psychical condition (Garrick and Requa 2003). Sustained injury can be accompanied by more intense feeling of such emotions as anger, fear, decrease of mood or tension, and also decrease of self-esteem (Schwab Reese, Pittsinger, and Yang 2012). Unprofitable changes were observed just after the accident and during the treatment (Ardennes Forest, Taylor, Feller and Webster 2012). The competitor's emotional reaction on injury and curative treatments connected with it is variable – negative feelings dominate directly after the accident; they diminish in progress of rehabilitation, and then increase, when the return to sport training becomes more and more real (Morrey, Stuart and Smith 1999).

Factors of the psychical nature also influence the efficiency of rehabilitation and possibility of the return to sports-activity. Besides, many physiotherapeutic applications influence also the psychical sphere (Zeitlin and co. 2000, Kuriyama and co. 2005, Boguszewski and co. 2010, 2012, Field and co. 2012). Research also showed the importance of stress coping abilities during recovering and rehabilitation (Crossman 1997). Podlog and Eklund (2007) account motivation as the key factor influencing the process of returning to sport, crediting the special role to needs of autonomy, competence and belonging, which according to the theory of the auto determination are the source of internal motivation (Ryan and Deci 2000).

Increased interest in psychological aspects of the return to sports-activity after sustained injury led to the essential observation: full physical and psychical preparation of the competitor for the continuation of suspended trainings does not always pair up. In spite the fact that the purpose of undertaken treatment and rehabilitation is the recovery and full participation in the sports competition, competitors often struggle with the uncertainty regarding their own readiness for the return to former training-loads (the Podlog and co. 2011).

The aim of the study was to gain information about the influence of the type and level of motivation defined by Gray (Carver and White 1994) as the intensification of activation of the behavioural activation (BAS) and inhibition (BIS) system on the assessment of sports-rehabilitation efficiency and the consequences of sustained injury for further sports-activity.

Material and Methods

Participants. There were 207 male and female competitors training basketball and handball who participated in the study. Among them there were 111 women (46 basketball and 65 handball players) and 96 men (48 basketball and 51 handball players), training in Warsaw athletic clubs (Tab. 1). Average age of competitors was 22.23 years (SD=2.79), and the training advancement of 7.67 years (SD=2.79).

Table 1

Characteristics of examined groups

gender	*sport*	*age [years]*	*body mass [kg]*	*body height [cm]*	*training experience [years]*
women	basketball	21.72 ±3.09	64.64 ±9.24	173.09 ±7.61	7.53 ±3.55
	handball	22 ±1.94	63.62 ±9.08	169.12 ±6.21	5.86 ±4.13
men	basketball	22.64 ±3.57	88.8 ±11.45	189.36 ±7.13	9.54 ±3.71
	handball	22.63 ±2.55	84.39 ±8.42	184.81 ±5.9	8.49 ±4.56

Measures. Carver and White's (1994) BIS/BAS scale was used in the research to assess the level of motivation of the studied people. The scale was adapted by Muller and Wytykowska (2005). Each of twenty four sentences of the questionnaire was a statement that a person could either agree with or disagree with. Answers possible to choose from were as follows: 1 – very true for me, 2 – true in some way, 3 – false in some way, 4 – very false for me.

The questionnaire measures the intensification of behavioural inhibition system (BIS), that is the inclination to avoid situations perceived as difficult and unpleasant, and behavioural activation system (BAS) – its result expresses itself by means of three scales. The BAS Drive scale (BAS D) qualifies the power of motivation in goal fulfilment, BAS Fun Seeking (BAS FS) expresses the inclination to looking for positive experiences, last from scales – BAS Reward Responsiveness (BAS RR) shows the level of stimulation sensitivity to the modification with rewards (Carver and White 1994; Muller and Wytykowska 2005).

The visual analogue pain intensity scale (VAS) was also used in the research. There was author′s survey done too and it was about sports injuries, methods of their treatment, further sports-activity after sustained injury and the range of use of physiotherapeutic applications and assessment of their efficiency. The efficiency of rehabilitative applications was rated in the scale from 1 to 10 points (where one means the lack of efficiency and 10 the maximum efficiency) in four categories: acute pain relieving (mark 1), moderate pain relieving (mark 2), restitution of strength of damaged muscles (mark 3) and restitution of the range of movement of the damaged joint (mark 4).

