Scientific Journal of the Military University of Land Forces
ISSN: 2544-7122 (print), 2545-0719 (online)
2019, Volume 51, Number 4(194), Pages 733-745
DOI: 10.5604/01.3001.0013.6469

Original article

Creativity and leadership: neurocognitive insights in use

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INFORMATIONS

Article history:

Submited: 02 August 2018

Accepted: 06 November 2018

Published: 16 December 2019

ABSTRACT

Creativity is seen as the "basis of competitive advantage". Therefore it also is distinguishes the more from the less successful military leader. This quality of leaders is so important that it is one of the Austrian Armed Forces Leadership Principles: flexibility (in mind and manoeuvre) – being flexible in thought and action, to be mentally versatile. To increase the chances for extraordinary creative outcomes there are several aspects, which can be used in the DMP, in military training as well as in leadership. This article focuses on stimulus variation, reference level variation, association variation, emotional state variation, reduced and focused attention. By linking these aspects with steps of the decision making process, training and leadership new approaches in the daily business can be found and better achievements reached.

KEYWORDS

creativity, flexibility in mind, success, leadership, DMP

Introduction

Importance of creativity in working processes is seen as critically important [1, p. 3-16]. "Creativity is defined as production of high quality, original, and elegant solutions to problems" [1, p. 4]. Creativity is also seen as the "basis of competitive advantage and the primary source of firm's profitability" [2, p. 116]. As a result, the leadership has to be creative, or evoke creativity in the sphere of its action and influence. Therefore, it is no surprise that leadership research forms theories, which relate leadership patterns to outcomes like creativity or effectiveness [3, p. 356]. As a consequence, leadership processes and leadership development have to include aspects to enhance creativity and prevent disrupting influences.

These conclusions also apply to military leadership. Although measurement of success is not directly economically derivable as it is in corporations, success of military leaders in mission depends on their ability to be mentally flexible in terms of behaviour, [4] problem solving [5, p. 331] and other cognitive fields [6]. This quality of leaders is so

important that it constitutes one of Austrian Armed Forces Leadership Principles: flexibility (in mind and manoeuvre) – being flexible in thought and action, being mentally versatile [7, p. 36]. However, is it possible to enhance creativity? How does it relate to leadership and its processes? In what way can it be used by military leaders?

John Anderson summarised Nobel laureate Herbert Simon's work on problem-solving capacities with simple reduction that "great intelligence performances (…) are based on elementary cognitive processes" [8, p. 3]. Consequently, the use of neurocognitive scientific knowledge supports leadership in answering the above-mentioned questions. Therefore, this paper will focus on the enhancement of creativity according to military decision-making processes as well as military training in order to prepare leaders to perform better in the VUCA [4, p. 490] world. For the sake of setting the frame for this publication, leadership, creativity and creative processes are outlined shortly. In the beginning, we will discuss leadership. How it could be defined, and what it means for creativity of a process, of human interaction. From that point on, the focus will shift to creativity, creative processes (including the military decision-making process), and the findings of neurocognitive science explaining the genesis of the novel. In the next step these topics will be combined so that these "aspects of creative work" can be connected with the decision-making process. Hereupon creativity aspects will be linked back to military training and leadership in general.

1. Leadership

The Austrian Armed Forces define leadership as a "general, direction-giving, steering and motivating influence on people and organisations in order for them to accomplish a mission and optimise the organisation" [9]. Rolf Wunderer, a German economic professor who focused his research on management and leadership, defined the term as a "goal- and outcome-oriented, activating and bidirectional social interaction to fulfil mutual tasks in and with an organised working environment" [10, p. 4]. Contrary to management, which is focused on regulating processes [11, p. 15], leadership has to focus on people. In other words, managers focus on systems and administration whereas leaders focus on people and development [12, p. 49]. The thing that these definitions have in common is that leadership means to influence people in order to achieve objectives. The discussion about the possibility of motivating people, in what way – intrinsic and extrinsic – as well as the aspects of sources of these drives, will not be part of this paper. Despite the interesting questions that could arise from the interpretation of Maslow's hierarchy of needs [13], the paper will focus on the process of reaching the goal creatively. According to Rudolf Steiger's human-centred leadership, leaders have to focus on employees in order to achieve an objective [14, Passim], which means focusing on the objective, but also on the people. He summarised his understanding already in 1998 stating that "perfect leadership needs loyalty both to the country, government and superiors, but also to subordinates" [15, p. 78], because otherwise trust or credibility of the leader becomes lost [15, p. 76 f.], mistakes would be hidden instead of learned [15, p. 74] and other negative influences would occur. Consistently, leadership combines

