# Reliability in an extreme situation in managerial activity

*Ramil* Suleymanov*, *Natalya* Klimanova, *Galina* Semenova-Poliakh

Kazan Innovative University named after V.G. Timiryasov (IEML), Kazan, Russia

**Abstract.** The article presents a new approach to researching reliability in an extreme situation in mid-level managers (males and females). We assessed reliability of psychomotor activity in an extreme situation, psychoemotional stability, and stability of the functional asymmetry of brain hemispheres. It was shown that psychoemotional stability is the most important reliability parameter in managerial activity, while for practitioners (civilians and enforcers) stability of thinking is the most important. For executives, psychoemotional stability is important for decision making in extreme situations, while for practitioners most important is the ability to adequately and effectively perform actions. The proposed approach to studying executives via diagnosing psychophysiological parameters provides an informative material for its effective use in professional selection and recruiting to executive and practitioner positions. By the example of diagnostics of male and female executives, as well as practitioners (civilians and enforcers) one can see how the reliability structure changes in compliance with the activity specificity. The reliability diagnostics indicators can be effectively used to specify the patterns of individual reliability of an executive or an employee.

## 1 Introduction

Performance of any enterprise or organization depends on the psychological features of its head [1–16]. The issue of researching a personality was thoroughly studied by A.L. Zhuravlev [6]. In his opinion, personality features of effective executives are insufficiently studied.

In the western literature, the personality problem is reduced to leadership qualities. The leadership issues were considered by J.A. Conger [17] and D. DeCremer and D. Van Knippenberg [18]. In particular, they studied the aspects of charismatic and transforming leadership in an organization, in terms of leaders promoting cooperation between executives and employees. These aspects were also studied by G. Yukl [19]. M. J. B. Maah and S. Ghavifekr [20] showed the capabilities of effective leaders in state and private universities of Malasia, while J. Jyoti and S. Bhau [21] offered their own approach to researching the impact of transformational leadership on labor productivity. They also paid

* Corresponding author: souleimanov@ieml.ru

special attention to the role of cooperation between a leader and a team member and identification of their relationships.

M. Cakir and Adiguzel Ipe [22] paid special attention to the knowledge exchange in organizations, which is very important, as the organization performance depends on the well-coordinated work of its various substructures. Ö. Yeniçeri and Y. Demirel [23] considered obstacles in the process of the knowledge exchange in organizations.

J.R. Hackman [24] studied the key features of self-regulated executive divisions, paying special attention to how authorities are distributed among those who perform work and those with mainly managerial duties.

Y. Gürkan [25], in line with the proposed management conception, showed the dependence of efficiency on modern managerial approaches.

While much attention is paid to personality qualities and leadership abilities of managers, there are few researches concerning reliability of executives, in particular, reliability in extreme situations.

Human reliability in an extreme situation of professional activity plays an important role in increasing the performance efficiency. Any system, be it a machine or a human being, has the important property of stability in performing actions and activity in general. Human reliability as a complex system is directly manifested in activity and influences its efficiency. In an enterprise, a lot depends on reliability of a person, especially an executive. It includes decision making under extreme conditions, adequacy of actions, and personnel management. In particular, psychoemotional stability and stability of thinking in extreme situations promotes adequate decision making.

Reliability is generally studied in representatives of dangerous professions: rescue service staff, firefighters, operational officers of Internal Affairs, etc. However, there is actually no literature data on studying reliability of executives in extreme situations. But it is they that have to make urgent decisions in high-tech industries.

Reliability in extreme situations was thoroughly studied by Yu.A. Tsagarelli (2009). He distinguishes the following components of reliability: psychoemotional stability, regulation of psychoemotional state, stability of the functional asymmetry of brain hemispheres and its regulation, as well as stability in performing actions in background conditions and in extreme situations [26].

