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**THE PHENOMENON OF ANTICIPATION IN PSYCHOLOGY:
THEORETICAL ANALYSIS**

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Abstract

Based on definitions given by Russian and foreign researchers, the term "anticipation" can be interpreted as the ability to accept and monitor future actions and decisions, i.e. to predict. The ability to imagine future events is an integral part of human cognition. This article reviews various points of views and approaches to the concept of anticipation. After theoretical analysis, the anticipation is studied within the framework of various theories and in connection with related terminology proposed by both Russian and foreign authors. As a result of the research, the ability of a person to anticipate the reflection of reality was described. Studying theoretical aspects of this phenomenon will help to achieve deeper understanding of human abilities to anticipate specific and desired future. In this article we argue that the violation of the anticipatory parameters of mental activity is one of the leading factors affecting mental and personal development, the adaptation of children.

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Keywords: Anticipation, prediction, foreseeing, mental representations of time.



1. Introduction

From the scientific point of view, anticipation has been an actual topic of research in psychological sciences for more than half a century (Feigenberg & Zhuravlev, 1977; Lomov & Surkov, 1980; Feigenberg, 1973).

The well-known innovative thinker and mathematician of the Victorian era in Britain, Charles Babbage, said in 1840 that "... intelligence will be measured by the ability to foresee."

The ability to anticipate is necessary for survival and contributes to the successful life of every organism. As a consequence, animals and people behave as if the anticipation of waiting makes this expectation more certain in the future. They behave prognostically: what happened once will happen again (Maystrov & Edlin, 1973).

Different points of view and approaches, the growing interest in the phenomenon of anticipation cause the importance of further study of anticipation and determine the relevance of research on this phenomenon.

The aim of the article is a theoretical study of the concept of "anticipation", the examination of this phenomenon from various points of view relying on the definitions of domestic and foreign authors.

2. Problem Statement

We suppose, that the violation of the anticipatory parameters of mental activity is one of the leading factors affecting mental and personal development, the adaptation of children.

3. Research Questions

- To analyze modern approaches of anticipation study by domestic and foreign scientists;
- to reveal the internal structure of anticipation;
- to analyze facts, sources of origin, development mechanisms and anticipation functioning.

4. Purpose of the Study

Basing on the theoretical analysis of domestic and foreign literature, consider the state of the problem of developing the ability to anticipate.

5. Research Methods

The theoretical methods of analysis and synthesis allow us to solve our research questions and arrive to the purpose of our research.

As a result of the research, the ability of a person to anticipate the reflection of reality and various types of future-oriented thinking were described.

Studying theoretical aspects of this phenomenon will help to achieve a deeper understanding of human abilities to anticipate specific and desired future.

Psychology traditionally pays more attention to the study of mental access to the past, and not to the future. The study of future thinking was largely ignored until recently (Suddendorf & Moore, 2011).

In the last twenty years a new, multidisciplinary understanding of future thinking has appeared. The driving force behind this development was the assertion that the adaptive function of memory systems lays

mostly not in the preservation of accurate records of the past, but rather in what they offer for the formation of the present and the future (Addis, Wong, & Schacter, 2007; Buckner & Carroll, 2007; Suddendorf & Moore, 2011; Tulving, 2005).

6. Findings

Based on the definitions of domestic and foreign authors, the term "anticipation" is interpreted as the ability to take and control future actions and decisions, i.e. predict.

In the scientific literature, expectation generally implies an attempt to predict behavioral consequences. Predictive behavior refers to the behavior that is influenced by expectations about the future, such as future environmental conditions, future actions or simply expectations about how things work in this situation (Abram, Picard, Navarro, & Piolino, 2014; Hamilton & Cole, 2017; Murphy et al., 2015; Anokhin, 1987; Lomov & Surkov, 1980; Mendelevich, 1996).

Studying the phenomenon of anticipation for many years, scientists acknowledge the importance of studying the foresight.