leading people as well as reaching the goal. To do so leaders have to decide which direction/path has to be taken so that all the efforts of the organisation can act together. Rudolf Steiger entitled his presentation given at the 2015 Theresan Military Academy autumn symposium "Deciding in military and civil leadership routine is most important and most difficult!" [16. p. 129]. The importance of the decision itself led to a very similar reduction defining leadership by a Viennese philosopher: Leading means deciding [17, p. 18]. However, what does *deciding* mean and where does it come from? The Collins COBUILD English Language Dictionary describes *deciding* as a final product of thought process or an external influence, which causes reduction from several options to a single choice [18, p. 364]. The word comes from Latin and its syllabication was de-cide. "De" can be translated as "off" and "cide" as "cut". "Off-cut": to cut off. Leading means cutting off other options so that all the efforts of the leading element and its parts can focus on the chosen direction. What does it mean for creativity? Solely perceived through the prism of cutting off options, decisions would mean the end of a creative process. Nevertheless, it already was adhered to the idea that creativity is an advantage of profitability. It has been stated that leadership has to be creative or evoke creativity in the sphere of its action and influence. The decision itself is not creative, but rather destructive. However, this does not count for the process before or after. Consequently, leaders can use these processes to become creative themselves, or to enhance creativity of their subordinates.

2. Creativity

Creativity is associated with, for example, genius, great works, artists or scientists. In general, most people reduce creativity to extraordinary work and success. A definition from a language dictionary will be mentioned as an example in order to show how common this misconception is: "Someone who is creative has the ability to invent and develop new and original ideas, especially in an artistic way" [18, p. 330]. However, "creativity is not an elite activity" [19, p. 10]. This common misunderstanding was scientifically strengthened in the way scientists analysed creativity in the beginning. Because creativity was understood as something that belonged only to exceptionally gifted people, ingenious personalities were the only subjects studied in the research. Scientists tried to analyse the creative process by interpreting speeches, letters or other sources created by geniuses in the field of arts such as Mozart or Shakespeare. In that way the moments and conditions of aha-moments could be extracted and were used to explain this phenomenon. In the 20th Century after the psychological concept of measuring cognitive capabilities like intelligence, the first tests for creativity were invented, like the Torrence Test of Creative Thinking. However, they were not very successful in predicting creative success of the tested persons [20, p. 35]. Andreasen defines creativity as a combination of "originality", "utility" that leads to a "product" or "creation" of something and begins with a "person" [20, p. 17]. Another definition is that "the creative idea or product needs to be *novel* or *original*, and second, it has to be *useful* or *adaptive* to at least a segment of the population" [19, p. 5]. The standard definition of creativity is that it "requires both originality and effectiveness" [21, p. 92]. Referring to these definitions it becomes clear, why the psychometric approach to creativity lacks predictive validity. How and why "a segment of the population" uses a new idea or product can hardly be

foreseen. Or to say it in the words of Brodbeck “to forecast the new would mean that the new is not new anymore”. Therefore, The science of creativity distinguishes between two kinds of creativity. One is extraordinary creativity which can only be figured out retrospectively. The so-called jury approach is applied for this purpose; based on it work is determined as extraordinary by a group of peers who are asked questions about a specific artistic/scientific/professional field, and whose work should be called creative or ingenious [20, p. 29]. The other one is ordinary creativity which everyone uses daily. This kind of creativity is used for problem solving as well as speaking with other people. Discussion and its development is always new and adaptive or useful for the people participating. Consequently everyone is creative, but depending on the success it can be determined how successful. This distinction between “ordinary” and “extraordinary” [20, p. 26 f.] makes it easier to focus on the process and the possibilities that enable emergence of creativity as well as prevention of constraining environmental factors. Therefore, exploration of the creative process will be the next point.

