



# HAZARD PERCEPTION AND ANXIETY IN NOVICE AND EXPERIENCED PARACHUTISTS

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**Introduction:** The article deals with the correlations between hazard perception and anxiety in parachutists. Theoretical background for the study is provided by Eysenck's theory of personality and Spielberger's theory of anxiety. Psychological characteristics of parachutists as a specific study population is also provided.

**Methods:** The Impulsivity Inventory (IVE) by Hans J. Eysenck and Sybil B.G. Eysenck measuring three personality features, i.e. impulsiveness, venturesomeness, and empathy was used in the study along with the State-Trait Anxiety Inventory (STAI) by C.D. Spielberger, R.L. Gorsuch, and R.E. Lushene used to study anxiety as both a state and a trait. The study was conducted in 64 amateur parachutists (male and female) aged 18 to 60 years, stratified according to their expertise into novice parachutists (1-50 jumps) and expert parachutists (more than 50 jumps).

**Results:** The study demonstrated, among others, that novice parachuters are characterized by an increasingly higher increases in anxiety states as measured by the increase in the heart rate immediately before the jump. No statistically significant differences were observed between the study groups with regard to hazard perception, impulsiveness, empathy, and anxiety as a trait.

**Discussion:** The article draws attention to anxiety as a state developing in novice parachutists as a result of stress due to the novelty of their situation. In addition, the lack of statistically significant correlations being observed between hazard perception, impulsiveness, empathy, and anxiety as a trait was due to the previous natural psychological selection process.

**Conclusions:** No statistically significant correlations were observed between hazard perception and anxiety as a trait.

**Keywords:** anxiety as state and trait, hazard perception, impulsiveness, empathy, parachutists

**Figures:** 8 • **Tables:** 2 • **References:** 18 • **Full-text PDF:** <http://www.pjamp.com> • **Copyright** © 2015 Polish Aviation Medicine Society, ul. Krasińskiego 54/56, 01-755 Warsaw, license WIML • **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education

## INTRODUCTION

In psychological literature, three approaches to risk and anxiety are encountered, namely: (1) the behavioral approach – risk and anxiety are factors associated with uncertainty or limitations to one's own activities; (2) the cognitive approach – risk and anxiety are a consequence of informed decisions made following the analysis of potential benefits and losses; and (3) the emotional approach – risk and anxiety are a reaction to impending threat [11,13]. Risk may be a source of both satisfaction or pleasure (stimulating risk) and anxiety [16]. The stimulating risk is impulsive in character and is associated with the demand for stimulation. Usually, stimulating risks are taken in following an internal impulse and are characterized by low levels of self-control. Sensation seeking is a personality trait defined by the search for experiences and feelings that are varied, novel, complex and intense as well as by the readiness to take physical, social, legal, and financial risks for the sake of such experiences as thrill- and adventure seeking (e.g. extreme sports), experience-seeking (e.g. preference for eccentric apparel, use of psychoactive substances, etc.), disinhibition (e.g. hazard, alcohol abuse, etc.), and boredom susceptibility (e.g. aversion to routine jobs, etc.) [18]. Thus, stimulating risk is dominated by the positive emotional aspect.

Stimulating risk is contrasted by instrumental risk which is an outcome of thorough calculation of benefits and losses from realization of assumed goal, characterized by high level of self-control in face of potential danger [17]. Determination of the scale of the risk and specific actions taken in risky situations is influenced by the specificity of risk, its extent, as well as the mechanism of loss or damage infliction. Psychologists formulated two positions regarding the factors involved in the risk-taking process. The first position assumes that decisions made by humans in risk-associated conditions depend on their venturesomeness, including their personality structures i.e. their sets of permanent traits such as anxiety levels, self-assessment of one's capabilities, as well as the locus of control. The supporters of this position assume that hazard perceptions affects the decision-making processes as well as the outcomes thereof. The impact of the environment is limited to a minimum [14]. It is assumed that risk-takers perceive risk as a positive value and therefore prefer high-risk tasks and are prone to choose more risky alternatives regardless of situation while hedgers, i.e. individuals who avert risks, avoid these alternatives in most cases [9]. The other position, referred to as environmentalism, assumes that the environment rather than

personality is the factor that determines human decisions (task-related and non-task related factors determine the choice of the cautious or the risky option), making human decisions circumstance-dependent and decision makers either risk-takers or averters.

