

PSYCHOLOGICAL CHARACTERISTICS OF DIFFERENT AGE-GROUPS OF HUNGARIAN NATIONAL ICE HOCKEY PLAYERS

- **László Tóth**
- **Gábor Gécsi**
- **Kornél Sipos**
- **József Bognár**

Semmelweis University Faculty of Physical Education and Sport Sciences,
Budapest, Hungary

Abstract

The purpose of this study was to identify those major psychological factors that affect ice hockey performance in a great manner. The exploration of the differences in CSAI-2, ACSI-28, and STPI-Y psychometric measures targeted the adult national team members and the U18 age-group of ice hockey players in Hungary. U18 (n=27) and adult national ice hockey players (n=25) filled out the tests during a training camp before international preliminary round matches. Based on the results of Independent T-test it was evident that State Anxiety, Cognitive Anxiety, Somatic Anxiety were significantly lower in the adult national team players than in the group of under 18 year-old players. Also, the adult team demonstrated a significantly higher score in relation to Peaking under Pressure and also in Freedom from Worry than the 18 year-old group. Discriminant analysis showed that Cognitive A-State, Trait Curiosity, Coachability, State Anger, Freedom from Worry, State Depression are those variables that differentiate the adult team from the U18 players. We can conclude that the members of the adult are generally in a more beneficial state from the standpoint of anxiety, pressure, and worry than the U18 ice hockey players. It seems that the experienced players can better manage unexpected match events (stress situations), than the younger players.

Key-words: CSAI-2, ACSI-28, STPI-Y, U18 and adult national players, ice hockey.

Introduction

When searching the literature on ice hockey, one can easily find studies on physiological factors such as on-ice, off-ice, conditioning level, and treadmill measures as related to skating economy, certain performance measures, prediction, and competitive performance (*Behm et al., 2005; Cox et al., 1995; Mascaro, Searer and Swason, 1992; Pelham and Hoyle, 1992; Twist and Rhodes, 1993*). Several researchers have studied success in ice hockey either by assisting points for victories and ties for a certain season or whether or not a player was selected as an “all-star” (*Engelhardt, 1995; Widmeyer and Birch, 1979*).

One of the early researchers in sport psychology, *Novotny and Petrak (1983)* reported that ice hockey players playing in higher level league were more extraverted and mentally stable than players of low level leagues. It was also interesting in that particular study that the performance of groups of higher and lower level athletes did not differ in the physical tests and anthropometric measures. According to *Orlick and Partington (1988)*, determination, self-sacrifice, ability to cope with pressure and dependability are the most significant mental skills necessary for success in ice hockey. Through qualitative data, it was reported that the most important characteristics for success in this sport were desire and passion for the game, overcoming adversity, work ethic, physical skills, and hockey sense (*MacDougall et al., 2002*).

Due to the nature of the sport, aggression has become a popular area to pursue from the beginning of sport psychological studies in ice hockey. *Silva (1980)* found that players who exhibited aggressive behavior showed poorer performance and lower concentration level than did those players who did not exhibit aggressive behavior. Using official game reports and penalty records, the total number of penalty minutes accumulated by individuals and/or teams, for the most part, also were a meaningful measure of aggression (*Wankel, 1973; Widmeyer and Birch, 1984*). *Bushman and Wells (1988)* compared and contrasted the number of minutes spent on the penalty bench for aggressive and non-aggressive penalties and found that only the duration of time for the penalty period given for an aggressive penalty could be deduced from the aggressiveness points. Other authors rejected the commonly held notion that aggressive behavior is a natural by-product of the combat allowed by the rules of ice hockey, and also that such behavior facilitates performance. This particular study also proved that this kind of behavior should be seen as learned reactions, which are adopted by imitating certain athletes and through reinforcement in various degrees according to the individual psychological disposition (*Gee and Leith, 2007*).

It is evident from the literature that the majority of research in ice hockey focuses primarily on the examination of the various forms of aggression. Only in the past few years, with the aid of newly developed psychometric assessment instruments, has sport psychology been able to more closely survey the complex personality traits of ice hockey players. Clearly, this will be a new and interesting direction for further studies in this area to pursue.