Today, many women work in production industries (plants), some of them occupy mid-level executive (managerial) positions. Compared to men, they face more difficulties executing their duties, as the attitude of men towards women executives is often negative. Second, it is harder for women to endure physical and psychological load. Also, it is psychologically harder for the industrial workers to obey women than men. Hence the problems related both to interaction and performance efficiency. There are few publications in the scientific literature, devoted to managerial activity of women. Most of the publications concerning industrial management do not specify the gender of managers; however, as most of the industrial managers are men, researches are devoted to “men’s” management styles. At the same time, women persistently gain their right for responsible positions in industrial management. These trends keep being more and more vivid in modern industries. The management styles and social-psychological spheres are different in men and women, being still understudied and psychologically underspecified. Hence the scientific problem, the essence of which lies in the need to research the social-psychological sphere of male and female executives, which influences the success and efficiency of their performance. Solving this problem is topical for psychology, as it allows broadening the scientific knowledge about the gender features of mid-level executives, which influence the success and reliability of their performance in extreme situations. Practically, this knowledge may serve as the basis for elaborating programs of professional training for executives (males and females).

## 2 Methodology of research

The theoretical and methodological foundation of the research was the theory and practice of systemic diagnostics of a human being and, in particular, the concept of reliability in an extreme situation by Yu.A. Tsagarelli [26].

In compliance with the task set, we carried out a research of 51 mid-level executives, among them 35 males and 16 females aged 23 to 69 y.o. The average age of the subjects was 40 y.o.

Reliability in an extreme situation is interpreted by Yu.A. Tsagarelli as "a property of a human being to faultlessly, duly, steadily and with the necessary accurateness execute the task set in an extreme situation" [26, p. 329].

The diagnostics was performed with a multifunctional "Aktivatsiometr ATs–9" device [26]. The following aspects were studied: psychoemotional stability (PS), stability of psychomotor activity in an extreme situation (SPAES), self-regulation of mental states (SRMS), stability of thinking (ST), thinking self-regulation coefficient (TSRC), stability of psychomotor activity under background (background stability) and extreme (extreme stability) conditions.

1. Psychoemotional stability (PS). Psychoemotional stability is "the stability of a mental state in extreme and tense situations" [26, p. 343]. Psychoemotional stability is important for any employee, and an executive is no exception. Insufficient psychoemotional stability negatively influences psychological reliability, often leading to emergencies, conflicts between employees or between an executive and employees. Diagnostics of psychoemotional stability is important for predicting an employee's behavior in an extreme situation.

2. Stability of psychomotor activity in an extreme situation (SPAES). Yu.A. Tsagarelli interprets stability of psychomotor activity in an extreme situation as a professionally significant property for representatives of various professions. It is characterized by failure-free and faultless activity under extreme conditions. That is, it is flawlessness (stability) of psychomotor actions and activity under extreme conditions [26, p. 340]. Stability of psychomotor activity is important for executives, as situations often occur when under extreme conditions they take initiative to prevent the consequences of the emergency.

3. Self-regulation of mental states (SRMS) plays a significant role in the structure of reliability. An executive must be able to remove tension, which is essential for their health. Cases of infarctions and strokes of executives in their working place are not rare. Such cases manifest insufficient mastering of methods and techniques of self-regulation of mental states.

4. Stability of thinking (ST). Stability of thinking is "the ability not to change the characteristics of thinking in an extreme situation" [26, p. 348].

Given that stability of thinking depends on the functional asymmetry of brain hemispheres, its indicator is the "stability of functional asymmetry of brain hemispheres (SFABH) as the ability not to change the asymmetry of the hemispheres' activation in an extreme situation" [ibid.]. It is the stability of interhemispheric balance of activation. Stability of thinking determines the adequacy and promptness of decision making in an extreme situation.

5. Thinking self-regulation coefficient (TSRC). Thinking self-regulation is the "ability to regulate thinking under the influence of autonomous impacts" [26, p. 355]. Practically, this is related to how well an executive can regulate and discipline one's cognitive activity in an extreme situation. The ability to manage one's cognitive activity is directly related to intellectual abilities and aptitude for learning.

6. Stability of psychomotor activity under background (back. st.) and extreme (ext. st.) conditions. Stability is related to result reproducibility. It is manifested both in regular and

extreme situations. At that, according to Yu.A. Tsagarelli, stability in an extreme situation occupies a higher position in the hierarchy compared to stability under background conditions. The latter is the basis and a necessary condition of the stability in an extreme situation [26, p. 357]. The background stability influences reliability in extreme situations indirectly through extreme stability.

An indicator for stability under extreme conditions is the reproducibility of results of managerial activity in an extreme situation. An indicator for background stability is the reproducibility of results of managerial activity under regular conditions [26, p. 357].