For instance, based on the ideas of children about future situations, the researchers studied the ability to report what will happen in the future and what will become useful (Russell, Alexis, & Clayton, 2010; Suddendorf, Nielsen, & Von Gehlen, 2011; Kuznetcova, & Akhmetzyanova, 2017; Akhmetzyanova, 2016; Nilopets, 2011):

- to distinguish the causal consequences of the past in the future (Suddendorf, 2010; Demidova, 2008);
- the influence of mother-child (Hudson, 2006; Gromova, 2004);
- on the current motivation that influences the choice (Atance & Meltzoff, 2006; Vinogradova, 2004);
- on the appropriate control of actions and executive functions (Garon, Bryson, & Smith, 2008; Semenova, 2005);
- on understanding of short-term sequences of events and causes of anxiety (McColgan & McCormack, 2008).

Foresight allows us to act right away to ensure future benefits and avoid future disasters. Imagining the future allows to avoid undesirable consequences and mistakes and form the desired future. The ability to imagine future events is an integral part of human cognition. Most of human actions are guided by foresight, distant goals and complex plans, and this can somehow explain human domination on this planet (Suddendorf, 2006).

The phenomenon of anticipation is displayed from different points of view and affects different areas of science.

For instance, Sergienko (1992) constructs his researches of anticipation on early human ontogenesis. A series of studies of anticipation in early human ontogenesis in 3-28 week old infants showed that anticipation is an inherent quality of people and their mental organization.

Mendelevich used clinical approach to study this phenomenon. Examining the genesis of neurosis, the researcher comes to the conclusion about inability of a person with neurotic disorders to anticipate future events (Sergienko, 1992; Mendelevich, 1996, Mendelevich, & Solovieva, 2002).

In his professional pedagogical activity, Regush (2003) defines anticipation as an important factor in decision-making, understanding of risks and choice of solutions.

Anokhin (1978), Bernstein (1997), Rusalov (1982), Shiryaev (1987) pay attention to the functions of the nervous system in anticipation from psychophysiology point of view.

In the foreign literature this phenomenon is considered:

- in terms of two systems of declarative memory: episodic and semantic.

The concept of "episodic memory" was first introduced by Tulving (1972) to divide general information in memory that is not a part of our personal experience (semantic memory) and memories about the events from the past (episodic memory). In particular, Tulving (1972) supposed that episodic memory is connected to the ability to mentally return to past events and to the ability to mentally travel to the future.

According to the hypothesis of constructive episodic modeling, both past and imagined future events largely depend on episodic memory (Addis, Wong, & Schacter, 2007).

Some authors believe that there is a general ability to think about important events that are not connected with current circumstances, which cover both the past and the future. This is called "autistic thinking" or "time travel" (Addis, Wong, & Schacter, 2007; Suddendorf & Moore, 2011; Suddendorf & Corballis, 2007; Tulving, 1972).

Theorists emphasize the importance of episodic and semantic systems for future forecasting and planning. Using information stored in episodic and semantic memories, mental scenarios are developed – they describe both the past and the expected future. Based on such constructed memory of the past, everyone can create different courses of future actions and anticipate their consequences (Atance & O'Neill, 2001; Buckner & Carroll, 2007).

Harvard University professor Schacter created a "constructive episodic simulation hypothesis" which assumes that episodic memory and its role in simulation of future episodic events are based on a common neural network, i.e. past and future mental episodes, close to the time of their creation, have greater clarity and sensitivity than those that were distant in time (Schacter, Addis, & Buckner, 2008; D'Argembeau & Van der Linden, 2004; Johnson, Foley, Suengas, & Raye, 1988; Szpunar & McDermott, 2008; Trope & Liberman, 2003).

These relationships were presented by Canadian scientists from the University of Western Ontario; they offered a bi-cone structure for describing mental temporal representations. Two cones meet at their wide ends, one cone for the past and another cone for the future. The intersection of these cones represents current moment of time. The lengths of the cones represent time: early past memories of childhood and anticipation of future stretching to the point at which person expects oldness and death. Thus, the whole interval of the bi-cone covers the entire life of a person in mental representation. These lengths of individual cones will change over time – the length of the past cone will grow, and the length of the future cone will reduce, since a person grows up becoming old (Spreng & Levine, 2006).