In psychology and psychiatry, anxiety as a risk-related component when estimating benefits and losses, goes beyond the limits of psychopathological as well as cultural or historical taxonomy. Four main approaches to anxiety are known in the field of psychology, including the theory of learning associated with the theory of conditioning, psychoanalysis, cognitive explanations and biological explanations.

Anxiety is analyzed from several theoretical perspectives such as the learning theory that accounts mainly for the cognitive aspects of anxiety stemming from conditioning or other processes by which the individuals learn their escape or evasion behaviors [10], or Freudian psychoanalysis that interprets anxiety to be a physiological reaction resulting from a conflict between the desired (id) and the moral imperative (superego) as well as the effort made by the ego to control these desires [6].

Psychiatric aspects of anxiety formulated using the categories of mental disorders were taken into account by A. Kępiński [5] who proposed the following classes of anxiety: - neurotic anxiety, most commonly manifested as indefinite, abstract anxiety, and - psychotic anxiety, which is further divided into depressive anxiety characterized by reduced life dynamics and increased perception of pain, and schizophrenic anxiety.

Primary, biological determinants of fear are referred to in the hypothesis proposed by Beck [1] who assumed that when encountering new situations that may lead to potentially dangerous outcomes, humans interpret these situations as dangerous, i.e. causing or enhancing the primary attitude of fear. This condition may translate social anxieties that are associated with encountering new social situations that may lead to potentially dangerous outcomes [3]. From the standpoint of biology, anxiety is enhanced by increased serotonin (pleasure hormone) or noradrenalin (fear hormone) transmission. Upon exposure to chronic stress, disturbances within the central nervous system may lead to late-type disorders [8]. In the context of this article, of key importance is the concept presented by Spielberger [12], who performed factorial analysis to identify two major aspects of fear: that of a state, taking into account

situational variability, and that of a trait, underlining the acquired nature of anxiety and pertaining to differences between individuals. Anxiety as a state is characterized by consciously perceived feelings of fear and stress, usually accompanied by the associated activation or excitation of the nervous system. Anxiety as a trait is a motif or acquired behavioral disposition that makes an individual susceptible to perceiving a wide range of objectively non-dangerous situations as hazardous and therefore reacting to such situations with anxiety that is incommensurate to the scale of risk. There is a correlation between the anxiety as a trait and anxiety as a state, as no higher levels of anxiety as a state are observed in individuals with high levels of anxiety as a trait as compared to those with lower levels of anxiety as a trait. In such cases, higher levels of anxiety may be observed only in strongly dangerous situations.

## METHODS

### Characteristics of subjects

The study was conducted in 64 amateur parachutists aged 18 through 60 years, divided into two groups (n=32 in each group) of novice (up to 50 jumps) and expert parachutists (more than 50 jumps) jumping from the altitude of 4000 m from a Turbolet L-410 plane allowing 16 individuals on the board. Detailed characteristics of the study groups is presented in Tab. 1.

### Characteristics of research methods

Hazard perception was assessed by means of IVE inventory by Hans J. Eysenck and Sybil B.G. Eysenck that is used to measure three personality features, i.e. impulsiveness, venturesomeness, and empathy, as adapted to Polish by A. Jaworowska [4]. Anxiety was assessed by means of State-Trait Anxiety Inventory (STAI) by C.D. Spielberger, R.L. Gorsuch and R.E. Lushene as adapted to Polish by K. Wrześniewski and T. Sosnowski [15] as well as by means of heart rate measurements. The study was carried out in two stages. In the first stage, carried out before the parachute jumps, the subjects completed the IVE inventory and State-Trait Anxiety Inventory, and heart rate measurements were performed. The second stage was carried out on

the same day immediately prior to the jump. The subjects retook the STAI inventory survey (X-1) and were subjected to heart rate measurements.

