

Psychomotor Training of the Military Sappers as a Means of Reducing Personal Fears and Anxiety

Oleh KHMILIAR¹,
Rostyslav KHMILIAR²,
Iryna KOVAL³,
Oleksandr SAVCHUK⁴,
Alla DUSHKA⁵,
Oksana BOLOTOVA⁶,
Ihor POPOVYCH⁷

¹ Doctor of Psychological Sciences, Full Professor, Head of the Department of Social Sciences, National Defense University of Ukraine named after Ivan Chernyakhovsky, Kyiv, Ukraine, hmiliar@ukr.net

² Cadet, National Academy of Land Forces named after hetman Petro Sahaidachny, Lviv, Ukraine, dynamorostik@ukr.net

³ Doctor of Psychological Sciences, Associate Professor, Department of Medical Psychology, Psychosomatic Medicine and Psychotherapy, Bogomolets National Medical University, Kyiv, Ukraine, dgspsychology9@gmail.com

⁴ Candidate of Psychological Sciences, Senior Lecturer, Department of Philosophy, Ivan Kozhedub Kharkiv National University of Air Force, Kharkiv, Ukraine, savchuk.project@gmail.com

⁵ Doctor of Psychological Sciences, Associate Professor, Leading researcher of the Department of psychological and pedagogical support of children with special needs, Mykola Yarmachenko Institute of Special Pedagogy and

Abstract: *The purpose of this study is to reveal the features of psychomotor training of a sapper, the development of the necessary sensory-intuitive skills to regulate their actions and deeds while performing tasks in the minefield. Material and methods. Three series of psychological experiments were conducted. The importance of psychomotor training in the context of reducing the level of anxiety and personal fears of sappers was revealed. The research was integrated into the process of training in the discipline "Blasting". The study did not change the structure of the discipline, as it was only related to the content. The collected and analyzed data were used for the quantitative method. Results. It was determined that the most talented servicemen, with well-developed coordination of movements, mental stability, ability to regulate personal fears, make quick decisions, work alone for a long time, stay calm in tense situations, should be involved in the sappers' activities. Conclusions. Our psychological training "Minefield" promotes the development of professionally necessary qualities among military sappers, provides the development of psychomotor and sensory-intuitive skills to regulate movements and actions during combat missions. Improves constructive attitudes in the unit of sappers, friendliness, reflexive listening, kindness, leadership and patience.*

Keywords: *Psychomotor skills; resilience; minefield; fear; anxiety; psychological training.*

How to cite: Khmiliar, O., Khmiliar, R., Koval, I., Savchuk, O., Dushka, A., Bolotova, O., & Popovych, I. (2022). Psychomotor Training of the Military Sappers as a Means of Reducing Personal Fears and Anxiety. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 13(4), 81-103. <https://doi.org/10.18662/brain/13.4/377>

Psychology of the National Academy of
Pedagogical Sciences of Ukraine, Kyiv,
Ukraine, a0509999100@gmail.com

⁶ Post-graduate Student, Department
Differential and Special Psychology,
Odesa I. I. Mechnikov National
University, Odesa, Ukraine,
OBolotova@ukr.net

⁷ Doctor of Psychological Sciences, Full
Professor, Department of Psychology,
Kherson State University, Kherson,
Ukraine, ihorpopovych999@gmail.com

1. Introduction

Sappers often say, that “the sapper makes a mistake twice”: the first time is when he chooses a profession, the second time is when he demines or disposes of the ammunition. Not questioning the above-mentioned statement, we should note that not everyone can professionally cope with the difficult and dangerous work of a sapper. Let us even make our own assumptions: “A sapper does not make a mistake, he has no right to do that, otherwise he is not worthy to bear the proud name of a sapper” (Stasiuk et al., 2009). During the hostilities, the profession of a sapper became a vital necessity. Sappers start and end the war. They spend decades eliminating the consequences of the war (Okipnyak et al., 2016). Nowadays it is impossible to imagine a victory in a battle without a sapper’s contribution. In the future, the need for professionally trained sappers will only increase.

Over the past six years, about a thousand servicemen and civilians have been injured due to the landmines in the Donbas region. About 200 of them were killed. According to UN humanitarian coordinator Neil Walker, Ukraine ranks third in the world in terms of contamination of the territory with explosive devices and first in the number of people killed by them. Our country inherited minefields and shells from two world wars, the activities of the USSR army, as well as a result of hostilities in the Donbas region. Besides, the administrative border between the annexed Crimea and the territory of Ukraine is mined. Experts say that after the end of hostilities in Donbas, it will take decades to clear Ukrainian land of mines (Okipnyak et al., 2016). According to experts’ estimates of the Ministry of Defense of Ukraine, 7.000 square kilometers are contaminated with explosives in the territories controlled by Ukraine. These lands are home to 1.5 million people. Another 15 thousand square kilometers that have mines are in the uncontrolled area.

An analytical review of recent research and publications shows that the main task of a sapper is to properly conduct combat operations of a defensive or offensive nature (Okipnyak et al., 2016; Schneck, 1998). Historically, it is believed that sappers serve in engineering troops. In the course of hostilities, they are responsible for digging trenches, building their own fortifications on the confrontation line, providing crossings over water obstacles, disposition of ammunition (Blank et al., 2014; Khmiliar & Nedviha, 2018).

The issue of psychomotor training of sappers is not properly developed yet in modern military psychological science. Currently, there are no significant scientific developments that would comprehensively reveal the problem of psychomotor development of a sapper and serve as a theoretical

and methodological basis for its practical organization. However, the role of psychomotor skills in the sapper's profession is undeniable. In some countries, the psychomotor development of a sapper is carefully monitored, and in the armed forces of France, Croatia, Ghana, Cuba, for example, the group of psychological services of the military type includes a psychomotor specialist (Khmiliar, 2019; Sopa & Pomohaci, 2019; Tofan, 2018).

