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Interaction of Young Adults' Information Technology Usage Habits and Cognitive Processes in Learning

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Information Technology Usage Habits, Cognitive Processes, Processes in Learning, Young Adults.

ABSTRACT:

This article explores the relationship between young adults' information technology usage habits and cognitive processes in learning. The study reveals that information technologies have become an irreplaceable part of modern education, offering wide opportunities to access information and resources, thus promoting the learning of young adults. The article includes a larger research phase, the aim of which is to qualitatively analyze the impact of expert interviews on information technology usage habits on young adults' cognitive processes and to investigate what changes it can create in the learning process. The research questions are: What is the impact of information technology usage habits on cognitive processes in young adults? What changes in cognitive processes can the use of information technology in the learning/studying process create? Data was collected using semi-structured interviews using open-ended questions. At the end of the research stage, it was found that the use of information technology has both positive and negative consequences. The use of information technology in the learning process has changed the way knowledge is acquired and has made information quickly and easily available, however, the use of technology creates an illusion that a person is equally optimally able to distribute attention to several tasks at the same time, maintaining the same quality as concentrating on one task. Learning with the help of information technology reduces the field of visual perception of a person, under its influence a different attitude towards time and the pace of life arises, creating a feeling of lacking time. Various cognitive, emotional, and social disorders arise or intensify, which directly affect the well-being of young adults. The conclusions of the conducted research indicate the importance of the interaction of information technology usage habits and cognitive processes in the learning of young adults.

1. Introduction

Information technologies (hereinafter referred to as IT) have created a new cultural phenomenon – a virtual cultural space, where the set of knowledge and skills of humanity enters, it is stored, and supplemented, which gives the opportunity to reflect on it. It becomes a place where people socialize, communicate, and create new content for this space.

The theories of cultural-historical psychology [1] postulate that human psychic processes and behavior are developed by the introduction of artificial means created by culture. Culture creates artificial culture-specific stimuli that people learn and use to guide their behavior. Symbols and words are essential means of self-regulation of human psychic processes, and as language developed as a cultural-historical product, it became the basis for the possibility of generalizing and turning the external reality into an internal intrapsychic reality. With the development of writing, humanity experienced a cognitive revolution that resulted in written language becoming an artificially created intellectual technology. The emergence of book printing technology and modern information technology continues this series of cognitive changes. There is no single answer to how and to what extent these intellectual technologies have an impact on the human psyche, but today, research from different fields shows that these different intellectual technologies

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have different effects on higher psychic processes. Some technologies are like extensions or accelerations of the human body – guns, cars, or tractors – but other technologies, like dice, a calculator, a map, a book, a computer or the Internet, are intellectual. Intelligent technology does not act as an extension of the body, but rather serves as a mediator between the human psyche and the environment. Intelligent technologies have a profound effect on how and about what we think [2].

The use of information technology in education is only logical, as it makes various activities much simpler and less time-consuming. Technologies allow access to information in a completely new and faster way than before, they also allow not only to generate and transmit information, but also to teach and learn without the limitations of space and time, as was especially observed during the COVID19 pandemic. Thanks to technology, many manual tasks can be easily automated. In today's classroom, technology is becoming an important factor in learning and development. In the ever-changing world of technology, educators are working hard to incorporate technology into their daily work to help students and teachers combine their passion for modern technology with learning. Some of the new technologies in education affect teaching and learning behavior, create changes in the roles of teacher, pupil and student, the need to use various self-learning opportunities increases, the availability of information becomes wider.

Therefore, along with the development and rapid progress of technology, it is also necessary to analyze the use of technology in education in depth, both from the perspective of the development of new theoretical directions, and also in order to understand the possibilities of using technology and promote its full use in the educational process. It is necessary to ensure that technologies make the learning process more efficient from its organizational perspective, as well as be used for knowledge improvement [3].

The research consists of several stages, and the purpose of the research stage reflected in the article is to qualitatively analyze expert interviews about the impact of information technology on young adults' cognitive processes and what changes in them can be caused by the use of information technology in the learning/study process.

2. Technology in the Learning Process

Today, educators are under a lot of pressure to provide the students of this century with quality education according to today's requirements. These demands provide students with the technological and information seeking and use skills necessary to compete in an ever-changing, technology-driven world [4].

Technology in education refers to any form of teaching and learning that uses technology and technological solutions, be it face-to-face, distance learning, online learning, or blended learning. Initially, educational technology understood everything that can be used to automate some activities (e.g., a calculator, a computer, etc.) or to expand access to information, which in the past could be provided through radio and television, but currently can be provided using online network opportunities [3]. Today, classroom technology ranges from IFPDs (Interactive Flat Panel Displays) to laptops and smartphones, all connected via Bluetooth and Wi-Fi and supported by many cloud-based applications. Pupils and students have become more independent due to technological support. In the current education system, technology is not an added advantage, it has become one of the basic requirements. Technologies affect students' communication, ease of communication and information acquisition, and the ability to control their own learning. Modern technologies only benefit education if they are used correctly. Many parents and teachers forbid children from using tablets and smartphones, but they have to accept the fact that a tablet or smartphone attracts students more than ordinary paper books. Smart technology makes their learning time and content easier. They also encourage collaboration in the learning process, where pupils or students can share their opinions and help their peers solve similar or related problems through online communication [5].

