

Exploring Cognitive, Affective, and Physical Aspects of Early Adolescents' Health Information Seeking Behaviors*

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ABSTRACT

This study reports on early adolescents' health information seeking behaviors that investigated cognitive, affective, and physical aspects of behaviors as they experienced to find information on their needs of health information seeking. In spite of the current widespread internet health information use by adolescents, little research exists to illuminate how they are engaged in cognitive, affective, and physical information behaviors in information search process. Qualitative data were collected through individual interviews informed by Kuhlthau's information search process. Forty adolescents from S city in South Korea participated in the project. Findings report thoughts, feelings, and actions aspects of information search process. This study expects to extend our knowledge of the adolescents' health information seeking behaviors of Kuhlthau's information search process.

Keywords: Adolescent, Health information seeking behavior, Kuhlthau information search process, Thoughts, Feelings, Actions, Public libraries

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1. Introduction

Within the field of information seeking behavior research, health information behavior in adolescence is a relatively less studied area compared to the research in adults. The study of health information behavior in adolescence during information search process is an important area for research development because the abilities for quality information help adolescents make better health decisions. Adolescents are not always adept at finding accurate and reliable information. Also, individuals may not have enough knowledge to assess the authority and quality of health information found when accessing it (Eysenbach & Köhler, 2002). Some people make serious misunderstandings about health problems after finding inaccurate information online (Kortum et al., 2008).

WHO (2021) defines ‘adolescents’ as individuals in the 10-19 years age group. UNICEF (2011) defines that “early adolescence might be broadly considered to stretch between the ages of 10 and 14”. Since adolescence is an important time to experience diverse knowledge physically and mentally, and to establish a framework for developing appropriate health information literacy skills in high school and adulthood (Edelman & Kudzma, 2017), the way adolescents interact with information systems when searching for relevant health information may influence learning outcomes and consequently affect their satisfaction. Moreover, adolescence is a critical time to learn and gain proper health information literacy and appropriate health information behavior.

In many studies, public libraries have been identified as possible settings for providing health information (Leung et al., 2016; Morgan et al., 2018; Rubenstein, 2018; Whiteman et al., 2018). However, there is a lack of information that adolescents experience when visiting public libraries with their health information needs. Due to the need for quality information education for young people, public libraries are planning to provide education in the library, while many are trying to develop programs. Nevertheless, for teenagers, the image of the library as a place for study remains strong in South Korea. It is important to know that adolescents’ health information seeking behaviors are not homogeneous to adults. Their health information needs vary with their sex, stage of development, living environment and socio-economic conditions. Therefore, the motivation for this study is to better understand health information behaviors of adolescents and how public libraries can participate and meet adolescents’ health information needs of the community.

Moreover, adolescence is a critical stage of learning process when health behaviors are established in the future. To help adolescents establish appropriate health behaviors and its literacy, it is

important for us to understand their experiences in information search process about how they search and use information found when interacting with information systems through Information and Communication Technologies (ICT). Understanding their experiences and process will be critical to design health information technologies and innovations to intervene in their health information needs at the right time and in the right place.

Thus, this paper examines cognitive, affective, and physical aspects of adolescents' health information seeking behaviors in order to better comprehend their experiences in information search process.

2. Literature review

To identify adolescents' health information seeking behavior, it is important to consider the context within which the search for health information takes place. The literature related to this paper includes studies of health information seeking behavior of adolescents, Kuhlthau's information search process, and public libraries that present cases for how public libraries can provide better services as a source of health information for adolescents.

2.1 Adolescents health information seeking behaviors

Health information seeking behavior (HISB) is a complex concept whereby health information is obtained from diverse sources (Lambert & Loiselle, 2007). Todd (2003) stated that adolescents' information seeking and use behavior is diverse, dynamic, and complex field and one shaped by many situational, personal, social, and organizational factors. Cusack et al. (2017) studied high school students' understanding of, and attitudes towards, concepts relevant to assessing health information and claims, concluding that school students are vulnerable to distorted and misleading health information due to the lack of basic health research process and methods of how to assess the accuracy of health information and claims. They pointed out that this restricts their ability to make informed health decisions, which is a skill that increases in importance as they become adults.

Gray et al. (2005) studied health information seeking behavior in adolescence to explore United Kingdom (UK) and United States (US) adolescents' perceptions and experiences of using the internet to find information about health and medicines. They discussed that the internet was

adolescents' primary general information source and perceived credibility of the internet varied because expertise and trustworthiness were sometimes difficult to determine. Duduciuc (2015) studied online health information seeking behavior during adolescence. The author found that the Internet is used to a certain extent by more than a third of the respondents for health topics and over half of them consider that the health-related information helped them to achieve a good trim.

Sun et al. (2019) studied consumer online health information behavior to identify criteria that consumers use to evaluate the quality of online health information and the indicators they use to support the evaluation. They identified 25 criteria and 165 indicators. The most widely reported criteria used by consumers were trustworthiness, expertise, and objectivity. The indicators were related to source, content, and design. Their study indicated that different age groups can be characterized as highly subjective about evaluating online health information quality. Diviani et al. (2015; 2016) studied the association between low health literacy and evaluation of online health information. They found out that low health literacy and related skills play a role in the evaluation of online health information. Incorrect health behaviors resulting from the selection and use of wrong health information can ultimately harm health, cause significant economic loss, and even endanger life, so the ability to use good health information is very important during adolescence. In this end, public libraries could educate users from different types of education sources and a personalized approach when promoting digital health information literacy.