2.1. Creative process

There are several stages in the process of creation. Problem finding, problem solving and implementation of solutions [22, p. 238]. These three phases are subsequently broken down into two separate phases – ideation and evaluation. Graham Wallas defined four phases in 1926. He distinguished preparation phase from incubation, illumination and verification [23, p. 10]. Another variation of this process was created by Schuler and Goerlich [24, p. 30]:

– problem finding,
– search for information, information intake and information rating,
– concept combination,
– ideation,
– elaboration and development of approach,
– idea evaluation,
– adaption and realization,
– implementation.

An important difference in the process is promoted by Carson. She distinguishes between the spontaneous and the deliberate pathway [19, p. 62]. According to her, preparation includes gathering general knowledge and specific skills. These facets are the proficiency on which a problem-finding process is based. At this point, the deliberate path follows a step-by-step problem-solving circle with a continuous search for a solution, whereas the spontaneous route takes a break to allow the sudden rise of an idea in a so-called incubation phase [19, p. 65]. After finding a solution, the process continues with an evaluation, elaboration and finishes in the implementation.

The military decision-making process can be considered to follow the deliberate pathway of problem solving. According to the truism “train as you fight” military leaders follow a specific procedure that works under stress and life-threatening circumstances. In the US Army the process contains mission analysis, development of the course of action

(COA), COA analysis (war game), COA comparison and COA approval. Orders are issued upon the approval and their execution begins after a rehearsal [25, Fig. 5.1]. There is a similar system in the Austrian Armed Forces. The control loop in extracts includes the parts orientation, concept development, plan development, whereas the concept development includes the phases evaluation of factors, consideration of courses of action and commander's decision [26, p. 29]. These processes are designed to be functional under extreme conditions because military commanders have to face time pressure and other stressful conditions to the point of danger of death during missions. Unfortunately, stressful conditions limit mental flexibility [27] and working memory [28]. Creativity as the "basis of competitive advantage" also means an advantage in the mission. Because of the limitation of time pressure and stressful environment it is very difficult for military leaders to come up with new solutions in the field [29]. However, where does creation of new ideas start in the military? Definitely, there are some processes similar to the spontaneous pathway. Between different tasks military leaders have the time to rethink the processes, decisions and other things. Daily routine and other things will get into the focus. It is when they can come up with spontaneous ideas [20, p. 43 f.]. Additionally, phases of gathering general knowledge and specific skills are important for preparing new solutions [30, p. 219]. These occur in the process of education during courses or studies, academic development, in think tanks, trainings or manoeuvres as well as during mission preparation. In order to enhance cognitive flexibility, more is needed than just this gathering. Unexpected events, schema-violations and diversified experiences, like a semester abroad, lead to this mental flexibility [31, p. 964].

At this point it would be appropriate to sum up the previous findings regarding creativity. Creativity is defined by novelty and effectiveness, and can be developed in an ordinary as well as extraordinary process. The common appearance is the ordinary process. During the process there is a deliberate pathway and a spontaneous one. Both occur in the military, although the deliberate one is implemented systematically. In order to prepare the chance of extraordinary creativity or at least a more creative ordinary creativity in military leaders, the preparation phase needs to include more diversified experiences. The next step will be development of a concept to diversify the experiences, so that mission preparation and officer training can be adapted to these factors.

2.2. Aspects of the new

Neurocognitive science discovered several aspects which can enhance creativity, and, therefore, support cognitive flexibility [30, Passim]. The following will be used in the military context [30, p. 210]:

– stimulus variation,
– reference level variation,
– association variation (memory traces, rarely used memories),
– emotional state variation,
– reduced attention,
– focused attention.

Stimulus variation

Changing the environment, in which the DMP takes place, changes thought (re)wiring and, therefore, enhances the possibility of producing new ideas [30, p. 211]. This can be achieved by changing the DMP procedure randomly, or by using a DMP of a completely different profession, for example a construction company. Another possibility is using the military DMP for solving problems of the civilians. All these are script irritations which result in a subconscious reflection of the DMP as well as linking new fields to own profession.