Information technology expands access to education while increasing its personalization and quality, significantly influencing the educational process, promoting active learning. Information technology facilitates the assessment of standardized knowledge and skills, as well as the calculation and interpretation of student and student achievement reports, all done digitally and easily accessible for reference. Compared to learning based on memorization, information technology improves reading comprehension by

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allowing students to choose what they want to learn and do it at their own pace, and to focus on real-life problems in relationships, life, science, or other issues [6]. Information technologies develop creative learning, they support the modification of existing data and the creation of new knowledge in order to create a specific product or achieve a specific educational goal. Such a learning organization promotes holistic learning. Unlike traditional classroom learning, where the main focus is on one aspect of a learning or study subject, information technology promotes an integrative approach to learning, reducing the boundary between theory and practice.

The use of information technology is human-centered and provides meaningful feedback through various interactive features. Instead of haphazard learning, information technology helps pupils and students explore and learn in innovative ways supported by postmodern learning theories [7]. Information technology develops collaborative learning, facilitating contacts and cooperation between students and teachers, regardless of their geographical location. In addition, it allows students to interact with individuals from many cultures and work in groups, which helps students develop their conversational skills and global awareness. According to researchers, the use of information technology often increases the cooperation between students and students both inside and outside of school, as well as more interactive contact between students and teachers [8].

S.Ghory, H. Ghafory tried to determine the educational impact of technology on the learning process. Using the many research findings, the researchers found that technology has beneficial effects on education, but it can also have negative effects. Teachers and students should embrace technology and work to reduce the barriers that prevent many students from succeeding. The researchers emphasize that it is time for all countries to implement a more technologically advanced education system in the future. In addition, researchers' findings show that learning through technology is more beneficial for the education system and society as a whole, as it allows pupils and students to increase their knowledge in many areas [7].

There are studies that show a decline in fine motor skills and, in particular, the impact of social media on writing. Teachers believe that social media has been both helpful and harmful to writing and encourage their students to write by hand at least a little because they feel that students are more active in thinking, synthesizing, and editing when writing by hand. Writing by hand discourages the temptation to copy the work of others. The positive thing is that thanks to social media, students can write collaboratively, share their work with more people and be more creative when writing messages to other people [8]. One of the studies aimed to analyze the impact of technology on student learning. The results of the study showed that there is a need for greater technology proficiency of teachers and students in order to better implement and use educational technologies in learning. In addition, this study showed that students feel engaged in the learning process and are satisfied with technology. The results of the study showed that the use of technology has many positive aspects, but there are also negative aspects in learning. Although teachers shared more positive than negative effects of technology when looking at the survey results, students' learning motivation and engagement were higher when information technology was used. In the future, teachers would like more personalized training on technology implementation in the classroom so that they feel more comfortable incorporating technology into the learning process. Educators also believed that students and pupils should be provided with more technology to promote greater autonomy and independence in learning [9]. The results of a similar study show a significant positive relationship between technological research skills and research self-efficacy. Technological research skills could improve students' research functions, showing the need for their acquisition [10]. Another study concluded that the balanced development of students' technological skills in higher education is crucial in the personal, social and professional spheres of the future, and that they also improve the quality of life. The integration of digital technologies plays a vital role in changes in the organization of academic work, in the relations between students, teaching staff and institutions, as well as in new teaching and learning experiences [11].

In today's world, classrooms are increasingly equipped with technology, and there is a rapid need to incorporate it into student learning. While technology can benefit student learning, it can also be detrimental to the educational process. Technology has positive and some negative effects on learning.

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The positive influence of technology in the learning process. Already in the previous section, when analyzing the studies, it was observed that the use of technology in education is evaluated both positively and negatively, and sometimes it is difficult to separate these two aspects. However, in order to analyze the interaction between technology and cognitive processes, we want to emphasize and distinguish both aspects, as well as pay attention to research on the impact of technology on the mental health of young adults. In this section of the article, we based the study of R. Raja, P. C. Nagasubramani on the positive and negative effects of technology on learning. As one of the most important positive aspects, the researchers mention the technologically improved learning and teaching process. This is due to the development of technology, and, for example, digital cameras, projectors, various training software, computers, presentations, 3D visualization tools, etc. in the learning process. All these technologies have become great assistants for teachers to help students learn the content of the study easily. Visual representation makes learning interesting and enjoyable for students. They can participate more in learning and educators have the opportunity to make lessons more interactive and engaging. The authors mention globalization as the next positive aspect. When studying at school in different cities or countries, students can get to know their peers through video conferencing without leaving the classroom. Some websites are used to allow students to learn foreign languages online in pairs or groups with students and a teacher from another country. This advantage leads to the next – technology-based learning has no geographical limitations . With the introduction of online and distance learning teaching and study programs, the need for face-to-face presence has disappeared, which promotes more than just learning. Distance learning and online education have become a very important part of the education system [12].

The advantages include the continuity of learning during COVID 19, allowing everyone to learn without leaving home. As well as among other advantages, inclusion should be mentioned, which means that the use of technology in learning is beneficial for people with intellectual, physical, visual and hearing disabilities. Technology helps to adapt learning to their needs and learning pace, allowing these people to fit into mainstream programs and this has increased their motivation and self-esteem.