Statistical analyses. To the elaboration of statistical data there were used some statistical tools: arithmetical mean, standard deviation, rho correlation by Spearman and the T-student test for independent groups. The level $p \leq 0.05$ was fixed as of minimum significance.

Results

Women and men did not significantly differ in the level of any motivation categories. The important difference ($p<0.05$) was noted only at basketball players in the BAS Drive category. Moreover, women declared considerably higher ($p<0.05$) level of pain complaints. The efficiency of rehabilitative applications in three from four categories (acute pain relieving, moderate pain relieving and restitution of strength of damaged muscles) was higher rated at men, differences however were not characteristic (Tab. 2).

Table 2

Results of BIS/BAS scale and pain, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) – the mean values ± SD

	women	men	women		men	
			basketball	handball	basketball	handball
BAS D	9.94 ±2.69	10.57 ±2.65	9.57 ±2.71	10.2 ±2.67	10.77* ±2.48	10.38 ±2.62
BAS FS	10.26 ±2.81	10.02 ±2.91	9.61 ±3	10.72 ±2.59	9.92 ±3.01	10.13 ±2.75
BAS RR	13.5 ±5.02	13.51 ±2.69	11.89 ±5.18	14.63 ±4.6	12.44 ±4.82	14.58 ±3.84
BIS	18.19 ±3.85	18.03 ±4.47	17.04 ±3.61	19 ±3.83	17.81 ±3.66	18.25 ±2.94
pain [VAS]	4.6 ±1.94	3.94* ±3.31	4.88 ±2.04	4.42 ±1.86	3.77* ±2.32	4.1 ±2.36
no training [month]	12.62 ±18	14.72 ±16.18	11.57 ±17.21	13.54 ±18.79	17.65 ±19.53	12.51 ±12.92
no competition [month]	`	16.28 ±17.71	14.05 ±20.36	14.4 ±21.47	18.91 ±20.73	14.1 ±14.65
mark 1	6.67 ±1.97	6.98 ±2.12	6.73 ±1.86	6.62 ±2.1	6.57 ±2.13	7.39 ±2.06
mark 2	6.99 ±2	7.16 ±2.16	7.12 ±1.93	6.85 ±2.08	6.73 ±2.05	7.58 ±2.22
mark 3	6.61 ±2.17	7.08 ±2.15	6.09 ±2.21	7.12 ±2.04	6.87 ±2.19	7.29 ±2.12
mark 4	7 ±2.14	6.83 ±2.16	6.84 ±2	7.15 ±2.28	6.4 ±2.08	7.27 ±2.18

* $p<0.05$ difference between women and men

Some important positive correlation between the pain intensity (measured with the VAS) and the level of BAS RR and BIS motivation was shown among female basketball and handball players. Additionally the assessment of rehabilitation in relieving of acute pain negatively correlated with the result of the BIS scale that is with the inclination to resign from the activity due to fear of negative results (Tab. 3).

At men practicing basketball and handball there was some strong negative correlation between the degree of goal oriented focus (BAS Drive) and the assessment of physiotherapy efficiency (in all its aspects). The positive correlation was noted instead between the time after injury, time of break in trainings and competitions and the susceptibility to looking for positive new strengthening (BAS FS) and between the training-advancement and the level of three measurements of motivation – BAS D, BAS FS and BAS RR (Tab. 4).

Table 3

Correlation (Spearman) between the BIS/BAS results and time after the injury, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and training experience in women practicing basketball and handball

	BAS D	BAS FS	BAS RR	BIS
time after the injury	-0.061	-0.152	-0.038	-0.078
pause in competition	0.015	-0.019	0.05	0.82
pause in training	0.003	-0.78	-0.002	0.045
mark 1	-0.128	-0.043	-0.2	-0.252*
mark 2	-0.059	-0.025	-0.176	-0.234
mark 3	0.068	-0.026	0.037	-0.035
mark 4	-0.01	-0.105	-0.097	-0.017
pain	0.052	0.113	0.219*	0.266**
training experience	0.042	-0.151	-0.082	-0.12