Psychomotor skills are an integral part of the harmonious development of a sapper. This profession requires not only careful professional training, but also a specific character, internal self-control. Among the range of professionally important qualities of a sapper the following should be distinguished: organizational skills, courage, strictness, sociability, friendliness, critical attitude to themselves and their activities. Analytical intelligence, responsibility, excellent hand motor skills, coordination of movements and actions, punctuality, accuracy, intuitiveness, high endurance and stress resistance, developed anticipation, ability to adequately assess the situation in the minefield are important for the servicemen of engineering and sapper units. The sapper must be able to: make quick decisions, work alone for a long time, stay calm and coordinated even in the most stressful situations (Khmiliar & Nedviha, 2018). In this context, it should be noted, that having lost his sense of fear, the sapper must leave his professional activity.

According to the World Health Organization, one person dies every 20 minutes as a result of mines, streamers and shells. When disposing of explosive devices, each sapper must know the structure, principle of operation, frequent faults of more than 700 types of mines, as well as the main types of ammunition used in different many armies around the world. During the demining of the territory of Yugoslavia, sapper dealt with the so-called ammunition of the British Mk1 and the American BLU 97B / B and A / B. These types of explosives, compared to the standard mines, are quite dangerous because the detonator used in their design can generate electricity and detonate even after it remains for a long time in the ground.

During the Afghan war, sappers neutralized the Soviet-made anti-tank mines (TM-46), Italian (TS-2.5 and TS-6.1), American (M-19), British (Mark 7) and Belgian (H55 and M3). Among the antipersonnel mines, the sappers mainly neutralized Soviet mines (PMN, POMZ-2), as well as Italian (TS-50), American (M18A1) and British (P5 Mk1) (Sloan, 1986).

In the process of demining, sappers use a special suitcase that suppresses radio waves in the demining area. Then, protecting himself with a shield, the sapper, with the help of a special "mechanical hand" moves the

explosive into an armored container. Even if a landmine explodes in an armored tank, there will be no negative consequences for the sapper.

During a combat mission, a sapper works in the special equipment, which is designed to protect him from possible explosions. The set of a special sapper suit, that weights about 16 kg, includes a protective jacket and pants, a helmet with armored glass, mine boots, Kevlar gloves, knee pads, as well as additional armor panels designed to protect the most vulnerable parts of his body. An important feature of this suit is that it can be quickly removed in case of an emergency. Two systems are built into the sapper's suit: 1) voice communication; 2) climate control. Autonomous power supplies, which are also built into the suit, are designed for 8 hours of continuous operation. As a sapper works in any weather and at any time of the day, a powerful lantern is installed on the helmet, in addition to the remote control module.

In addition to the suit, special shoes "spider boots" protect the sapper from an explosion. When attached to shoes, they reduce the possibility of touching a mine, and also create a certain gap between an explosive device and a shoe, thereby reducing the degree of damage. When demining sand or soft ground, a sapper uses special attachments in addition to "spider shoes". In the process of demining, the sapper must be able to use different trench tools (saw, sapper blade, plastic knife, sapper probe) (Blank et al., 2014; Strutynsky et al., 2019).

By setting a mine, a sapper thus begins a covert hunt for the enemy. A mine means death that is delayed in time. Ernest Heminguel noted: "Nothing can be compared to a hunt for a man. He, who explored and started to love this activity, no longer pays attention to anything else" (Hemingway, 1974, p. 347). A sapper is fundamentally different from a beast hunter. The victim in this case can also threaten the sapper. This profession is not about getting food or becoming an athlete. The result is the physical destruction of an enemy.

Even though a sapper is required to be courageous to fight alone, to be alone for a long time with his thoughts, fears and doubts, the very presence in the minefield of can lead to a "mine syndrome". Out of its three types, only one is positive – "a sense of mastery of space", "victory over space". This feeling arises after demining a dangerous area and it is to some extent useful for a sapper, because it invigorates, makes a sapper "mature", frees him from the fear that at first restrained his actions. Two other results of a "mine syndrome" – "speed" when driving the armored personnel carrier on the road with mined roadsides, and "a sense of elevation above the ground" – have a destructive effect on the behavior of the sapper.

Having decided to become a sapper, a serviceman must realize that he is an unusual soldier. By analyzing more than a hundred sappers by the method "Motivation to avoid failure", we have repeatedly been convinced that each one is highly motivated to avoid failure. His courage and his behavior as a whole, are always ambivalent. By demining an area, a sapper must minimize the risk, detect and neutralize the most insidious mines set by the enemy. At the same time, when setting a mine, a sapper is obliged to outsmart the enemy. Thus, the sapper saves his life and the lives of his colleagues.

It should be borne in mind that explosive devices installed by the enemy have become quite insidious. If earlier sappers, usually looked for them under feet, in Donbas the fighters began to place them at the head level. Such an improvised explosive device may consist, for example, of an RGD-5 grenade with fishing hooks. If you touch one of these hooks, the grenade will explode at face level, leaving no chance for a person to survive. According to the sappers, special attention should be paid to the urban territories, where Ukrainian sappers have repeatedly discovered such "inventions". Sappers do not advise to touch the abandoned weapons, ammunition, equipment, valuables, books, toys, packs of cigarettes and other objects lying on the ground.

The sapper should not feel hatred towards an enemy. He treats it as *"a prey that fell into his net"*. The military analyst David Reed addressed the servicemen in this regard: "When deciding to become a sapper, you have to ask yourself, do I have the fiery temperament? How often do I get nervous? After all, anger increases the heart rate, which often causes irrational behavior. This is the worst thing that can happen to a sapper."

Thus, the activity of a sapper requires well-developed professionally important qualities, which are the key to his professional suitability. Despite attempts by the world community to ban the use of mines, they continue to be dangerous weapons. Mines are cheap to manufacture, they are easy to install, they significantly reduce the speed of modern mechanized armies. Therefore, the armed forces must constantly teach sappers techniques and methods of how to deal with mines.

Hypothesis. We assume that the formative strategy of sapper psychomotor training will greatly minimize personal fears and anxiety.

Purpose of the article is to reveal the features of psychomotor training of a sapper, development of the necessary sensory-intuitive skills to regulate their actions in the minefield.