The negative impact of technology in the learning process. Researchers R. Raja, P. C. Nagasubramani on the negative aspect of technology-based learning mention that one of the most important is the decline in writing skills that we have already discussed. Today, people rely more and more on digital communication, which allows you to not think about improving your writing skills. Many young adults today do not know the spelling of different words, the rules of grammar or what the literary style of writing is. As the next negative impact, we can mention the decrease and neglect of academic honesty in teaching and studies and honesty in general, because technologies contribute to the increase in the number of cheating cases. Graphing calculators, smart watches, mini cameras, and similar devices have become great sources for cheating on exams and tests. We should also mention the rapidly developing artificial intelligence (e.g., *chatGPT*). The lack of focus, or changes in the quality of attention, is reflected in the fact that text messages and graphic communication with emoticons and abbreviations have become a favorite way of spending time for many schoolchildren and students. It is observed that students spend time with their mobile phones both during the day and often at night as well. This results in a constant connection to the online world, which creates a lack of focus and concentration in academics and sometimes even in sports and extracurriculars [12].

As another of the disadvantages, we can mention the possibility of addictive behavior appearing, which could harm the personal and social development of young adults [12].

The impact of technology on youth mental health and disorders. Many studies have been conducted on the impact of IT on the mental health of young adults. As an example, a study was conducted on the relationship between excessive use of devices and mental health among 15–18-year-olds. Researchers used a three-section questionnaire on more than 1,000 students to determine the correlation between technology addiction, general health, and their sociodemographic information. The results showed that excessive use of technology is associated with poorer mental health. Excessive use of technological devices can lead to alienation from other

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people and lead to anger, tension and/or depression when technology is not available [13].

There is a direct correlation between the amount of time spent in front of the screen during the school and student day with emotions, behavior and mental health. During the COVID-19 pandemic, pupils and students spent most of the day in front of screens, which had a negative impact on mental health, as there was no balance between screen time and sports or other extracurricular activities. In a study of 1,500 mothers, the majority (60.2%) observed changes in their children's behavior. The most frequently observed symptoms were restlessness (69.1%), aggression (33.3%) and anxiety (34.2%) [14]. A survey was conducted to determine the general health status of the students according to their sleep quality, phone usage habits and related to social media or internet addictions. Students with poorer overall health scores were those with excessive phone use and internet and social media addiction [15]. It is still unclear how to determine the exact amount of technology use that can be considered "healthy" for students. However, it stands to reason that using devices on a daily basis worsens overall health. Academic success has a direct correlation with overall health and well-being. Excessive use of technology is a "gateway habit", opening up opportunities for negative lifestyle choices in adolescents [16].

All these studies show the integration of technology in the learning process and the need for new research on how technology affects learning and teaching skills. Therefore, a study should be conducted on the interaction of information technology and cognitive processes in learning for young adults, showing the opinion of experts on this topic.

A. DESIGN

The study has a qualitative design. This one study is a part of a larger project "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357). The purpose of this research phase is to qualitatively analyze expert interviews about the impact of information technology on young adults' cognitive processes and what changes in them can be caused by the use of information technology in the learning/studying process.

The research questions are: What is the impact of IT on cognitive processes in young adults? What changes in well-being and cognitive processes can be informed by the use of technology in the learning/study process Semi-structured interviews using open questions were used to obtain data.

The topic of expert interviews was divided into four conditionally separated blocks. The questions of the first block can be considered as introductory or warm-up questions that helped the respondent to "connect" to the topic. The wording of the questions could be different for different respondents, but they were similar in content. Here are some examples of introductory block questions: What do you think, does Internet use affect young adults' cognitive practices and cognitive processes? How do information acquisition and perception habits change? How might this affect their cognitive development? Are there any differences, peculiarities between the age groups of young adults 15 – 18 years and 19 – 25 years? For what purposes do young adults use computer technology and which types have more dangerous consequences?

The questions of the next block were related to possible problems: Do you agree that young adults, when they often use digital tools for cognitive (learning/studying) purposes, encounter the following problems, which are mentioned in the sources by psychologists and media researchers:

- fragmentation of knowledge, understanding, loss of cohesion;
- deterioration of advanced reading (reading with comprehension) skills;
- distractibility, problem with distracting attention, impaired ability to focus;
- the illusion is formed that one can successfully perform cognitive tasks and other tasks at the same time, or perform different learning tasks at the same time;
- the illusion is formed that knowledge is easily accessible (everything can be found on the Internet), so there is no need to try to memorize and learn a lot by yourself.

The questions of the third block were devoted to the issues of mutual interaction between the Internet and

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cognitive styles, for example: Have you noticed that young adults process information in different ways? Have you noticed any changes in cognitive styles, does technology change the way young adults think, process information? Have you observed "cognitive offloading" – facilitating intellectual activity, the fact that young adults are increasingly trying to facilitate their cognitive work? Do young adults not do it too much? What are the observations regarding "digital skin" also "soft cyborgization"? Is it observed that the thinking habits and style of young adults resemble algorithmic thinking: "yes/no", "if yes, then", categorical, not allowing ambiguity, etc.? Have you noticed that the young adults of the digital generation have any changes in the relationship between memory and thinking, for example, memory is less loaded with information, knowledge, thus thinking becomes simpler? Does not thinking turn into memory (as it does at an early age)? Are there any peculiarities/changes in the development of conceptual thinking? Is there a tendency for thinking to become distinctly empirical, only now in a different way – instead of relying on sensory organs, but on digital tools? How do young adults of the digital generation develop critical thinking? Does the ability to express oneself, to use language change? Do young adults use IT tools to communicate with others, or on the contrary - do their homework alone using technology?