## RESULTS

Following indicators were taken into account in the study: hazard perception (HP), impulsiveness (I) and empathy (E), anxiety as a trait (X2) and anxiety as a state (X1), heart rate, increase in anxiety as a state (X-1) and increase in the heart rate (H2-H1). The normalcy of distribution of the quantitative data was assessed using the Shapiro-Wilk's test. In case of normally distributed variables, parametric significance tests were used, whereas non-parametric methods were used in cases lacking normal distribution of data. Correlations between pairs of quantitative variables were assessed by means of Pearson's correlation coefficient and Spearman's rank correlation coefficient. Comparisons between groups were made using Student's t-tests in case of normally distributed variables and Mann-Whitney's U-test in case of variables with distribution significantly different from normal.

The following hypotheses were analyzed: (1) Hazard perception has no effect on the increase in the level of anxiety as a state; (2) Novice and expert parachutists are no different in terms of anxiety as a trait and state; (3) Novice and expert parachutists are no different in terms of hazard perception; (4) Novice parachutists are characterized by a higher increase in anxiety as a state (X1-2-X1-1) and heart rate (H2-H1) before the jump as compared to expert parachutists.

Figures 1 and 2 present the distribution of hazard perception (HP) and the increase in anxiety as a state (X1-2-X1-1) in the groups of novice and expert parachutists. As shown in Fig. 1., both the novice and the expert parachutists' group are characterized by overrepresentation of parachutists with above-average and high venturesomeness levels.

As shown in Fig. 2., the increase in the anxiety as a state is high in novice parachutists as compared to expert in whom the distribution of the increase in the anxiety is close to normal and much lower in terms of absolute levels. Tab. 2. presents the coefficients of correlation between hazard perception

Tab. 1. Characteristics of study subjects stratified according to the expert or novice parachutist's status.

	Novice parachutists (N=32)		Expert parachutists (N=32)	
	Mean	SD	Mean	SD
Age	31.72	7.91	35.72	7.47
Number of parachute jumps	22.62	16.63	1148.63	967.48

and the increase in anxiety as a state in both novice ( $r=-0.049$ ) and expert parachutists ( $r=-0.043$ ).

The analysis of differences in hazard perception (HP) between novice and expert parachutists presented in Fig. 3. revealed no statistically significant differences between these groups ( $p=0.278$ ). The mean score in novice parachutists was 8.09 while the mean score in the other group was only slightly higher and amounted to 8.5.

No differences were also observed between novice and expert parachutists in the anxiety as a trait as confirmed by Fig. 4.

In the group of novice parachutists, the mean score of anxiety as a trait (X2) was 37.0 as compared to 34.09 in the expert group. The difference was not significant in statistical terms ( $p=0.204$ ).

No differences were also observed between novice and expert parachutists in the anxiety as a state (X1) as confirmed by Fig. 5.

As shown in Fig. 5., no statistically significant differences are observed between the groups in terms of STAI-measured anxiety as a state ( $p=0.851$ ). The mean score in the novice group ( $M=27.59$ ) was not significantly different in statistical terms from the mean score in the expert group ( $M=27.78$ ).

Fig. 6. presents physiological results of heart rate measurements (H1) in novice and expert parachutists.

Mean heart rate values in the novice and the expert groups were 72.59 and 75.06, respectively, thus confirming that the heart rate levels were

Tab. 2. Coefficients of correlation between hazard perception and the increase in anxiety as a state.