Rarely does one find research publications in the literature that summarize the results of multifaceted psychological examinations carried out in ice hockey. According to our knowledge there are very few empirical studies that measure competitive anxiety, athletic coping skills, and personality factors in a complex way in elite ice hockey players.

One study reported no significant difference among these anxiety, coping, and personality features of different age-groups of youth ice hockey players except for Trait Anger (Gécsi et al., 2009). It seems that it is a new course of study to compare and contrast certain psychological measures in different age-groups of national team members. In our work the authors endeavor to promote the justification for regular psychological preparation in the top levels of ice hockey.

Hence, the purpose of this study was

1. to define those psychological factors within 18 and adult national teams of ice hockey players that affect athletic performance,
2. to define the primary divergent psychological characteristics amongst the U18 and adult national ice hockey team members using STPI-H, CSAI-2, and ACSI-28 variables, and
3. to discover those primary psychological traits which are clearly characteristic of ice hockey players.

Methods

Participants

Hungarian national ice hockey team players, U18s (group 1) and adults (group 2), participated in the study (N=52). As indicated by the rules of ice hockey, U18 means that players below 18 years of age can play for that particular team. This is the youngest age group of selected national players for which the International Ice Hockey Federation regularly organizes official international championships. The mean age of the U18 team (n=27) was 16.78 and it was 27.21 for the adult national team (n=25). All scales were answered by all the players during training camp before international preliminary round matches. A psychologist knowledgeable of the scales as-

sisted responding to questions which arose during filling out of the questionnaires.

Instruments

All three assessment instruments (STPI-Y-H, CSAI-2-H, ACSI-28-H) methods are used widely in applied sport psychology, however, not so much in ice-hockey. They are applicable as diagnostic tools for both coaching and competition situations (Kyprianou and Sipos, 2005; Majoross, Tóth and Lénárt, 2004; Tóth et al., 2006).

State Trait Personality Inventory-revised form (STPI-Y)

STPI-Y (STPI-Y) self-evaluation scale was developed by Spielberger (1995) in order to demonstrate individual differences of state/trait anxiety, curiosity, anger and depression (10-item psychometric scales with 4 grades from 10 to 40 points). The Hungarian version of STPI-Y (STPI-Y-H) scale has an internal consistency (Cronbach alpha/ α) range of 0.64 (State Curiosity) to 0.91 (State Anger) (Sipos and Spielberger, 2005).

Competitive State Anxiety Inventory-2 (CSAI-2)

CSAI-2 self-evaluation scale was developed for measuring cognitive and somatic competitive anxiety of athletes, together with state self-confidence (Martens, Vealey and Burton, 1990). The Hungarian version of CSAI-2 (CSAI-2-H) contains 27 items all in range from 9 to 36 points (Sipos et al., 2000). The scale is exceptionally suitable for examining anxiety and self-confidence of competitors in sports. Hungarian version of CSAI-2 reported a reasonable internal consistency for Cognitive Anxiety ($\alpha=0.80$), Somatic Anxiety ($\alpha=0.85$), and also for Self-confidence ($\alpha=0.85$).

Athletic Coping Skills Inventory-28 (ACSI-28)

Smith and colleagues' (1995) self-evaluation scale of 28 items assigned a numerical assessment from 1 to 4 point for the following psychological traits: coping with adversity; peaking under pressure; goal setting/mental preparation; concentration; freedom from worry; confidence and achievement motivation; and coachability (range from 4 to 16 on all of the scales). The Hungarian version of the scale (ACSI-28-H) was defined by Jelinek (2000) and its Cronbach alpha coefficients ranged between 0.59 (Confidence and Achievement Motivation) and 0.84 (Peaking under Pressure).

Data process and analyses

The data was processed with SPSS for Windows 15.0. If any of the variables for a competitor was missing, the data of the competitor were deleted from the analysis. In the course of data processing, first frequencies for the individual scales and the Cronbach alphas were calculated, then the differences between U18 and adult team with independent T-test were assessed. Also, after checking for the various assumption of discriminant analysis (normal distribution, correlation, Box's M-test), a stepwise discriminant analysis was used to build a predictive model of group membership with age as a grouping factor.

