

ISSN 2712-8040 (print)



LURIAN JOURNAL

2022. Vol. 3. No. 1
lurian.urfu.ru

Lurian Journal. 2022. Vol. 3. No. 1

Established 2019
Published quarterly

Founded by **Federal State Autonomous Educational Institution of Higher Education “Ural Federal University named after the first President of Russia B. N. Yeltsin”**
19, Mira Str., 620002, Yekaterinburg,
Sverdlovsk region, Russia

Supported by:
Lomonosov Moscow State University
(Moscow, Russia),
Russian Psychological Society
(Moscow, Russia),
Russian Academy of Education
(Moscow, Russia)

Journal Registration Certificate
ПИ № ФС77-77365, as of 10.12.2019

Editorial Board Address:
Ural Federal University named after the first
President of Russia B. N. Yeltsin.
Office 238, 51 Lenin Ave., 620000,
Yekaterinburg, Russia
lurian.journal@urfu.ru
lurian.urfu.ru

Журнал основан в 2019 г.
Выходит 4 раза в год

Учредитель: **Федеральное государственное автономное образовательное учреждение высшего образования “Уральский федеральный университет имени первого Президента России Б. Н. Ельцина”**
620002, Россия, Свердловская обл.,
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(Россия, Москва)

Свидетельство о регистрации
ПИ № ФС77-77365, от 10.12.2019

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первого Президента России Б. Н. Ельцина.
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Enjoy your reading!

ОТ РЕДКОЛЛЕГИИ

Уважаемые авторы и читатели!

4 марта ушла из жизни Глозман Жанна Марковна, главный редактор Lurian Journal, выдающийся ученый, доктор психологических наук, профессор Московского государственного университета, научный руководитель Научно-исследовательского центра детской нейропсихологии им. А. Р. Лурия.

Жанна Марковна была примером трудолюбия, увлеченности и профессионализма. В наших сердцах она навсегда останется жизнерадостным, отзывчивым, энергичным человеком, а ее научная и нейропсихологическая работа будет продолжать служить путеводной звездой.

Два года Жанна Марковна активно работала над журналом: приглашала авторов, готовила собственные статьи, продвигала журнал в научном сообществе.

Теперь функции главного редактора взяла на себя Эльвира Эвальдовна Сыманюк — талантливый ученый и руководитель, доктор психологических наук, профессор, член-корреспондент Российской академии образования, автор более 270 работ, в числе которых научные статьи, монографии и учебные пособия.

Lurian Journal продолжает свою деятельность на основе тех принципов, которые постулировались Жанной Марковной:

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Традиционные рубрики журнала:

- «Научные исследования» (Original Articles);
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- «Памяти А. Р. Лурия» (In Memory of A. R. Luria).

Дополнительные рубрики:

- «Краткие сообщения» (Short Communication);
- «Молодой ученый» (Young Scientist).

Статьи публикуются на русском и английском языках.

Приглашаем российских и зарубежных ученых и практиков к сотрудничеству!

ORIGINAL ARTICLES

НАУЧНЫЕ ИССЛЕДОВАНИЯ

Olfaction as One of the Key Components of the Neuropsychological Examination

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Обоняние как один из ключевых компонентов нейропсихологического исследования

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To cite this article: Fóz, A., Nassar, L. H., Manzano, A. C. B., & Anauate, C. (2022). Olfaction as One of the Key Components of the Neuropsychological Examination. *Lurian Journal*, 3(1), pp. 11–28. doi: 10.15826/Lurian.2022.3.1.1

Abstract. Olfactory deficits are common among non-clinical and clinical patients, particularly in those with neuropsychological conditions. They are, however, often not diagnosed because standard assessments focus on superior cognitive domains and do not examine the senses. Olfactory function greatly impacts mental health and quality of life. It is also associated with the likelihood of developing neurological or psychological conditions and impacts the prognostic and rehabilitative outcomes of patients, particularly in regards to cognitive health. The purpose of this article is to (a) provide an overview of the olfactory sense and its unique characteristics, (b) discuss the scientific literature around olfaction and related neurological and psychological conditions, (c) present common olfactory assessment techniques, and (d) argue for the inclusion of olfactory measures to standard neuropsychological examinations. An olfactory measurement tool is currently being developed that is suitable to supplement neuropsychological examinations.

Keywords: *olfactory sense; neuropsychological assessment; olfactory test; anosmia; hyposmia; neurological health; psychopathologies; brain impairment; cognition*

Аннотация. Нарушение обоняния часто встречается у неклинических и клинических пациентов, особенно у пациентов с расстройствами нейropsychологического характера. Однако его сложно диагностировать, поскольку стандартные тесты сфокусированы на диагностике высших когнитивных областей и не определяют состояние органов чувств. Функция обоняния оказывает большое воздействие на психическое здоровье и качество жизни. Она также может указывать на вероятность развития неврологических или психологических состояний и влиять на прогностические и реабилитационные результаты пациентов, особенно в отношении когнитивного здоровья. Цели данной статьи: (а) ознакомить с результатами теоретического изучения феномена обоняния и его уникальных характеристик; (б) представить обзор научной литературы, посвященной обонянию и связанными с ним неврологическими и психологическими состояниями; (в) показать наиболее распространенные методы диагностики обоняния; (г) доказать необходимость включения оценки обоняния в стандартную процедуру нейropsychологического исследования (в настоящее время ведется разработка инструментария).

Ключевые слова: *чувство обоняния; нейropsychологическая оценка; диагностика обоняния; потеря обоняния; понижение обоняния; неврологическое здоровье; психопатологии; поражение мозга; когниция*

Introduction

Approximately one fifth of the world's population suffers from an olfactory disorder (Croy, Nordin, & Hummel, 2014). Olfactory deficits, known as anosmia, are common results of brain disorders affecting 10–66.8 % of those who experienced brain trauma (Drummond, Douglas, & Olver, 2013). Only a minority of patients who underwent neurological traumas and have consequential olfactory shortcomings, nonetheless, are

aware of such deficits (Callahan & Hinkebein, 2002). This could be because standard neuropsychological examination measures, such as the Mental Status Examination (Martin, 1990) and the Glasgow Coma Scale (Teasdale & Jennett, 1976), cover cognitive and executive functioning but occlude sensory perception. Thus, olfactory deficits are often not brought to the awareness of patients or their healthcare providers. There is a lack of universal clinical practice guidelines for the detection of olfactory dysfunction (Miwa et al., 2019). In the present article, we examine the scientific literature around olfaction, olfactory deficits, and how olfactory dysfunctions relate to neurological, neuropsychological, and other health disorders. Common olfactory assessment strategies are hereby introduced and discussed through Lurian and Neurolurian paradigms. Olfactory rehabilitation and its potential to improve neurological functioning, prognosis, and quality of life are considered. Lastly, we argue for the addition of olfactory measures to standard neuropsychological examinations.

The Olfactory Sense

Olfaction is a highly instinctive component of the human experience. Scliar (2020) refers to it as a “nasal instinct” that is, probably, the most ancient of the five senses. Smells are believed to be first perceived unconsciously by archaic brain structures, away from the neocortex. The symbolic nature of olfaction is well understood by photographers who capture politicians with their fingers in their noses. This induces an automatic feeling of disgust in the spectator due to the evolutionary function of olfaction: to protect against the dangers of ingesting rotten food or the exposure to noxious substances; when something has an unwholesome smell, we instinctively obstruct our nostrils, either with our hands or by shrinking our faces.

Both sensation and perception are connected to the lived experience. According to Gazzaniga and Heartherton (2005), perception involves the processing, organization and interpretation of sensory stimuli captured by sensation. It is the result of conscious experiences that allow for the attribution of meaning to a given sensation. While bottom-up processing is based on the physical characteristics of the stimulus, top-down processing rests on how we interpret the captured information through our knowledge, expectations, and experiences. Our sensory systems for each of our senses — olfaction, gustation, vision, audition, and tactile — translate the physical properties of stimuli into neural impulses through sensory coding (Ibid.). Two additional senses are now also considered: vestibular (movement) and proprioception (body position). Along with gustation, olfaction is a chemosense originated when chemical stimuli, i.e., odorants, bind to chemoreceptors. The olfactory mucosa is so sensitive that few molecules are sufficient to stimulate it, producing an odor sensation. The sensation will be greater with more stimulated receptors, which depends on the concentration of odorous substances in the air. The receptors involved in olfaction and gustation regenerate every sixty days and new ones arise after two months (Martin, 2013).

Olfactory information is processed in the most archaic part of the brain, the rhinencephalon, a word of Greek origin that translates into: “smell” and “brain.”

Odor particles enter the rhinencephalon and meet receptor neurons in the olfactory mucosa whose axons form the olfactory nerve bundle and synapse in the olfactory bulb. Information subsequently reaches the primary olfactory cortex (POC) found in the prefrontal cortex, where elemental olfactory information begins to be processed (Silveira-Moriyama et al., 2016). The rudimentary rhinencephalon has few connections with brain zones that, from an evolutionary point of view, have more recent origins, such as the neocortex, where the centers of language are found (Scliar, 2020). The rhinencephalon is associated with ancient brain structures such as the limbic system, highly involved with emotions and memory, and the pituitary gland which is an important component of the hormonal system (Ibid.). It is, thus, not by chance that olfactory stimuli also evoke feelings and recollections.

The Subconscious Quality of Smells

We find it easier to describe appearances, sounds or tastes than smells. In addition to the scarcity of vocabulary dedicated to odors, there is a difficulty in consciously attributing emotions to smells, something that does not happen as strongly with other senses such as sight and hearing. We speak, for example, of ‘intimidating,’ “comforting” appearances or noises, but restrict ourselves to simple adjectives such as “pleasant” and “unpleasant” to report odors. This may be due to the fact that olfaction is more unconscious than the other senses. Developmental research indicates that the ability to detect smells is established prenatally. Exposure to prenatal odor through amniotic fluid has been found to significantly affect odor-mediated behavior after birth (Ciccotti, 2010). Newborns of mothers who ate foods with anise during their pregnancy had positive reactions sucking, attempting to touch, and chewing to the anise odor. Newborns whose mothers had not consumed anise had more aversive reactions to the odor — furrowing of the nose and eyebrows, mouth arching downwards, and head movement (Ibid.).

As highlighted by Scliar (2020), the perception of smells arises prior to the ability to express oneself verbally. As a result, we have strong emotions and reactions in response to different odors, however, lack the means to verbally discuss such instinct-driven experiences. In this way, before we can rationally examine a given smell and translate it into words, we act instinctively, automatically in response to the stimulus. In light of the evolutionary process this is understandable as instinctive reactions saved the life of the primitive man who sniffed an approaching beast by activating the simple and binary “fight or flight” reaction. Additionally, some olfactory receptors detect pheromones which are chemical substances emitted by beings of the same species that, for example, stimulate an instinctive sexual approach.