	Novice prachatusits (N=32)		Experienced parachutists (N=32)	
	HP	P	HP	P
Hazard perception (HP) and the increase in anxiety as a state (X1-2-X1-1)	-0.049	0.788	-0.043	0.815

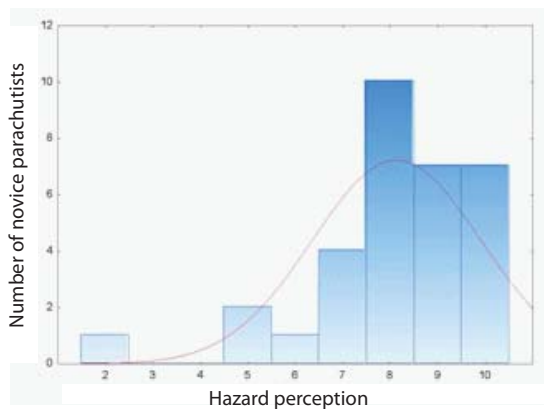


Fig. 1. A

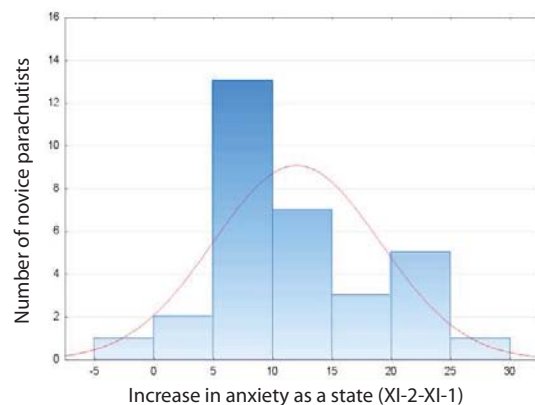


Fig. 2. A

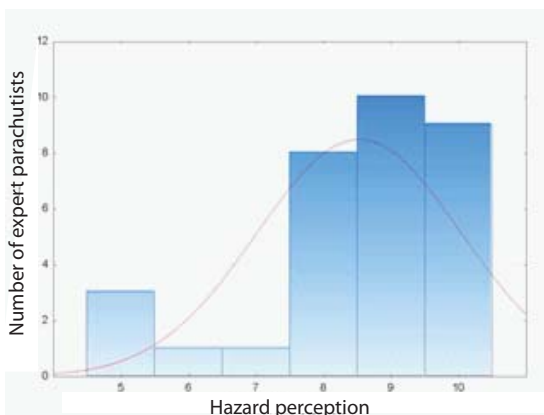


Fig. 1. B

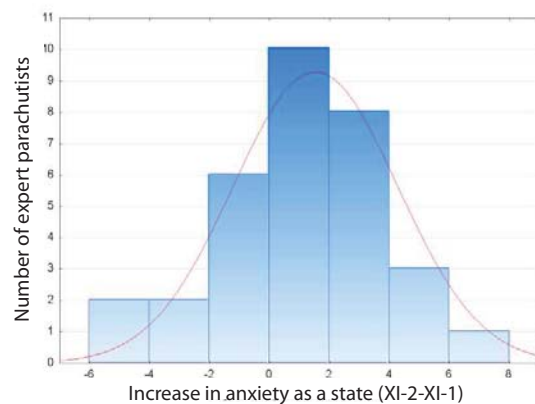


Fig. 2. B

Fig. 1. Distribution of hazard perception in the groups of novice (A) and expert (B) parachutists.

Fig. 2. Distribution of the increase in anxiety as a state (X1-2-X1-1) in the groups of novice (A) and expert (B) parachutists.