* p<0.05, ** p<0.001, *** p<0.001

Table 4

Correlation (Spearman) between the BIS/BAS results and time after the injury, pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and training experience in men practicing basketball and handball

	BAS D	BAS FS	BAS RR	BIS
time after the injury	0.274*	0.287*	0.354**	0.34
pause in competition	0.157	0.32*	0.124	0.048
pause in training	0.14	0.318*	0.11	0.037
mark 1	-0.437**	-0.163	0.048	0.165
mark 2	-0.39**	-0.167	0.082	0.126
mark 3	-0.423*	-0.048	0.089	0.111
mark 4	-0.394**	-0.09	0.074	0.207
pain	0.14	0.19	0.118	-0.006
training experience	0.22*	0.265*	0.251*	-0.095

* p<0.05, ** p<0.001, *** p<0.001

At female basketball players there was some positive correlation between the number of sustained injuries and the results on the BAS Reward Responsiveness scale ($p<0.01$) and BAS Fun Seeking ($p<0.05$). Higher results on both scales are accompanied in described group by the greater subjective feeling of pain complaints. In the group of women training basketball negative correlation between the results of the BAS Reward Responsiveness scale and the assessment of efficiency of physiotherapy in relieving of acute and moderate pain was noticed. In described group the higher activation of behavioural inhibition system (results on the BIS scale) led to lower assessment of rehabilitation efficiency in reduction of pain complaints aside from their intensification. Greater goal orientation (higher results on the BAS Drive Scale) also resulted in lower assessment of physiotherapeutic applications within the range of pain relieving and the restitution of agility of a damaged body part (Tab. 5).

Table 5

Correlation (Spearman) between the BIS/BAS results and pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and number of injuries in women and men practicing basketball

	women				men			
	BAS D	BAS FS	BAS RR	BIS	BAS D	BAS FS	BAS RR	BIS
pause in training	0.29	0.126	0.284	0.268	0.031	0.353*	0.316	0.179
pause in competition	0.223	0.108	0.232	0.241	0.019	0.327*	0.33*	0.188
pain	0.272	0.332*	0.433**	0.262	-0.137	0.183	0.197	0.06
number of injuries	0.159	0.292*	0.39**	0.266	0.117	0.052	0.312*	0.011
mark 1	-0.461**	-0.195	-0.369*	-0.433*	-0.229	-0.237	-0.106	-0.332
mark 2	-0.368*	-0.221	-0.365*	-0.533**	-0.224	-0.248	-0.094	-0.344
mark 3	-0.209	-0.058	0.065	-0.077	-0.332	0.027	-0.016	-0.366*
mark 4	-0.428*	-0.309	-0.177	-0.28	-0.239	0.3	-0.001	-0.28

* $p<0.05$, ** $p<0.001$, *** $p<0.001$

Different dependences were noted in the group of men – of basketball players. There was observed some dependence between the period of break in trainings and starts as a result of sustained injury and the result of the BAS Fun Seeking scale. Additionally, the period of resignation from the participation in sport positively correlated with the results on the BAS Reward Responsiveness scale. High results on the BAS scale, measuring the influence of rewards on the system of motivation, were connected in the above-group with the greater number of sustained injuries during the sports-

career. There was also noted negative correlation between the assessment of efficiency of physiotherapy in restitution of strength of the injured body part and the results on the BIS scale (Tab. 5).

At female handball players appeared some dependence between the higher results on the BIS scale and the declared higher level of pain complaints, what was not observed at women practicing basketball. Any important relationship between the results of the BAS scale and the undertaken activity after injury wasn't noticed. At women training handball none of above-dependences appeared (Tab. 6).

In the group of men practicing handball none of above-dependences weren't observed, too. The result of the BAS Reward Responsiveness scale correlated negatively ($p<0.01$) with the number of sustained injuries. Important negative correlation was observed between the assessment of efficiency of physiotherapy in all curative ranges (relieving of acute and moderate pain, restitution of strength and the agility of damaged body part) and the results of the BAS Drive scale. Equally significant dependence appeared between the intensification of tendency to avoid hazard and unpleasant experiences (higher results on the BIS scale) and the positive assessment of efficiency of rehabilitative applications (all of four aspects of their influence) (Tab. 6).