Research on the relationship between smell and cognition points to a possible existence of olfactory memories that are independently constituted, autonomous and non-reliant on superior cognitive skills (e.g., Danthiir, Roberts, Pallier, & Stankov, 2001). Zucco (2003) found that distracting interferences do not impact the recognition of olfactory materials. It is hypothesized that odor recollection is given through a memory system separate from the remaining senses with the assumption that (a) odor stimuli do not

induce conscious representations of themselves, and (b) odor memories can be stored at a subconscious level. This means that a person exposed to an odor would first become conscious of the smell, during memory encoding, then, once the stimuli is removed, have no conscious representation of it. The odor would be implicitly and effortlessly stored in memory without the person's conscious awareness (Ibid.). This argues for a potential of olfactory tests to investigate neuropsychological states of those with impaired awareness and cognition that are unresponsive to stimuli that require greater cognitive engagement.

Olfaction and Health

Odor exposure has been found to induce changes in brain electrical activity correlated with attention (Martin, 2013) and to improve correct recollection of events that took place years earlier (according to Aggleton and Waskett, as cited in Martin, 2013). Smells have also been shown to enhance pain perception (Martin, 2006). Olfaction is directly linked to safety and quality of life. Disturbances around smell are known to possibly lead to significant impairments in important domains such as the ability to detect harmful chemicals and smoke, as well as to taste and enjoy food and maintain healthy eating habits (Croy et al., 2014; Hummel & Nordin, 2005). It can also compromise social interactions, affect mood, and contribute to anxiety, feelings of isolation, and / or depression (Croy et al., 2014).

Olfactory dysfunctions are prevalent among the general population and even more common in clinical samples. They are tightly associated with different neuropsychological conditions, however, largely unconsidered in clinical settings; they are not a component of standard neuropsychological examinations. As a result, patients and healthcare providers remain unaware of olfactory issues and how they relate to the clinical condition at hand. We hereby provide an overview of olfaction in brain health to illustrate the importance of considering olfaction in clinical neuropsychological examinations.

Olfaction in Neurological and Neuropsychological Conditions

Olfaction and Psychopathologies

Neural structures involved in the processing of olfaction are tightly connected to limbic structures in which emotional processing takes place. As previously discussed, both structures are considered rudimentary in that they are evolutionarily more primitive than other parts of the human brain. This suggests that olfaction and emotion were both primordial functions in development. Moreover, olfactory and emotional functioning share key structures such as the amygdala and the hippocampus responsible for admitting and processing incoming environmental signaling (Croy & Hummel, 2017). They receive "raw" olfactory information that bypasses the thalamus and are crucial for determining the emotional load attributed to whatever is captured from the environment. Given the independent and subconscious path of olfactory information, it is believed that odors can elicit corresponding emotive states before they reach consciousness (Ibid.).

Notably emerging research indicates that affective disorders, especially depression, may lead to decreased activation and volume in olfactory structures in the brain, particularly in the olfactory bulb. Conversely, the olfactory bulb could serve as an indicator of greater susceptibility for the development of depression (Ibid.). Research by Rottstaedt et al. (2018) found that psychiatric patients had a significantly reduced olfactory bulb — 13.5 percent smaller than control. Additionally, olfactory bulbs reduced in size anticipated major depression in 70 percent of cases.

The intimate anatomical and functional associations between emotion and olfaction are thought to explain why they are often simultaneously compromised. It has been, for example, observed that those with anosmia — lack of olfactory abilities — are more likely to show symptoms of depression than those who do not have anosmia (Croy & Hummel, 2017). Conversely, subjects with depression score lower on olfactory tests measuring odor identification, discrimination, and sensitivity (e.g., Lombion-Pouthier, Vandel, Nezelof, Haffen, & Millot, 2006). Interestingly, Lombion-Pouthier et al. (2006) also found that depressed people have a tendency to overestimate the pleasantness of odors. The dynamics between olfactory and mental disabilities vary according to the psychological condition at hand. Unlike depression, anorexia nervosa was found to increase subjects' sensitivity to odors making them judge those as more intense but less pleasant. Those with alcohol or other drug addictions had significant difficulties in identifying odors (Ibid.). Moreover, smell identification deficits are a typical feature of early onset psychosis as well as of cognitive deficits and negative symptoms in schizophrenia (Corcoran et al., 2005). A review of the scientific literature focused on affective and anxiety disorders found no olfactory deficits in most people with bipolar disorder (Burón & Bulbena, 2013). Odor identification issues were notably present in people with post-traumatic stress and obsessive-compulsive disorders (Ibid.). Burón and Bulbena (2013) concluded that examining olfaction could be an effective supplementary tool to better understand psychopathological conditions.

Olfaction in Neurological and Neurodegenerative Conditions

Olfactory deficits are common in an array of neurological and neurodegenerative conditions such as cerebrovascular accidents, traumatic brain injuries and dementias (e.g., Aliani et al., 2013). Reduced sensibility to odor — hyposmia — is a major symptom of Parkinson's Disease (PD) present in approximately 90 percent of early-staged cases (Xiao, Chen, & Le, 2014). The gradual loss of smell is considered a predictor of the development of PD. Therefore, investigating this sense can collaborate with early and more accurate diagnoses. The observation that olfactory deficits manifest themselves prior to other symptoms of PD led to the hypothesis that the initial causative event for the development of the disorder takes place in the rhinencephalon — olfactory region — before the basal ganglia becomes affected (Hawkes, Shephard, & Daniel, 1999). Hyposmia and anosmia are studied as potential biomarkers for different brain-based disorders; examining olfactory symptoms in neurological conditions could help clarify their underlying pathological mechanisms (Xiao et al., 2014).

Despite few publications on olfaction in patients with cerebrovascular disease, it is accepted that, to some extent, hyposmia occurs. The limited number of post-stroke olfactory studies generally report olfactory impairments more often than complete olfactory loss (Omori & Okutani, 2020). Conversely, olfactory recovery interventions are a promising rehabilitation strategy for those who suffered a stroke (Wehling et al., 2015). Olfactory assessments are also commonly used in neurological clinics to help identify possible cognitive decline in stroke patients or in those with other neurological disorders (Dulay, Gesteland, Shear, Ritchey, & Frank, 2008; Makizako et al., 2014; Ryo et al., 2017; Westervelt, Bruce, Coon, & Tremont, 2008).

Impaired olfaction has also been found associated with worsened prognostic outcomes of neurological complications. Callahan and Hinkebein (2002) established that people who suffered Traumatic Brain Injuries (TBIs) performed better cognitively when in the absence of smell dysfunctions. Anosmic patients had lower executive skills and were more functionally impaired than their non-anosmic counterparts. Comparative scores on neuropsychological measures of executive abilities (the University of Pennsylvania Smell Identification Test (UPSIT) and the Disability Rating Scale (DRS)) indicated that poor olfaction poses a risk for successful post-traumatic rehabilitation (Callahan & Hinkebein, 2002). Those with smell dysfunction experienced longer coma periods as well as greater deficits in memory, learning, complex attention, and problem solving (Ibid.).

There also is evidence to support a relationship between decreased olfaction and worsened prognosis of people at risk for Alzheimer's Disease (AD) and other dementia-related conditions. In spite of the need for a stronger body of findings, olfactory dysfunction has the potential to be a more significant indicator of prospective neurodevelopmental diseases than standard neuropsychological assessments (Martin, 2013). A systematic review by Sun, Raji, MacEachern, and Burke (2012) focused on the benefit of using olfactory identification tests as prognostic tools for AD and dementia. In one of the highlighted studies, Mild Cognitive Impairment (MCI) was longitudinally observed to lead to AD more often in the presence of poor olfactory performance; subjects with better olfactory identification abilities were less likely to progress from MCI into AD (Devanand et al., 2008; Sun et al., 2012). Moreover, Morgan, Nordin, and Murphy (1995) studied olfaction in people diagnosed with probable and questionable AD. They compared odor and picture identification capacities and found that odor identification was more strongly compromised than picture identification among subjects with probable and questionable AD. Morgan et al. (1995) concluded that the sense of smell can be a key diagnostic tool for AD that could improve the current neuropsychological assessment procedures.

Olfactory Loss in Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)

Approximately one in every four patients admitted with SARS-CoV-2 self-reported issues with perceiving smells (according to Giacomelli, as cited in Hornuss et al., 2020). Research by Hornuss et al. (2020), nonetheless, indicates that the negative impacts of the virus on olfaction might be greater than perceived by the patients; the objective Sniffin' Stick

Test revealed that both anosmia and hyposmia were significantly more prevalent than patients subjectively recognized. Forty four percent of people categorized as having no olfaction (anosmia) and half of those with compromised abilities (hyposmia) did not recognize that they had olfactory deficits (Hornuss et al., 2020). The researchers, thus, stress the important role of objective olfactory measurements in the evaluation of clinical presentations of SARS-CoV-2 patients (Ibid.).

Beyond being one of the symptoms of SARS-CoV-2, olfactory dysfunction serves as a precursing clinical sign of a developing infection (Li, Bai, & Hashikawa, 2020); difficulty detecting smells tends to appear prior to other symptoms such as cough and fever. Moreover, Li, Long, et al. (2020) found that olfactory impairments can hold for longer than 95 days with a median duration of 62 days. Even though hyposmia tends to fade away within a couple of days upon healing from the infection, which was true for 44 % of studied Europeans (Lechien et al., 2020), some patients continue to have long-term impairments upon discharge (Li, Long, al., 2020).

Notably, the olfactory loss in SARS-CoV-2 is present in the absence of nasal obstruction and, thus, cannot be explained as resulting from a mechanical blockage of the olfactory pathway (Parma et al., 2020). Viruses that affect the Central Nervous System (CNS) are commonly neurotropic, such as measles virus and human immunodeficiency virus (HIV), however, respiratory viruses, such as influenza and coronaviruses, have progressively become a neuropathological threat (Bohmwald, Galvez, Ríos, & Kalergis, 2018). Respiratory viruses have been identified in the Cerebrospinal fluid indicating that, upon reaching the lungs, such viruses can infiltrate the CNS (Ibid.). SARS-CoV-2 is thought to have a disturbing effect on sensory-neural systems given its multimodal effect of impacting both olfaction and gustation and altering chemical sensitivities of membranes (Parma et al., 2020).

Olfactory neurons are considered possibly involved in the anosmic experience by acting as a portal for the entry of the SARS-CoV-2 virus (Hornuss et al., 2020). Other coronaviruses, including SARS-CoV, are known to have a high capacity of neuroinvasion (Ibid.). Given the similarities between SARS-CoV and the newer version of the virus (SARS-CoV-2), it is hypothesized that the latter could also impact the CNS. Characteristic clinical manifestations of SARS-CoV-2 — headaches, nausea, and vomiting — could indicate neurological impacts of the infection (Li, Bai, et al., 2020). Conversely, research by Mao et al. (2020) tentatively found that 36.4 % of SARS-CoV-2 infections came with neurological expressions. Neurological manifestations were more common in severe SARS-CoV-2 cases and included impaired consciousness (14.8 %), cerebrovascular diseases (5.7 %), and skeletal muscle injury (19.3 %). The neurological implications of the new coronavirus are, nonetheless, not yet fully understood and more research is needed. Particular attention should be given to the routes through which the respiratory virus reaches the CNS as well as to the long-term consequences of a neuroinvasion. When it comes to the guiding theme of this research, it is important to note that SARS-CoV-2 is another medical condition that is better understood with insights from olfactory assessments.