A short digression will explain the function of brain networks. The brain is a huge network of neurons that are connected with one another. These connections – synapses – can forward and block electric impulses. Therefore, they use the so-called neurotransmitters. This system can promote information or prevent it from reaching other areas in the brain. Different brain areas specialise in specific tasks or abilities. For example, there are areas receiving incoming external signals, like the visual cortex or the auditory cortex, and special regions responsible for language or recognising faces and forms [32, 33]. These different networks compete with each other to mediate an appropriate state of the system according to the present situation. This means, the different areas are stimulated by the environment, by the incoming signals as well as the intention of the person and their current emotions. These factors influence bargaining of the thought processes until the final thought or intent can reach our consciousness [33, 34]. The paths connecting different areas develop according to experience, and constitute the so-called memory traces [8, 33]. The more often a trace is used, the easier it will be for it to activate in the future – this principle is also known as Hebb's learning rule. This leads to the situation in which "routine thoughts" usually come to mind first. They are closely associated with a problem or a task. The more rarely an association occurs, the further away it is, the harder it will be for it to occur in a specific situations. Consequently, with growing experience, humans show a tendency to produce specific sets of solutions for problems. However, at the same time, this phenomenon limits the possibility of producing new ideas and solutions to problems. Therefore, irritations of scripts and routines help to activate areas located far away from normal behaviour, because the routine solution does not become activated [30, p. 203]. This makes new associations and creative innovations much more possible.

Returning to stimulus variation, which is also a completely different environment, like a natatorium, a zoo or a shopping mall, has a similar effect. These surroundings change the context and, therefore, change the activated memory traces.

Reference level variation

The English word bridge has a lot of different meanings. "A bridge is a structure that is built over a river, railway" [18, p. 170], but could be possibly understood as "a piece of metal that holds false teeth in your mouth" or "a card game for four players" [18]. Depending on the context, the brain activates different areas. The reference changes, and so do the thoughts and interpretations of the world. For example, experiments with different languages of contestants change the perception of the world [35]. Language is not the only thing that can be used to alter thoughts. Changing the point of view can also be used for this purpose. Altered references could also be useful while discussing

similar tasks at military command levels different than usual, or while trying to solve tasks from the point of view of a different division.

Association variation

Associations can be used to create new thoughts. Therefore, it is necessary to think of an association which has never been used before, like salt and moon. Therefore, these new associations create new memory traces [30, p. 214 f.]. This can be done by methods such as brainstorming or mind-mapping. Randomly choose one of the associated terms and use it as the starting point for new brainstorming or mind-mapping. Repeat the procedure until the initial word seems to be completely unrelated to the problem. Then connect the words of the last brainstorming with the initial word. Figure out links and combinations, and new memory traces can be activated. A similar effect can be created by randomly choosing two words, writing down their associations, and continuing to link the results to the problem. The effect can be extended thanks to rarely-used memories. Rarely-used memories mean memories from other fields of profession, or memories from the (military) past.

Emotional state variation

Different emotional states result in different solutions to the same problems [36-38]. Happiness and fear activate different pathways in the brain [19, p. 50 f.]. Body language, facial expressions and gestures can influence the mood and, as a result, the way of thinking [39, p. 10 f.], a fake smile, for example, simulates a real one by stimulating the muscle called cygomaticus major, and can cause real happiness after a short period time [40, p. 342]. Reaching different emotional states, mental imagery and different kinds of breath control or stress relief techniques [41] can stimulate creativity.

Reduced attention

Mozart and Kekule came up with great ideas during naps. In the state between being awake and asleep the brain reduces its consciousness, and the focus gets lost. Boredom and waiting without really thinking about anything are similar states of mind. This “random episodic silent thought” state (REST-state) increases the performance of subjects in creativity tests [20, p. 70, 72]. Boredom, doing nothing or unwinding oneself can increase creativity. Leaders usually want their team to work effectively, however, trying to stimulate these conditions could increase the performance in the long run.

Focused attention

Focusing attention, usually on unimportant things, can also lead to new ideas. Things such as mindful meditation, integrated body-mind training or similar techniques can increase creativity [30, p. 254]. These forms of focusing train the attention to centre the breath or other hardly recognised body parts [42]. A special way of this training is insight in which area the influence of surroundings is momentarily and purposely deactivated [19, p. 168].

3. Referring these effects with the DMP

At first, it must be remembered that solid, professional foundations of a skill, knowledge and experience are necessary to make use of these creativity-enhancing approaches.

Only expert knowledge is in the position to categorise relations and principles in a deeper way [8, p. 286] so that creative problem solving does not make an analogy or transfer errors [8, p. 440, 30, p. 64]. On the basis of it, the above mentioned approaches can be used to increase creativity and create novel ideas.