Results

The descriptive statistics of STPI-Y-H, CSAI-2-H, and ACSI-28-H for both U18 and adult team and also the Cronbach alpha values for internal consistency of the tests are shown in Tables 1, 2, 3.

Table 1: Descriptive statistics and reliability values for the subscales of STPI-Y-H

	Mean±Std	Age-groups	α	Mean±Std	Std. Error Mean
State Anxiety	16.01±3.90	U18	0.88	17.18±4.50	0.86732
		Adult*	0.81	14.76±2.68	0.53628
State Curiosity	22.69±2.90	U18	0.44	22.74±3.13	0.60292
		Adult	0.53	22.64±2.70	0.54123
State Anger	11.32±1.61	U18	0.90	11.74±1.76	0.34007
		Adult	0.45	10.88±1.33	0.26658
State Depression	14.86±2.42	U18	0.86	14.40±2.64	0.50990
		Adult	0.55	15.36±2.09	0.41984
Trait Anxiety	18.69±3.37	U18	0.77	19.25±4.28	0.82447
		Adult	0.61	18.08±1.89	0.37824
Trait Curiosity	29.53±3.31	U18	0.54	28.96±3.45	0.66556
		Adult	0.70	30.16±3.09	0.61828
Trait Anger	21.55±4.91	U18	0.86	22.33±5.77	1.11068
		Adult	0.78	20.72±3.72	0.74503
Trait Depression	15.26±2.80	U18	0.87	15.03±2.27	0.43847
		Adult	0.72	15.52±3.31	0.66363

* $p < 0.05$

Table 2: Descriptive statistics and reliability values for the subscales of CSAI-2-H

	Mean±Std	Age-groups	α	Std. Error	
				Mean±Std	Mean
Cognitive A-State	15.32±4.33	U18	0.86	16.88±5.03	0.968
		Adult*	0.63	13.64±2.59	0.519
Somatic A-State	13.67±3.21	U18	0.66	14.62±3.45	0.664
		Adult*	0.75	12.64±2.62	0.525
Self-Confidence	27.53±3.89	U18	0.84	26.85±4.78	0.920
		Adult	0.74	28.28±2.52	0.505

* p < 0.05

Table 3: Descriptive statistics and reliability values for the subscales of ACSI-28-H

	Mean±Std	Age-group	α	Mean± Std	Std. Error
					Mean
Coping with Adversity	11.67±2.03	U18	0.51	11.70±2.19	0.42304
		Adult	0.60	11.64±1.89	0.37807
Peaking under Pressure	12.59±2.57	U18	0.86	11.88±2.95	0.56823
		Adult*	0.73	13.36±1.86	0.37363
Goal setting/Mental Preparation	10.07±2.55	U18	0.66	10.22±2.75	0.52929
		Adult	0.62	9.92±2.37	0.47582
Concentration	12.63±2.14	U18	0.72	12.22±2.50	0.48137
		Adult	0.55	13.08±1.60	0.32104
Freedom from Worry	12.71±2.29	U18	0.75	11.92±2.78	0.53623
		Adult*	0.47	13.56±1.15	0.23152
Confidence and Achievement Motivation	12.19±1.98	U18	0.66	11.92±2.26	0.43666
		Adult	0.48	12.48±1.61	0.32208
Coachability	12.24±2.03	U18	0.78	13.74±2.22	0.42898
		Adult	0.48	12.92±1.75	0.35081

* p < 0.05

In assessing the results of STPI-Y-H there were no significant discrepancy, with the exception of State Anxiety. Based on the results of Independent T-test State Anxiety was found significantly lower in the adult national team players than in the group of under 18 year-old players ($t=2.334$; $df=50$; $p<0.024$). Independent T-test of CSAI-2-H showed a significantly lower Cognitive Anxiety ($t=2.890$; $df=50$; $p<0.006$) and Somatic Anxiety ($t=2.323$; $df=50$; $p<0.024$) for adult national team players than for the U18 players. The statistical difference between the U18 and adult ice hockey players in ACSI-28-H was perceptible in the case of Peaking under Pressure and Freedom from Worry. The adult team demonstrated a significantly higher scores in relation to Peaking under Pressure ($t=2.112$; $df=50$;

p< 0.038) and also in Freedom from Worry (t=-2.721; df=51; p< 0.009) than the 18 year-old group.