Olfactory Plasticity and Neuropsychological Rehabilitation

The neurological plasticity of the human brain has been extensively investigated in recent decades (Goldstone, 1998). Neuroplasticity can be observed not only after functional loss due to stroke, brain tumors or sensory deprivation (Merabet & Pascual-Leone, 2010) but also following the acquisition or optimization of sensory function with learning (Gilbert & Sigman, 2007). The olfactory system exhibits great changeability, due to mechanisms that have been extensively investigated both at cognitive and cellular levels (Mainland et al., 2002). A recently published study indicated that human olfactory acuity, as well as the primary representations of cortical odor, persist at normal levels despite acute nasal occlusion (Kollndorfer et al., 2014). These normal levels of performance are presumed to be maintained by top-down compensatory systems made possible by the neuroplastic quality of the brain.

The mechanisms of neural plasticity in the olfactory system are of particular interest given that losses or reductions in olfactory function are prevalent in many neurological and psychiatric conditions. As discussed in previous sections, smell loss is among the first symptoms of neurodegenerative disorders, such as Alzheimer's or Parkinson's disease. Olfactory deficits greatly impact quality of life and become especially debilitating when coupled to other sequels of brain injuries and disorders such as impaired cognition, sensation or motion (Drummond et al., 2013). Thus, neural plasticity in relation to olfactory dysfunction can have widespread implications for brain function far beyond olfactory perception. Olfactory rehabilitation is crucial for neurological functioning, prognosis, and quality of life. Thanks to the neuroplastic nature of the brain, the capacity to detect odors is changeable and one can learn to detect a particular smell through olfactory training (e.g., Cain & Gent, 1991).

In a study by Pistoia et al. (2015) a participant in a minimally aware state subjected to an olfactory imagination task was able to develop his conscious awareness skills upon a series of trials. The improvement most likely resulted from the training he received by repeating the olfactory-imaginative exercise which induced the patient to learn and develop a previously lacking ability. Olfactory training was found successful in the rehabilitation of people suffering from post-traumatic olfactory dysfunction. A randomized control trial training was administered for five minutes daily with four odorants (rose, eucalyptus, lemon, and cloves) during 16 weeks. Olfactory function scores on the Sniffin' Sticks Test raised 33 % in those who received treatment (according to Konstantinidis et al., as cited in Miwa et al., 2019). As a side note, olfactory training has also been shown to enhance functioning in non-traumatic olfactory dysfunctions, such as those following viral infections (according to Hummel et al., as cited in Miwa et al., 2019). It is worth mentioning, that to date no medication has been scientifically shown beneficial in cases of viral olfactory impairments (Miwa et al., 2019).

In conclusion, olfactory training is a promising therapeutic treatment for olfactory loss. Although the effectiveness of olfactory training programs has been observed in several

groups of patients with anosmia and hyposmia, the neurological basis of the intervention remains poorly understood.

Measuring Olfaction

Olfaction is considered an especially challenging sense to measure as smells are invisible, unlike vision, and can only be perceived in a proximal environment, unlike sounds that can be heard by multiple people who are further apart. There are no official and/or universal clinical practice guidelines for the detection of olfactory dysfunctions (Miwa et al., 2019). There are, nonetheless, several measures designed to assess olfaction. Common olfactory assessments are here discussed.

Psychophysical techniques are a frequent component of olfactory assessments. The procedure consists of the presentation of different odors to a patient and the assessment of the respective response. Results are then adjusted according to age, sex, as well as clinical individualities. Psychophysical measures can be given in the form of odor differentiation, odor identification, magnitude estimation of odor intensities, odor detection threshold, or odor recognition memory tasks (Rombaux et al., 2009). Several olfactory tests consist of the verbal identification of odors from an array of descriptors. This simple and generally accessible method could, nonetheless, have the shortcoming of not being well suited for patients with impaired cognitive abilities or compromised awareness.

Among the most common orthonasal, i. e., through sniffing, olfactory measures lies the Sniffin' Sticks Identification Test (Hummel, Kobal, Gudziol, & Mackay-Sim, 2007). In this quantitative assessment patients are prompted to identify target odor(s), presented on felt-tip pens, from an array of different odorants. Odorants include cinnamon, apple, leather, fish, pineapple, sesame oil, etc. Odor threshold, odor discrimination, and odor identification are all part of the Sniffin' Sticks assessment. Together such measurements generate the "threshold-discrimination-identification" score that quantifies the patient's olfactory function. Retronasal Tests, on the other hand, reside on the assessment of olfaction at the back of the nasal cavity. This is done (a) through the mouth, e. g., with odorous powders applied to the tongue, or (b) via the nasal cavity itself — via canulas attached to an olfactometer (Rombaux et al., 2009). Similar to orthonasal identification, participants are asked to match the odor to an array of different smells (Ibid.).

Other reliable and valid measures are: the Scandinavian Odor-Identification Test, where sixteen odors are successively presented and the subject is given four possible responses per stimulus to choose from (Nordin, Brämerson, Liden, & Bende, 1998); the San Diego Odor Identification Test, consisting of eight common household odorants in an opaque jar (Krantz et al., 2009); the University of Pennsylvania Smell Identification Test (UPSIT) which can be self-administered and uses microencapsulated odorants accessed via the scratching of standardized impregnated test booklets (Doty, Shaman, Kimmelman, & Dann, 1984); a Brazilian-Portuguese version of the UPSIT is available

and could serve as an alternative for native Portuguese speakers (Silveira-Moriyama et al., 2010); there is also a shorter version of the UPSIT, the Brief Smell Identification Test (B-SIT), with 12 scratchable odorants (Krantz et al., 2009).

In an attempt to establish standardized olfactory assessment and treatment guidelines for clinical settings, the Japanese Rhinologic Society (JRS) founded the Subcommittee of the Japanese Clinical Practice Guideline. In Japan, olfactory dysfunction is commonly measured through the T&T olfactometer assessment. The T&T intravenous test is composed of five different odors (methyl cyclopentenolone, skatole, b-phenylethyl alcohol, g-undecalactone, and isovaleric acid) with seven or eight graded concentration levels. Odor detection and recognition thresholds are recorded generating a mean T&T score considering all odors, concentrations, and both nostrils where 1.0 or less is considered normal and 5.6 or higher categorized as anosmia (Miwa et al., 2019). Another olfactory test commonly administered in Japan is the intravenous injection of thiamine Propyldisulfide (Alinamin), a substance characterized by a garlic-like odor sensation. This subjective assessment captures the mean latency time and duration of such sensation with 8 s and 70 s, respectively, considered healthy. Prognosis has been found to be significantly worse in subjects who do not respond to Alinamin (Ibid.).

Olfactory Event Related Potentials (ERPs) is a technique to measure the brain's response to a stimulus in a person's environment. An olfactometer delivers the odor through either a "flow" or a "pulse" method which induces polyphasic response signals (Martin, 2013; Rombaux et al., 2009). The continuous odor flow is considered a superior technique to measure odor-evoked ERPs (Martin, 2013). Chemosensory ERPs generally confirm the results of psychophysical olfactory tests (Rombaux et al., 2009). It is important for the chemosensory stimuli to be presented repetitively with a steep onset (Ibid.).

Unlike the most common olfactory assessment techniques described above, Pistoia et al. (2015) used an olfactory imagination task to investigate uncovered consciousness. The studied patient had severe brain injuries and was initially considered mostly cognitively unaware. The subject was prompted to think about an unpleasant odor. The subsequently induced EEG patterns indicated that the participant was indeed consciously aware as their brain promptly responded to the delivered task. Pistoia et al. (2015) innovatively suggested that (a) olfactory imagination is more available to the injured brain than other non-olfactory stimuli, and (b) that olfactory imagination, without the presence of the actual smell, can indicate conscious awareness.

Lurian and Neolurian Neurofunctional Paradigms

The *Neuropsychological Factor* concept, coined by A. R. Luria, refers to the neurological impairment of a local brain region and its corresponding psychological expression (Luria, 1973). The concept stresses the importance of qualitative and comprehensive assessments of somatic and psychological symptoms in determining the location of the brain damage responsible for an observed abnormality (Peña-Casanova & Sigg-Alonso, 2020).

A. R. Luria recognized that mental activities rely on the collective functioning of distinct neurological regions. The neuroscientist further identified three main

functional areas within the brain, each responsible for a cluster of capacities. According to Luria (1973), the first subregion composed of the brain stem, diencephalon, and mesial portions of the cortex is involved in *regulating tone and waking and mental states*. Parolfactory regions, olfactory bulbs, and the hippocampus can be found in this region. The second subregion, i. e., lateral postcentral regions of the neocortex on the convex surface of the hemispheres, is important for *obtaining, processing and storing information coming from the outside world*. Olfactory structures within the second unit are the primary olfactory cortex and parolfactory regions. Lastly, the precentral anterior regions of the hemispheres are responsible for *programming, regulating and verifying mental activity* (Luria, 1973) with the integration of cortical and subcortical systems.

Peña-Casanova (2018) further developed on the three subunits initially proposed by Luria advocating for a total of five modified functional subregions within the brain. The two added regions were (a) striatal (basal ganglia) systems (unit IV) and (b) cerebellar structures (unit V). Peña-Casanova's model differs from Luria's in that it (1) includes aspects not incorporated in the three-regions model and (2) is not cortico-centric with a greater focus around the subcortex. Luria's perception of the brain as a complex functional system with distinctive collaborative regions persists in the five-unit model. Through the addition of units IV and V, Peña-Casanova (2018) covers important subcortical regions involved in olfaction. The olfactory tubercle, found in the limbic striatum (unit IV), is a strong respondent to presented odors. The structure is highly involved in odor motivated behaviors and reward cognition (Ashwell & Mai, 2012). Moreover, the addition of unit V speaks to the contemporary understanding of the cerebellum as a region involved in communication across cortical and subcortical regions. It is moreover believed that the cerebral unit V contains a feedback mechanism that responds to changing odor concentration (Sobel et al., 1998).

We will base ourselves on the first unit of Luria's concept to assess how capable a given patient is to receive olfactory information. Our goal is to achieve a more comprehensive clinical picture with insights around neurofunctional capacities. The fifth cerebral unit proposed by Peña-Casanova will also be a starting point for the development of our olfactory assessment tool; we plan to measure how patients with neuropsychological impairments respond to different odor concentrations.

Discussion and Future Directions

Our primary focus was on olfaction. This sensory function is empirically supported to distinguishably influence neuropsychological domains. Held in the most archaic regions of the brain, known as the rhinencephalon, olfaction is a unique sense in which perception takes place, mostly, bypassing the thalamus. The rudimentary rhinencephalon has few connections to brain zones that, from an evolutionary point of view, have more recent origins, such as the neocortex where the centers of language are found (Scliar, 2020). The, comparably, direct pathway involved in smelling is believed to explain some of the unique

characteristics of the olfactory sense. Those include the great relationship between smell and emotions, and the often subconscious nature of the olfactory process which makes olfaction highly influential of how people function and experience their surroundings; olfaction can influence emotional and psychological states and is, thus, highly associated with the development of psychopathologies. The fact that smells can often be perceived by the brain without conscious awareness often allows it to be responsive in unconscious patients. This is an important consideration in the context of neuropsychological testing where patients are often unresponsive to cognitive assessments. The olfactory sense could serve as an alternative, and supplementary, tool to explore brain functioning in severely debilitated patients.