In the development of COA and COA analysis stimulus variation and reference level variation are helpful, because the problem will be thought through in a lot of different ways, including different point of views and complex scenarios. During COA comparison, emotional state variation could help to see blind spots. COA approval and rehearsal are better off by using attention reduction or the focusing technique combined with association variation so that the process can be reflected in a completely different way and reasoning errors are more likely to be noticed. The Austrian control loop would use association variation and attention reduction/focus in the orientation phase and for the consideration of courses of action. Concept and plan development would use emotional state variation, reference level variation and stimulus variation.

4. Referring these effects to military training

In the military training it can be considered that additional education, which is not linked to the job description as well as dissimilar experiences prepare open minds [43-45]. As already seen, international experiences are also an important factor in terms of increasing creativity and diversity [31]. Therefore, this intercultural or wider educational approach can be used for lectures, training programs, mission preparations and other educational purposes. By using different locations, different ways of thinking, new associations, different emotional states, and reduced or focused attention a wider field of memory traces is developed and network-like connections are better wired and more flexible. These approaches can also be used during speeches and presentations, however, more creativity is required in this case, for example in terms of how and when the right questions should be asked, how should breaks be used and so on.

5. Referring to leadership

While turning back these findings to thoughts concerning leadership, Wunderer's definition of leadership should be remembered; it states that "goal- and outcome-oriented, activating and bidirectional social interaction to fulfil mutual tasks in and with an organised working environment" [10, p. 4]. It is easy to realise that the goal, the mutual task is a very important part of it. Therefore the cooperative performance should be strengthened. It can be achieved by creating an environment which clearly defines the (same) goal for everyone, and in which the workers support one another and a trustful corporate behaviour along with positive conflict management exist [10, p. 28]. Another aspect of influence that can increase performance may be the "organised working environment". A few starting-points will be mentioned just to provide some examples: time for ideas, easy access to information (systems), reduction of stress, possibility of withdrawal [24, p. 100].

At this point it is important to recall Neuberger who stated that leaders should focus on people and development [12, p. 49]. Therefore, development of people and organisa-

tion from a creativity-enhancing environment should be considered a priority. It has already been stated that leading means focusing on people and the mission, or, as it was provocatively phrased by Steiger in 1998: “goal-centred and human-centred leadership – an antithesis?” [15]. In his paper, Steiger defines human-centred leadership as a concept in which “actions and behaviour of all participants are aimed at given or agreed upon goals, whereas employees play an important role as humans” [15, p. 70]. Consequently, the leader has to create an environment, which makes development and creativity possible, and takes the personality of the workers into account as well. With regard to the leadership cycle (preparation or planning phase, implementation of decisions, control), the focus will now shift to the processes before the decision in order to create a connection with the formerly found approaches.

Establishing an open, unprejudiced and respectful working atmosphere constitutes a very important base for creativity. In such atmosphere conflicts, mistakes or problems will be appreciated [46, p. 16], and, therefore, the employees will feel that it is safe to try new things and that they are supported. Consequently, leaders not only have to develop the above-mentioned DMP and implement changes that influence training, but they also have to change behaviours in the element, if it does not exist yet. Subordinates need to have the chance to try new things or even be guided to do so. However, it is important that they receive backup instead of reprehensions should they fail or the result of their attempts is undesired. Otherwise “loyalty to the subordinates” will be ruined and the “perfect leadership” would turn into an ordinary one.

At this stage of the paper a few aspects which could ruin creativity have to mentioned. At the beginning of the planning phase military leaders usually have to meet in person to assess the timeline as part of the orientation. It is known that time pressure and other stressful elements negatively influence the cognitive abilities [27, 29, 47]. Stringent planning can provide employees with safety because strict guidance lifts responsibility and pressure. Consequently, appropriate time planning can help subordinates deliver creative and thought-through solutions. This could be one of many ways to allow the officer to show his or her most important qualities like creativity and flexibility [25, p. 3-1].