2. Materials and methods

Methodology

The implementation of the basic principles of human psychomotor activity in the research methodology of psychomotor training of military sappers will lead to a considerable reduction in personal fears and levels of anxiety (Klimenko, 1997), psychophysiological mechanisms of human praxis (Klimenko, 2013), spatial self-regulation (Khmiar et al., 2020), sensorimotor activity patterns (Plokhikh, 2021; Plokhikh et al., 2021), anticipatory and prognostic patterns of individual response (Nosov et al., 2020c; Popovych et al., 2020a; 2021a; 2021b; Zinchenko et al., 2019). Since the participants in the formative strategy of the study were second-year cadets of the National Academy of Land Forces named after Hetman Petro Sagaidachny, then we considered the findings of empirical studies on youth development patterns (Kononenko et al., 2020; Popovych et al., 2021c), features of the educational process (Hudimova, 2021; Hudimova, et al., 2021), anxiety (Popovych et al., 2020b), stressful situations of respondents (Shevchenko et al., 2020a; 2020b), extreme situations and features of load transfer, bordering on human capabilities (Nosov et al., 2020a; 2020b; Zinchenko et al., 2020; 2022). The analyzed research were essential for developing the study's formulation strategy.

Participants

Given the specifics of the study, the group was recruited on the basis of voluntary participation in a psychological experiment. The group of participants consisted of second-year cadets of the National Academy of Land Forces named after Hetman Petro Sagaidachny, who are healthy and systematically work to improve their psychomotor development. The research was integrated in the process of training in the discipline "Blasting", without changing its structure, as it was only related to the content of the discipline. A total of 54 cadets, future sappers of the Armed Forces of Ukraine, aged 18-20, were involved in the study.

Procedure

In order to realize the purpose of the research, the psychological experiment was conducted on the basis of the International Center for Peacekeeping and Security of the National Academy of Land Forces named after Hetman Petro Sagaidachny. It lasted for four weeks and consisted of three series.

In *the first series* the psychological factors that influence the

effectiveness of combat tasks performed by sappers were defined. With the help of the developed and tested questionnaire "Fears of a sapper", the most common sources of personal fears of sappers were determined. The processing of the questionnaire's results included: 1) determining the frequency of sappers' personal fears, taking into account the ranking of their sources; 2) factor analysis of the obtained data to identify the degree of relatedness between individual sources of personal and individual psychological characteristics of sappers, anxiety and accentuations of character in particular.

When performing a combat mission, the sapper requires extraordinary concentration (Howell & Buro, 2011). Each mine tells the story of its "author", and even the smallest detail characterizes the sapper as a specialist (Blank et al., 2014). Therefore, in *the second series* of psychological experiments with military sappers a psychological training "Minefield" was conducted, which aimed at the development of the necessary psychomotor and sensory-intuitive skills to regulate the actions and deeds during combat missions. In the middle of the training ground, a corridor was outlined, 1–1.5 meters wide and 5–7 meters long. Throughout the whole corridor different "mines" were placed. This could be real mines, matchboxes, pens, mobile phones, watches, cones and other tools. Depending on the game tasks and the specific situation, 10-20 pieces of "mines" were placed equidistantly, so that a sapper's foot could fit between them. 19 variants of the training game "Minefield" have been developed. In each case, the inversion was based on modifying the object used as a "mine", which, accordingly, changed the results of the "explosions".

Before the training, one of the sappers was blindfolded. The other participants had to guide him correctly along the "mined" corridor. In this case, the sapper should not step on mines, as this will lead to "death" and negative results for the group. The other players should give a sapper the right tips, without entering the territory of the minefield and without touching the sapper.

During the training, the correctness of the game tasks was monitored and the number of errors was recorded. Several variants of the game were used: 1) in case the sapper stepped on a mine and "died", he dropped out of the game; if two groups competed, the winner was the one in which the smallest number of sappers "died"; 2) any case of "detonation" testified that not only the sapper, who stepped on a mine, returned to the starting position, but also all those players who had already successfully passed the minefield; 3) the players themselves could decide who was considered "dead" and who could be "resurrected"; 4) after passing a minefield, the

mines' places were changed. The success depended on the player's speed on the minefield, the number of dead, the interaction between the sappers, the originality of the methods of passing the minefield.

The main goal of the "Minefield" training was to develop constructive relationships within the group, mutual understanding, attention to each other, reflexive listening, friendliness, leadership and patience. The training game developed the vestibular apparatus, coordination of movements, orientation in space, mental stability and ingenuity.

In order to analyze the training games, we will outline some of them.

In the game "**Strange Mines**" personal belongings of sappers were used as mines (watches, military tickets, mobile phones), which made the game interesting and fun. The course of the training was recorded on camera and then shown to the sapper to interpret his actions. In some places, squeak toys were used as mines. Their loud squeak signaled an "explosion", which made the game more extreme.

In the game "Name mines" the names of all participants of the training were put on paper "mine-cards". The cards were put with signatures at the top so that everyone could see whose name was written. When a sapper stepped on a mine, the player whose name was written on the card "died" or performed a creative task.

Lighted candles were used as mines in the game "Ignition Mines". The sapper could either wear shoes or be barefoot. That depended on his level of preparation, self-confidence. The game took into account security measures.

In the game "Suspended minefield" mines were attached to the ceiling threads with tied weights hanging at different distances from the floor. The sapper, passing the "minefield" had to be careful not only not to step on the mines, but also not to touch them.

In the game "Mine Labyrinth" the group of sappers had to carry a bottle of water through the labyrinth, which was placed on a round surface. Threads were tied to the edges of the labyrinth. In order to successfully perform the task, each sapper had to coordinate his movements and actions with other participants. This version of the game developed the vestibular apparatus and psychomotor coordination of movements.

Statistical analysis

Statistical processing of the obtained data was conducted using the package "Statistica 8.0" (StatSoft, USA) and spreadsheets "Microsoft Office Excel 2010" (USA), which enabled the analysis of measurements and calculation of baseline values. In the process of mathematical processing of

the obtained data, the method of average values and the sampling method were used, which made it possible to obtain the arithmetic mean value; standard deviation; representativeness error; coefficient of variation. The conformity of the sample to the law of normal distribution was checked on the basis of the Shapiro-Wilk test. In the process of analysis of statistically significant differences between the samples, the level of reliability $P = 95.0\%$ was set (the significance level $p < .05$ was considered significant).