The questions of the fourth block were like the conclusion of the interview and included a question about the expert's opinion, what are the positive and negative aspects of using the Internet for teaching/studying purposes and the possibility to supplement the existing information if the respondent thought it necessary.

The analytical strategy used for the qualitative data was thematic analysis [17]. Thematic analysis was carried out in six stages: 1) familiarization with the content of the interviews, 2) generation of initial codes, 3) search for themes, 4) revision of themes, 5) definition and naming of themes, and 6) preparation of the report.

B. PARTICIPANTS

7 respondents took part in the study – experts aged between 35 and 65 years. Respondents participated in the study voluntarily, having previously given verbal consent. The basic occupation of experts is teacher, lecturer, and doctor. All respondents work with young adults in their daily work and are well informed about young adults and their use of information technology. The data of respondents – experts are confidential and are not disclosed, for confidentiality purposes experts are numbered from 1 to 7.

C. MATERIALS AND PROCEDURE

All interviews took place on the ZOOM platform, were recorded and then transcribed. All respondents gave their voluntary consent to the interview. Research funding for the project was allocated within the project "The impact of internet usage patterns on the development of youth's cognitive styles" (No. lzp-2021/1-0357). At the beginning of the interview, experts were informed about the project, its goals and expected results. Ethical issues were discussed before the interview began. The expert could refuse and stop the interview at any time if it affected his safety or ethics in any way. At the beginning of the interview there was an introduction to the respondent, when he was ready to start the interview, then the interview started. The interviews lasted about 45 minutes. At the end of the interview, the interviewer expressed gratitude for participating in the interview. This process was repeated with all participants. The recorded interviews were then transcribed. A thematic analysis was performed to process the data. After the transcription process the recordings were then deleted, in accordance with ethical guidelines and data protection regulations.

Interviewees are informed of their right to learn about the progress and results of the research by contacting the interviewer during the course of the research.

3. Findings

Thematic analysis was used for data analysis, which is part of the overall research project "The impact of internet usage patterns on the development of youth's cognitive styles" and is included in the first stage of its research design and from these interviews topics that should be discussed in the next phase of the research in focus groups were identified, topics that include young adults' information technology usage habits, in relation to cognitive processes and possible psychological disorders as a consequence of excessive Internet use were identified. Thematic analysis made it possible to analyze the interviews as a data set, dividing it into separate themes, repeated and significant themes were

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obtained for interpretation. According to the thematic analysis method, the analysis had six stages: the first stage was familiarization with the data, the second stage of analysis was the generation of initial codes, the third stage was the search for themes, the fourth stage of thematic analysis was the review and selection of themes so that they could be specifically defined in the fifth stage. The last - sixth stages of the analysis included interpretation and preparation of the report. During data familiarization, the interview transcripts were read and analyzed several times to gain an understanding of the content. A table was compiled in which the quotes of each respondent-expert were added to the given topic. After this stage, initial codes were identified and grouped into thematic groups. All relevant words or concepts were highlighted, marked, and annotated. Seven main themes were thus identified: (1) memory; (2) attention; (3) perception; (4) thinking; (5) communication; (6) knowledge; (7) disorders. This article reflects (see Tables 1-7) the answers of the respondents, which allowed to arrive at a specific topic and interpretations of the topic.

Topic: Memory

Table 1. Memory in respondents' answers

Respondent	Quotes
P.1.	"Memory processes are also less trained" “Size of memory, absolutely not trained in any way” "Relying on the Internet and not memorizing"
P.2.	“Memory is very short-termed” "Young adults are generally less educated, they don’t remember facts, history" "The effect is on certain skills, actions, habits change, facts, figures are not remembered by heart, fear of missing something" "No longer remembers facts and numbers by heart."
P.3.	"Memory is not trained these days, you don't have to learn anything by heart, everything can be found on the Internet."
P.5.	"Long-term memory is not affected, the amount of short-term memory changes, a lot is transferred to gadgets, cyborgization or "incarnation of gadgets" takes place. "The ability to remember unrelated facts changes to the ability to navigate the flow of facts and process this information."
P.6.	"Without repetition, knowledge does not settle in a person's biological memory, and the student only remembers that he said something, but does not remember what he said." "Saves meta-information that is not usable, and you get the feeling that if you need it, you will be able to quickly find slides or fast internet" "Transactive memory - has always existed in human society" "Nowadays, it's the world wide web where everything is stored..." "Students who have slides get the false feeling that they know the information."
P.7.	"Research in cognitive psychology shows that logical memory is based on mechanical memory. Therefore, in the first grades of primary school, it is very important to train them to learn by heart. But if he didn't train this mechanical in his childhood, then he has difficulties with the logical"

When interpreting the answers of experts on the topic "Memory", it was found that memory is trained less, which affects its volume. Experts point out that technology affects changes in short-term memory, and that relying on technology, which can be defined as extended memory, does not create the need to store information in memory and repeat it. Over-reliance on technology can interfere with memory retention. Experts

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pointed out that IT affects long-term memory in an indirect way (not sleeping, not reproducing) by interfering with the retention of information in long-term memory. The Internet is defined as a form of transactive memory and technologies, used appropriately, can relieve memory from memorizing redundant information.