Multitasking, namely doing a lot of things at the same time, constitutes another negative influence. Multitasking reduces capability of working memory, impairs performance of long-term memory and facilitates distraction [48]. The latter could be positive for enhancing lateral inhibition, which would cause a change in the stimulus/reference level/ association variation. This may be important in the case of, for example, improvised musical performances [49], but excessive inflow of e-mails, telephone calls and so on affects work performance and, thus, creativity. However, also simple daily activities of the leader – like monitoring the progress, assigning tasks and so on – can enhance creativity, limit or even destroy it [50, p.25].

As a result, creativity can be supported by reducing multitasking (e.g. no-mail days; less office hours for external clients, …) and time pressure (e.g. by planning in advance, including different departments in time, not pressuring the subordinates, …) providing stress-relieving training (physical exercise with medium load, administration of antioxidants, recovery-supporting nourishment and supplements, …).

Thanks to the use these findings in human and organisational development or in the decision-making process, a broader spectrum of ideas and therefore solutions can be found. This is useful for team development, but also for personal progress and the results of the unit.

Summary

Creativity is an important aspect that influences competitive advantage [2, p. 116]. Leadership needs to be mentally flexible in terms of behaviour [4] and problem solving [5, p. 331]. They also have to create an environment which makes excellent performance possible. For this purpose, leadership should strengthen cooperative performance [10, p. 26] and combine loyalty with tasks and subordinates [15, p. 78]. Organisation of the working environment is also part of this excellent performance-supporting environment [24, p. 100]. Creativity is a cognitive activity. Consequently, it is based on elementary neuronal processes [8, p. 3]. Understanding these processes can facilitate arranging these settings, which may in turn, have a better result. A few examples of the aspects that could be used for the purposes of military training and some factors thanks to which the results of the decision-making process may be broader were presented in this paper. However, they were described very briefly, because each single one of them along with their functions and background knowledge associated with them should be described in separate papers. The aim of this paper was to provide an explanation of the importance of creativity in (military) leadership, and focus on the process before making a decision. Transfer to other daily routines as well as to the execution part of the DMP are similar to the general creative approaches, but they are already more limited to the decisions taken and their boundaries, which are created by the “off-cutting” of possibilities. Moreover, creativity techniques and the already-mentioned aspects can be easily combined to perform excellently.

Acknowledgement

No acknowledgement and potential founding was reported by the author.

Conflict of interests

The author declared no conflict of interests.

Author contributions

The author contributed to the interpretation of results and writing of the paper. The author read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