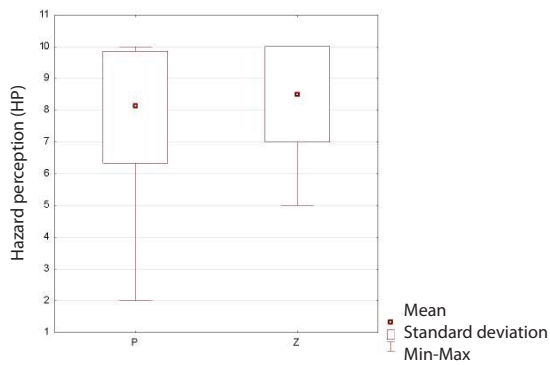


Fig. 3. Mean hazard perception scores in novice and expert parachutists groups.

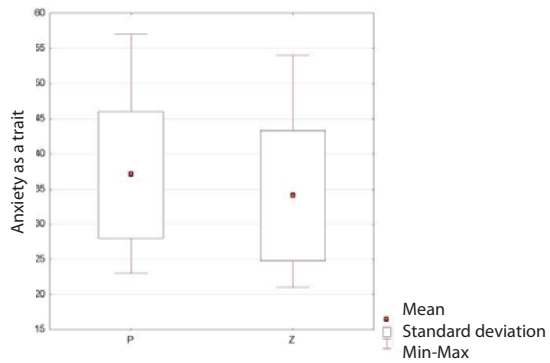


Fig. 4. Mean anxiety as a trait scores in novice and expert parachutists groups.

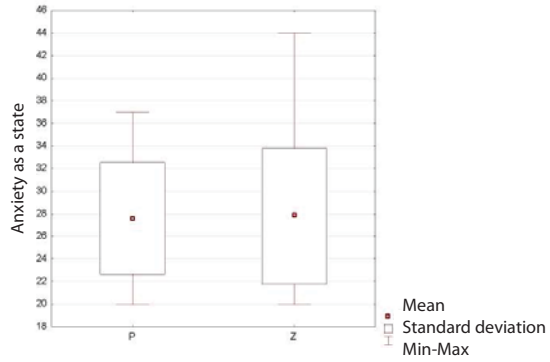


Fig. 5. Mean anxiety as a state scores in novice and expert parachutists groups.

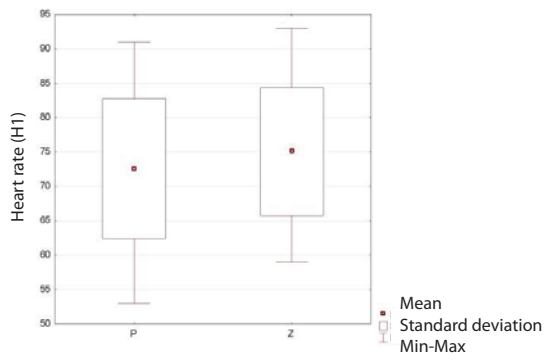


Fig. 6. Mean heart rate measurements in novice and expert parachutists groups.

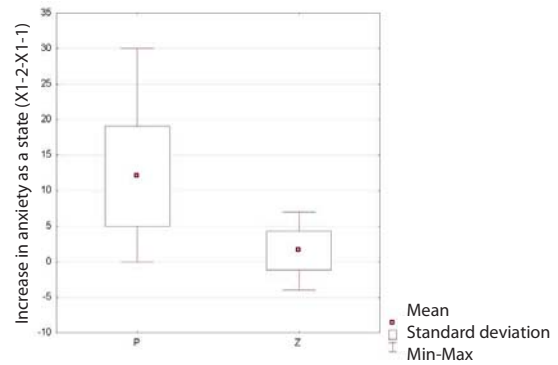


Fig. 7. Mean values of the increase in anxiety as a state (X1-2-X1-1) before the jump in the groups of novice and expert parachutists (difference is statistically significant,  $p < 0.001$ ).