The relatively small degree of significant difference between the U18 and adult national ice hockey teams raises the question as to what those relevant factors are that play an important role in differentiating the age-groups. The results of discriminant analysis showed that Cognitive A-State, Trait Curiosity, Coachability, State Anger, Freedom from Worry, and State Depression are those variables that differentiate the groups (Table 4).

Table 4: Discriminant analysis for all the variables with age as a grouping factor

Step	Entered	Removed			Wilks' Lambda					
	Statistic	df1	df2	df3	Exact F			Statistic		df1
	Statistic	df1	df2	Sig.	Statistic	df1	df2	Sig.	Statistic	df1
1	Cognitive A-State		0.857	1	1	50.000	8.350	1	50.000	0.006
2	Trait Curiosity		0.784	2	1	50.000	6.733	2	49.000	0.003
3	Coachability		0.696	3	1	50.000	6.992	3	48.000	0.001
4	State Anger		0.628	4	1	50.000	6.966	4	47.000	0.000
5	Freedom from Worry		0.569	5	1	50.000	6.975	5	46.000	0.000
6		Cognitive A-State	0.578	4	1	50.000	8.592	4	47.000	0.000
7	State Depression		0.508	5	1	50.000	8.898	5	46.000	0.000

At each step, the variable that minimizes the overall Wilks' Lambda is entered.

- a Maximum number of steps is 36.
- b Minimum partial F to enter is 3.84.
- c Maximum partial F to remove is 2.71.
- d F-level, tolerance, or VIN insufficient for further computation.

Based upon the results of Eigen value and Canonical correlation, the authors can state that the function explains 96.7% of the variance and so the function discriminates well (Table 5).

Table 5: Eigenvalues for discriminant analysis

Function	Eigenvalue	% of Variance	Cumulative %	Canonical correlation
1	0.967(a)	100.0	100.0	0.701

(a) First 1 canonical discriminant functions were used in the analysis.

Wilk's Lambda (Table 6) shows the proportions of the total variance (50.8%) in the discriminant scores not explained by differences among groups.

Table 6: Wilks' Lambda for discriminant analysis

Test of function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	0.508	32.138	5	0.000

Also, according to Chi square result, there is a significant difference between the two groups' centroids. Table 7 shows relatively high accuracy because 84.6% of original grouped, and 80.8% of cross-validated grouped cases were correctly classified .

Table 7: Classification results(b,c) for discriminant analysis

		Age-group	Predicted group membership		Total
			Young	Adult	Young
Original	Count	Young	23	4	27
		Adult	4	21	25
	%	Young	85.2	14.8	100
		Adult	16	84	100
Cross-validated (a)	Count	Young	21	6	27
		Adult	4	21	25
	%	Young	77.8	22.2	100
		Adult	16	84	100

a, Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.

b, 84.6% of original grouped cases correctly classified.

c, 80.8% of cross-validated grouped cases correctly classified.

Discussion

The applied psychometric assessment instruments proved reliable in testing the ice hockey teams of both age-groups. STPI-Y-H scale results' greater tendency towards Trait Curiosity and Trait Anger/Hostility is presumably a result of sport-specific behavior (*Sheldon and Aimar, 2001*) and the lower level Trait Depression suggests that little frustration is accumulated in this sport. It is probably due to the rules of the game that allow players to carry out some aggressive impulses during the game, and consequently major

mood swings affect the players less. The little level of statistically meaningful discrepancy between the age-groups suggests that all players with experience at international championships have similar state-trait personality measures in this sport. However, U18 team had a higher level of State Anxiety than the adult team members in the tested period, which means that the adult national team members are probably more used to high level competitive situations.