The empirical body of literature has linked olfactory dysfunctions to a wide-range of health conditions. Those include, but are not limited to, neurological and neurodegenerative illnesses, such as traumatic brain injuries, cerebrovascular accidents and Alzheimer's disease, Parkinson's Disease, psychological disorders, including anxiety, depression, and psychotic conditions, and even the current pandemic of SARS-CoV2 (e.g., Hornuss et al., 2020; Rottstaedt et al., 2018; Sun et al., 2012; Xiao et al., 2014). Assessing abnormalities in olfaction is, thus, crucial as it may help diagnose numerous conditions that affect the human brain. Notably, olfactory deficits often serve as biomarkers for conditions when they manifest themselves prior to other symptoms (Martin, 2013; Sun et al., 2012). Examining olfaction in patients who already have a pre-existing diagnosis can also be insightful given that olfactory abilities provide cues regarding the prognosis of several neuropsychological conditions. In other words, functional olfaction often indicates greater chances of successful rehabilitation (Callahan & Hinkebein, 2002). It is crucial for healthcare providers, clinical patients, and the general population alike to be vigilant to issues around olfaction. If those are experienced, they must be examined as a potential indicator of other health complications.

Neuropsychological testing is a central component of the diagnostic process for clinical conditions. The goal is to identify and differentiate illnesses, assess the severity of a disorder, understand the patient's daily experiences and limitations caused by the condition, as well as make prognostic estimations based on baseline impairment. The standardized Neuropsychological scales currently used by professionals of the field, such as the Glasgow Coma Scale (Teasdale & Jennett, 1976) and The Mini-Mental State Examination (Martin, 1990), are largely focused on cognitive domains. While they evaluate the superior mental functions such as, attention, learning, memory, and other executive and motor functions, they leave sensory capacities behind. We argue that including sensory scales to the neuropsychological assessment battery would provide a more thorough and comprehensive understanding of a patient's health and well-being as well as allow for more informed and timely diagnosis.

We decided to begin by developing an olfactory battery suited to be included in neuropsychological assessments. We will base ourselves on the first unit of Luria's concept to assess how capable a given patient is to receive olfactory information. This could be fundamental for patients who are particularly compromised in their cognitive

capacities and would, thus, likely not be responsive to standard neuropsychological tests that require greater cognizance levels. Luria described his first unit as one responsible for *regulating tone and waking and mental states*. In accordance with the research previously described, parolfactory regions and olfactory bulbs can be found in this region, which once again highlights the tight relations between olfaction and conscious neurological states. Through the measurement of patients' responses to an array of selected odors, we hope to contribute to a more comprehensive clinical picture and to a better understanding of subconscious neurological functioning in those with severe cognitive impairments.

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Original manuscript received September 30, 2021

Revised manuscript accepted May 02, 2022

First published online July 20, 2022

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The Assessment of Different Types of Attention in Children Using a Computerized Test Battery

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Использование компьютеризированной батареи тестов для оценки различных аспектов внимания у детей

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To cite this article: Talalay, I. V. (2022). The Assessment of Different Types of Attention in Children Using a Computerized Test Battery. *Lurian Journal*, 3(1), pp. 29–35. doi: 10.15826/Lurian.2022.3.1.2

Abstract. We designed a computerized test battery that was used to assess sustained, selective and divided attention in children aged 8 vs. 9 years. A group of children aged 8.34 ± 0.48 years ($n = 30$, 14 male, 16 female) and a group of children aged 9.33 ± 0.51 years ($n = 42$, 21 male, 21 female) participated in the study. The test battery included one simple reaction time task, two divided attention tasks, two sustained attention tasks, and one selective attention task. The analysis of task performance revealed age-related difference in the efficiency of sustained attention: the reactions of 9-year-old children to target stimuli were significantly faster than the reactions of 8-year-old children. The computerized battery showed sensitivity to different aspects of attention and might become a useful tool for the neuropsychological assessment of attention in children with and without developmental disorders.

Keywords: selective attention; divided attention; sustained attention; computerized test battery; Go/NoGo; SRT; Flanker task

Аннотация. Разработанная компьютеризированная батарея тестов предназначена для исследования длительного (устойчивого), избирательного и распределенного видов внимания у детей. В исследовании приняли участие две группы детей разного возраста: 30 детей в возрасте 8.34 ± 0.48 года (14 мальчиков, 16 девочек) и 42 ребенка в возрасте

9.33 ± 0.51 года (21 мальчик, 21 девочка). Батарея тестов включала один тест на скорость реакции (Simple Reaction Time Task), два теста на распределенное внимание, два теста на непрерывное внимание и один тест на избирательное внимание. Анализ результатов выполнения тестов детьми выявил возрастные различия: время реакции у детей 9–10 лет было значительно ниже, чем у детей 8–9 лет при выполнении монотонных задач, требующих длительного удержания внимания. Разработанная батарея тестов показала «чувствительность» к различным аспектам внимания и может стать полезным диагностическим инструментом для нейропсихолога при оценке внимания у детей с нарушениями и без нарушений развития.

Ключевые слова: избирательное внимание; распределенное внимание; длительное внимание; компьютеризированная батарея тестов; Go/NoGo; SRT; Flanker task

Introduction

In psychology, attention is regarded as a set of cognitive processes including orienting (e.g., Herreros, Lambert, & Chica, 2017; Plude, Enns, & Brodeur, 1994; Posner, 1980), filtering (e.g., Akhtar & Enns, 1989; Das, Biesmans, Bertrand, & Francart, 2016; Plebanek & Sloutsky, 2018; Plude et al., 1994), searching (e.g., Plude et al., 1994; Woodman & Luck, 1999; Yantis & Jonides, 1984), and expecting (e.g., Brunia, Hackley, van Boxtel, Kotani, & Ohgami, 2011; Plude et al., 1994; Talalay, Kurgansky, & Machinskaya, 2018; Weiss, Meltzoff, & Marshall, 2018). However, this description is incomplete because it does not encompass all aspects of attention. On the basis of experimental studies (e.g., Gray, James, & Winterbottom, 2016; Richards, Samuels, Turnure, & Ysseldyke, 1990), we selected three components of attention that might play a major role in the regulation of cognitive processes and behavior.

These components include *selective attention* (the ability to focus on relevant stimuli while ignoring irrelevant or conflicting stimuli), *divided attention* (the ability to focus on two or more stimuli at the same time, and *sustained attention* (the ability to focus on monotonous tasks during a long period of time).

Neuropsychologists use various methods to quantitatively assess different types of attention. However, there are only few computerized tests for children that include all the above-mentioned components. Therefore, we decided to develop a computerized battery of attention tests, specially designed for school-age children.

Materials and Method

The test battery is implemented in Octave 6.1.0 (<https://www.gnu.org/software/octave>) on the basis of Psychtoolbox-3 (<http://psychtoolbox.org>) and consists of six tests.

(1) *The Simple Reaction Time task (SRT)* measures the level of general arousal (e.g., Deary, Liewald, & Nissan, 2011; Stebbins, 2007). Participants are asked to press

a response key when the target stimulus (*Fig. 1(A)*) occurs. The stimulus is presented 30 times with a stimulus onset asynchrony of 1000–2000 ms.

- (2) *The Flanker task (FLANKER)* is used to assess selective attention in the neutral, congruent, and incongruent conditions (e.g., Eriksen & Eriksen, 1974; Fan, McCandliss, Sommer, Raz, & Posner, 2002; Gratton, Cooper, Fabiani, Carter, & Karayanidis, 2018; Santhana Gopalan, Loberg, Hämäläinen, & Leppänen, 2019; *Fig. 1(F)*). In FLANKER, five horizontally aligned stimuli (either arrows or lines) occur simultaneously. A participant should detect the direction (left or right) of the target arrow in the middle and then press a corresponding key. The sets of stimuli are presented one by one at 2000 ms intervals. The test consists of 90 trials.
- (3) *The Go/No-Go task with infrequent Go trials (GNG-1)* is used to assess sustained attention (e.g., Casey et al., 1997, Gratton et al., 2018). In GNG-1, three different stimuli (*Fig. 1(D)*) are presented one by one at 2000 ms intervals. A participant should react to one of them (*Fig. 1(D, 1)*) by pressing a response key. The third drawing in *Fig. 1(D)* is considered as a “trap” stimulus because of its similarity to the target stimulus. The test consists of 120 trials, 36 of which are target.

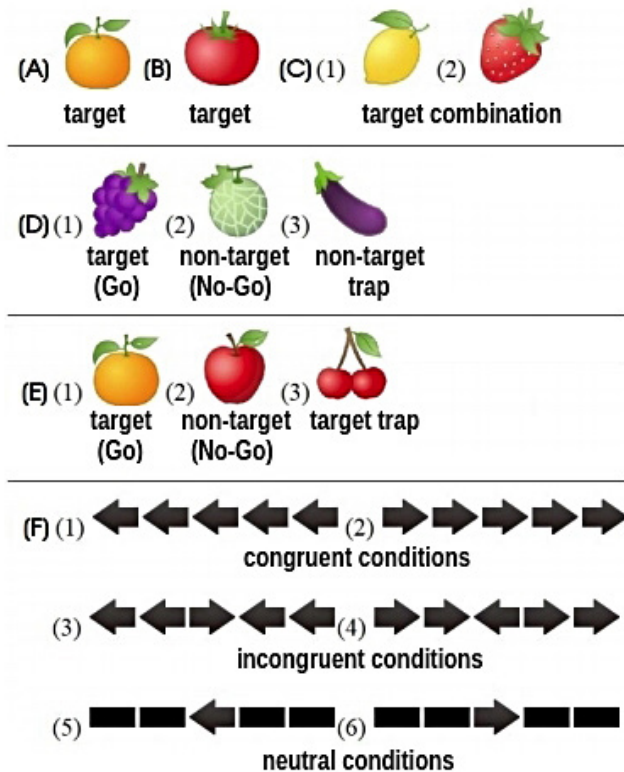


Figure 1. The stimuli used in (A) SRT, (B) DIV-1, (C) DIV-2, (D) GNG-1, (E) GNG-2, and (F) FLANKER. All stimuli are inserted in a white square with $1.5^\circ \times 1.5^\circ$ angular size. All stimuli (or matrices) are presented at the center of a gray display screen

- (4) *The Go/No-Go task with infrequent No-Go trials (GNG-2)* is used to assess sustained attention and response inhibition (e.g., Casey et al., 1997, Gratton et al., 2017). In GNG-2, three different stimuli (Fig. 1(E)) are presented one by one at 2000 ms intervals. A participant should ignore one of them (Fig. 1(E, 2)) and react to the other stimuli by pressing a response key. The third drawing in Fig. 1, E is considered as a “trap” stimulus because of its similarity to the non-target stimulus. The test consists of 120 trials, 48 of which are non-target.
- (5) *The Divided Attention task with one target stimulus (DIV-1)* is used to assess attention divided among nine spatial sources of visual information. In DIV-1, 3-by-3 matrices of different stimuli (the drawings of fruits and vegetables) are presented one by one at 2000 ms intervals. A participant should find the target stimulus (Fig. 1(B)) and then press a response key. The test consists of 60 trials, in 30 of which the target stimulus appears in a random location.
- (6) *The Divided Attention task with two target stimuli (DIV-2)* is a more difficult version of DIV-1. The procedure of DIV-2 is similar to the procedure of DIV-1. The only difference is that a participant should respond only when both target stimuli occur (Fig. 1 (C, 1, 2)). The test consists of 70 trials, in 15 of which both target stimuli appear in random locations.