3. Results and discussion

During the psychomotor training of sappers, close attention was paid to the issue of fear regulation. Lieutenant-General of the Engineering Troops D. Karbyshev considered fear as an indispensable companion of the sapper's activity, a regulator of his behavior during demining. There is not a single sapper who does not feel fear while demining and neutralizing explosive devices. Fear is the sapper's guard, who tells him what is possible and what is not. To a large extent, a sapper remains alive due to being afraid. "You should be able to restrain fear, learn to control it, by not allowing it to control you", said D. Karbyshev addressing the sappers during World War II (Nedviga, 2019).

Interpretation of empirical data was preceded by verification of the hypothesis of the existence of a relationship between the two classifications, i. e. the existence of interdependence between the sources of personal fears and the professional activities of sappers (Conroy et al., 2007). The hypothesis was tested using the criterion χ^2 . The null hypothesis was that there was no connection between the professional activities of the sappers, the basic characteristics and the sources of personal fears.

The value of χ^2 with f degrees of freedom was determined by the formula:

$$\chi^2 = n \left[\sum_{i=1}^l \sum_{j=1}^k \frac{f_{ij}^2}{f_i f_j} - 1 \right], \text{ when}$$

$$f = (l - 1)(k - 1), \text{ where}$$

f – degree of freedom; l – number of sources of personal fears; k – the number of basic psychological measurements.

The obtained value of χ^2 was compared with the critical one. Since $\chi^2 >_{0,99} \chi^2_{54}$ ($\chi^2 = 88,63$; $_{0,99} \chi^2_{54} = 81,1$), the null hypothesis about the independence of classifications was rejected at the level of 0.01 ($\alpha = 0.01$),

i. e. the studied classifications are dependent. Thus, it is obvious that there is a strong positive relationship between the identified sources of personal fears of sappers and their professional activities.

Since all identified fears of sappers (except social ones) are forms of the fear of death, we conducted a preliminary study of the interdependence of fears “of death” and “of disability” as the dominant fears of sappers (Tabl. 1).

Table 1. Correlation between the manifestation of fears “of death” and “of disability” with the professional activity of servicemen-sappers (%)

Research subjects	Sources of personal fears	
	Fear of death	Fear of disability
<i>Sappers</i>	75.6	98.5

Source: Personal elaboration, 2021.

As we can see, the fear “of disability” (98.5) clearly outweighs the fear “of death” (75.6). This idea is confirmed in the sappers’ statements, “Better at once than to suffer all my life”, and is also reflected in the sappers’ feelings of pity towards his relatives, who will need to take care of a disabled soldier for the rest of his life.

In order to identify the internal structural relationships between the personal fears of sappers, we conducted a factor analysis of the obtained empirical data. When interpreting the selected factors, their element-by-element factor load was taken into account ($>.600$). Conclusions that the obtained indicators are confirmed in more than 65% of cases were taken at the level of significance of .05 and .001. Factor analysis of the sappers’ fears made it possible to identify 10 main factors that explain 72.03% of the total variance.

The first is a “disability” factor (10.85%), which is determined by fears: “to become disabled” (.94), “to get seriously injured” (.90). The second is the “death” factor (9.46%). It included fears: “death of comrades during demining” (.92), “fear of death” (.88), “death of the sappers of other engineering units” (.76). The third is the “minefield” factor (8.87%), that included the following fears: “explosion on a mine” (.84), “demining of improvised explosive devices” (.82), “mine of the unknown production” (.78), “fear of performing mine reconnaissance with a probe” (.76), “fear of the minefield” (.76), “controlled minefields” (.78). The fourth is the “anxiety” factor (8.12%), which consisted of the following fears: “making a mistake in detecting explosive objects” (.68), “failure to cope with the combat mission” (.64),

“uncertainty in the reliability of mine search equipment” (.58), “wrong decisions” (.57), “explicit feelings of anxiety before demining” (.65), “a mistake in marking the mined areas” (.72). *The fifth is the “social factor”* (7.34%), that included fears: “commander’s condemnation of sapper’s indecisiveness during demining” (.82), “problems in relations with commanders and colleagues” (.61), “unpleasant news from home” (.51). *The sixth is the “explosion factor”* (6.73%), that combines fears of “putting an explosive substance (TNT) on a mine with an equipped means of detonation” (.87), “neutralization of aircraft bombs” (.78), “transfer (transportation) of mines to places of detonation” (.65). *The seventh is the “tension” factor* (5.84%), that included the following fears: “performing a combat mission independently (individual demining)” (.75), “demining work in a confined space” (.63), “the need to pass the demining route first” (.63), “hand tremor during demining” (.50). *The eighth is the “psycho-traumatic factor”* (5.67%), which is determined by fears of “mental trauma” (.72), “severe infectious disease” (.54), “dead people” (.50). *The ninth is the “sharp intense impacts” factor* (4.86%), that combined fears of “unexpected sharp sounds from a minesweeper” (.71), “blasting of a search dog on a mine” (.53). *The tenth factor* is determined by a separate fear (4.29%) of “climatic and geographical conditions” (.68).

Based on the results of an empirical study of the relationship between the sources of sappers’ personal fears and their individual-typological characteristics, in particular the anxiety level, we obtained the following results (Tabl. 2).

Table 2. The relationship between groups of sappers’ personal fears and anxiety levels (%)

Groups of fears	Anxiety levels		
	high	middle	low
<i>Fear of disability</i>	70.47	14.51	15.02
<i>Fear of death</i>	24.78	59.68	15.54
<i>Fear of the minefield</i>	41.07	48.15	10.78
<i>Social fears</i>	26.21	36.76	37.03
<i>Fear of explosion</i>	46.09	3.63	50.28
<i>Psycho-traumatic fear</i>	16.79	55.93	27.28
<i>Fear of tension</i>	37.84	56.11	6.05
<i>Fears of sharp intense impacts</i>	20.62	45.30	34.08
<i>Fear of climatic and geographical conditions</i>	32.39	18.33	49.28

Source: Personal elaboration, 2021.

Depending on the dominant anxiety level, personal fears are expressed differently among the sappers. Fears of “becoming disabled” (70.47) are the most intense among sappers with a high anxiety level. The second place is taken by “fears of death” (59.68) and “fears of tension” (56.11), which prevail among sappers with a medium anxiety level. “Psycho-traumatic fears” (55.93), “minefield fears” (48.15) and “fears of sharp intense impacts” (45.30) are quite significant for sappers with an average anxiety level. The third place is shared by “fears of explosion” (50.28) and “fear of climatic and geographical conditions” (49.28), which are most pronounced among the sappers with low levels of anxiety. The “social fears” of the sappers were evenly distributed among the three levels of anxiety (26.21; 36.76; 37.03).