Topic: Attention

Table 2. Attention in respondents' answers

Respondent	Quote
P.3.	"Young adults cannot focus their attention for long, they are distracted by their gadgets, they cannot fully focus and complete tasks."
P.4.	"Perceptual imbalance, disharmony - if this type of perception does not correspond to the pace of the student [cognitive processes], then his attention will wander" "The phenomenon [divided attention] exists, it is related to the learning process - the speech [of the teaching staff] is not as fast as the students' thoughts, so the student "jumps" from the content of the lecture to the technology. The brain is in a more intense mode with constant switching."
P.5.	"Concentration of attention is associated with inhibition, regulation of movements, regulation of emotional impulses, the flow of information is large, inhibition weakens. The screen doesn't train attention, but we don't know, maybe in the future we won't need it at all, it just shows the contradiction between school requirements and environmental/developmental needs."
P.6.	"Experiments have been conducted that show that attentional abilities have not become weaker, this is evolutionarily impossible. His attention switches every 20 seconds or so, from email to music, from music to *Word*, from *Word* to *Facebook*, and from the outside, it looks like he can't keep his attention, even though he could, it's just that the content is so varied that he just keeps his content wandering around comfortably. In addition, each unit of content is viewed for less than 1 minute. It is an illusion that at the same time students can multitask, listen to the lecturer at the same time and do something in parallel."
P.7.	"Focusing abilities seem to decrease, intentional attention is the one that causes the greatest difficulty."

When interpreting the topic "Attention", it was found that IT did not change the biological prerequisites of attention, but that they make the processes of attention switching, concentration, division more visible. The attractiveness of technology promotes the development of intentional attention, but young adults have difficulty focusing attention on tasks that require effort because of the technology environment in which effort is minimal or not required at all. Technology makes available stimuli that are more interesting to young adults than the content of the curriculum, thereby diverting attention away from the formal curriculum. Technologies create the illusion that a person is equally optimally able to distribute attention to several tasks at the same time, maintaining the same quality as concentrating on one task (monotasking or multitasking).

Topic: Perception

Table 3. Perception in respondents' answers

Respondents	Quotes
P.1.	"Inability to perceive audio information. Young adults perceive more superficial and simple information, that it will be more difficult to process large arrays or synthesize information. From the perspective of cognitive processes,

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Respondents	Quotes
	the scope of perception could decrease."
P.3.	"Moving pictures are needed to keep attention and perception, unable to read long messages. Theory questions can no longer be included in the exams, because the answers can be found on the Internet."
P.4.	"Perception and attention disbalance, disharmony – perceives everything, but does not select information on which to focus, visual perception is very pronounced, [..] and this could also be interpreted as not going into depth."
P.5.	"Interaction with information – visual information dominates, also in social communication. Does not call but writes text messages – written non-verbal communication."
P.7.	"They perceive information in very large chunks, very large pieces, they perceive information diagonally, sometimes without even going into the essence. Young adults need visual perception tasks more. Involvement of young adults contributes to a better ability to absorb information. If young adults feel good, feel involved, they also perceive information more, they perceive information better, they have better analytical abilities, critical thinking."

When interpreting the data on perception, it was concluded that IT develops visual perception and reduces the need to use the auditory perception channel. Young adults perceive a large amount of information superficially and without going deep. Technologies reduce the field of human visual perception, and under their influence, a different attitude towards time and the pace of life arises, creating a feeling that time is swelling.

Topic: Thinking

Table 4. Respondents on thinking

Respondents	Quotes
P.1.	"All psychic activity becomes more fragmented, more uniform and no synthesis is formed. Young adults have an uncritical reliance on information, they trust it. The positive aspects are related to the development of strategic thinking, intuition, reflection and learning foreign languages."
P.2.	"Thinking takes time, and we don't seem to have that time."
P.3.	"Young adults are unable to find regularities, they compile their works without knowing how to generalize. When writing theses, one relies on the Internet, there is no critical thinking."
P.4.	"I think young adults retain all the same judgment and sometimes, sometimes very good. "
P.5.	"Thinking functions do not disappear - they change, their proportions change. Conceptual thinking, if we look at it very narrowly, is declining, but that is because the environment is changing – the impact of technology. The function itself does not disappear..."
P.7.	"The lack of abstraction is [..] even when reading, also when searching for research in databases, then you have to have a very specific task, not a very broad one. They make less effort, however – to understand, to delve deeper. Young adults can connect such things and at such lightning speed, but the older generation does not know how. And then we think that they know or know something worse than us, because we don't fully understand

When interpreting the topic of thinking, it can be concluded that under the influence of IT, the use of

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thinking operations has changed, for example, young adults have difficulty synthesizing, generalizing, abstracting. Concrete thinking develops more, there are difficulties in critically evaluating the available information, because there is a lot of it. They are better able to recognize false information or fake news on the Internet, so young adults are more difficult to deceive. Technologies are developing the ability to copy and paste information from the Internet without processing it cognitively. Acquiring information contributes to the learning of a foreign language, which in turn teaches to think in the constructs of another language. Technology offers ready-made information/concepts and young adults do not need to use thought operations to go deeper. Young adults have developed an understanding of technology and how to use it, they are developing the ability to process information obtained through technology at a faster pace.