The sequence of trials in each test is pseudorandom.

Two groups of children participated in the study: 30 children (14 male, 16 female) aged 8.34 ± 0.48 years and 42 children (21 male, 21 female) aged 9.33 ± 0.51 years.

All participants performed 6 attention tests. The tests were presented in two different sequences: (1) SRT, FLANKER, DIV-1, GNG-1, DIV-2, GNG-2; (2) SRT, GNG-1, DIV-1, GNG-2, DIV-2, FLANKER. The sequences were counterbalanced across participants. Participants were instructed to respond as quickly and accurately as possible for all tasks.

Results

Reaction times (RT) was analyzed that corresponded to correct-response trials and the percentage of correct responses in both groups. The analysis of task performance revealed age-related differences in the efficiency of sustained attention (Fig. 2).

Reaction Time

For GNG-1, the statistical analysis showed a significant difference in RT between 9-year-old ($M = 591 \pm 74$ ms) and 8-year-old ($M = 651 \pm 82$ ms) children, $t(70) = 3.217$, $p = .002$.

For GNG-2, a similar difference in RT between the groups was observed ($M = 661 \pm 90$ ms vs. $M = 701 \pm 77$), but it was found to be nearly significant, $t(70) = 1.962$, $p = .054$.

The RT values are shown separately for each attention test and each age group in Fig. 2(1).

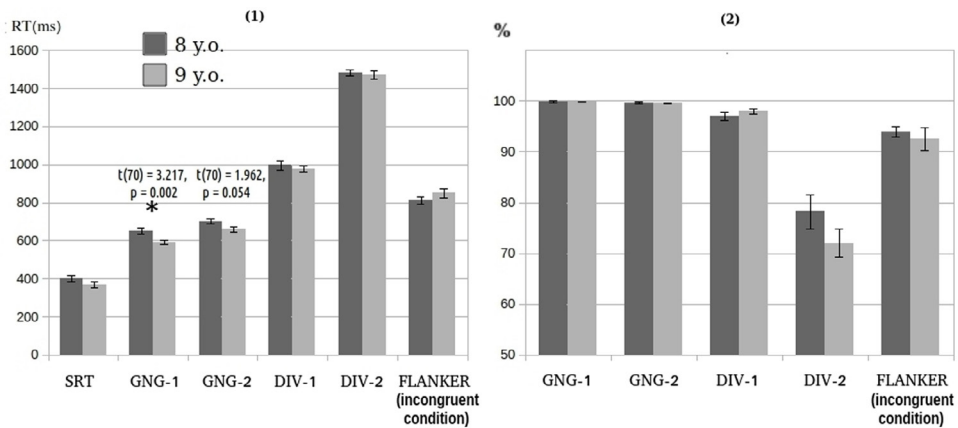


Figure 2. Averaged RT in milliseconds (1) and accuracy score percentage (2) are shown for each attention test and each age group. Error bars correspond to the standard error of mean (SEM). Significant differences are marked with stars

The Percentage of Correct Responses

The statistical analysis revealed no significant or nearly significant difference in the accuracy of task performance between the two groups.

The percentage of correct responses is shown separately for each attention test and each age group in Fig. 2(2).

Conclusion

A computerized test battery was designed for the assessment of selective, divided, and sustained types of attention in school-age children. The battery was used to compare the efficiency of attention in typically developing children aged 8 vs. 9 years. The analysis of task performance revealed age-related difference in the efficiency of sustained attention: the reactions of 9-year-old children to target stimuli were significantly faster than the reactions of 8-year-old children.

The computerized test battery is found to be sensitive to different aspects of attention and might become a useful tool for the neuropsychological assessment of attention in children with and without developmental disorders.

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Original manuscript received September 30, 2021

Revised manuscript accepted May 02, 2022

First published online July 20, 2022

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Reflection as a Factor in the Success of Learners' Innovative Activity

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Рефлексия как фактор успешности инновационной деятельности обучающихся

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To cite this article: Bykova, E. A. (2022). Reflection as a Factor in the Success of Learners' Innovative Activity. *Lurian Journal*, 3(1), pp. 36–45. doi: 10.15826/Lurian.2022.3.1.3

Abstract. The analysis of the psychological grounds for learners' innovative activity would provide avenues for development of innovation capabilities in the younger generation. In the article, reflection is considered a mechanism that impacts the efficacy of action. In this regard, the purpose of the study was to analyze how reflective practice is manifested in learners who are engaged in the university innovative activity but demonstrate its varying degrees. As a working hypothesis, it was assumed that students with varying degrees of innovative activity differ in the level of general reflection of their own activity and its individual components: information-based activity, motivation, benchmarking, decision-making, and performance. The study showed that students experience the greatest difficulties when analyzing the conditions for organizing activities, assessing their own resources and possible risks. Also, significant differences were found in the degree of intensity of such a component as the information-based activity among students with varying degrees of innovative engagement.

Keywords: *reflective practice; innovative activity; innovative action; innovative person*

Аннотация. Изучение психологических оснований инновационной деятельности позволит наметить пути развития инновационного потенциала обучающихся. Рефлексия рассматривается как механизм, оказывающий влияние на эффективность инновацион-

ной деятельности. Целью исследования являлось изучение выраженности рефлексии деятельности у студентов, проявляющих разную степень активности в процессе инновационной деятельности в вузе. В качестве гипотезы выступило предположение о том, что студенты с разной степенью инновационной активности отличаются по уровню общей рефлексии собственной деятельности и отдельных ее составляющих: информационной основы деятельности, мотивации и целеполагания, процесса принятия решения и осуществления деятельности. Исследование показало, что наибольшие затруднения студенты испытывают при анализе условий организации деятельности, оценке собственных ресурсов, возможных рисков. Обнаружены значимые различия в степени выраженности такой составляющей рефлексии, как информационная основа деятельности, у студентов, имеющих разный уровень инновационной активности.

Ключевые слова: рефлексия деятельности; инновационная деятельность; инновационная активность; инновационная личность

Introduction

The issue of a person's readiness for innovative activity is now becoming increasingly important.

According to the Strategy for Innovative Development of the Russian Federation, an essential component of the national economic policy today is the development of innovative products, an increase in the number of agencies that implement technological innovations, and the formation of demand for innovative products.

In our opinion, a person can carry out innovative activity only if there is a set of individual characteristics that ensure effective implementation. This is due to the complexity of the phenomenon of innovation, which requires both the compliance with the step-by-step arrangement and a careful study of the personal and intellectual abilities of innovators (Meshcheryakova & Larionova, 2013). The innovative development of the country is possible in the conditions of significant human resources, which are the support and strategic value of the nation. Consequently, there is a need for early identification and development of innovative personality traits and the formation of readiness for innovative activity, starting with school and continuing with university education.

The study of personal determinants that ensure success in innovative activity can now become a relevant area of research. This would enable some adjustments to the system of education and training of the younger generation, which constitutes tomorrow's innovative potential of the nation.

Most of the research on innovation, innovative activity and innovative person concerns economics, organizational psychology, labor psychology and pedagogical innovation. However, the development of an innovative person at the stage of training in educational organizations and the continuity of the development in the school-university chain have been insufficiently studied.

Thus, psychological characteristics of learners, which are predictors of the future success of their innovative actions in an educational organization and after graduation, can be identified as a research problem.

The innovative action considers as an independent, productive, creative, and purposeful activity in which the learner, assisted by new means of achieving the performance objective, develops as a participant of innovation and as an innovative person.

Most of foreign and domestic researchers attribute the following personal characteristics to an innovative person: openness to the environment and innovations, the desire for self-realization and creative activity, attempts to change the existing living conditions and the desire for novelty, as well as curiosity, critical attitude to benchmarks and reflective learning skills (E. I. Fedak and S. V. Tsentserya (2011), V. A. Slastenin and L. S. Podymova (1997), et al.).

Furthermore, it is important to note that the learning environment fosters the cognition of learners and plays an important role in the development of creative thinking (V. V. Rubtsov, I. M. Ulanovskaya). With the appropriate organization of the teaching and learning context, the learning environment increases cognitive motivation, reduces learners' anxiety, and makes self-esteem and the level of aspirations more differentiated (Rubtsov & Ulanovskaya, 2020, p. 71).

The study of innovative activity was based on the beliefs expressed by the proponents of the activity approach. *The activity approach* is a research methodology, the basis of which is the category of object-oriented activity (M. Ya. Basov). The approach presupposes the singling out of such units of analysis that would prevent the researcher from losing the specific nature of the activity (L. S. Vygotsky).

According to Vygotsky, activity has a decisive role to play in the mental development of a person. Also, the role of an adult is important as a navigator affecting the acquisition of knowledge and methods of action. Vygotsky recognizes the «role» of the adult in the formation of the activity and its forms in the child, meaning the formation of the personality of the child by adults based on their shared life and activities (Vygotsky, 2000). Innovation is understood as the joint activities of the learner and the teacher, who acts as a mentor and guide (carrier of experience and innovation skills).

A joint innovation results in the creation of a new educational product and new knowledge in the subject matter. Innovative activity is always accompanied by a particular goal recognized by the learner and actions aimed at achieving it. At the same time, the activity can be both individual and collective (Bykova, 2018).

Considering the complex structure of innovative activity, we single out a set of its system-forming components, namely: motivational, cognitive, behavioral, and monitoring and evaluative.

The motivational component provides the formation of personal meaning and motivation for action. Being a subject of activity, a person is capable to want and desire anything, which is satisfied in activity and through activity. Thus, the learner can independently set the goal of the activity. Also, the resources of the inner world are involved

under the influence of motivation and the goal. Motivation impacts the acceptance of innovative activity, the definition of its personal meaning, and the selection of methods of achieving the result.

The cognitive component creates the basis for the formation of a conscious attitude towards an innovative product and helps foresee the course of events and predict the result. Under the principle of the unity of consciousness and activity, activity is analyzed as a conscious reality. Besides, activity awareness is closely related to motivation, goal setting and reflection.

The behavioral component ensures the implementation of the objective and its step-by-step achievement, and it is interpreted as innovative behavior. Regarding the learners, the innovative behavior considers as “[...] a particular type of personality activity, manifested in the ability to flexibly respond to situations of uncertainty and overcome obstacles, showing willingness to take part in new activities that require independence and persistence in achieving goals, and creativity” (Bykova, 2018, p. 20). The formation of the prerequisites for innovative behavior is initiated as early as the learning period in educational institutions.

