BOUNCING BACK: RESILIENT HUMAN FACTOR MANAGEMENT

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Abstract

Due to the fourth industrial revolution employees in high-risk environments are confronted with increasing complexity and thus, the need to make ever greater and faster adaptations. As a consequence, the importance of efficient and safe human-machine interactions - in other words, human factors – is constantly growing. In this context, one skill is becoming increasingly relevant: resilience. This ability to react appropriately in difficult situations, recognize mistakes and 'bounce back' from adverse or altering circumstances, increasing challenges and possible setbacks is of enormous value, especially for employees in high-risk environments. The basic prerequisite of resilience is considered to be balance of a person's life energy among the various areas of life – a basic principle of Positive Psychotherapy. In addition, there are several personality traits, competencies and psychosocial factors that have been shown to help improve resilience. Both aspects will be examined in the following article. Also, the article invites self-reflection on one's own life balance, personality traits and competencies central to resilience. For the encouraging and interesting message is: Resilience can be developed and promoted - and can thereby contribute to increasing safety in high-risk environments as well as to promoting the employees' health.

Introduction

Over the last decades tremendous efforts have been made to improve safety in human-machine systems (Dietrich & Childress, 2016). Considering that the world in general, and the work environment specifically, is characterized by the increasing reliance on technical systems, the need and urgency to strive for the best possible fit between human actions and technical systems becomes obvious (Flach et al., 2018). These intersections of human behavior and technical systems are called *human factors.*

According to Badke-Schaub and colleagues (2012), human factors encompass all physical, psychological, and social characteristics of humans insofar as they influence or are influenced by actions in and with socio-technical systems (Badke-Schaub et al., 2012). Thus, it is a matter of examining human capabilities and

limitations in interaction with technical systems with the aim to establish the best possible fit between people and those technical systems (Civil Aviation Safety Authority [CASA] Australia, 2019). The consideration of the human factors is aimed at increasing the efficiency and safety of the systems, while also ensuring the well-being of the people working with them (Badke-Schaub et al., 2012).

Human factors are especially relevant in high-risk environments, that is "environments in which there is a more than normal chance to damage one's own life, the life of others or material property" (Dietrich & Childress, 2016, p. 1), as these environments are per definition characterized by increased challenges to the safety of the systems as well as the well-being of the workers. One prime example of a high-risk environment is the cockpit of an airplane (ebd.). A good management of this high-risk environment and especially of the human factors at work is tremendously important as aviation safety not only affects passengers or the flight crew, but is also essential to governments, consumers, and billions of businesses tied to the transportation of goods around the globe (Allianz Global Corporate & Specialty [AGCS], 2014; Huang, 2009). According to a global study on aviation safety, "the global population relies on a safe and efficient commercial aviation network" (AGCS, 2014, p. 4). As flight safety does not only depend on the aircraft and the technical conditions but is also significantly determined by the behavior of the crew members as well as their interaction with the technical systems - the *human factors* - (Bartsch, 2005; Faber, 2012), aviation is a prime example for human factor management in high-risk environments and shall therefore be used as the framework in the following article.

The analysis and consideration of human factors is becoming increasingly important in aviation. One of the reasons for this is that fewer and fewer aviation accidents are occurring because of technical problems alone, while instead an increasing number of safety-related incidents are due to human errors and failed human-machine interactions. For example, the Australian Aviation Authority (CASA Australia, 2019) concludes that human error was at least a contributing factor in 70-80% of aviation accidents. According to Bartsch (2005), "human error" is named as the cause in nearly 75% of all aviation accidents. In addition, between 62% (Civil Aviation Authority United Kingdom [CAA UK], 2013) and 70% (AGCS, 2014) of the globe's fatal aviation accidents are attributed to human error. At that, the most common safety issues include inadequate handling of the aircraft by the pilot (CAA UK, 2013), insufficient response to a technical error by the crew, as well as human factors in general (European Aviation Safety Agency, 2018).

Faber (2012) attributes these developments to the increased complexity of the aircrafts and the entire aviation system. Thus, the fourth industrial revolution that the working environment is currently undergoing is also bringing some changes to the aviation industry. An increase in digitalization, the risk of overreliance on cockpit automation, intensified competitive and rationalization pressures, a rapid increase in air traffic density, and other safety-related changes all contribute to growing demands on pilots and crew members (Bartsch, 2005; CASA Australia, 2019). Human factors thus assume an essential role in aviation safety (Afrazeh & Bartsch, 2007). Due to this, there have been repeated calls to consider the Human Factors in an interdisciplinary manner and to place them in the focus of scientific research in order to be able to guarantee a high level of safety in aviation and other high-risk environments (Afrazeh & Bartsch, 2007; Bartsch, 2005; ICAO, 1993, cited in Wiegmann & Shappell, 2001).