Topic: Knowledge

Table 5. Respondents on knowledge

Respondents	Quotes
P.1.	"Knowledge is needed when you get into real practical action and then you just have to act, then there is no time to look for information on the computer[..] The problem could be with spelling, correct sentence formation."
P.2.	"Young adults are generally less educated, less knowledgeable about what comes from schools. There are such unreasonable, unthought-out conclusions, gaps in knowledge, haste, simultaneity, and speed, that very essential aspect is removed from education and, therefore, also from a person."
P.3.	"Gets fragmentary knowledge. Fragmentary knowledge does not allow to see the overall picture and regularities. They rely on the Internet to always be able to find information quickly."
P.4.	"By the time the lecturer tells something in a slow pace, the young adult will have already understood, found, studied everything, because they have already understood these models, how those tools are made, how they work, and they get there very quickly - knowledge are learned differently. The availability of knowledge creates a high speed of its acquisition, but also superficiality. Technologies develop the ability to explore different sides, to interpret differently [..] The ability to find the necessary information [..] Information is not knowledge."
P.5.	"[..] in the course of development, useless skills are lost – for example, oral storytelling. Knowledge is acquired in a different way."
P.6.	"No need to worry, because the information will always be available, for example, some kind of Wikipedia page, databases, etc. when searching for such information, false beliefs or illusions of knowledge arise, that if I can quickly find everything, then with time I may have a false belief that it is my own knowledge. The knowledge is stored somewhere outside, but I get the false belief that it is my biological knowledge. As soon as a person acquires this knowledge, he does not know how to use it, or uses it very superficially, incorrectly, fragmentarily. [..] the knowledge I use must also be specific. It must be learned in-depth and thoroughly."
P.7.	"[..] there is a fragmentary understanding of practical matters."

Gadhering the answers of experts on the acquisition of knowledge for young adults and interpreting them on the topic of "knowledge", it can be concluded that IT has changed the way in which knowledge is acquired and has made information quickly and easily accessible, which can have both positive and negative effects on knowledge. On the plus side, technology makes

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information available quickly, but not all information is knowledge. From this comes the negative aspect that knowledge is superficial, sometimes erroneous. External media cannot be relyed on for the acquisition and use of professional knowledge. Technologies create the illusion of a knowledge system, although in reality knowledge is fragmentary, and there is also an imbalance between knowledge about the real and virtual environment, if the level of knowledge is high in the virtual environment, then it is low in the real environment.

Topic: Communication

Table 6. Respondents on communication

Respondents	Quotes
P.1.	"Mutual communication deteriorates. "
P.2.	"Technology is essentially encapsulated in the home environment, it's the free time we spend in technology. Statistically, we start to read books less, we go out less, having lost the ability to relax well as a result of digitization."
P.3.	"Computer specialists [IT students] spend a lot of time in front of the screen. Technology is their lifestyle and family members. Communicate with peers in Discord, not only for studies, but use it for fun. "
P.4.	"Text message communication has quite seriously undermined the ability to express not only in writing, but also orally. There are a lot of people who spend their time on Facebook. There is a feeling that they are in a kind of communication starvation. Hide yourself in zoom."
P.5.	"Does not call, but writes Text messages – written, not verbal communication. Speech as social communication diminishes when sitting in technology. Video is not a medium of speech e.g., TikTok."
P.6.	"I absolutely believe that there, on the internet and in the technology environment, it is very interesting, there is both an opportunity to regulate the mood or to forget, and to gain new friends, skills, everything you need. In the daily life of an adult, I could probably be wrong, but most likely the TV will be on, two adults in front of the TV with phones in their hands, and somewhere in the background a child with his console. As if all together but there are several screens. And there you have to look for an answer to the question why it is so."
P.7.	"Then they also develop so-called virtual communication skills. It has a positive effect on self-esteem, they can choose their own environment, they can switch off, they can turn off, connect, choose their friends. Various events in the virtual environment, they form teams there, participate in projects, in various games, play those levels, can sell those (laughs), can earn. As this multicultural experience develops, they also do not understand how far others have embellished their personalities and what can be expected from them."

By collecting the answers given by experts about communication for young adults, it can be concluded that the way of communication and the need for face-to-face communication are changing under the influence of IT. The possibilities of using technologies have contributed to the possibility of choosing communication and cooperation partners. Virtual communication replaces face-to-face communication, which has helped develop multicultural experience. In turn, such multicultural communication changes such aspects of thinking as decision making or problem solving. The social hierarchy, social roles and relationships in the family are changing. The form of communication is becoming shorter, more written, less verbal and pictograms are used a lot.

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Topic: Disorders

Table 7. Respondents on psychological disorders

Respondents	Quotes
P.2.	"Young adults develop various disorders: narcissism, obsessive compulsive disorder. For hyperactive children, using the Internet has a greater negative impact on their studies. Young people may have Internet addictions, read less books, spend more time at home, change the social hierarchy and social roles in the family."
P.4.	"Is an internet, [and] gaming addict. "
P.5.	"The artificially drawn boundaries between the norm and the non-norm. There will be an increase in the number of children who have/will have various types of functional impairment, learning disabilities, ASD, dysgraphia, etc., but these are neurophenotypes, they are not diseases. This manifests itself in the complex features of the CNS, which are never dichotomous: there is intelligence-no intelligence, The problem arises from the contradiction between the neurophenotype of these children and society's expectations or artificially drawn boundaries[..]"
P.6.	"[..] it does both direct and indirect damage to health[..] Not using your brain so much to keep developing, stimulating yourself. Those who are less cognitively active in middle age are at risk of developing neurodegenerative diseases sooner. Similar to muscles. Changing habits: young adults are used to surfing [the Internet]. And everyone has their own habits of how they consume social and other digital content. It gives the impression that young adults switch quickly."
P.7.	"Dissociative thinking - from time to time living in such, I must say, fictional world. [Young adults] lose this sense of reality and they also do not understand how far others have embellished their personalities and what can be expected of them."