The monitoring and evaluative component provides the capacity to track and correct the innovative actions and evaluate their final and intermediate results. The component is implemented through reflection. Advanced reflection conditions the flexibility and dynamism of the person, and the ability to change modes of behavior depending on the circumstances and situations that are currently important, allowing the person to overcome the stereotypes that have developed through the activities.

The key provisions of the system-genetic concept which implies that the effective performance is manifested in the developed reflection in relation to separate constructs (Shadrikov, Kurginyan, & Kuznetsova, 2015). Acting as a mechanism of activity, reflection affects the scope of motivation and needs and leads to goal-setting and the implementation of innovative activity, as well as its mapping.

The necessary stage of the formation of personal readiness for innovative activity is defined as the development of reflexive evaluation of one's own condition and activities, through the verbalization of internal mental constructs when coping with difficulties and solving problems in the learning environment (Galazhinsky & Klochko, 2009).

Since the assessment of one's effective actions is possible only with the developed reflection, it seems important to study this feature in the framework of learners' activities to determine the degree of its intensity. Thus, in the future, ways were determined to optimize the process of improving the reflective component with its subsequent inclusion in the innovative actions. The specified problem allowed us to determine the purpose of our research — to study the intensity of reflective practices in learners, as well as to compare the characteristics of reflection manifested by learners with varying degrees of involvement in the innovative activity of an educational organization. As a hypothesis, the assumption was made that the quality of reflective practice is less among students with low innovative activity than among students who actively participate in innovations offered at the university.

Design

The study involved 412 full-time undergraduates of the Pedagogical University, aged 18 to 22 (of which 198 boys and 214 girls). They are second, third and fourth-year students.

Based on the preliminary questionnaire that assesses the degree of learners' involvement in the innovations, all the participants were divided into 3 groups.

Group 1 included students who actively participate in any new activity offered to them (competitions for grants, research projects, and research work), resulting to a research product or creative project, etc.

Group 2 included students who are highly motivated (they claim to have a desire to participate in innovative projects), however, they show little activity and anticipate help and invitation from lecturers. Given the multicomponent structure of innovative activity, which includes motivational, cognitive, behavioral, and emotional components, it is the behavioral component that requires special attention and formation.

Group 3 included participants who are inactive and disinterested in projects, research work and competitions offered in an educational organization. Students are not aware of themselves as actors of activity, capable of independently setting a goal and finding ways to achieve it.

Methods

To analyze the phenomenon of reflection, the concept of V.D. Shadrikov was considered. According to the researcher, the learner's effective performance is manifested in the developed reflexivity in relation to the individual activity constructs. Reflecting on a specific activity, the individual "... shows the ability to consciously reproduce the experience gained, to master and turn it into a generalized method of action in a specific problem situation ..." (Shadrikov et al., 2015, p. 10).

In addition, it is worth considering the idea of a differential model of reflexivity (D. A. Leontiev, E. N. Osin), with systemic reflection being singled out as one of the constructs. Systemic reflection is based on the perception of oneself from the outside perspective and allows for successful solution of any problem, since it makes it possible to consider interaction in all its aspects (Leontiev & Osin, 2014).

The reflective practice test was used as a diagnostic tool (V.D. Shadrikov, S.S. Kurginyan, and M.D. Kuznetsova) aimed at the analysis of the general reflection and its individual components (Shadrikov et al., 2015).

As a working hypothesis, it was assumed that students with varying degrees of innovative activity differ in the level of general reflection of their own activity and its individual components: information-based activity, motivation, benchmarking, decision-making, and performance.

Discussion

Analysis of the data shows that for the most part, students on all 4 scales demonstrate a pronounced reflection within the normative values characterizing the respondent as capable of effectively performing their own activities. This demonstrates a clear understanding of the expected outcomes of someone's actions, associated with motivation and goal setting, and the ability to analyze the objective and subjective conditions, which allows organizing the activities in accordance with a given goal and a planned result (Figure).

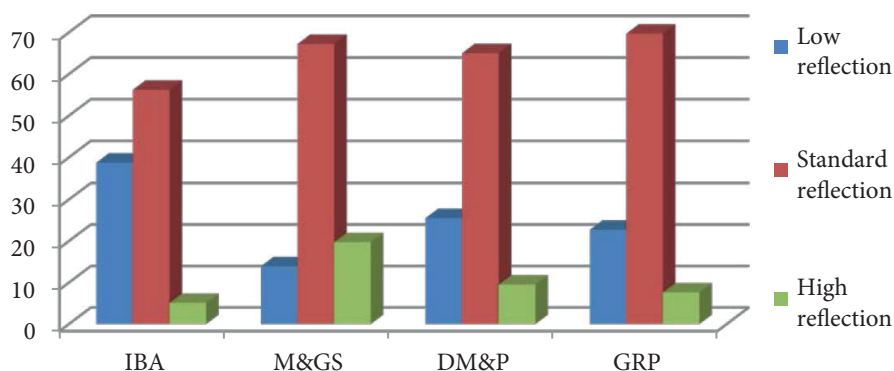


Figure. The reflective practice manifested by students at colleges and universities, %.

Note. IBA — information-based activity, M&GS — motivation and goal setting, DM&P — decision-making and performance, GRP — general reflective practice

However, a detailed analysis of the data allows us to conclude that a fairly large number of students demonstrated a low reflection on the scale *Information-based activity*. This may indicate the insufficient assessment of the conditions of activity and its regulatory methods (resources, opportunities, restrictions in the context of activity, and the requirements imposed by it). Presumably, when faced with the need to perform innovative activities, such difficulties can become an obstacle to a clear understanding of the possibilities of achieving the objective, assessing strengths and resources, and adequately assessing the situation. This can further influence the formation of motivation for activity and a clear image of the desired (subjectively significant result). In general, these indicators can have a negative impact on the implementation of actions, their outcomes and efficiency. Given the complexity of achieving the result and the high level of ambiguity of innovative activity, it is likely that the risks of abandoning it at the initial stage and during the formation of subjective significance will increase.

Also, over 20 % of learners demonstrated low reflection on the scale *Decision-making and performance*, which determines the degree of awareness of decisions made (awareness of the prerequisites, causes and consequences of decisions, making a choice from alternatives). This indicates the inability of these learners to make deliberate and balanced decisions with a view to achieving the planned result, to consider all possible

consequences, to demonstrate independence, and to carefully design action sequences. When learners act in innovative ways, these factors can become an obstacle to the rational achievement of the goal and the refusal to take active actions in the face of obstacles and risks, that are an integral part of innovations.

Low indicators on the scale *General reflective practice* are indicative of difficulties that may arise. This can be attributed to the learners' low awareness and the impossibility of assessing the need to modify activities, based on the analyzed intermediate results. If the final objective is not achieved, learners with low reflection will be unable to analyze the reasons for their own failure and to correct erroneous actions.

To compare the level of reflection manifested by representatives of three groups of learners with different degrees of educational innovative activity, the findings were assessed. It was assumed that students with a high innovative activity are distinguished by a more developed reflection, which is a condition for the success of innovations. The Kruskal-Wallis H-test (for 3 or more independent samples) was used to statistically compare the indicators of the reflection manifested by representatives of these groups (*Table*).

Table

Comparative analysis of reflection manifested by groups of students with different innovation levels

	<i>Scales of the methodology of reflexivity</i>			
	<i>IBA</i>	<i>M&GS</i>	<i>DM&P</i>	<i>GRA</i>
Group 1	15.7	20.2	29.8	65.1
Group 2	15.1	21.1	29.1	65.3
Group 3	13.2	20.5	28.8	61.9
	$H_{emp} = 9.021$ $p = .01$	$H_{emp} = 1.934$ $p = .38$	$H_{emp} = 0.589$ $p = .74$	$H_{emp} = 3.946$ $p = .13$

Notes. Statistically significant differences are in bold. IBA — information-based activity, M&GS — motivation and goal setting, DM&P — decision-making and performance, GRP — general reflective practice

Significant differences between the groups, identified on the IBA scale ($p \leq .01$), indicate that the students of Group 3 (not participating in innovative activities) assess the conditions of their activity lower. It is difficult for them to assess the situation in detail at the time of preparation for activity. The inability to adequately assess the risks, own resources and limitations can lead to doubts about the possible success of the upcoming activities and in planning individual actions on the way to achieving the objectives at the orientation stage. Resulting from the impossibility of adequately targeting and selecting methods for solving problem situations, the motivation for the forthcoming activity drops sharply and the general activity decreases. This is probably an important

factor when deciding on participation in the types of educational innovative activities and it leads to the rejection of any initiative.

No significant differences were found on the remaining scales, and we can infer that the differentiation by activity levels occurs as early as the stage of orientation in activity, which, due to low reflection in a student group with low activity, can complicate the transition to subsequent stages.

In our opinion, the study shows that preparing students for innovative activities requires efforts to develop the ability to reflect on their own practices. However, at the same time, it is important to pay attention to each reflexive component: from reflection on the information-based activity to the development of reflection on motivation and goal setting with the subsequent transition to activities and comparison of the outcomes with the objectives. Also, it would be appropriate to start that kind of training much earlier than at the stage of university education. Since reflection, according to research in developmental psychology, becomes available to children as early as at primary school age, the early development of the qualities of reflective thinking and assessment of their own activity will allow learners to achieve greater success in their practices, especially at the stage of assessing the conditions of future activities.

Conclusions

The research has shown that students experience the greatest difficulties when analyzing the conditions for organizing future activities, assessing their own resources and possible risks. In general, this can reduce the motivation for activity and impedes the prediction of the outcome. Regarding innovative activity, characterized by a high degree of uncertainty of the outcome and involving some risk, a complicated analysis of the information-based activity can lead to a complete refusal to carry it out.

A decrease in the efficiency of the activity, entailing a drop in motivation, and, ultimately, a refusal to carry it out, may be caused by an inadequate reflexive analysis of the preliminary conditions of activity (low indicators on the IBA scale). A particular difficulty can be caused by an insufficiently developed ability to organize one's activities in accordance with the objective and the expected outcome.

The study has found significant differences in the intensity of reflection on information-based activity among students with varying levels of innovative activity. This confirms our hypothesis that the developed reflection on practice is a factor in the effectiveness of innovative activity. In our study, the differences in the indicators on the IBA scale indicate that the students of Group 1 (with high innovative activity) developed skills and abilities necessary for assessing information indicators that characterize the subject and subjective conditions of their activity. Thus, it makes it possible to organize the activity in accordance with the objective and the expected result. This ensures success in achieving the outcomes of the activity.

Considering reflection as an important condition for the formation of all components of the psychological aspect of activity, it can be assumed that students with varying degrees of reflection will, to varying extents, reflect different components of innovative activity. Reflection provides an opportunity to analyze one's own innovative activity at different stages, evaluate the outcomes and compare them with the preliminary objective, as well as make timely adjustments during the implementation of the plan. Thus, reflection can be directed both at a holistic activity and at its individual structural components and has an individual expression in relation to these components. The significance of reflection for innovative activity is due to its specificity, a certain nature of novelty, non-standard conditions for implementation, the inability to foresee the outcomes and often the lack of previous experience in performing activities of this kind.