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References

1. Mumford M, Hester K, Robledo I. *Creativity in Organizations: Importance and Approaches*. In: Mumford M (ed.). *Handbook of Organizational Creativity*. Oklahoma: Elsevier Inc.; 2012.
2. Bratnicka K, Gabrys B, Bratnicki M. *How Organizational Creativity Influence Firm's Profitability: The Moderating Role of Corporate Entrepreneurship*. In: Teirlinck P, Kelchtermans S, de Beule F (eds.). *Proceedings for the 8th European Conference on Innovation and Entrepreneurship*. Brussels: Academic Conferences International Limited; 2013, p. 116-25.
3. Pearce C. *The future of Leadership Development: The importance of identity, multi-level approaches, self-leadership, physical fitness, shared leadership, networking, creativity, emotions, spirituality and on-boarding processes*. Human Resources Management Review. 2007; 17:355-9.
4. Laurence J. *Military Leadership and the Complexity of Combat and Culture*. Military Psychology. 2011;23:489-501.
5. Gumpitsch F. *Gefechtstechnik- und Taktikausbildung – Auswirkungen auf Fuhrungsentscheidungen von WEST POINT-Absolventen anhand eines aktuellen Gefechtsbeispiels im Vergleich mit den osterreichischen Fuhrungs- und Einsatzgrundsatzen*. In: Artmann M. Gumpitsch F, Testor K. *Die Ausbildung zum Berufsoffizier der U.S. Army am Beispiel des Laufbahnbildes eines West Point-Kadetten im Vergleich mit der osterreichischen Offiziersausbildung an der Theresianischen Militarakademie*. Wiener Neustadt: Master-Thesis; 2008, p.235-346.
6. Judge TA, Colbert AE, Ilies R. *Intelligence and Leadership: A Quantitative Review and Test of Theoretical Propositions*. Journal of Applied Psychology. 2004;89(3):542-52.
7. Dienstvorschrift fur das Bundesheer (DVBH). *Taktischer Fuhrungsprozess*. Wien: BMLV; 2009.
8. Anderson JR. *Kognitive Psychologie. Eine Einfuhrung*. 2nd ed. Heidelberg: Spektrum Akademischer Verlag; 1996.
9. MilLex. *Militarlexikon*. Wien: BMLV: 2018.
10. Wunderer R. *Fuhrung und Zusammenarbeit. Eine unternehmerische Fuhrungslehre*. Munchen: Wolters Kluwer; 2003.
11. Bockmann W. *Wer Leistung fordert, muss Sinn bieten. Moderne Menschenfuhrung in Wirtschaft und Gesellschaft*. Dusseldorf: Econ Taschenbuchverlag; 1990.
12. Neuberger O. *Fuhren und fuhren lassen*. Stuttgart: Lucius & Lucius Verlag; 2002.
13. Maslow A. *A theory of human motivation*. Psychological Review. 1943;50(4):370-96.
14. Steiger R. *Menschenorientierte Fuhrung*. Zurich: Huber Frauenfeld Verlag; 2016.
15. Steiger R. *Auftragszentrierte und menschorientierte Fuhrung – ein Widerspruch?* Armis et Litteris. 1998;2:69-78.
16. Steiger R. *Entscheiden ist im militarischen und zivilen Fuhrungsalltag das Wichtigste und Schwierigste!* Armis et Litteris. 2016;34:129-39.
17. Liessmann KP. *In Wirklichkeit ist alles ganz einfach – Aufbau und Reduktion von Komplexitat in sozialen Systemen*. Armis et Litteris. 2001;7:7-21.
18. Sinclair J et al. (ed.). *Collins Cobuild English Language Dictionary*. London and Glasgow: University of Birmingham, Klett; 1988.
19. Carson S. *Your creative brain*. San Francisco: Jossey-Bass, a Wiley Imprint; 2010.
20. Andreasen NC. *The creating brain. The neuroscience of genius*. New York, Washington D.C.: Dana Press; 2005.
21. Runco MA, Jaeger GJ. *The Standard Definition of Creativity*. Creativity Research Journal. 2012;24(1):92-6.

22. Basadur M. *Managing the Creative Process in Organizations*. In: Runco MA (ed.). *Problem Finding, Problem Solving, and Creativity*. New Jersey: Ablex Publishing Corporation; 1994, p. 237-68.
23. Wallas G. *The Art of Thought*. New York: Harcourt, Brace and Co.; 1926.
24. Schuler H, Goerlich Y. *Kreativitat*. Gottingen: Hogrefe Verlag; 2007.
25. FM-101-5. *Staff and Organizations and Operations*. Washington D.C.: Headquarters Department of the Army; 1997.
26. Dienstvorschrift fur das Bundesheer (DVBH). *Taktisches Fuhrungsverfahren*. Wien: BMLV; 2012.
27. Plessow F, Kiesel A, Kirschbaum C. *The stressed prefrontal cortex and goal-directed behaviour: Acute psychosocial stress impairs the flexible implementation of task goals*. Experimental Brain Research. 2012;216(3):397-408.
28. Robinson SJ, Owen-Lynch PJ, Sunram-Lea SI. *Stress reactivity and cognitive performance in a simulated firefighting emergency*. Aviation, Space and Environmental Medicine. 2013;84(6):592-9.
29. Scott JP, McNaughthon LR, Polman RC. *Effects of sleep deprivation and exercise on cognitive, motor performance and mood*. Physiologoy and Behavior. 2006:87(2):396-408.
30. Testor K. *Kognitionstheoretische Grundlagen der Kreativitat*. Wien: Springer-Verlag; 2018.
31. Ritter SM et al. *Diversifying experiences enhance cognitive flexibility*. Journal of Experimental Social Psychology. 2012;48:961-4.
32. Silbernagl S, Despopoulos A. *Taschenatlas der Physiologie*. 6th rev. ed. Stuttgart: Thieme Verlag; 2003.
33. Rosler F. *Psychophysiologie der Kognition. Eine Einfuhrung in die Kognitive Neurowissenschaft*. Heidelberg: Spektrum Akademischer Verlag; 2011.
34. Badre D, D'Esposito M. *Is the rostro-caudal axis of the frontal lobe hierarchical?* Nature Reviews Neuroscience. 2009;10:659-69.
35. Athanasopoulos P et al. *Two languages, two minds – flexible cognitive processing driven by language of operation*. Psychological Science. 2015;26(4):518-26.
36. Chependik LG, Cornew LA, Farah MJ. *The influence of sad mood on cognition*. Emotion. 2007;7(4):802-11.
37. Strack F, Martin LL, Stepper S. *Inhibiting and facilitating conditions of the human smile: a nonobtrusive test of the facial feedback hypothesis*. Journal of Personality and Social Psychology. 1988;54(5):768-77.
38. Ito TA et al. *The influence of facial feedback on race bias*. Psychological Science. 2006;17(3): 256-61.
39. Pease A, Pease B. *The definitive book of body language*. New York: Bantam Dell; 2004.
40. Ekman P, Davidson RJ. *Voluntary smiling changes regional brain activity*. Psychological Science. 1993;4:342-5.
41. Tauber M. *Lehrgang zum diplomierten Neuromentaltrainer. Seminareinheiten 1-4 von Februar bis Juni 2016*. Wien: Institut fur Mentale Erfolgsstrategien; 2016.
42. Ding X. et al. *Short-term meditation modulates brain activity of insight evoked with solution cue*. Social Cognitive and Affective Neuroscience. 2015;10:43-9.
43. Spitzer M. *Lernen – Gehirnforschung und die Schule des Lebens*. Heidelberg: Spektrum Akademischer Verlag; 2009.
44. Spitzer M. *Digitale Demenz*. Munchen: Droemer Verlag; 2012.
45. Stadelmann W. *Musik und Gehirn*. Padagogik. 2005;224.
46. Schwarz G. *Konfliktmanagement*. Wiesbaden: Gabler Verlag; 2003.