By collecting the answers given by experts about the disorders that can be caused by the use of IT for young adults, it can be concluded that there is a risk of Internet addiction, and that technology affects health in a direct and indirect way. Indirectly, habit-forming mechanisms are disrupted, but directly, frequent use of technology leads to inactivity and reduced mental exercise, thereby increasing the risk of neurodegenerative diseases. The influence of the technological environment is more likely to show a larger spectrum of different types of functioning disorders (dysgraphia, dyslexia, ADHD, learning disabilities, OCD, narcissism). According to experts, the use of information technology creates the possibility of dissociation, and it poses a threat to the development of the spectrum of dissociative disorders.

4. Discussion

Communication technology, which was revolutionary, is now firmly rooted in daily activities, becoming an integral part of life in many ways. Our research shows the impact of IT on various cognitive processes in young adults, which is of great importance in the learning process. This research echoed many studies conducted elsewhere in the world.

The results of our research show that the memory is trained less, and the Internet is used more as a means of searching for information. Looking at memory as a cognitive process, a study was carried out, the aim of which was to show, through a case study and in-depth interviews with network users, the resulting changes - new relationships with time and space, forms of sociability, access to a large amount of information and interactivity. The results of the study showed changes in these areas. Habits and behavior, communication, interaction and learning methods changed radically, creating an extremely dependent relationship with the media. Consequently, the Internet remains more and more in the memories and individual experiences of its

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users, and it also has a great impact on the formation of social memory. By changing everyday life and communication, it also changes the way of thinking, worldviews and takes an important place in the formation, maintenance and development of symbolic life, which contributes to the formation of collective memory. The Internet lives as a kind of feedback loop with collective memory: it affects the memories of its participants and at the same time imbues it with imaginary and social memory [18]. Other studies also show the influence of the media and the Internet on the development of cognitive processes [19],[20].

The internet and technology have affected the way people learn, remember and solve problems. The study investigated how people become ready to use the Internet as a form of cognitive discharge. Three experiments show that using the Internet to obtain information changes a person's tendency to use other ways to obtain information (offloading). Specifically, participants who used Google to answer the initial set of difficult questions were more likely to choose to use Google when answering a new set of relatively simple questions than participants who answered the initial questions from memory. These results show that it is more likely to rely on the Internet for information search [18]. Our research shows similar results, where experts indicate that young adults do not rely on their cognitive abilities and knowledge, but look for information on the Internet, which has become a way of learning and the easiest way to obtain information.

It is not news that the media and the Internet are closely related to entertainment and the performance of various activities at the same time, developing precisely the performance of many tasks at the same time (multitasking) [21], thus changing the division/switching of attention and perception processes in the process of learning, knowledge strengthening and resilience. In 2017, 15 independent studies examined the relationship between Internet use disorder and attention deficit disorder and found that individuals with Internet use disorder were more than three times more likely to have attention deficit disorder than healthy controls [22]. Also, the results of our study show the possible possibility of attention deficit syndrome in young adults, given this multitasking and constant switching of attention. Other studies on young adults show similar results [23].

Analyzing the peculiarities of young adults' identity perception, it is known that young adults choose an idealized profile and want other people to see them that way, choosing to show their abilities, physical parameters and even humor or sociability in social networks. It should also be noted that younger teenagers are less aware of the risks of deception on the Internet [24], [25]. As a result, the use of digital programs has dramatically changed the way young adults interact with their peers, access information and engage in social relationships. This has had a significant impact on their health, including their well-being (such as their smartphone usage habits), their sleep-wake cycles, and their cognitive development (such as their level of attention during a task). Given the importance of viewing technology use as an important role in adolescent development, one of the main questions that many scholars are now trying to answer is how adolescents' online presence shapes their offline lives [26]. The results of our study show the risks of a sedentary lifestyle for young adults, so it is important to understand how young adults can reduce the use of IT for tasks, using IT less and only when necessary. As already mentioned above, communication has changed over time and young adults communicate more on social networks, which is shown by many conducted studies. Social media has become an integral part of everyday life and it is estimated that there are 3 billion social media users worldwide. The most active users of social media are teenagers and young adults. Consequently, the number of studies on social media has grown rapidly identifying the potential relationship between social media use and mental health and well-being [27]. Young adults' social support, well-being and overcoming loneliness are the main reasons often cited for using social media and digital technologies [28]. Young adults rely heavily on the Internet for social support [29], which are very acceptable, but social support can also be obtained face-to-face from family, close people and friends. In their study of loneliness, researchers analyzed the relationship between loneliness and social Internet use. If in one case the Internet is used as a way to improve relationships and create new social connections and is a useful tool for reducing loneliness. Then, in another case, social technologies are used to escape the social world and escape the "social pain" of interaction, the feeling of loneliness increases. Researchers believe that loneliness

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is also a determining factor in how people interact with the digital world. Single people prefer to use the Internet for social interaction and are more likely to use the Internet in this way, crowding out time spent in offline social activities. This suggests that lonely people may need social support for their Internet use in order to use it in ways that enhance existing friendships and/or form new ones [30]. The Internet also provides access to social support regardless of time and space [31]. To overcome loneliness, young adults are ready to communicate with a chatbot and experience different types of social support – appraisal, informational, emotional and instrumental support – from these chatbots [28]. The results of our research also show that face-to-face meetings are decreasing for young adults, so loneliness can increase, but multicultural experience is also increasing, which allows you to communicate with people from all over the world and expand your circle of contacts.