The results of the study can be of some practical significance since knowledge of the psychological framework for the innovative activity of students can contribute to the development of innovative potential and innovative activities. According to the cultural-historical approach of the Russian psychological school, outlined in the works of L. S. Vygotsky, the development of the psyche occurs due to external influence, and the environmental factor can be decisive for the internal resources of the individual. Hence, to develop reflexive abilities, maintain motivation for innovative activity and develop innovative activity among learners, it is necessary to create special conditions that enable the formation of characteristics of an innovative person. This will ensure a high level of efficiency and effectiveness of learners' activities at different educational levels.

The following conditions can be identified: a special learning environment aimed not only at maintaining the learners' innovative activity, but also at developing the skills and abilities of reflection on practice through a system of specially developed learning technologies; high motivation of the child himself, a conscious attitude to the goal and results of the activity (his formation as a subject of activity); the special nature of the relationship in the teacher (mentor) — child system; continuity in the school-university system in preparing learners for participation in innovative activities in an educational organization.

The study does not claim to be complete and requires further consideration of the factors that determine the innovative activity of students, particularly their personal characteristics, gender and age determinants.

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Original manuscript received September 30, 2021

Revised manuscript accepted May 02, 2022

First published online July 20, 2022

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SCIENTIFIC LIFE

НАУЧНАЯ ЖИЗНЬ

Психологическое благополучие лиц пожилого возраста

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Psychological Well-Being in the Elderly People

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Для цитирования: Борисов, Г. И., Дорогина, О. И., Зиннатова, М. В., Лаврова, М. А. (2022). Психологическое благополучие лиц пожилого возраста. *Lurian Journal*, 3(1), pp. 49–54. doi: 10.15826/Lurian.2022.3.1.4

To cite this article: Borisov, G. I., Dorogina, O. I., Zinnatova, M. V., & Lavrova, M. A. (2022). Psychological Well-Being of the Elderly People. *Lurian Journal*, 3(1), pp. 49–54. doi: 10.15826/Lurian.2022.3.1.4

Аннотация. В статье представлены материалы круглого стола, прошедшего в Уральском федеральном университете имени первого Президента России Б. Н. Ельцина (г. Екатеринбург) 2 апреля 2022 г. На заседании обсуждались вопросы психологического благополучия лиц пожилого возраста: методологические основания исследования, стратегии достижения, связь с физиологическим и психологическим здоровьем, психологическая поддержка и др.

Ключевые слова: благополучие; психологическое благополучие; пожилые; маркеры психологического благополучия; стратегии достижения благополучия; здоровье; психологическая поддержка

Abstract. On April 2, 2022, Ural Federal University (Yekaterinburg) hosted a round-table conference, devoted to discussing issues of elderly people's psychological well-being: methodological foundations of research of psychological well-being, strategies for achieving psychological well-being, the relationship of psychological well-being with physiological and psychological health, features of psychological support for the elderly.

Keywords: *well-being; psychological well-being; elderly people; markers of psychological well-being; strategies of well-being; health; psychological support*

Введение

2 апреля 2022 г. в Уральском федеральном университете состоялась XVIII Международная научно-практическая конференция «Психология: от теории к практике». В рамках конференции были представлены лекции, мастер-классы, круглые столы, тренинги. Ведущими выступили ученые и преподаватели, студенты, партнеры департамента психологии Уральского гуманитарного института.

В статье рассмотрены материалы круглого стола «Психологическое благополучие лиц пожилого возраста», ведущими которого стали исследователи и практики УрФУ: Георгий Игоревич Борисов, Ольга Ивановна Дорогина, Мария Владимировна Зиннатова, Мария Александровна Лаврова. В обсуждении с элементами дискуссии приняли участие более 20 человек, среди которых были студенты Уральского федерального университета и заинтересованные исследователи.

Изучение психологического благополучия людей пожилого возраста позволяет обеспечить их полноценную жизнедеятельность, активное участие в жизни общества, создает возможности для совершенствования государственных программ поддержки населения.

Методологические основания исследования благополучия. Психологическое благополучие

Доклад М. В. Зиннатовой посвящен определению методологических основ исследования феноменов благополучия и, в частности, психологического благополучия. Отмечено, что традиционно в психологических исследованиях благополучие анализируется в контексте феноменов счастья, удовлетворенности жизнью, субъективного благополучия. В докладе определена сущность благополучия, выделены разные виды благополучия: физическое, социальное, материальное, средовое, духовное, деятельностное (в том числе профессиональное), психологическое.

Была представлена эвристическая модель психологического благополучия, содержащая факторы, определяющие проявление этого конструкта в жизнедеятельности человека. В основу построения данной модели заложены подходы Н. Брэдбёрна, Э. Динера, К. Рифф. К факторам психологического благополучия

можно отнести: «благоприятное» место рождения, проживания, коллективную историческую память, нормальную наследственность, благоприятные социально-экономические условия жизнедеятельности, физическое здоровье, психическое здоровье, социальный фактор, активность личности и др. Проявления психологического благополучия характеризуются: удовлетворенностью жизнью, балансом положительных и отрицательных эмоций, частотой и интенсивностью положительных эмоций, позитивным отношением к себе и самопринятием, позитивными отношениями с другими, автономией, направленностью и осмысленностью жизни, стремлением к саморазвитию и самотрансценденции и т. д.

М. В. Зиннатова отметила, что факторы психологического благополучия и его проявления в жизнедеятельности человека тесно взаимосвязаны, влияют друг на друга. При этом проявления психологического благополучия, по сути, выступают его маркерами, позволяя использовать научные принципы при организации психологической помощи населению разных возрастных групп, в том числе и лицам пожилого возраста.

В завершение доклада были представлены некоторые направления современных зарубежных исследований психологического благополучия лиц пожилого возраста.

Благополучие пожилых людей: сущность и стратегии достижения

О. И. Дорогина отметила, что благополучие, согласно Р. Patalay и Е. Fitzsimons, — это нечто большее, чем отсутствие плохого здоровья, и отражает субъективное ощущение жизни. В своем докладе О. И. Дорогина рассмотрела конкретные аспекты психологического благополучия, которые были составлены таким образом, чтобы отразить социальное и эмоциональное функционирование в пожилом возрасте, включающее четыре характеристики: любознательность, устойчивость или адаптивное реагирование на проблемы и стрессоры, отношения с близкими или лицами, осуществляющим уход, и положительное отношение к жизни. Эти аспекты благополучия были определены в докладе как важные показатели благополучия пожилых людей.

Вслед за J. Brandtstädter и К. Rothermund О. И. Дорогина обратилась к анализу основного принципа теории преодоления двойного процесса, который заключается в том, что люди справляются с проблемами старения либо путем активного изменения своей среды в соответствии с обстоятельствами, либо путем корректировки своих личных предпочтений и целей в соответствии с требованиями окружающей среды. О. И. Дорогина отметила адаптивные стратегии для преодоления ограничений, налагаемых старением, таких как проблемы тяжелой утраты и нарушения сенсорных функций. Способность пожилых людей к адаптации своих ожиданий с учетом возрастных ограничений способствует их устойчивому благополучию,

несмотря на многочисленные проблемы, присущие старению. В докладе были приведены эмпирические данные, свидетельствующие о том, что внедрение таких стратегий позволяет пожилым людям справляться с инвалидностью и ухудшением здоровья.

Психологическое благополучие и здоровье в пожилом возрасте

Доклад Г. И. Борисова был посвящен анализу связи психологического и физиологического благополучия, а также психологического здоровья людей пожилого возраста. Здоровье и психологическое благополучие рассматриваются как взаимосвязанные явления, тем не менее связь эту можно представить с различных позиций.

С одной стороны, психологическое благополучие рассматривается как ресурс здоровья: установлено, что психологическое благополучие предотвращает возникновение сердечно-сосудистых заболеваний (J. K. Boehm, L. D. Kubzansky), снижает риск возникновения деменции (A. R. Sutin et al.), предопределяет улучшение здоровья со временем (J. Yoo, C. D. Ryff). С другой стороны, имеются исследования, изучающие ресурсы личности, которые обеспечивают благополучие в период заболевания (L. Iani et al.). Кроме того, выявлено, что психологическое благополучие влияет на восприятие заболевания (F. Braido).

Согласно второму направлению, здоровье является условием благополучия. Результаты исследований показали, что программы по улучшению здоровья способствуют улучшению психологического благополучия (A. Carroll et al.); доступность медицинского страхования обеспечивает субъективное благополучие (S. Kim, K. Koh); психическое здоровье опосредованно способствует субъективному благополучию (C. Kokkinos); позитивная самооценка здоровья снижает риск возникновения низкого субъективного и психологического благополучия; низкая самооценка здоровья связана с низкими показателями психологического благополучия (M. Taloyan et al.); операция и реабилитация позитивно влияют на психологическое благополучие (A. Realo et al.; L. Bergstrom et al.). Тем не менее позицию, что здоровье является причиной высокого психологического благополучия, считают недоказанной (H. Friedman, M. Kern).

Таким образом, можно определить взаимоотношения психологического благополучия и здоровья как сложные и многогранные.

Кроме того, были представлены результаты эмпирического исследования связи психологического благополучия и здоровья. Были обнаружены позитивные корреляционные связи физического и психологического здоровья и их субшкал с психологическим благополучием и его характеристиками у людей пожилого возраста.

На основе проделанной работы можно сделать вывод, что психологическое благополучие и здоровье являются взаимообусловленными явлениями. С одной

стороны, психологическое благополучие способствует улучшению показателей физического и психического здоровья, с другой — физическое здоровье обеспечивает высокое психологическое благополучие.

**Психологическое благополучие в пожилом возрасте:
миф или реальность?
Практическая работа психолога**

М. А. Лаврова представила доклад на тему «Психологическое благополучие в пожилом возрасте: миф или реальность? Практическая работа психолога». В нем были рассмотрены психические особенности пожилого возраста, которые определяют специфику психологической работы с пожилыми людьми: особенности когнитивных функций и нейропсихологической сферы, изменения эмоциональной, соматической и поведенческой сфер, изменения ценностных ориентаций. Также были выделены основные факторы благополучия, рассматриваемые в научных и практических исследованиях: трудовая деятельность, социальный капитал, жизненные интересы и ценности, генетический вклад и др. М. А. Лаврова описала модели психологической поддержки пожилых людей, акцентирующие внимание на когнитивной, эмоциональной, коммуникативной сферах. В завершение доклада внимание слушателей было акцентировано на том, что возможность благополучного старения существует и, как правило, она носит компенсаторный характер по отношению к возникающим возрастным изменениям; при этом механизм компенсации может быть вполне адекватным и обеспечивать полную адаптацию к новым условиям жизни, если он включает элементы обучения новым видам и способам деятельности, стратегии поведения, направленные на преодоление дефицитарности.

Заключение

Тематика круглого стола вызвала живой интерес и активное обсуждение. По его итогам были сформулированы основные выводы: феномен психологического благополучия пожилых людей требует более глубокого осмысления со стороны научного сообщества; пожилые люди могут нуждаться в психологическом сопровождении их жизнедеятельности с целью ее гармоничного и благополучного протекания; психологическое благополучие в пожилом возрасте является многофакторным и многовариативным явлением.