“Fears of explosion” (3.63) among sappers with an average level of anxiety were the least manifested. At the same time, this group of fears is quite significant for sappers with high and low levels of anxiety. The “fears of tension” is insignificant for sappers with a low level of anxiety (6.05). Compared to the fears of “becoming disabled”, that are the most pronounced among the people with a high level of anxiety (70.47), this group of fears is less prevalent among sappers with a medium (14.51) and low (15.02) levels of anxiety, by 55.96 and 55.45 percent, respectively.

The identified interdependence of groups of sappers’ fears and the anxiety levels make it possible to predict their behavior during demining and effectively involve them in combat missions (Derakshan & Eysenck, 2009; De Vibe et al., 2012; Dobkin et al., 20213).

In the study, considerable attention was paid to establishing the dependence of the behavior of sappers under the influence of fear and dominant character accentuations. The Leonhard-Smishek method was used to identify character accentuation and it was first found out to what extent the dominance of a certain character accentuation is reflected in the process of demining. Subsequently, the relationship between the sappers’ character accentuations and the sources of their personal fears was established (Tabl. 3).

Table. 3. Types of accentuations of sappers involved in combat missions

Type of accentuation	Amount of detected accentuation %	Level of the demining performance
<i>Hypertensive</i>	34.4	high
<i>Distim</i>	6.8	low
<i>Cycloid</i>	9.2	middle
<i>Excitable</i>	5.8	low

<i>Stuck</i>	3.9	low
<i>Pedantic</i>	19.8	middle
<i>Anxious</i>	6.2	low
<i>Emotive</i>	4.3	middle
<i>Demonstrative</i>	5.1	high
<i>Exalted</i>	4.5	middle

Source: Personal elaboration, 2021.

The study made it possible to establish the presence of accentuation among 57.6% of people. The dominant type of character accentuation is the hypertensive type (34,4). The second and third most frequent accentuations among sappers are pedantic (19.8) and cycloid (9.2) types of accentuation. They were followed by distim (6.8), anxious (6.2), excitable (5.8), demonstrative (5.1), exalted (4.5) emotive (4.3), and stuck (3.9) types.

The psychological examination of the subjects showed that most types of accentuations are characterized by the predominance of fear “of disability” over the fear “of death”. It was also established that the hypertensive (15.7), distim (14.6), cycloid (affective-labile) (7.9), emotive (12.8), exalted (12.2), stuck (12.8) accentuations are characterized by the obvious prevalence of the fear “of disability”. Among the subjects of demonstrative (10.5), pedantic (9.6) and anxious (14.6) types, the fear “of death” is more intense. Among sappers of excitable accentuation (11.6; 10.1) these fears are almost equally manifested (Tabl. 4).

Table 4. Distribution of fears “fear of death” and “becoming disabled” between character accentuations of sappers (%)

Type of accentuation	Sources of personal fears	
	Fear of death	Fear of disability
<i>Hypertensive</i>	9.2	15.7
<i>Distim</i>	10.7	14.6
<i>Cycloid</i>	5.7	7.9
<i>Emotive</i>	6.5	12.8
<i>Exalted</i>	8.5	12.2
<i>Demonstrative</i>	10.5	6.4
<i>Stuck</i>	6.8	12.8
<i>Pedantic</i>	9.6	5.9
<i>Excitable</i>	11.6	10.1
<i>Anxious</i>	14.6	5.5

Source: Personal elaboration, 2021.

Fear “of death” had the highest percentage among the anxious accentuators (14.6). The lowest percentages were found among the individuals with cysloid (5.7), emotive (6.5) and stuck (6.8) accentuations. The fear “of disability” is intensely manifested among people with hypertensive (15.7) and distim (14.6) types of accentuation.

It was determined that the existing most common sources of sappers’ personal fears sappers have different frequency and intensity of manifestation depending on the prevalence of certain accentuative differences. That is, the sources of personal fears and accentuative differences of sappers are closely related, which has been confirmed in a number of studies (Anglin et al., 2017; Hjeltne et al., 2015; Yen, 2020).

In the *third* series of the psychological experiment, the effectiveness of the psychological training “Minefield” was tested. It was found out how much the training program helped reduce the anxiety level and personal fears of sappers, as well as increased stress resistance and self-improvement of psychomotor and sensory-intuitive skills needed to regulate their actions during combat missions in the minefield (Ozerov, 2002).

The criteria that contributed to the effectiveness of the training program were: a) understanding of the traumatic impact of the mined area on the sapper’s personality; b) expansion of the sapper’s motivational potential; c) the sapper’s desire to reduce the level of risky actions; d) development of self-regulation and sensory-intuitive skills of behavior during a combat mission in a minefield; e) the effectiveness of mutual understanding and support during the combat mission (Cucui, 2017; Shinkaryuk, 2005; Stanculescu, 2016).

According to the results of psychological training, there were some positive personal changes among the researched subjects, namely: improving self-control, understanding the role of critical thinking in the process of demining and disposal of ammunition, the development of the vestibular apparatus and coordination of movements in general. These changes contributed to the sapper’s self-improvement, anticipation, patience, the ability to adequately assess the situation in the minefield, the ability to make quick decisions, stay calm in tense situations.

After comparing the results obtained before and after the psychological training, we have noticed an increase in the number of individuals with low anxiety (24.3) and a decrease in the number of sappers with medium (47.9) and high (27.8) anxiety levels. Due to the proximity to real circumstances, the training exercises broadened the sapper’s comfort zone and contributed to the productivity growth in the dangerous conditions of a minefield (Tabl. 5).

Table 5. Indicators of the sappers' anxiety levels "before" and "after" the psychological training "Minefield"

Anxiety level	Number of sappers (%)	
	"Before" the psychological training	"After" the psychological training
<i>Low (2 – 8)</i>	20.7	24.3
<i>Middle (9 – 12)</i>	49.2	47.9
<i>High (13 – 14)</i>	30.1	27.8

Source: Personal elaboration, 2021.