The width of these cones represents the number of details that have occurred or will occur at different times. Memories of various aspects of human life will be located in different segments of the cone, extending from the center to the circle, according to what we remember (Roberts & Feeney, 2009).

- in a joint study, scientists from New Zealand, the United Kingdom, Canada and the United States study the link between anticipation and cognitive flexibility.

Brain can generate predictions about the future using information received from past and present memories (Roberts et al., 2017).

People can create detailed mental simulations of new future events for effective planning (constructive episodic simulation hypothesis) (Addis, Wong, & Schacter, 2007).

In fact, it is quite possible that the ability to simulate experience underlies person's ability to respond flexibly to unexpected changes in the environment (Buckner & Carroll, 2007; Roberts et al., 2017).

Cognitive flexibility is described as a mental ability to switch between thinking about two different concepts and thinking about several concepts simultaneously (Scott, 1962).

According to episodic simulation hypothesis, the storage of episodic memories is a sample of episodic details, such as familiar people, places and objects, and it makes up content for modeling the future (Addis, Wong, & Schacter, 2007).

- in their research, the scientists of York St John University study the concept of "forecasting" through "self" perspective in the first and third persons.

Adhering to the model of temporal distance in future thinking (TEDIFT MODEL – "TEMPORAL DISTANCE IN FUTURE THINKING"), i.e. the probability of a pre-experience of the future is modeled by a temporal distance of the event and self-esteem (for example, when comparing events that will occur next week, next year, in five years) (La Corte & Piolino, 2016).

The remoteness of events from the present moment is characterized by visual images, sensations, experiences. According to construal level theory, a person imagines the future, relying on abstract or specific events i.e., distant future events are mentally presented in a more abstract way than closer future events (Abram et al., 2014; D'Argembeau & Van der Linden, 2004; Murphy et al., 2015; Trope & Liberman, 2003).

Hamilton and Cole (2017) emphasize that in their memories and in imagination people can use the perspectives in first person (acting person) and in third person (observer). They suggested that temporal distant self-images would be more often reflected in episodic thoughts than temporal self-images of the present. Such visualization increases the possibility of future well-being. The explanation may be connected with the frequency of mental modeling. In addition, this study has shown that self-imagining from an observer's point of view, perhaps, has a mirror nature of the past and future event.

- in terms of the possibilities of human brain (neuropsychology).

One of the first original articles, with seemingly paradoxical title called "Memory of the Future", dedicated to anticipating brain representations, was written by neuroscientist Ingvar (1985), who invented a widely used term memory of the future for these processes. Ingvar (1985) meant programs of actions or plans for future behavior and cognition. Since these programs can be saved and recalled, they could be called "memories of the future". According to Ingvar (1985) "the concept of the future, as memories of past events, can be remembered, often in great detail".

Ingvar (1985) summarized the evidence which indicated that the areas of prefrontal cortex play crucial role in planning, anticipating, and programming complex sequences of actions (Fuster, 1989; Knight & Grabowecy, 2000; Mesulam, 2000; Shallice & Burgess, 1996; Stuss & Benson, 1986).

Neurologist Fuster (1985) listed three comprehensive cognitive functions of the prefrontal cortex, which are important for linking events in time. These functions are "short-term memory, preparatory set and inhibitory control".

Around the same time, Tulving (1983, 1985) stated that episodic memory, traditionally defined as a memory system that supports the memorization of personal experience, allows people to participate in the "mental time travel" both to the past and to the future.

The signs of the connection between processing of past and future events were presented by observations of patients with memory impairment, with bilateral hippocampal damage received after a head injury. Thus, patients with amnesia could not reproduce personal information about past and future events.