7. Preparedness is viewed as a synthesis of special knowledge, skills and competences, providing the possibility for quality execution of activity [26, p. 330]. Diagnostics of preparedness is performed with the technique of expert assessment. It is related to quality performance of any activity, both under regular and extreme conditions. Complex activity requires higher preparedness. Preparedness of an executive is associated with mastering basic competences, such as the ability of integrate people's intellect, the ability to form and develop goal-oriented teams of actively and fruitfully interacting employees, etc. [27, p. 26].

## 3 Research results

The results of executives (males and females) in reliability in extreme situations are shown in Fig. 1.

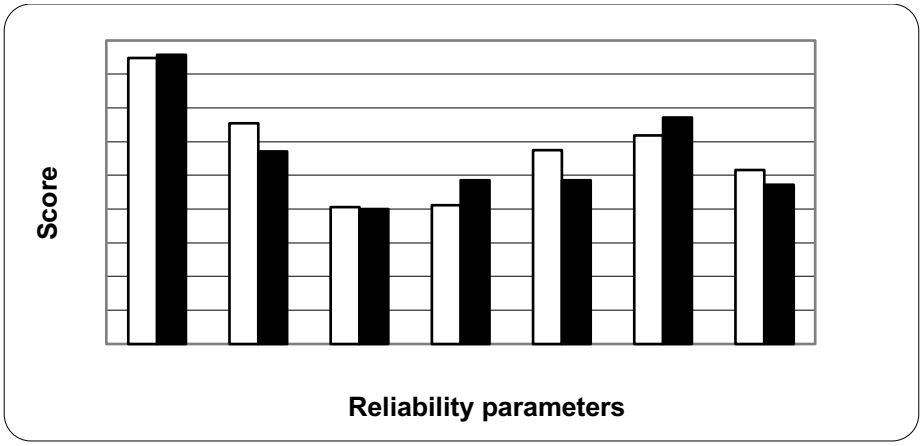


**Fig. 1.** Manifestation of the parameters of reliability in an extreme situation in executives (males and females).
**Legend:** Row 1 – executives-men, row 2 – executives-women.

Reliability parameters: 1) psychoemotional stability, 2) stability of psychomotor activity in an extreme situation, 3) self-regulation of mental states, 4) stability of functional asymmetry of brain hemispheres (SFABH), 5) self-regulation of functional asymmetry of brain hemispheres (SRFABH), 6) stability of executing actions under background conditions, 7) stability of executing actions under extreme conditions.

The results of comparing (by average indicators) of men and women executives by reliability in extreme situations showed the absence of significant differences in all parameters ($p > 0.05$).

However, it is interesting to compare men and women executives by the unit weight of each component in the structure of reliability in an extreme situation in each group (see Table 1).

**Table 1.** Unit weights of the components of reliability in an extreme situation among executives – men and women.

| **Executives – men** | | | **Executives – women** | | |
|---|---|---|---|---|---|
| **Ranking** | | **Unit weight %** | **Ranking** | | **Unit weight %** |
| 1 | PS | 21,05 | 1 | PS | 21,73 |
| 2 | SPAES | 16,24 | 2 | back. st. | 17,02 |
| 3 | back. st. | 15,33 | 3 | SPAES | 14,49 |
| 4 | TSRC | 14,28 | 4-5 | ST | 12,31 |
| 5 | ext. st. | 12,78 | 4-5 | TSRC | 12,31 |
| 6 | ST | 10,22 | 6 | ext. st. | 11,95 |
| 7 | SRMS | 10,07 | 7 | SRMS | 10,14 |

**Legend:** PS – psychoemotional stability, SPAES – stability of psychomotor activity in an extreme situation, SRMS – self-regulation of mental states, ST – stability of thinking, TSRC – thinking self-regulation coefficient; back. st. – stability of psychomotor activity under background conditions, ext. st. – stability of psychomotor activity under extreme conditions.

As can be seen from Table 1, psychoemotional stability is the most expressed parameter for both male and female executives. It should be noted that in many works on psychology of law-enforcement activity, psychology of extreme situations, and psychology of sport reliability in an extreme situation is reduced to psychoemotional stability. Actually, it is hard to imagine an emotionally unstable executive, who is not able to manage one's emotions and productive interaction with the subordinates.