Оригинал статьи получен 01 июня 2022

Исправленная статья принята 02 июня 2022

Первая публикация онлайн July 20, 2022

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YOUNG SCIENTIST

МОЛОДОЙ УЧЕНЫЙ

Neuroticism, Preoccupied Attachment Style, and a Chronic Disease Condition as Predictors of Reminiscence During an Illness

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Нейротизм, тревожный стиль привязанности и хроническое заболевание как предикторы реминисценции во время болезни

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To cite this article: Ecer, E. (2022). Neuroticism, Preoccupied Attachment Style, and a Chronic Disease Condition as Predictors of Reminiscence During an Illness. *Lurian Journal*, 3(1), pp. 57–61. doi: 10.15826/Lurian.2022.3.1.5

Abstract. The main aim of the study was to analyse to what extent attachment styles, personality traits, and a chronic disease condition were predictors of reminiscence during an illness. The second goal was to examine the relationship between personality traits, attachment styles, and reminiscence during an illness. Reminiscence during an illness was divided into two categories as emotional and cognitive patterns of the past experiences. In the study, there were 73 Turkish participants (43 males, 58.9 %). The mean age of participants was 40.2 ($SD = 11.8$). Results indicated that preoccupied attachment style, agreeableness, and whether having a chronic disease explain with 22.4 percent of the total variance of reminiscence during an illness. Reminiscence during an illness was positively related to preoccupied attachment style and negatively correlated with agreeableness along with extroversion. Gender had a significant effect on openness to experience, preoccupied attachment style, neuroticism, and negative cognitive reminiscence during an illness. Finally, chronic illness had a significant impact on reminiscence during an illness and neuroticism. The study suggested that personality traits, attachment styles, and gender affected the reminiscence during an illness.

Keywords: attachment style; reminiscence of past experiences during an illness; Big Five Personality Traits

Аннотация. Цели исследования состояли в том, чтобы проанализировать, в какой степени стили привязанности, личностные черты и хроническое заболевание являются предикторами реминисценции во время болезни; изучить взаимосвязь между личностными чертами, стилями привязанности и реминисценцией во время болезни. Было выделено две категории реминисценции: эмоциональные и когнитивные паттерны прошлого опыта. В исследовании приняли участие 73 человека из Турции (из них 43 мужчины, 58.9 %). Средний возраст участников составил 40.2 года ($SD = 11.8$). Результаты показали, что реминисценция во время болезни в 22.4 % случаев объяснялась тревожным стилем привязанности, покладистостью характера и наличием хронического заболевания. Реминисценция во время болезни положительно связана с тревожным стилем привязанности и отрицательно — с доброжелательностью и экстраверсией. Выявлена зависимость тревожного стиля привязанности, нейротизма, негативных когнитивных воспоминаний и открытости опыту от пола больного. Наконец, значительное влияние на реминисценцию во время болезни и проявление нейротизма оказывали хронические заболевания. Исследование показало, что черты характера, стили привязанности и пол влияют на реминисценцию во время болезни.

Ключевые слова: стиль привязанности; воспоминание о прошлых переживаниях во время болезни; Большая пятерка черт характера

Introduction

Individuals may have various thoughts and emotional patterns during an illness. Reminiscence refers to remembering any emotions which trigger thoughts. It was found that people with a high level of anxiety and depression tended to use reminiscence (Cully, LaVoie, & Gfeller, 2001). Insecure attachment styles and neuroticism were predictors of suicidal thoughts (Khosravi & Kasaeiyan, 2020). Moreover, fear of death was positively related to neuroticism (Pradhan, Chettri, & Maheshwari, 2022), and sensation of chronic pain was explained by attachment styles (Romeo, Tesio, Castelnuevo, & Castelli, 2017). In the current study, the aim was to examine the effects of attachment styles, big five personality traits, and having a chronic disease on reminiscence during an illness. The second aim was to analyse the relationship between five personality traits, attachment styles, and reminiscence during an illness.

Materials and Methods

In the study, there were 73 Turkish participants (43 males, 58.9 %). The mean age of participants was 40.2 ($SD = 11.8$), ranged from 20 to 75. The majority of participants were married ($n = 38$, 52.1 %) and had a university degree ($n = 57$, 78.1 %). Participants were asked to have a chronic illness or not. Majority of participants did not report a chronic illness ($n = 51$, 69.9 %). Individuals fulfilled the Relationship Scale Questionnaire

(Griffin & Bartholomew, 1994), Brief Big Five Personality Traits Scale (Rammstedt & John 2007), and Reminiscence During an Illness which developed by the author via a Google form. Attachment styles (secure, preoccupied, dismissing, fearful), personality traits, and whether having a chronic illness were chosen as independent variables. Reminiscence during an illness was a dependent variable. The study was computed in SPSS program using Pearson correlation coefficient, Independent Sample T-Test, Multiple Linear Regression analysis.

Results

Correlation Levels Between Variables

Pearson correlation coefficient showed that fearful attachment was negatively correlated with secure attachment style ($r = -.43, p = .001$), and extroversion ($r = -.33, p = .01$), while it was positively related to dismissing attachment style ($r = .42, p = .001$).

Figure showed that reminiscence during an illness was positively related to preoccupied attachment style ($r = .33, p = .001$), while negatively related to agreeableness ($r = -.26, p = .03$) and extroversion ($r = -.27, p = .02$).

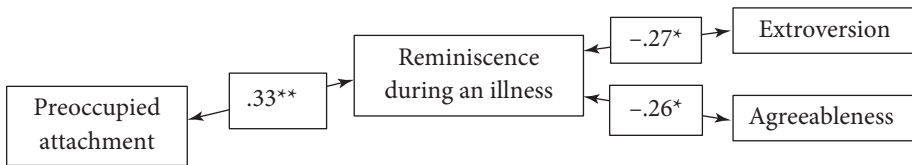


Figure. The correlation level related to reminiscence during an illness.

Note. ** $p \leq .01$, * $p \leq .05$

Agreeableness was positively correlated with consciousness ($r = .27, p = .02$), extroversion ($r = .26, p = .02$), and openness to new experiences ($r = .25, p = .03$). Consciousness was positively related to extroversion ($r = .37, p = .001$). Extroversion was negatively correlated with neuroticism ($r = -.35, p = .003$).

The Mean of Variables

The study indicated that majority of participants had a dismissing attachment style ($n = 39, 59.1\%$), secure attachment style ($n = 16, 24.2\%$), fearful attachment style ($n = 7, 10.6\%$), preoccupied attachment style ($n = 4, 6.1\%$). The mean of variables in turn: extroversion — 3.66, $SD = .9$, agreeableness — 4.06, $SD = .69$, neuroticism — 2.9, $SD = .86$, openness to new experience — 3.39, $SD = .94$, the total level of reminiscence during an illness — 2.43, $SD = .93$, negative emotions of reminiscence — 2.66, $SD = 1.01$, negative cognitive reminiscence — 2.25, $SD = 1.02$.

The Effects of Gender on Variables

Results illustrated that men had a higher level of preoccupied attachment style: mean for males was 4.3 ($SD = .8$), mean for females were 3.09 ($SD = 1.35$), $t(71) = -4.82$, $p = .001$; and negative cognitive reminiscence during an illness: mean for males was 2.45 ($SD = 1.07$), mean for females was 1.97 ($SD = .88$), $t(71) = -2.03$, $p = 0.04$. Females performed a higher score of openness to new experience: mean for females was 3.71 ($SD = .98$), mean for males was 3.16 ($SD = .85$), $t(71) = 2.56$, $p = 0.01$; and neuroticism: mean for females was 3.17 ($SD = .92$), mean for males was 2.71 ($SD = .76$), $t(71) = 2.31$, $p = .02$.

The Effects of Having Chronic Illness on Variables

It was found that participants with chronic illness had a lower level of reminiscence during an illness: mean for people who had a chronic illness was 2.09, $SD = 1$, mean for people who do not have a chronic illness was 2.58, $SD = .93$, $t(71) = -2.03$, $p = .04$. Furthermore, individuals with the absence of a chronic illness had a higher score on neuroticism ($M = 3.03$, $SD = .82$), than people with a chronic illness ($M = 2.59$, $SD = .89$), $t(71) = -2.05$, $p = .04$.

Predictors of Reminiscence During an Illness

Table with Multiple linear regression analysis showed that reminiscence during an illness was explained with 22.4 % by a chronic illness case, preoccupied attachment style, and agreeableness, $F(3,69) = 7.92$, $p = .001$, $R^2 = .26$.

Table

Predictors of reminiscence during an illness

Predictors	Unstand. coefficients		Stand. coefficients	<i>t</i>	<i>p</i>	95 % CI	
	<i>B</i>	<i>SE</i>	<i>Beta</i>			lower bound	upper bound
Chronic illness	.5	.22	.24	2.3	.02	.068	.939
Preoccupied attachment	.30	.08	.38	3.6	.001	.135	.469
Agreeableness	-.4	.14	-.29	-2.8	.007	-.702	-.115

Note. $R = .51$, $R^2 = .26$, adjusted $R^2 = 22.4$.

Conclusion

The research concluded that having preoccupied occupied attachment styles led to negative emotions during an illness. Moreover, people with high levels of neuroticism and less level of agreeableness affect cognitive and emotion patterns during an illness. These findings may be helpful in the therapeutic setting.

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Original manuscript received September 30, 2021

Revised manuscript accepted June 02, 2022

First published online July 20, 2022

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Scientific edition

Научное издание

Lurian Journal

2022. Vol. 3. No. 1

Editor *Natalia Chapaeva*
Layout designer *Vladislav Matveev*
Cover design *Vladislav Taskaev*

Редактор *Наталья Чапаева*
Верстка *Владислав Матвеев*
Дизайн обложки *Владислав Таскаев*

Free price
Release date 24.04.2022.
Format 70 × 100 1/6. Acc. publ. p. 5,5. Cond. print. p. 5,2.
Font Minion Pro, Myriad Pro.
Offset paper. Number of printed copies 300. Order № 187.

Ural University Press
4, Turgenev Str., 620000 Yekaterinburg, Russia
Printed in Ural Federal University Publishing Centre
4, Turgenev Str., 620000 Yekaterinburg, Russia
Phone: +7 (343) 358-93-06, 350-90-13, 358-93-22, 350-58-20
Fax: +7 (343) 358-93-06
E-mail: press-urfu@mail.ru
<https://print.urfu.ru>

Цена свободная
Дата выхода в свет 24.04.2022.
Формат 70 × 100 1/6. Уч.-изд. л. 5,5. Усл. печ. л. 5,2.
Гарнитура Minion Pro, Myriad Pro.
Бумага офсетная. Тираж 300 экз. Заказ № 187.

Издательство Уральского университета
620000, Екатеринбург, ул. Тургенева, 4
Отпечатано в Издательско-полиграфическом центре УрФУ
620000, Екатеринбург, ул. Тургенева, 4
Тел.: +7 (343) 358-93-06, 350-90-13, 358-93-22, 350-58-20
Факс: +7 (343) 358-93-06
E-mail: press-urfu@mail.ru
<https://print.urfu.ru>