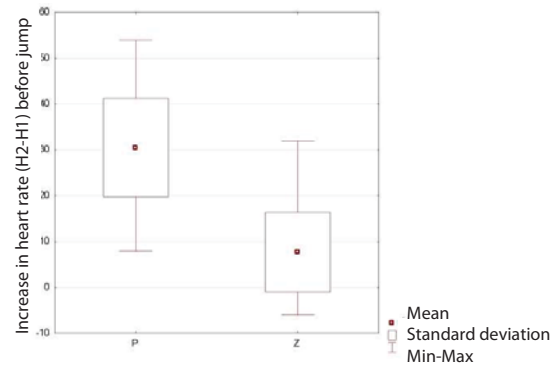


Fig. 8. Mean values of the increase in heart rate (H2-H1) before the jump in the groups of novice and expert parachutists.

not significantly different ( $p=0.315$ ) between the study groups of parachutists subjects.

The hypothesis stating that parachutists are characterized by a higher increase in anxiety as a state (X1-2-X1-1) and heart rate (H2-H1) before the jump as compared to expert parachutists was confirmed as shown in Figures 7 and 8.

As shown in Fig. 7., the increase in self-assessed anxiety as a state was statistically significantly higher ( $p < 0.001$ ) in the novice group ( $M=12$ ) as compared to the expert group ( $M=1.53$ ). The same was true for anxiety as a state measured by heart rate measurements.

As shown in Fig. 8, the expert group was characterized by a significantly lower heart rate ( $M=7.69$ ) as compared to the novice group ( $M=30.5$ ).

## DISCUSSION

The first hypothesis pertained to the correlation between hazard perception and anxiety as a state in parachutists before the parachute jump. The results are indicative of no correlations between the variables. Statistically significant differences

were observed in anxiety as a state between the first and the second (i.e. taken immediately before the jump) measurement in novice parachutist. This means that anxiety before the jump does not depend on hazard perception.

Another hypothesis pertained to the lack of significant differences between the novice and advanced group of parachutists in terms of hazard perception, anxiety as state and trait (both self-assessed and measured by heart rate monitoring), which might be due to natural psychological preselection process.

The third hypothesis pertained to differences between the study groups in relation to anxiety as state measured by STAI and heart rate monitoring immediately before a parachute jump. The study confirmed the existence of statistically significant differences between expert and novice parachutists. In novice parachutists, the increase in anxiety as a state and heart rate was significantly higher than in the group of expert.

Results obtained in verification of the first three hypotheses are in line with the results of studies conducted in parachutists by S. Epstein [2] who confirmed that N. E. Miller's concept of risk seeking-aversion conflict may be used to explain the changes in motivation and anxiety as being dependent not only on individual traits but largely also on the expertise of parachutists. Results obtained in the group of novice subjects demon-

strate that the highest anxiety is perceived when the command to jump is issued; afterwards, the anxiety level diminishes. This is also in line with the results of studies focusing on changes in emotions other than anxiety as observed during parachute jumps in novice and expert parachutists. As suggested by these results, novice parachutists tend to perceive emotions (such as anxiety, euphoria, etc.) more strongly than their expert colleagues. In order to increase the emotional intensity, expert parachutists get involved in more risky activities such as group jumps, night jumps, high-altitude jumps, etc. [7].

## CONCLUSIONS

The conclusions drawn from the study are as follows:

- There is no correlation between hazard perception and the increase in anxiety as a state prior to the parachute jump.
- The group of novice parachutists does not differ significantly from the group of expert in terms of hazard perception, anxiety as a trait and anxiety as a state.
- Novice parachutists are characterized by a significantly higher increase in anxiety as a state level measured prior to the parachute jump by both self-assessment and heart rate monitoring methods as compared to expert parachutists.

## AUTHORS' DECLARATION:

**Study Design:** Jan Felicjan Terelak, Katarzyna Przychodzka; **Data Collection:** Katarzyna Przychodzka; **Manuscript Preparation:** Jan Felicjan Terelak; **Funds Collection:** Jan Felicjan Terelak, Katarzyna Przychodzka. The Authors declare that there is no conflict of interest.

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