The results of both CSAI-2-H and ACSI-28-H illuminate the fact that the members of the adult team are in a more beneficial state from the standpoint of anxiety, pressure, and worry than the U18 group. The experienced players can most likely better manage unexpected events (stress situations), than the younger players. The level of stress management is generally a good indicator of the success of the elite players, as ever newer strategies must be mobilized in the constantly changing conditions of the game, and new tasks must be continuously solved (*Anshel et al., 2001*). It is believed that adult players most likely know the boundaries of their own optimal arousal zone well and they can better regulate them in the interest of optimal achievement (*Sheldon and Aimar, 2001*) than the U18 team members.

The results of discriminant analysis confirm that Cognitive Anxiety, Trait Curiosity, Coachability, State Anger, Freedom from Worry, State Depression all are important categorizing factors between U18 and adult national team players in the sport of ice hockey. Similarly for other team sports, a fundamental criterion for making it to the team is the intensification of the individual effort towards success in this sport. The players playing on the same posts in the team are considered rivals and the uncertainty of being named to the first team requires unification of strength resources. Coachability is apparent in the harmonic relationship between the coach and the competitor and also in the full completion of the training.

Conclusions

Emotional instability appears to be present in 18-year-olds, which in most cases is detrimental to performance, particularly under pressure. Although coaches are expert in identifying and managing young talented players, one can assume that most of them might not have the necessary skills and/or abilities to use psychological skills in their practices and games (*Humara, 2000*). Therefore, it seems important to teach psychological self-regulation methods at early age, which can later become one of the basic pillars of the individual optimal performance.

It is well known that the development of cognitive skills is considered as important factor in improving coping strategies in sport success (*Smith*

and Christensen, 1995), however coping does not necessarily assume effectiveness (Anshel et al., 2001). In successful training of U18 players, coaching behavior is able to provide social support that plays an important role, which effectively aids coping ability and the control of minor mood swings in this age-group.

The examination of the results for the adult team players establishes the fact that best results in most cases are achieved when they are treated as real partners.

References

- Anshel, M.H., Kim, K.W., Kim, B.H., Chang, K.J, and Eom, H.J. (2001): A model for coping with stressful events in sport: Theory, application, and future directions. *International Journal of Sport Psychology*, 32. 43-75.
- Behm, D.G., Wahl, M.J., Button, D.C., Power, K.E., and Anderson, K.G. (2005): Relationship between hockey skating speed and selected performance measures. *Journal of Strength and Conditioning Research*, 2. 326-331.
- Bushman, B. J. and Wells, G. L. (1998): Trait aggressiveness and hockey penalties: Predicting hot tempers on the ice. *Journal of Applied Psychology*, 6. 969-974.
- Cox, M.H., Miles, D.S., Verde, T.J., and Rhodes, E.C. (1995): Applied physiology of ice hockey. *Sports Med*, 19. 184-201.
- Engelhardt, G. M. (1995): Fighting behavior and winning National Hockey League games: A paradox. *Perceptual and Motor Skills*, 80. 416-418.
- Gee, C. J., and Leith, L. M. (2007): Aggressive behavior in professional ice hockey: A cross-cultural comparison of North American and European born NHL players. *Psychology of Sport and Exercise*, 4. 567-583.
- Géczi, G., Tóth, L., Sipos K., Fügedi, B., Dancs, H., and Bognár, J. (2009): Examination of Competitive State Anxiety, Athletic Coping Skills and Personality in young elite Hungarian National Ice Hockey Players. *Kinesiology*, 1. 88-96
- Humara, M. (2000): Personnel selection in athletic programs. *Athletic Insight: The Online Journal of Sport Psychology*, 2. 2.
- Jelinek, Z. (2000): *The personality correlates of the physical vulnerability in sports*. ELTE, Budapest. MSc Thesis (in Hungarian).
- Kyprianou, P. and Sipos, K. (2005): *Reliability Examination of the Greek Athletic Coping Skills Inventory-28 (ACSI28-G) results for team sport athletes in Cyprus*. 4th European Sports Medicine Congress & FIMS Team Physicians Development Course Lemesos – Cyprus, 2005, October 11-15. Proceedings: (Work code: FX13C00057.)
- MacDougall, M., Scott, D., Leavins, N., and Summers, K. (2002): *Psychological characteristics of elite hockey players*. Unpublished manuscript. University of New Brunswick, Fredericton, NB.
- Majoross, K., Tóth, L., and Lénárt, Á. (2004): *A study on STPI-Y, CSAI-2, ACSI-28 and Lifestyle Defense Mechanism in student groups of coaching and sport*