Patients were asked to generate existing experiences and build new plans on a daily basis. As a result of observations, the participants talked about their imaginary plans, which were constructed only on the basis of their content, their spatial coherence and their subjective qualities (Addis, Wong, & Schacter, 2007).

Later researchers called such preserved memories of future planned activities "a prospective memory" (Burgess, Gonen-Yaacovi & Volle, 2011; Gilbert, 2011; Momennejad & Haynes, 2012).

- in terms of scenario planning.

In scenario planning, the unit of analysis is represented by "intuitive logic". According to the researches of the American economist, one of the most prominent futurists of the last third of the 20th century, Hermann Kahn, who worked at the American Research and Development center (RAND Corporation) in the 1950s and 1960s, the process of intuitive logic was imported into the Netherlands-British oil and gas company (Royal Dutch Shell) in the late 1960s. This mostly qualitative approach was an intellectual challenge to a highly quantitative prediction method (McKiernan, 2017).

The process of intuitive logic generally moves from the stage of diagnostics to the stage of scenarios and to the strategic process step by step from data collection, analysis, synthesis, research of key questions, constructing scripts, writing scripts, testing scenarios and processing. The process of intuitive logic offers people the opportunity to imagine longer futures than usually. However, little is known about cognitive processes. Subsequently, studies in neuroscience showed how people imagine the future based on past events (Schacter, Benoit, Brigard & Szpunar, 2015).

Despite the potential benefit of scenario planning in the cognitive sciences, there are a number of potential drawbacks in terms of prospective thinking. As Gilbert and Wilson (2007) noted, errors in brain analysis can lead to erroneous simulations of future events. For example, future simulations suffer from:

- a) inaccurate memories of the past that cause the future to blur;
- b) focus on the main features of the future alleged state and the omission of "non-essential features";
- c) shortened form of the future, for example: a few selected moments, rather than a fully detailed description;
- d) assumption that the contextual factors affecting current situation will be the same as those that affect the future.

I.e.: the cerebral cortex tries to deceive the rest of the brain, posing itself as a sensory system. It imitates future events to learn what the subcortical structures know, but cannot generate simulations that have all the reality of true perception (Gilbert & Wilson, 2007).

This is important for scenario planning for a number of reasons.

Scenario planning and cognitive science have a common interest in exploring the past and are tied to imagining the future (McKiernan, 2017).

Studies show that people tend to emphasize atypical events (for example, more extreme or negative) in the formation of future simulations of such events, because these events are more memorable (Morewedge, Gilbert, & Wilson, 2005).

Future scenarios may be distorted by such extremes, since the "incorrect" past was used in the modeling of the future.

- in terms of self-regulation.

In his study on prediction and self-regulation, Nielsen (2017) considers self-regulation as a process that allows people to control and change their behavior, in accordance with the requirements of the environment.

Self-regulation refers to a wide range of processes which people use to manage different goals, thoughts, feelings, or behaviors (Baumeister & Heatherton, 1996).

The author outlines some important aspects of self-regulation, especially those that focus on setting goals. Changing behavior is a complex process. To increase the probability of success, people must fully adhere to the goal, and make the right decision. However, the author emphasizes that, unlike forecasting models, the study of self-regulation gives instructions on how to reduce the frequency with which prediction failures occur. According to the author, purposeful behavior is formed on the basis of past behavioral tendencies in order to reduce or avoid conflict. In situations where there are temptations, it is necessary to deliberately suppress impulses, returning back to the goal – congruent behavior (Nielsen, 2017).

