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PROJECT OF MONITORING OF EMPLOYEES' PSYCHOPHYSICAL CONDITION USING AFTEREFFECT AS A MEAN OF DECREASING THE NUMBER OF ACCIDENTS AND WRONG DECISIONS

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Summary: The aim of presented work is to propose a method of psychophysical condition's examining and monitoring in managers and employees who hold responsible positions that require high decisional efficiency. Based on the existing empirical and theoretical knowledge, it is here assumed that lateralization and brain's hemispheres' cooperation are closely related to stress, fatigue and well-being. Aftereffect is presented here as a method of measurement of lateralization and its level. Exemplary experimental procedures of this phenomenon and its interpretation in terms of psychophysical condition are described. Development of method of psychophysical condition's measurement that will include stress, fatigue or personal problems that frequently lead to desperate behaviour at work or elsewhere is highly worthwhile. This development as well as practical use of aftereffect to monitor the psychophysical state will surely contribute to reduction of accidents' at work rate and will increase the probability of taking accurate decisions by managers as well as it will facilitate adoption of life style that promotes good psychophysical condition.

Keywords: psychophysical condition, brain's hemispheres cooperation, lateralization, aftereffect, stress, accidents rate, decisional errors

1. Introduction

As it is said by English, wrong decisions most commonly are not the effect of lack of substantive knowledge but are caused by tension, stress or fatigue. So called human factor is a cause of not only many mistakes made by managers but, what should be also noticed, it is a main source of many of accidents and catastrophes that are taking place in other occupations. Nowadays, condition of employees is measured in form of obligatory periodic health examinations, but do they include psychophysical condition as well? In practice this issue is left either to the employee him(her)self or to his/her immediate supervisor. But from where the concerned person or the supervisor can get the knowledge of current psychophysical state? It is not easy to notice tension or stress in oneself, especially when one is experiencing problems on daily basis and every difficulty is attributed to the external world. Researches show that for example pilots have difficulties in specifying their condition and level of psychological tension (Beaty, 1995) succumbing to illusions what is a common cause of air accidents (Bednarek, 2011). So is there any method which would be accurate and which would allow for frequent examinations that would specify psychological condition and then based on them to decide what kind of work or what task should be undertaken in given moment? Wouldn't it be good to have this kind of measuring tool, to monitor on the regular and frequent basis employee's psychophysical state, and not only to check his /her suitability to work on certain post every now and then? The aim is not to impose additional restrictions or formalism that would constitute an additional burden to the employee or the supervisor but the authentic attention and care about his/her condition, the quality and safety of performed work. This kind of knowledge would be certainly important not only for managers, who could

learn how to manage themselves in better way but also for people working as pilots, lifeguards, or solders executing important tasks or missions.
As an answer to above stated problem in this paper, it is proposed to apply the aftereffect phenomenon to the diagnosis of the level of brain hemispheres' cooperation that conditions and reflects psychophysical state of the examined individual.

2. Lateralization and brain hemispheres' cooperation as manifestation of psychophysical condition

In accordance to Broca's notion lateralization that is functional predominance of one of the body sides (that concerns lower and upper limbs, eyes and ears) over the other is determined by predominance of one of the brain's hemispheres over the other. Left hemisphere controls the functioning of the right side of the body, while right hemisphere controls functioning of left side of the body. Dominance of left hemisphere is manifested in right-handedness, while dominance of right hemisphere is manifested in left-handedness. However, damages in right hemisphere of left-handed people entail symptoms that are both quantitatively and qualitatively (i.e. easiness of recovery of given function) are not closely related with those, that occur in case of damages to left hemisphere of right-handed individuals. That means, that lateralization constitutes a highly complex issue and requires the analysis of functioning of brain as a whole. Dominance of one of the hemispheres can have physiological or pathological character. One person can be left-handed because main nerve impulses are coming from right hemisphere (physiological left-handedness) or because his/her left hemisphere was damaged what led to taking the function over by the right hemisphere (pathological left-handedness). Physiological and pathological right-handedness is explained analogously.
Dominance of one of the hemispheres over the other can be expressed weaker or stronger, therefore one can be identified as clearly and totally right-sided and passing through intermediate stages ambidextrous people can be find – only if hand dominance is considered. Moreover, in one person dominance of different limbs and organs can manifest itself in different ways what leads to distinguishing – apart from homogeneous left- and right-handedness – various forms of crossed lateralization. In order to describe lateralization – most commonly the dominance of hand, eye or leg is examined. Most often it is assumed that physiological left- or right-handed lateralization is determined when we are born what does not mean however that that the learning process, upbringing or various psychophysical states do not influence it.
Lot of studies showed that different psychophysical disorders, including psychical diseases are linked with lateralization and especially with the cooperation of brain's hemispheres. That concerns also stress, fatigue and well-being that is, generally speaking, psychophysical condition. In other words, if we want to state what is the condition of the employee in order to take care of it, if we want to capture moments in which we should not take important decisions or if we want to decrease the number of accidents at work, the development of the tool that would enable us to identify present psychophysical state should be taken on. We should have the diagnostic tool that enables us to identify the state that we are in especially, as it was mentioned, its evaluation based on well-being made but the one who is concerned, is unreliable.