Characteristically, male executives surpass women in the stability of psychomotor activity in an extreme situation. In men, this parameter ranks second by unit weight, in women it ranks third. Rather often, especially in dangerous industries, men must have, besides physical strength, temperance and will power. Executives-men often have to take responsibility in extreme situations and do the job together with employees.

Another important feature of the reliability structure in both groups is that one of the most significant components is the stability of psychomotor activity under background conditions. In female executives this parameter ranks second by unit weight, in men it ranks third. Actually, stability is essential for any activity. As for managerial work, it should be noted that background stability serves as the basis for stability in extreme situations. In this respect, stability is essential as a system-forming factor, influencing the reliability of executives.

One more feature of the reliability structure in both male and female executives is that stability of thinking ranks higher in women (rank 4–5) compared to men (rank 6). This is due to the fact that men, because of their physical and psychological qualities, and especially because of the current tradition, more often do physical jobs. Also, they are traditionally considered to be defenders (of the Motherland, the family, etc.). This is a norm for any man. This is apparently not accidental that men are advanced in terms of psychomotor activity in extreme situations, as well as in terms of stability of psychomotor activity in extreme situations. At the same time, stability of thinking in women is the factor allowing them not to lose self-control, think steadily in an extreme situation, and stay mobilized, which positively influences their managerial activity.

Although the reliability of executives (males and females) was mainly determined by their psychoemotional stability, they are distributed rather evenly by other parameters, judging by their unit weights. It means that each component of reliability contributes to the overall structure of reliability of executives in extreme situations.

Further we compare the obtained results by reliability in extreme conditions in executives – civilians and enforcers (see Table 2) [26].

**Table 2.** Unit weights of the components of reliability in an extreme situation in civilians and enforcers [26].

| Civilians | | | Enforcers | | |
|---|---|---|---|---|---|
| **Ranking** | | **Unit weight %** | **Ranking** | | **Unit weight %** |
| 1 | ST | 21 | 1 | SRMS | 21 |
| 2 | TSRC | 18 | 2 | ST | 17 |
| 3 | ext. st. | 16 | 3 | SPAES | 16 |
| 4 | SRMS | 14 | 4 | ext. st. | 16 |
| 5 | SPAES | 14 | 5 | TSRC | 12 |
| 6 | back. st. | 11 | 6 | back. st. | 11 |
| 7 | PS | 6 | 7 | PS | 7 |

**Legend:** PS – psychoemotional stability, SPAES – stability of psychomotor activity in an extreme situation, SRMS – self-regulation of mental states, ST – stability of thinking, TSRC – thinking self-regulation coefficient; back. st. – stability of psychomotor activity under background conditions, ext. st. – stability of psychomotor activity under extreme conditions.

Enforcers are law enforcement officials (departments of internal affairs, state fire-fighting service, and corrections department), while the civilians are trade personnel, professors, and students. It should be highlighted that the civilians and enforcers are subordinates, that is, practitioners. For us, it is interesting to compare reliability of executives and practitioners. Comparing the structure of reliability of executives with those of the civilians and enforcers, one may notice a striking difference. In particular, while for the executives the unit weight of psychoemotional stability occupied the largest share, it was the last in ranking for the civilians and enforcers, constituting just 6–7% of the whole structure. As Yu.A. Tsagarelli explains, psychoemotional stability is the factor reducing the postponed negative mental states (post-stress states, post-traumatic syndromes, etc.). That is why, psychoemotional stability as a direct factor of reliability in extreme situations in less important for practitioners than for executives.

At the same time, stability of thinking occupies the leading positions in executives. In practitioners, stability of thinking directly influences the adequacy and efficiency of their performance. For example, if thinking is unstable, any change in the algorithm of actions under extreme conditions leads to a failure. In this case, stability of thinking compensates the change in the algorithm of actions and results in the behavior adequate to the current situation. As for the executives, stability of thinking is important to make correct and adequate decisions. In this case, thinking relies on psychoemotional stability, creating the basis for stability of thinking. Thus, stability of thinking is important both for executives and practitioners, but is manifested differently in their activity.

## 4 Discussion of the results

The results showed that diagnostics of reliability in extreme situations is a highly informative indicator, which can be effectively used in professional selection and recruiting. For mid-level executives (males and females), such components of reliability are important as psychoemotional stability, stability of psychomotor activity in an extreme situation, stability of psychomotor activity under background conditions, while stability of thinking is important for civilians, including representatives of various professions, and enforcers. For executives, psychoemotional stability is important for decision making in extreme situations, while for enforcers and civilians – actually, practitioners – the ability to adequately and effectively perform actions is most important.