7. Conclusion

The analysis of scientific opinions in the field of anticipation allowed us to make a number of conclusions:

- anticipation is considered in terms of human ontogenesis by Sergienko (1992); in terms of the genesis of neurosis by Mendeleovich (1996); in terms of professional pedagogical activity by Regush (2003); using psychophysiological approach, Rusalov (1982), Shiryayev (1987), and others studied psychophysiological entities systematically, allowing a person to foresee future situation, and lead to neuroses in cases of neurotic disorders;

- due to episodic and semantic memory systems for future forecasting and planning, mental scenarios describing both the past and the expected future are developed. Based on such constructed memory of the past, everyone can conduct different courses of future action and anticipate their consequences;

- past and future mental episodes, close to the time of their creation, have greater clarity and sensitivity than those that were distant in time;

- the areas of prefrontal cortex play a decisive role in planning, anticipating and programming complex sequences of actions;

- the phenomenon of anticipation is associated with such concepts as "memory of the future", "mental time travel", prospective memory, self-regulation, "intuitive logic", cognitive flexibility;

- anticipation can be considered in the structure of a "bi-cone", in a model of time distance in future thinking, in the theory of strict levels, etc.

The existing different scientific opinions form different types of future-oriented thinking. Most of human actions are guided by foresight, distant goals and complex plans.

After theoretical analysis, the anticipation is being studied within various theories and in connection with related terminology proposed by domestic and foreign authors. The analysis showed a constant growing interest in this phenomenon in various fields of science and areas of human activity.

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References

- Abram, M., Picard, L., Navarro, B., & Piolino, P. (2014). Mechanisms of remembering the past and imagining the future—New data from autobiographical memory tasks in a lifespan approach. *Consciousness and cognition*, 29, 76-89.
- Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: common and distinct neural substrates during event construction and elaboration. *Neuropsychologia*, 45(7), 1363-1377.
- Akhmetzyanova, A. I. (2016). Anticipatory competence and ability to probabilistic forecasting in adolescents: research results. *International Journal of Environmental and Science Education*, 11, (8), 1923-1932.
- Anokhin, P. K. (1978). *Philosophical aspects of the theory of functional systems*. Moscow: Nauka.
- Anokhin, P. K. (1987). *Anticipatory reflection of reality. Selected works. Philosophical aspects of the theory of functional systems*. Moscow: Nauka.
- Atance, C. M., & Meltzoff, A. N. (2006). Preschoolers' current desires warp their choices for the future. *Psychological Science*, 17(7), 583-587.
- Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in cognitive sciences*, 5(12), 533-539.
- Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological inquiry*, 7(1), 1-15.
- Bernstein, N. A. (1997). *Essays on the physiology of movements and physiology of activity. Biomechanics and physiology of movements*. Moscow: Publishing house of the Institute of Practical Psychology.
- Buckner, R. L., & Carroll, D. C. (2007). Self-projection and the brain. *Trends in cognitive sciences*, 11(2), 49-57.
- Burgess, P. W., Gonen-Yaacovi, G., & Volle, E. (2011). Functional neuroimaging studies of prospective memory: what have we learnt so far?. *Neuropsychologia*, 49(8), 2246-2257.
- Carver, C. S., & Scheier, M. F. (2004). Self-regulation of action and affect. *Handbook of self-regulation: Research, theory, and applications*. New York, NY, US: Guilford Press.
- La Corte, V., & Piolino, P. (2016). On the Role of Personal Semantic Memory and Temporal Distance in Episodic Future Thinking: The TEDIFT Model. *Frontiers in human neuroscience*, 10, 385.
- D'Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and cognition*, 13(4), 844-858.
- Demidova, E. V. (2008). *Crimes of homeless children and orphans and their prevention. PhD dissertation*. Juridical Institute of the Ministry of Internal Affairs of the Russian Federation, Kazan.
- Feigenberg, I. M. (1973). Disorders of probability prediction in schizophrenia. Schizophrenia and probability prediction. *Disorders of probability prediction in schizophrenia. Schizophrenia and probability prediction*. Moscow: TsOLIUV.
- Feigenberg, I. M., Zhuravlev, G. E. (1977). *Probability anticipation in human activity*. Moscow: Nauka.