According to Prof. Dr. Klaus Schwab (2016, p. 11), Founder and Executive Chairman of the World Economic Forum, the changes brought about by the fourth industrial revolution are so "profound that there has never been a time in human history of greater promise or potential peril." In consideration of these increasingly fast changing working conditions and the concomitant demand on workers to perform ever new and ever faster adaptations, one skill is becoming increasingly important: *resilience*.

Resilience is defined as a person's ability to adapt successfully despite risk or adversity (Masten et al., 1990) and "to rebound, to bounce back from adversity, uncertainty, conflicts, failure or even positive change, progress and increasing responsibility" (Luthans, 2002, p. 702). Key indicators are both the person's internal well-being as well as his or her effective functioning in a changing environment (Masten et al., 1990). In the context of human factors, resilience can be defined as the ability to adapt to changing, high-risk situations, to recognize mistakes, to respond appropriately, and to learn from them (Jeffcott et al., 2009). This application of resilience to the work context builds on ideas from Positive Psychology, which focuses on a person's

strengths and abilities, rather than his or her weaknesses and vulnerabilities (Luthans, 2002). Especially in professions with complex human-machine interactions, such as aviation, the importance of resilience has increased tremendously, as it has become unlikely to be able to prevent errors altogether, and thus the focus must be on detecting failures early on, responding appropriately, and recovering quickly from setbacks (Badke-Schaub et al., 2012; Sheridan, 2008). In this context, resilience is also critical to maintaining employee health and well-being (Liu et al., 2014; Pipe et al., 2012; Straud et al., 2018; Turner et al., 2019). Thus, because resilience is seen as a skill that can be developed and trained (Luthans, 2002; Robertson et al., 2015), it is particularly important for pilots, crew members and employees in other high-risk environments to apprehend the basic building blocks of resilience.

Therefore, the present paper aims at providing an overview of principles from Positive Psychotherapy, personality traits and psychosocial competencies relevant for resilience. Additionally, possibilities for practical application in the sense of training and developing resilience shall be discussed.

Literature review and practical application

3.1 Life balance as a prerequisite for resilience

A healthy balance in the distribution of a person's life energy is considered a basic prerequisite for resilience (Peseschkian & Remmers, 2020a). This assumption is based on the balance model by Nossrat Peseschkian, the founder of the concept of Positive Psychotherapy. According to him, there are four central areas of life in which humans live and function and for which they can expend energy (ebd.). These areas and the individual distribution of energy have a great influence on the person's life satisfaction and self-worth, as well as on how he or she deals with conflicts and challenges in life. Thus, they are hallmarks of a person's personality (ebd.). The four areas of life, which Peseschkian arranges in his model as the four corners of a rhombus, are shown in Figure 1.
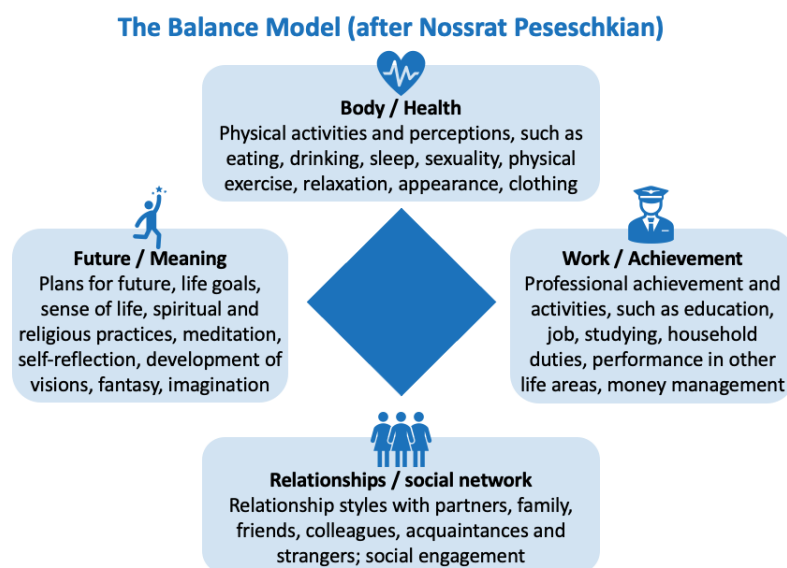