Table 6

Correlation (Spearman) between the BIS/BAS results and pause in training, pause in competition and assessment of rehabilitation (mark 1-4) , pain and number of injuries in women and men practicing handball

	women				men			
	BAS D	BAS FS	BAS RR	BIS	BAS D	BAS FS	BAS RR	BIS
pause in training	-0.103	-0.193	-0.23	-0.086	0.208	0.247	-0.104	-0.132
pause in competition	-0.1	-0.114	-0.133	-0.038	0.287	0.293	-0.13	-0.135
pain	-0.146	-0.139	0.02	0.27*	0.18	0.183	-0.036	-0.122
number of injuries	0.058	0.001	-0.015	-0.14	-0.182	-0.056	-0.421**	0.105
mark 1	0.258	0.158	-0.033	-0.11	-0.622**	-0.15	0.2	0.641**
mark 2	0.303	0.238	-0.003	0.037	-0.484**	-0.166	0.215	0.48**
mark 3	0.267	-0.114	-0.171	-0.104	-0.466**	-0.125	0.219	0.569**
mark 4	0.336	0.025	-0.138	0.129	-0.453**	-0.186	0.127	0.552**

* $p<0.05$, ** $p<0.001$, *** $p<0.001$

Discussion

There can be two forms of reacting on the new situation: willingness to learn and experience new types of stimulation or increase of precaution

and consequently even the escape from the unknown (Smolewska, McCabe and Woody 2006). The strategy accepted by the given individual most often is relative to the manner of transmission and processing the sensory information in the nervous system, which is the physiological base of temperament (Aron and Aron 1997). It is considered that behind the direction of motivation (the choice between looking for and avoiding reaction on the event), in the situation perceived as new or difficult, there is the inclination to react on the stimulation of two systems of connections between component parts of the nervous system: The Behavioural Activation System (BAS) and Behavioural Inhibition System (BIS) (Carver and White 1994). BAS is the system responsible for fixation of rewarded reactions and giving reasons to the active looking for positive experiences and undertaking of goal oriented behaviours (Becerra Garcia 2010). Activity of the hypothalamus and higher concentration of dopamine in synapses, which most likely characterize people with stronger inclination to looking for stimulation (Carver and White 1994), are responsible for positive feedback generated by the system. The source of BIS stimulation, responsible for the inclination to opting out of situation threatening with an unpleasant or inexplicable experience, comes from the hippocampal activity and enlarged production of norepinephrine (Becerra Garcia 2010). Nowadays the BIS/BAS Scale by Carver and White is considered as the most adequate tool used in the measurement of activation of both systems with the self-esteem of the examined person (Voight and co. 2009).

The level of activation of behavioural systems probably translates into willingness to participate in sports-activities. Research showed that higher BIS activation favourably correlated with the avoidance of the motor activity, BAS activation instead (in the aspect of goal orientation) correlates negatively with not taking up the physical activity (Voight and co. 2009). At teenagers, strong BIS activity correlated negatively with the efficiency of the circulatory system, with subjective satisfaction from performed physical exercises and resulted in worse mood during overcoming large and moderate workloads. Higher BAS activation correlated with the positive attitude towards undertaking physical effort and with greater acceptance of average training loads (Schneider and Graham 2009).

Negative impact of sustained injury on the psyche of the competitor is described enough, for a short time there have also been paid some attention to its possibly positive aspects (based on theory invoking of post stress development (increase) (Wadey, Clark, Podlog and McCullough 2013).

Obtained results are incoherent. In order to achieve more exact results of the study on relationship between motivational systems and the sports-

activity after sustained injury, it would be advisable to repeat the research on greater group of people.

Conclusions

1. Strong relationship between the levels of different forms of motivation with chosen aspects of rehabilitation of sportsmen was proved.
2. At men high level of goal oriented motivation was connected with negative assessment of rehabilitation efficiency, what itself could evidence the frustration due to inability to train. Strong goal orientation may therefore shorten the time of convalescence.
3. At women pain complaints caused the inclination to resignation from activities because of fear of negative experiences.
4. Obtained results can become a base of randomized prospective research with the participation of more numerous and diverse group of sportsmen.

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