Due to the training exercises, there was a decrease in sapper's internal tension, increased resistance to stressors, increased energy and emotional tone, which helped improve spatial orientation and ingenuity during combat missions.

The training exercises, which required reflexive listening, patience, slowness and elegance of action and were based on mutual understanding and support between sappers, concomitantly helped reduce their personal fears (Tabl. 6).

Table 6. Indicators of sappers' personal fears "before" and "after" the psychological training "Minefield"

Research subjects	Sources of personal fears "before" the psychological training (%)		Sources of personal fears "after" the psychological training (%)	
	Fear of death	Fear of disability	Fear of death	Fear of disability
Sappers	75.6	98.5	74.2	97.3

Source: Personal elaboration, 2021.

According to the results of the sappers' reports, the training exercises "Strange Mines", "Ignition Mines", "Suspended Minefield", "Mined Crossroads" and "Mined Lie" allow to fully reproduce the real minefield and thus develop the sappers' ability to regulate personal fears. At the same time, we should state that the sappers' level of the personal fear "of death" remained almost the same (74.2). This is probably due to the sapper's awareness that his personal equipment, in case of an unpredicted mine

explosion, has a low level of protection, compared to other specialists of engineering and sapper units.

The training exercises “Live Mines”, “Spider Web”, “Mined Forfeit” and others helped improve the effectiveness of combat missions among the sappers with dominant anxious, distim, excitable and stuck types of accentuation. The efficiency of these processes of demining was low before the psychological training (Tabl. 7).

Table 7. The influence of the sappers’ character accentuations on the effectiveness of combat missions “before” and “after” the psychological training “Minefield”

Type of accentuation	Detected accentuation (%)	Level of the sapper’s performance “before” the psychological training	Level of the sapper’s performance “after” the psychological training
<i>Hypertensive</i>	34.4	high	high
<i>Distim</i>	6.8	low	middle
<i>Cycloid</i>	9.2	middle	middle
<i>Excitable</i>	5.8	low	middle
<i>Stuck</i>	3.9	low	middle
<i>Pedantic</i>	19.8	middle	middle
<i>Anxious</i>	6.2	low	middle
<i>Emotive</i>	4.3	middle	middle
<i>Demonstrative</i>	5.1	high	high
<i>Exalted</i>	4.5	middle	middle

Source: Personal elaboration, 2021.

The introduced psychological training “Minefield” promoted the development of professionally necessary qualities among sappers; provided the development of psychomotor and sensory-intuitive skills to regulate movements and actions during the combat mission in the minefield; improved constructive relations in the unit. The training exercises improved the sapper’s vestibular apparatus, his coordination of movements, spatial orientation and mental stability.

It was established that the simulated dangerous conditions can increase the productivity of the sapper’s psychomotor activity (Ajumunisha & Tholappan, 2018). This statement clearly confirms the hypothesis of

M. Bernstein (1991) about the “law of rationality”, according to which in the case of excessive stress, when nerves and muscles are in the intense state, the body simply cannot afford useless movements, and as a result works “in the best way, and the sappers’ movements become as rational as possible”. I. Pavlov (1951) mentioned that the highest spiritual rise and physical strength of a man occur in a dangerous situation.

The results of the psychological experiment confirm the opinion of V. Klymenko (1997; 2013), that the specificity of the psychomotor problem in danger is largely determined by sensory-perceptual and intellectual fields of activity, which activate the sapper’s decision-making process.

Thus, the psychological training “Minefield” made it possible to turn the discipline “Blastings” into a lesson of effective thinking, feelings and imagination. The regular use of the suggested training exercises in the sapper’s educational process will ensure the effective psychomotor development, which will help reduce anxiety and personal fears (Ciomag, 2015; Murrihy et al., 2017).

4. Conclusions

The psychomotor training of a sapper should nowadays be considered not only as the initial functional level of development of the relevant mental and motor qualities, but also as a complex, multifaceted process that helps reduce personal fears and anxiety. The content of the sapper’s professional training should necessarily address the psychomotor development, as well as the military training.

Only the sappers, whose sensory-intuitive skills are balanced with the analytical mind, responsibility, excellent locomotion of arms and legs, coordinated movements and actions, accuracy, slowness, high endurance, stress resistance and resilience, can successfully cope with the tasks in the minefield. The psychological training has developed among the sappers the ability to make quick decisions, work alone for a long time and remain calm in the most stressful situations.

Source of Funding. No financial or material support was received in conducting this research or in preparing this manuscript.

Conflicts of interest. The authors declare no conflict of interest.

References

- Ajumunisha, A. B., & Tholappan, A. (2018). Psychomotor Domain of Bloom’s Taxonomy in Teacher Education. *Shanlax International Journal of Education*, 6(3), 11–14. <https://doi.org/10.5281/zenodo.1299766>

- Anglin, K. M., Novell, C. A., Murphy, J. S., & Goodwin, G. A. (2017). Identifying Predictors of Army Marksmanship: A Cognitive, Affective, and Psychomotor Perspective. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 61(1), 838–842.
<https://doi.org/10.1177/1541931213601683>
- Bernstein, N. A. (1991). *O lovkosti i yeye razvitiu* [About dexterity and its development]. Physical Culture and Sports.
- Blank, M., Garza, J. G., & Wade, B. R. (2014). Sapper-Athlete-Warrior Program: An Integrated Approach To Periodized Warrior Fitness. *Journal of Sport Psychology in Action*, 5(2), 73–87.
<https://doi.org/10.1080/21520704.2014.892912>
- Ciomag, R. V. (2015). Physical Education – Component of General Education – Means of Balancing the Human Body. Marathon Revista motricității umane. *Departamentul de Educație Fizică și Sport*, 7(1), 26–31.
<http://www.conferinte-defs.ase.ro/2015/pdf/01%20Physical%20Education/01%20Ciomag%20V ali.pdf>
- Conroy, D. E., Kaye, M. P., & Fifer, A. M. (2007). Cognitive links between fear of failure and perfectionism. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 25(4), 237–253. <https://doi.org/10.1007/s10942-007-0052-7>
- Cucui, G. G. (2017). Tracks utilitarian of applicative – means psychomotor skills development to young schoolchildren. *The European Proceedings of Social & Behavioural Sciences*, 2, 106–110. <https://doi.org/10.15405/epsbs.2017.07.03.15>
- Derakshan, N., & Eysenck, M. W. (2009). Anxiety, processing efficiency, and cognitive performance: new developments from attentional control theory. *European Psychologist*, 14(2), 168–176. <https://doi.org/10.1027/1016-9040.14.2.168>
- De Vibe, M., Bjørndal, A., Tipton, E., Hammerstrøm, K., & Kowalski, K. (2012). Mindfulness based stress reduction (MBSR) for improving health, quality of life, and social functioning in adults. *Campbell Systematic Reviews*, 8, 3.
<https://doi.org/10.4073/csr.2012.3>
- Dobkin, P. L., Hickman, S., & Monshat, K. (2013). Holding the heart of mindfulness-based stress reduction: Balancing fidelity and imagination when adapting MBSR. *Mindfulness*, 6, 404.
<https://doi.org/10.1007/s12671-013-0225-7>
- Khmlilar, O. F., & Nedviha, O. V. (2018). The psychology of the professional activity of a sapper. *Science and Education a New Dimension. Pedagogy and Psychology*, 155(65), 61–63.
https://www.researchgate.net/publication/328877088_The_psychology_of_the_professional_activity_of_a_sapper