The Balance Model (after Nossrat Peseschkian)

Body / Health
Physical activities and perceptions, such as eating, drinking, sleep, sexuality, physical exercise, relaxation, appearance, clothing

Future / Meaning
Plans for future, life goals, sense of life, spiritual and religious practices, meditation, self-reflection, development of visions, fantasy, imagination

Work / Achievement
Professional achievement and activities, such as education, job, studying, household duties, performance in other life areas, money management

Relationships / social network
Relationship styles with partners, family, friends, colleagues, acquaintances and strangers; social engagement

Figure 1. The Balance Model after Nossrat Peseschkian (adapted by Christ & Mitterlehner following Peseschkian & Remmers, 2020a).

While each person has the necessary skills for all four of these areas of life and thus would theoretically be able to achieve balance, some areas may be overemphasized, and others neglected (ebd.). The reasons for this may lie in the person's culture, family, biography, education, or environment. According to Peseschkian, however, one should aim for a balance between these four areas of life (ebd.). In this context, 'balance' means an approximately equal distribution of one's own energy among the four areas of life, whereby energy does not necessarily equate time (Peseschkian & Remmers, 2020b). This balance of one's life energy forms the basis for both the health and resilience of a person (Peseschkian & Remmers, 2020a). Thus, it has

been shown several times that coaching, consulting or therapy based on the principles of Positive Psychotherapy, encouraging the patient to recognize and use his or her personal resources to create balance (Peseschkian & Remmers, 2020a), can significantly increase the person's resilience (Keshavarz Mohammadi et al., 2018; Kim & Na, 2017). In addition to this scientifically proven effective therapy method (Christ et al., 2021), self-reflection on one's own balance can also be helpful and set the stage for healthy resilience. In this regard, the reflective questions presented in Figure 2 can provide some inspiration.
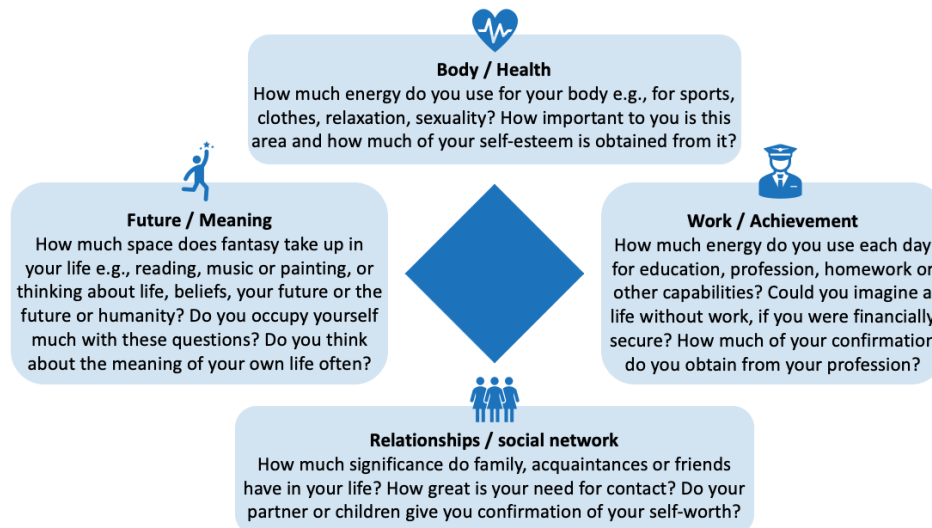

Body / Health
How much energy do you use for your body e.g., for sports, clothes, relaxation, sexuality? How important to you is this area and how much of your self-esteem is obtained from it?

Future / Meaning
How much space does fantasy take up in your life e.g., reading, music or painting, or thinking about life, beliefs, your future or the future or humanity? Do you occupy yourself much with these questions? Do you think about the meaning of your own life often?

Work / Achievement
How much energy do you use each day for education, profession, homework or other capabilities? Could you imagine a life without work, if you were financially secure? How much of your confirmation do you obtain from your profession?

Relationships / social network
How much significance do family, acquaintances or friends have in your life? How great is your need for contact? Do your partner or children give you confirmation of your self-worth?

Figure 2. Reflective questions on one's balance of life according to the Balance Model after Nossrat Peseschkian (adapted by Christ & Mitterlehner following Peseschkian & Remmers, 2020a).