An interesting study was conducted in South Korea in 2018, in which 29,811 students aged 16-18 participated, analyzed the relationship between the time spent on the Internet and mental health among adolescents. The results of the study showed that the Internet use group, which exceeds the average use time (193.4±1.6 min/ day), differs from the mental health group, whose indicators are lower than the average use time; especially regarding subjective health status, stress level, sadness, and suicidal thoughts [32]. One study conducted in a large population survey covering 11 European countries looked at the prevalence of pathological Internet use in a sample of 11,956 adolescents and found that only 4.4% of adolescents had this psychological addiction [33]. The prevalence of problematic internet use, depression, anxiety, and stress symptoms among adolescents was 16.32%, 30.16%, 35.97% and 18.80%, respectively. Although the prevalence of problematic internet among boys (17.89%) was higher than among girls (14.86%), girls had the highest rates of depression, anxiety, and stress. And the prevalence of problematic internet was highest in 9th grade (17.29%) [34]. This suggests many disorders related to the use of IT, which can have long-term consequences and the need for the intervention of mental health professionals to solve the problems. Our study analyzed cognitive processes more, however, experts were asked questions about disorders related to IT use. As previously mentioned, experts acknowledged that young adults may have attention disorders and addictions, but many other mental health disorders and Internet addictions among young adults cannot be ruled out, as other studies also show [35], spending a long time online.

In order to ensure appropriate behavior towards the use of the Internet, improve social-emotional learning as well as self-regulation strategies and prevent its misuse, it is argued that teenagers should be taught technological literacy [36].

Summing up the results of all the studies, it can be concluded that there is a need for an intervention in the learning process that would increase awareness of the risks in young adults' mental health, change behavior and manage the mental health of those young adults who spend an excessive amount of time online. Therefore, it is necessary to comprehensively promote the importance of healthy Internet use. In order to reduce sadness, suicidal thoughts and stress among young adults, educational programs that teach appropriate use and timing of the Internet should be developed and implemented.

5. Conclusion

Information technology has become an essential part of today's education system, providing wide access to information and resources that are important to the learning of young adults. Cognitive processes such as thinking, memory, attention and problem solving are very important in the learning process. Information technology can facilitate and support these cognitive processes. Available digital tools and software, such as e-books, interactive learning materials and simulators, can help young adults acquire and consolidate knowledge, improve skills, and promote critical thinking.

The results of the study show that IT can interfere with the retention of information in memory and affects long-term memory in an indirect way (not sleeping, not reproducing) by interfering with the retention of information in long-term memory. Technologies create the illusion that a person is equally optimally able to distribute attention to several tasks at the same time, maintaining the same quality as concentrating on one task. IT reduces the field of visual perception of a person, and under its influence, a different attitude towards time and the pace of life occurs, creating a feeling that time is swelling. Technology offers ready-made

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information/concepts and young adults do not need to use thought operations to go deeper.

Knowledge can be superficial, sometimes erroneous. Technologies create the illusion of a knowledge system, although in reality knowledge is fragmentary, and there is also an imbalance between knowledge about the real and virtual environment, if the level of knowledge is high in the virtual environment, then it may be low in the real environment.

Virtual communication replaces face-to-face communication, which has helped develop multicultural experience. On the other hand, such multicultural communication changes such aspects of thinking as decision making or problem solving. The form of communication is becoming shorter, more written, less verbal and pictograms are used a lot.

Indirectly, habit-forming mechanisms are disrupted, but directly, frequent use of technology leads to inactivity and reduced mental exercise, thereby increasing the risk of neurodegenerative diseases. Therefore, it is important to ensure a balance between the use of information technology and other types of learning, such as face-to-face interaction, discussions and practices. Physical interaction with others and real objects is very important for the cognitive development of young adults.

Despite all the disadvantages listed, IT can be very useful in the learning process. With their help, communication skills can be developed, quick access to information and learning can be accessible to everyone, incl. for people with various physical and mental disorders. However, teachers and educational institutions must be well trained and prepared to use information technology in the learning process effectively and purposefully. Technical infrastructure and access to appropriate resources are also required.

Future research should conduct a broader and deeper analysis of the relationship between information technology and cognitive processes in learning for young adults, including different age groups and learning contexts. It is important to evaluate the impact of technology on learning outcomes and youth development in general.

These conclusions indicate the importance of the connection of information technology and cognitive processes in the learning of young adults. In order to fully use the potential of information technology, it is necessary to maintain a balance in the use of information technology and ensure appropriate training for teachers and infrastructure in educational institutions. Further research is needed to gain a deeper understanding of the impact of information technology and how it can contribute to the academic achievement, well-being, and development of young adults.

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