- Khmiliar, O. F. (2019). *Psykhomotorni vlastyosti ofitsera* [Psychomotor properties of the officer]. COMPRINT.
- Khmiliar, O., Popovych, I., Hrys, A., Pavliuk, M., Zavatska, N., Lytvynenko, O., & Blynova, O. (2020). Spatial Regulation of Personality Behavior in the Conditions of Progression of the COVID-19 Pandemic. *Revista Inclusiones*, 7(SI), 289-306. <http://www.revistainclusiones.org/index.php/inclu/article/view/1760>
- Klimenko, V. V. (1997). *Mekhanizmy psykhomotoryky lyudyny* [Mechanisms of human psychomotor skills]. Knowledge.
- Klimenko, V. V. (2013). *Psykhofizyolohichni mekhanizmy praksysu lyudyny* [Psychophysiological mechanisms of human praxis]. Slovo Publishing House.
- Kononenko, O., Kononenko, A., Stynska, V., Kachmar, O., Prokopiv, L., Katolyk, H., & Popovych, I. (2020). Research of the factor structure of the model of world view settings at a young age. *Revista Inclusiones*, 7(3), 98–116. <http://www.revistainclusiones.org/index.php/inclu/article/view/1618>
- Nedviga, O. V. (2019). *Psykhologichne zabezpechennya profesiynoyi diyal'nosti viys'kovosluzhbovtziv-saperiv v osoblyvykh umovakh diyal'nosti* [Psychological support of the professional activity of servicemen-sappers under special conditions]. [Unpublished doctoral dissertation]. Chernyakhovsky National Defence University of Ukraine.
- Hemingway, E. A. (1974). Farewell to Arms. *Peaks of world literature*, 17, 347–354. http://www.kkoworld.com/kitablar/Ernest_Heminquey_Elvida_silah_eng.pdf
- Hjeltnes, A., Binder, P-E., Moltu, C., & Dundas, I. (2015). Facing the fear of failure: An explorative qualitative study of client experiences in a mindfulness-based stress reduction program for university students with academic evaluation anxiety. *International Journal of Qualitative Studies on Health and Well-being*, 10(1), 27990. <https://doi.org/10.3402/qhw.v10.27990>
- Howell, A. J., & Buro, K. (2011). Relations among mindfulness, achievement-related self-regulation, and achievement emotions. *Journal of Happiness Studies*, 12(6), 1007–1022. <https://psycnet.apa.org/doi/10.1007/s10902-010-9241-7>
- Hudimova, A. Kh. (2021). Psychological well-being and social media users' behavioral online patterns in everyday life and during COVID-19 pandemic. *Insight: the psychological dimensions of society*, 5, 133-147. <https://doi.org/10.32999/2663-970X/2021-5-9>
- Hudimova, A., Popovych, I., Baidyk, V., Buriak, O., & Kechyk, O. (2021). The impact of social media on young web users' psychological well-being during the COVID-19 pandemic progression. *Revista Amazonia Investiga*, 10(39), 50–61. <https://doi.org/10.34069/AI/2021.39.03.5>

- Murrihy, C., Bailey, M., & Roodenburg, J. (2017). Psychomotor Ability and Short-term Memory, and Reading and Mathematics Achievement in Children. *Archives of Clinical Neuropsychology*, 32(5), 618–630. <https://doi.org/10.1093/arclin/acx033>
- Nosov, P., Palamarchuk, I., Zinchenko, S., et al. (2020a). Development of means for experimental identification of navigator attention in ergatic systems of maritime transport. *Bulletin of the University of Karaganda – Physics*, 1(97), 58–69. <https://doi.org/10.31489/2020Ph1/58-69>
- Nosov, P. S., Popovych, I. S., Cherniavskiy, V. V., Zinchenko, S. M., Prokopchuk, Y. A., & Makarchuk, D. V. (2020b). Automated Identification Of An Operator Anticipation On Marine Transport. *Radio Electronics, Computer Science, Control*, 3, 158–172. <https://doi.org/10.15588/1607-3274-2020-3-15>
- Nosov, P. S., Zinchenko, S. M., Popovych, I. S., Ben, A. P., Nahrybelnyi Y. A., & Mateichuk, V. M. (2020c). Diagnostic System Of Perception Of Navigation Danger When Implementation Complicated Maneuvers. *Electronics, Computer Science, Control*, 1, 146–161. <https://doi.org/10.15588/1607-3274-2020-1-15>
- Okipnyak, K. A., Maliuk, M. G., & Okipnyak, O. S. (2016). Interpretation and substantiation of the model of a sapper taking into account the modern requirements. *Young Scientists*, 121(40), 491–496. <http://molodyvcheny.in.ua/files/journal/2016/12.1/113.pdf>
- Ozerov, V. P. (2002). *Human psychomotor abilities*. Phoenix+.
- Pavlov, I. P. (1951). *Otvet fizjologa psikhologam* [Physiologist's answer to psychologists]. USSR Academy of Sciences.
- Plokhikh, V. V. (2021). Assessment of subject's readiness for urgent actions using the variations of sensorimotor response tasks. *Insight: the psychological dimensions of society*, 5, 46–65. <http://doi.org/10.32999/2663-970X/2021-5-4>
- Plokhikh, V., Popovych, I., Zavatska, N., Losiyevska, O., Zinchenko, S., Nosov, P., & Aleksieieva, M. (2021). Time Synthesis in Organization of Sensorimotor Action. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, 12(4), 164–188. <https://doi.org/10.18662/brain/12.4/243>
- Popovych, I., Arbeláez-Campillo, D. F., Rojas-Bahamón, M. J., Burlakova, I., Kobets, V., & Bokshan, H. (2021a). Time perspective in the professional activity of specialists of economic sphere. *Cuestiones Políticas*, 39(69), 424–445. <https://doi.org/10.46398/cuestpol.3969.27>
- Popovych, I., Borysiuk, A., Zahrai, L., Fedoruk, O., Nosov, P., Zinchenko, S., & Mateichuk, V. (2020a). Constructing a Structural-Functional Model of Social Expectations of the Personality. *Revista Inclusiones*, 7(SI), 154–167. <https://revistainclusiones.org/index.php/inclu/article/view/354>