47. Ozdemir PG et al. *The influence of shift work on cognitive functions and oxidative stress*. Psychiatric Research. 2013;210(3):1219-25.
48. Uncapher MR, Thieu KM, Wagner AD. *Media multitasking and memory: Differences in working memory and long-term memory*. Psychon Bulletin Review. 2016;23(2):483-90.
49. Liu S et al. *Neural Correlates of Lyrical Improvisation: An fMRI Study of Freestyle Rap*. Scientific Reports. 2012. Rep. 2, Art. 834. doi:10.1038/srep00834.
50. Amabile TM. *Leader behaviors and the work environment for creativity: Perceived leader support*. The Leadership Quaterly. 2004;15:5-32.

Biographical note

Karl Testor – CPT, Mag. (FH) Dr., holds a PhD-degree in neurocognitive sciences and a Master in leadership. He combines his studies in improving the leadership training at the Theresian Military Academy in Austria. His research focuses on the improvement of leadership performance and includes practical guidelines as well as theoretical foundations.

Kreatywność i przywództwo: wzgląd neurokognitywny w użyciu

STRESZCZENIE

Kreatywność jest postrzegana jako „przeważająca kompetencja". Dlatego też wyróżnia się na tle mniej udanego przywództwa wojskowego. Jakość przywódcy jest tak ważna, że stanowi jeden z filarów w Austriackich Siłach Zbrojnych. Wszechstronność umysłowa przekłada się na bycie elastycznym w myśleniu i manewrze oraz elastyczność w działaniu. Aby zwiększyć szanse na osiągnięcie niezwykle twórczych wyników, istnieje kilka sposobów, które można wykorzystać zarówno podczas szkolenia wojskowego, jak również w trakcie realizacji procesu podejmowania decyzji. Ten artykuł koncentruje się na zmiennościach bodźców, zmianie poziomu odniesienia, zmianie asocjacji, zmianie stanu emocjonalnego, zmniejszeniu skupienia i wagi. Łącząc te aspekty z etapami procesu decyzyjnego, można znaleźć nowe podejście zarówno do czynności życia codziennego, jak i szkolenia tak, aby osiągać lepsze wyniki.

SŁOWA KLUCZOWE

kreatywność, elastyczność umysłu, sukces, przywództwo, proces podejmowania decyzji

How to cite this paper

Testor K. *Creativity and leadership: neurocognitive insights in use*. Scientific Journal of the Military University of Land Forces. 2019;51;4(194):733-45.

DOI: http://dx.doi.org/10.5604/01.3001.0013.6469