## 5 Conclusion

Summarizing the above, we should note that the diagnostics of reliability in extreme situations is an important tool, which allows obtaining objective data on each incumbent for a certain position and can be effectively used in professional selection and recruiting. By the example of diagnostics of male and female executives, as well as practitioners (civilians and enforcers) one can see how the reliability structure changes in compliance with the activity specificity. The reliability diagnostics indicators can be used to specify the patterns of individual reliability of an executive or an employee.

## Acknowledgment

The article was prepared with the financial support of Kazan Innovative University named after V. G. Timiryasov.

## References

1. T. Yu. Bazarov, *Psychology of personnel management* (2016)
2. D. M. Bagdzhyunene, *Social-psychological features of a personality of a production collective executive*, Abstract of a PhD thesis. Leningrad (1983)
3. I. G. Belkov, *Personality of an executive and management style* (1992)
4. E. B. Voronova, *Personality of an executive in the system of management*: *Sociological-economic analysis,* PhD (Sociology) thesis (1993)
5. L. A. Dedusheva, M. N. Kuzina, E. V. Astratenkova, *Sociology and psychology of management* (2019)
6. A. L. Zhuravlev, *Psychology of joint activity* (2005)
7. A. T. Zub, *Psychology of management* (2015)
8. V. V. Kozlov, *Psychology of management* (2017)
9. V. A. Konovalenko, M.Yu. Konovalenko, A.A. Solomatin, *Psychology of personnel management* (2016)
10. L. M. Korolev, *Psychology of management: tutorial* (2016)
11. M. E. Litvak, *Command or obey*? *Psychology of management* (2018)
12. M. E. Litvak, T.A. Soldatova, *How to manage oneself, one's business and fate: Practical psychology of management* (2018)
13. E. S. Chugunova, S. M. Mikheeva, *Experience of applying the group technique of engineers' personality assessment.* Lithuanian Scientific-Research Institute of Scientific-Technical Information and Technical-Economic Research (1977)
14. A. M. Rudenko, *Psychology of personnel management* (2015)
15. S. I. Samygin, *Psychology of management* (2016)
16. S. I. Samygin, G. I. Kolesnikova, S. N. Epifantsev, *Sociology and psychology of management* (2015)
17. J. A. Conger, *Charismatic and transformational leadership in organizations: An insider's perspective on these developing streams of research*, The Leadership Quarterly, **10**, 145-179 (1999)

18. D. De Cremer, D. Van Knippenberg, *How do leaders promote cooperation? The effects of charisma and procedural fairness*. Journal of Applied Psychology, **87**, 858-866 (2002)
19. G. Yukl, *Leadership in organizations. Pearson Education. The effect of leader outcomes on influence, attributions, and perceptions of charisma*. Journal of Applied Psychology, **84**, 428-436 (2013)
20. M. J. B. Maah, S. Ghavifekr, *Determining the key capacities of effective leaders in Malaysian public and private focused universities*, Sage Open, **8(4)**, 1-12 (2018)
21. J. Jyoti, S. Bhau, *Impact of transformational leadership on job performance: Mediating role of leader–member exchange and relational identification*, Sage Open, **5(4),** 1-13 (2015)
22. M. Cakir and Adiguzel Ipe, *Knowledge sharing in organizations: A conceptual framework*, Human Resource Development Review, **2(4),** 337-359 (2003)
23. Ö. Yeniçeri, Y. Demirel, *A study on organizational and individual impediments against knowledge sharing in organizations*, Karamanoglu Mehmetbey University Journal of Social and Economic Research, **12(9),** 221-234 (2007)
24. J. R. Hackman, *The psychology of self-management in organizations*, Psychology and work: Productivity, change, and employment, 89-136 (1986). Access mode: https://doi.org/10.1037/10055-003
25. Y. Gürkan, *Performance concept and performance management in organizations in line with contemporary management approach*, Vergi Dünyası, **169**, 48-69 (1995)
26. Yu.A. Tsagarelli, *Systemic diagnostics of a person and development of mental functions* (2009)
27. G. B. Morozova, *Psychological support of an organization and personnel* (2006)