- Popovych, I., Chervinskyi, A., Kazibekova, V., Chervinska, I., & Machynska, N. (2021b). Estudio empírico de la tipología de expectativas sociales del individuo. *Amazonia Investiga*, 10(43), 112-122.
<https://doi.org/10.34069/AI/2021.43.07.11>
- Popovych, I., Kononenko, O., Kononenko, A., Stynska, V., Kravets, N., Piletska, L., & Blynova, O. (2020b). Research of the Relationship between Existential Anxiety and the Sense of Personality's Existence. *Revista Inclusiones*, 7(SI), 41-59.
<http://www.revistainclusiones.org/index.php/inclu/article/view/300>
- Popovych, I., Shevchenko, A., Galvez, L. M., Klenina, K. (2021c). Research of the relationship between social desirability and value orientations of adolescents. *Revista Notas Históricas y Geográficas*, 26(1), 241–268.
<https://www.revistanotashistoricasygeograficas.cl/index.php/nhyg/article/view/339>
- Schneck, W. C. (1998). The origins of Military Mines. *Engineer Bulletin*, 7, 46–49.
<https://man.fas.org/dod-101/sys/land/docs/980700-schneck.htm>
- Shevchenko, R., Cherniavskiy, V., Zinchenko, S., Palchynska, M., Bondarevich, S., Nosov, P., Popovych, I. (2020a). Research of psychophysiological features of response to stress situations by future sailors. *Revista Inclusiones*, 7(SI), 566-579.
<http://www.revistainclusiones.org/index.php/inclu/article/view/1780>
- Shevchenko, R., Popovych, I., Spyska, L., Nosov, P., Zinchenko, S., Mateichuk, V., & Blynova, O. (2020b). Comparative analysis of emotional personality traits of the students of maritime science majors caused by long-term staying at sea. *Revista Inclusiones*, 7(SI), 538-554.
<http://www.revistainclusiones.org/index.php/inclu/article/view/1309>
- Shinkaryuk, A. I. (2005). *Psykhomotorno-rivneva struktura aktyvnosti ta svobody sub'yekta* [Psychomotor-level structure of activity and freedom of the subject]. Oium.
- Sloan, C. E. (1986). *Mine warfare on land*. Brassey's Defence Publishers.
- Sopa, I., & Pomohaci, M. (2019). Testing the Psychomotor Training in the Military Pentathlon at the 50 m Race with Obstacle. *Land Forces Academy Review*, 24(4), 283–290. <https://doi.org/10.2478/raft-2019-0035>
- Stanciulescu, R. (2016). Development of basic physical qualities, essential condition for creating a competitive physical capacity. *Scientific Bulletin of the Academy of Land Forces. Nicholas Balcescu*, 21, 1(41), 54–60.
<https://doi.org/10.1515/bsaft-2016-0037>
- Stasiuk, V. V., Primak, P. T., & Khmiliar, O. F. (2009). *Psykhologichne zabezpechennya profesiynoyi diyal'nosti saperiv-myrotvortsiv* [Psychological support of professional activity of peacekeepers]. Aspect-Polygraph LLC.

- Strutynsky, V., Kotsiuruba, V., Dovhopoliy, A., Husliakov, O., Budianu, R., Kolos, O., & Hrechka, I. (2019). Substantiating the requirements to functional indicators for the manipulators of mobile robotic demining complexes. *Eastern-European Journal of enterprise technologies*, 5/7(101), 42–50.
<https://doi.org/10.15587/1729-4061.2019.178466>
- Tofan, M-P. (2018). The role of sports competitions in the military environment. *International Scientific Conference “Strategies XXI”: technologies – military applications, simulations and resources*, Bucharest, 2, 259–262.
https://www.academia.edu/39968841/STRATEGIES_XXI_TECHNOLOGIES_MILITARY_APPLICATIONS_SIMULATION_AND_RESOURCES
- Yen, T. T. H. (2020). Game-Based Learning: An Innovative and Scalable Approach to Mine Risk Education. *Journal of Conventional Weapons Destruction*, 23(3), 31–34. <https://commons.lib.jmu.edu/cisr-journal/vol23/iss3/8>
- Zinchenko, S. M., Ben, A. P., Nosov, P. S., Popovych, I.S., Mamenko, P., & Mateichuk, V. (2020). Improving The Accuracy And Reliability Of Automatic Vessel Moution Control System. *Radio Electronics, Computer Science, Control*, 2, 183-195. <https://doi.org/10.15588/1607-3274-2020-2-19>
- Zinchenko, S., Nosov, P., Mateichuk, V., Mamenko, P., Popovych, I., & Grosheva, O. (2019). Automatic collision avoidance system with many targets, including maneuvering ones. *Bulletin of university of Karaganda*, 96(4), 69-79.
<https://doi.org/10.31489/2019Ph4/69-79>
- Zinchenko, S., Tovstokoryi, O., Nosov, P., Popovych, I., & Kyrychenko, K. (2022). Pivot Point position determination and its use for manoeuvring a vessel, *Ships and Offshore Structures*,
<https://doi.org/10.1080/17445302.2022.2052480>