3.2 Resilience through personality and competencies

While a healthy life balance poses a good basis for resilience, certain personality traits, acquired skills, and social factors also play an important role (Raetze et al., 2021; Wu et al., 2013). Although resilience itself is not considered a stable personality trait and thus can be developed at least to some degree, resilience is influenced by some stable personality traits (Saklofske et al., 2013). These include a person's emotional stability, openness to new experiences, and conscientiousness, as well as the degree of extraversion and agreeableness in dealing with others (Di Fabio & Saklofske, 2018). In addition, dispositional optimism, i.e., the belief that the situation will have a positive outcome, is also important for successful adaptation in stressful situations (Segovia et al., 2012).

However, in addition to these personality traits, which are relatively enduring and thus less trainable, research also points to the importance of specific developable competencies: essential, for example, is the use of appropriate coping mechanisms in stressful or adverse situations (Gloria & Steinhardt, 2014). Particularly beneficial in this regard are active attempts to reduce or cope with the stressor or to internally reevaluate the situation so that it appears less threatening and negative (Gloria & Steinhardt, 2014; Wu et al., 2013). As a person's appraisal of a situation or incident has a major impact on the emotions that are triggered in him or her in that very situation, reappraising a negative situation can also change one's emotional response, which is important for a successful adaptation to risky or adverse situations (Troy & Mauss, 2011). In contrast, maladaptive coping strategies, such as distracting oneself from the problem situation or repressing and denying it, have a negative impact on resilience (Gloria & Steinhardt, 2014; Wu et al., 2013).

Furthermore, emotional intelligence plays a major role in this context (Di Fabio & Saklofske, 2018). This ability of a person to recognize, use, deal with, and process emotions (Andrei et al., 2016) is of great importance for resilience (Di Fabio & Saklofske, 2018). In addition, high levels of emotional intelligence are associated with more positive social interactions and improved social relationships (Lopes et al., 2003; 2004). From these, in turn, social support can be obtained, which is hugely important for resilience (Ozbay et al., 2008). Social skills in themselves can also help people to

make positive adaptive choices and respond flexibly to difficult situations (Kinman & Grant, 2011).

Finally, a person's ability to see and find meaning and significance in life is central to that person's resilience (Alim et al., 2008). This includes, for example, overall life satisfaction, clarity of one's own life goals, perceived control over one's own life, and coherence, i.e., the view of having found meaning in one's life (Francis et al., 2019). Individuals with this capacity generally also demonstrate higher levels of resilience (Alim et al., 2008).

An overview over the described principles of Positive Psychotherapy, personality traits and personal competencies relevant to a person's resilience shall be provided by Figure 3. One's life balance according to the Balance Model by Nossrat Peseschkian is seen as the foundation while a person's traits, acquired competencies and psychosocial factors build the pillars on which one's resilience rests.

Figure 3. Overview over the principles of Positive Psychotherapy, personality traits and personal competencies relevant to one's resilience

Conclusion

The summary of current developments in working life, especially in the field of aviation safety, provided at the beginning of this article clearly demonstrate that resilience has become an essential characteristic of employees in aviation and other high-risk working environments. Yet, this realization has received rather little attention in the past. However, the interesting and encouraging message is: one's resilience is developable (Luthans, 2002; Robertson et al., 2015).

In this regard, outlining life balance as an essential aspect of resilience as well as key personality traits and competencies, can and should encourage some self-reflection: What about my own life balance? Which areas currently receive and require a lot of energy, and which may be somewhat neglected? Which of the personality traits and competencies discussed do I possess? Which ones would I like to develop further?

Such reflection can already be an important first step towards building resilience.

Moreover, numerous studies and evaluations show that resilience and the identified relevant psychosocial factors and competencies can be trained and improved through interventions, coaching, and therapies (Alim et al., 2008; Feder et al., 2009; Grant et al., 2009; Robertson et al., 2015; van Hove et al., 2016; Waite & Richardson, 2004).

The good news, therefore, is that it is possible to foster and develop resilience in high-risk environment employees - and thus prepare them better for the enormously increasing demands of the changing working environment, especially in the area of human factors. At the same time, the fact that adults benefit significantly from these intervention programs also shows that too little is still being done in regard to building resilience and that employees often do not yet realize their full potential. Thus, greater promotion of

building resilience among high-risk environment employees still holds great potential, both for ensuring system safety and for improving employee well-being. After all, as English philosopher Bernard Williams put it, "Man never made any material as resilient as the human spirit" – we must just use it properly!

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