- management*. 25th International Conference of Stress and Anxiety Research Society, Amsterdam, Holland, 10-12. July.
- Martens, R., Vealey, R. S., and Burton, D. (1990): *Competitive Anxiety in Sport*. Human Kinetics Books, Champaign, IL.
- Mascaro, T., Seaver, B.L., and Swanson, L. (1992): Prediction of skating speed with off-ice testing in professional hockey players. *J. Orthop. Sports Phys. Ther.*, 10. 92-98.
- Novotny, L., and Petrak, B. (1983): Characteristics of juniors and schoolboys ice hockey players. *International Journal of Sport Psychology*, 1. 15-26.
- Pelham, T.W., and Hoyle, R.J. (1992): Stretching to maintain ROM in young hockey players during skill acquisition. *Nat. Strength Cond. Assoc. J.*, 14. 58-60.
- Orlick, T., and Partington, J. (1988): Mental skills to excellence. *Sport Psychologist*, 2. 105-130.
- Sheldon, J.P., and Aimar, C.M. (2001): The role aggression plays in successful and unsuccessful ice hockey behaviors. *Research Quarterly for Exercise and Sport*, 3. 304-309.
- Silva, J. M. (1980): Understanding aggressive behavior and its effects upon athletic performance. In Straub, W. F. (Ed.): *Sport psychology: An analysis of athlete behavior*. Movement, Ithaca, NY. 177-186.
- Sipos K., and Spielberger, C. D. (2005): First results with the Hungarian version of the State-Trait Personality Inventory (Form Y) and Lifestyle Defense Mechanisms scales. (in Hungarian) *Kalokagathia*, 1-2. 73-91.
- Sipos K., Kudar K., Bejek K., and Tóth L. (2000): *Standardisation and Validation of the Hungarian Competitive State Anxiety Inventory-2 (CSAI-2)*. 20th International Conference of STAR, Cracow, Poland, July 12-14. 131.
- Smith, R. B., Schutz, R. W., Smoll, F. L., and Ptacek, J. T. (1995): Development and validation of a multidimensional measure of sport-specific psychological skills: The Athletic Coping Skills Inventory-28. *Journal of Sport & Exercise Psychology*, 17. 379-398.
- Smith, R.E., and Christensen, D.S. (1995): Psychological skills as predictors of performance in professional baseball. *Journal of Sport & Exercise Psychology*, 17. 399-415.
- Spielberger, C. D. (1995): *Revised State-Trait Personality Inventory (STPI Form Y)*. Scoring information for the revised STPI. (Manuscript.)
- Tóth, L., Géczi, G., Bognár, J., and Sipos, K. (2006): *Examination of competitive state anxiety (CSAI-2), athletic coping strategies (ACSI-28), and STPI-Y variables in different age groups of Hungarian ice hockey players*. 27th International Conference of the Stress and Anxiety Research Society, 2006 July 13th-15th, Rethymnon, Crete, Greece.
- Twist, P., and Rhodes, T. (1993): A physiological analysis of ice hockey positions. *Nat. Strength Cond. Assoc. J.*, 15. 44-46.
- Wankel, L. M. (1973): An examination of illegal aggression in inter-collegiate hockey. In Williams, I. D., and Wankel, L. M. (Eds): *Proceedings of the Fourth*

Canadian Psycho-Motor Learning and Sports Psychology Symposium. Ottawa: National Health and Welfare. 531-542.

Widmeyer, W. N., and Birch, J. S. (1979): The relationship between aggression and performance outcome in ice hockey. *Canadian Journal of Applied Sport Sciences*, 4. 91-94.

Widmeyer, W. N., and Birch, J. S. (1984): Aggression in professional hockey: A strategy for success or a reaction to failure? *Journal of Psychology*, 117. 77-84.