- Fuster, J. M. (1985). The prefrontal cortex, mediator of cross-temporal contingencies. *Human neurobiology*, 4(3), 169-179.
- Fuster, J. M. (1989). *The Prefrontal Cortex: Anatomy, Physiology, and the Frontal Lobe*. New York: Raven Press.
- Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: a review using an integrative framework. *Psychological bulletin*, 134(1), 31-60.
- Gilbert, D. T., & Wilson, T. D. (2007). Propection: Experiencing the future. *Science*, 317(5843), 1351-1354.
- Gilbert, S. J. (2011). Decoding the content of delayed intentions. *Journal of Neuroscience*, 31(8), 2888-2894.
- Gromova, C. R. (2004). *Interrelation of anticipatory abilities of children and their parents (in normal conditions and with neurotic disorders)*. PhD dissertation. Kazan State Medical University, Kazan.
- Hamilton, J., & Cole, S. N. (2017). Imagining possible selves across time: Characteristics of self-images and episodic thoughts. *Consciousness and cognition*, 52, 9-20.
- Hudson, J. A. (2006). The development of future time concepts through mother-child conversation. *Merrill-Palmer Quarterly*, 52(1), 70-95.
- Ingvar, D. H. (1985). Memory of the future: an essay on the temporal organization of conscious awareness. *Human neurobiology*, 4(3), 127-136.
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, 117(4), 371-376.
- Knight, R. T., & Grabowecky, M. (2000). The New Cognitive Neurosciences. *The New Cognitive Neurosciences*, 1319-1339.
- Kuznetcova, E. A., & Akhmetzyanova, A. I. (2017). Anticipation in the conditions of intellectual and mental disability. *The Turkish Online Journal of Design, Art and Communication TOJDAC, Special Edition*, 1085-1092.
- Lomov, B. F., & Surkov, Y. N. (1980). *Anticipation in the structure of activity*. Moscow: Nauka.
- Maystrov, L. Ye., & Edlin, I. S. (1973). Babbage and his difference engine. *Nauka i tekhnika: Voprosy istorii i teorii*.
- McColgan, K. L., & McCormack, T. (2008). Searching and planning: Young children's reasoning about past and future event sequences. *Child Development*, 79(5), 1477-1497.
- McKiernan, P. (2017). Prospective thinking; scenario planning meets neuroscience. *Technological Forecasting and Social Change*, 124, 66-76.
- Mendelevich, V. D. (1996). The anticipation mechanisms of the genesis of neurosis. *Psychologicheskoye journal*, 17(4), 107-115.
- Mendelevich, V. D., & Solovieva, S. L. (2002). *Neuroscience and psychosomatic medicine*. Moscow: MED Press-Inform.
- Mesulam, M. M. (2000). Principles of Frontal Lobe Function. *Principles of Frontal Lobe Function*, 8-30.
- Momennejad, I., & Haynes, J. D. (2012). Human anterior prefrontal cortex encodes the "what" and "when" of future intentions. *Neuro Image*, 61, 139-148.
- Morewedge, C. K., Gilbert, D. T., & Wilson, T. D. (2005). The least likely of times: How remembering the past biases forecasts of the future. *Psychological Science*, 16(8), 626-630.
- Murphy, S.E., O'Donoghue, M., Drazich, E. H., Blackwell, S. E., Nobre, A., Holmes, E. A. (2015). Imagining a brighter future: the effect of positive imagery training on mood, prospective mental imagery and emotional bias in older adults. *Psychiatry Research*, 230, 36-43.
- Nielsen, K. S. (2017). From prediction to process: A self-regulation account of environmental behavior change. *Journal of Environmental Psychology*, 51, 189-198.
- Nilopets, A. M. (2011). *Representations of Age and Perspective of Growing-up and Their Dynamics in 6-8 Year Olds*. PhD dissertation. Moscow State University of Psychology and Education, Moscow.
- Regush, L. A. (2003). *Psychology of forecasting: achievements in knowledge of the future*. Saint Petersburg: Speech.
- Roberts, W. A., & Feeney, M. C. (2009). The comparative study of mental time travel. *Trends in cognitive sciences*, 13(6), 271-277.