3. Visual aftereffect as the indicator of employees' lateralization and psychophysical condition

If lateralization and cooperation of brain hemispheres is so important for evaluation of psychophysical condition, the question of how it can be measured should be posed. Is it possible to measure it during the work time or shortly before starting work, so the evaluation of employee's condition could be made relatively quickly and accurate with possibility of repeating of the examination if necessary? There is a certain rhythm of operating in the workplace and employees must efficiently fulfil their responsibilities what means that there is no much time that could be devoted to diagnostics in type of laboratory examinations.
Phenomenon that meets those requirements is visual aftereffect. It can serve as an indicator of lateralization, and more importantly, it enables specifying level of brain's hemispheres cooperation what allows to evaluate mental condition of employee. It has been relatively long time ago postulated to use this phenomenon in examining of eyes' lateralization (Zazzo, 1974, p. 29), but there were no special reasons to develop this proposal, especially if sufficiently extensive knowledge on importance of functional hemispheres' asymmetry wasn't available. Nowadays we have more detailed knowledge on brain's functioning and modern examination methods, i.e. PET or diffusion tensor imaging technique – DTI (Gazzaniga, 2011). Those methods seem to be so attractive that other proposals remain on the side-lines. Moreover, what is important to presented here considerations, so far visual aftereffects haven't been explained in satisfactory way, thought they still are the subject of many researches and theoretical interpretations, what was presented in several works Anstis, Verstraten and Mather (1998), Harciarek (2014), Anstis (2014). Regardless from its interpretation, this phenomenon enables specifying eyes' lateralization by measurement of duration time of the aftereffect reaction for left and right eye. Whereas the difference in duration times of this phenomenon between each eye is an indicator of the level of side predominance of one or the other eye. The bigger is the difference, the higher is the level of lateralization that is the level of predominance of one eye over the other. Left-sided lateralization (predominance of the left eye) is interpreted as the dominance of right hemisphere, and right-sided lateralization (predominance of right eye) as dominance of the left hemisphere.
In examining the aftereffect phenomenon moving stimulus can be used, i.e. disc with printed Archimedes' spiral with the diameter of 35 cm that is turning with speed of 33 rotations per minute on which examined person is looking for 60 seconds from a distance of 80 cm. After the turning spiral is stopped, the examined person still can see the illusory motion which lasts for some time. Examination of lateralization of the eye based on the aftereffect phenomenon can be conducted also with use of static stimulus, i.e. red square which each side has 3,5 cm and which is place on white background. In this case, the gaze should be fixed for one minute on this square and after that it should be covered with white paper board on which examined person should observe aftereffect in form of fair, lighting square. Duration time of this phenomenon induced either by rotating spiral or by motionless square should be defined for each person separately. Comparison among those duration times constitutes the basis of identifying the level of lateralization. For better reliability of the measurement it is advisable to repeat the examination, especially since it does not take a long time.
On the basis of acquired duration times of aftereffect phenomenon the evaluation of employee's psychophysical condition can be made. If the times of aftereffects in left and right eye are equal, the level of lateralization is low what suggests worse psychophysical condition of the examined person. Also too long duration time of aftereffect reaction or a long time of a latency (time period between the cessation of the gaze's fixation and the appearance of the aftereffect) should be interpreted as not good psychophysical state. In order to specify in reliable and accurate way the psychophysical condition of employee standardization

examination should be conducted and the measurement of reliability and accuracy of this method should be made.
It is worth noting that objectification of above described examination method is possible if in order to specify duration time of aftereffect also EEG will be used. But this is a future version which surely can take place when this method will prove to be useful, especially in helping in management and in increasing of the level of work efficiency in many occupations that require high psychophysical performance.
Method proposed here, in which aftereffect is an indicator of psychophysical condition, can be practically used in managers' periodic examinations or in situation when he or she has to take an important decision or perform difficult task. In case of psychological state's monitoring by use of this method and in case of stating high inner tension it is possible to apply therapeutic or relaxing actions to reset the optimal level of manager's psychophysical condition.

4. Conclusion

Taking into account the human factor accidents and managers' wrong decisions, measuring and monitoring of psychophysical condition is highly desirable. The method proposed above enables not only to evaluate of employee's psychophysical efficiency in relatively short time, but also can be repeatedly used also in the same person without concern that the previous examinations will influence the next one or will prevent them, what often happens in case of psychological examinations. In contrary, next examinations due to the experience will be more accurate and correct. Method of diagnosis of psychophysical condition with use of aftereffect that is proposed in this paper should be subjected to standardization as soon as possible, incorporate to practice of managing and include in already existing techniques that help to fight stress and to understand it in better way (Heszen, 2013, Grzywacz, 2012). Using of this method to monitor the psychophysical condition we can anticipate efficiently and quickly forthcoming state of managers' overload and thereby protect examined person from intense stress, which may occur as culmination of tensions. By this, we will surely contribute to decrease in number of accidents caused by so called human factor.

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