- Robertsa, R. P., Wiebelsa, K., Sumnera, R. L., Mulukoma, V., Gradyc, C. L., Schacterd, D. L., Addis, D. R. (2017). An fMRI investigation of the relationship between future imagination and cognitive flexibility. *Neuropsychologia*, 95, 156–172.
- Rusalov, V. M. (1982). Electrophysiological correlates of human probabilistic-prognostic activity. A systematic approach to the psycho-physiological problem. *Electrophysiological correlates of human probabilistic-prognostic activity. A systematic approach to the psycho-physiological problem*, 34-40.
- Russell, J., Alexis, D., & Clayton, N. (2010). Episodic future thinking in 3-to 5-year-old children: The ability to think of what will be needed from a different point of view. *Cognition*, 114(1), 56-71.
- Schacter, D. L., Addis, D. R., & Buckner, R. L. (2008). Episodic simulation of future events. *Annals of the New York Academy of Sciences*, 1124(1), 39-60.
- Schacter, D. L., Benoit, R. G., De Brigard, F., & Szpunar, K. K. (2015). Episodic future thinking and episodic counterfactual thinking: Intersections between memory and decisions. *Neurobiology of learning and memory*, 117, 14-21.
- Scott, W. A. (1962). Cognitive complexity and cognitive flexibility. *Sociometry*, 405-414.
- Semenova, O. A. (2005). *The formation of the functions of regulation and control in junior schoolchildren. PhD dissertation*. Moscow State University.
- Sergienko, E.A. (1992). *Anticipation in early human ontogenesis. PhD dissertation*. Russian Academy of Sciences. Moscow.
- Shallice, T., & Burgess, P. (1996). The domain of supervisory processes and temporal organization of behaviour. *Phil. Trans. R. Soc. Lond. B*, 351(1346), 1405-1412.
- Shiryaev, D. A. (1987). *Psychophysiological Mechanisms of Probabilistic Prediction*. Riga: Zinatne.
- Spreng, R. N., & Levine, B. (2006). The temporal distribution of past and future autobiographical events across the lifespan. *Memory & cognition*, 34(8), 1644-1651.
- Stuss, D.T., Benson, D.F. (1986). *The Frontal Lobes*. New York: Raven Press.
- Suddendorf, T. (2006). Foresight and evolution of the human mind. *Science*, 312, 1006–1007.
- Suddendorf, T. (2010). Linking yesterday and tomorrow: Preschoolers' ability to report temporally displaced events. *British Journal of Developmental Psychology*, 28(2), 491-498.
- Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel, and is it unique to humans?. *Behavioral and brain sciences*, 30(3), 299-313.
- Suddendorf, T., & Moore, C. (2011). Introduction to the special issue: The development of episodic foresight. *Cognitive Development*, 26(4), 295-298.
- Suddendorf, T., Nielsen, M., & Von Gehlen, R. (2011). Children's capacity to remember a novel problem and to secure its future solution. *Developmental Science*, 14(1), 26-33.
- Szpunar, K. K., & McDermott, K. B. (2008). Episodic future thought and its relation to remembering: Evidence from ratings of subjective experience. *Consciousness and cognition*, 17(1), 330-334.
- Trope, Y., & Liberman, N. (2003). Temporal construal. *Psychological review*, 110(3), 403.
- Tulving, E. (1972). Episodic and semantic memory. In Organization of Memory. *Episodic and semantic memory. In Organization of Memory*, 381-403.
- Tulving, E. (1983). *Elements of Episodic Memory*. England: Clarendon Press, Oxford.
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychology/Psychologie canadienne*, 26(1), 1-12.
- Tulving, E. (2005). Episodic memory and autoeosis: Uniquely human. *The missing link in cognition: Origins of self-reflective consciousness*, 3-56.
- Vinogradova, E. L. (2004). *Conditions for the formation of cognitive motivation of senior preschoolers. PhD dissertation*. Moscow State University of Psychology and Education.