Okoniewski et al. (2014) examined health information seeking behaviors of ethnically diverse adolescents. They stressed out that while adolescents are the largest users of information technology, there remains a dearth of research on their information needs and patterns of use, and further denoted that it is critical for healthcare providers, researchers, and innovators to understand how adolescents use technology to meet their health information needs, in what order of preferences. McKinnon et al. (2020) examined how adolescents search for and appraise online health information indicating that there was a large discrepancy between adolescents' ability to search for and assess online health information and their perceived ability. They further stressed out that adolescents' inability to recognize their need for assistance in improving their search and assessment strategies highlights the need for health information literacy education.

Esmailzadeh et al. (2018) studied adolescent health information seeking behavior related to high-risk behaviors in a selected educational district at public schools in Isfahan. They concluded that medical librarians' abilities are suggested to be used for the production, evaluation, and introduction of health-related reading materials in the field of high-risk behaviors in easy language

and suitable for adolescents. Maitz et al. (2020) studied internet-based health information seeking behavior of students aged 12-14. They showed that it is possible to draw the attention of students to critical aspects of internet search and to slightly improve their search competence in a workshop, and further denoted that there is an urgent need to improve the health literacy, and targeted students need special education for this purpose. Students using a superficial approach prioritized with easy-to-use sources, in-depth students recognized the quality aspect, and strategic students organized and structured their search (Heinström, 2006).

Consequently, public libraries could participate in health literacy education program and play a key role in improving students' health-related knowledge in digital health information literacy.

2.2 Kuhlthau's information search process

Information seeking is a complex learning process of finding relevant information to reduce uncertainty and fill a knowledge gap (Kuhlthau, 1991). Information seeking models represent how people search for information in specific environments and how they interact with information system to satisfy information needs. Information seeking models vary based on what and how a user is seeking for information depending on information needs from researchers in the Library and Information Science disciplines (Marchionini & White, 2007).

Kuhlthau (1988a; 1988b; 1988c) proposed and developed six-stage mode of information search process based on Kelly's phases of construction, Taylor's levels of information need, and Belkin's anomalous state of knowledge in naturalistic settings. She emphasized on user thoughts, feelings, and actions rather than on information systems experimented in undergraduate students and validated with high school students. The model of ISP has six stages from the user's perspectives: task initiation, topic selection, prefocus exploration, focus formulation, information collection, and search closure (Kuhlthau, 1991). The ISP model describes that a user's thoughts, feelings, and actions are presented common within each stage as a series of thoughts, feelings, and actions (Kuhlthau, 1993). However, at each stage, thoughts, feelings, and actions are various as the user moves to the next stage depending on how change occurs in the process. Kuhlthau et al. (1990) validated the model of the search process in various types of libraries to determine whether the search process is the same for academic, public, and school library users and settings. She (1993) identifies that these aspects of ISP may affect the user's information search process in terms of task, time, interest, and availability of information.

As the information search process evolves, thoughts of users that begin uncertain, vague, and

ambiguous become clearer, more focused, and specific. Feelings of anxiety and doubt become more confident and certain as the search process progresses. Through their actions, users look for relevant information to their general topic of interest in the beginning stages of the search process and pertinent information toward the end of the search (Kuhlthau, 1993). Kuhlthau (2005) revealed that people experience the process of information seeking holistically as an interplay of thoughts, feelings, and actions.

As information search and use increasingly became the focus of information technology, there arose a need to identify a zone of intervention in the process of information seeking for information intermediaries (Kuhlthau, 2005). Furthermore, the nature of search task affects people’s information search behavior (Vakkari, 2003). The increasing complexity of information search makes high cognitive load (Gwizdka, 2010). Ways to reduce confusion and uncertainty in search process under conditions of cognitive load depend on methods to measure load (Bilal & Gwizdka, 2018). This load can come in three types of experience (i.e., cognitive, affective, and physical aspects) in Kuhlthau’s ISP. Also, individual user’s preferences and differences impact on information search behavior (Zhang et al., 2016) and information source and eHealth literacy can affect consumer health information credibility evaluation behavior (Chang et al., 2020; Zhang et al., 2015). Ghosh et al. (2018) investigated the relationship between searching and learning by conceptualizing information seeking as a learning process, and learning as an outcome of the information seeking process. Beheshti et al. (2015) revealed five factors based on Kuhlthau’s ISP model that consist of information behavior characteristics over time for the grade 8 students as follows. 1) Goals (thoughts), 2) Knowledge and information management (thoughts & actions), 3) Consultation (actions), 4) Positive emotions (feelings), and 5) Negative emotions (feelings).

<Table 1> The model of information search process

	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (Affective)	Uncertainty	Optimism	Confusion Frustration Doubt	Clarity	Sense of direction/ confidence	Satisfaction or Disappointment	Sense of accomplishment
Thoughts (Cognitive)	Vague	→		Focused	→		Increased interest Increased self-awareness
Actions (Physical)	Seeking relevant information	→				Seeking pertinent information	

Note. Adopted from “Information search process” by C. Kuhlthau, 2021, (<http://wp.comminfo.rutgers.edu/ckuhlthau/information-search-process/>). Copyright 2021 by Carol Kuhlthau.

2.3 Public libraries as a provider for health information

Public libraries are important health information providers and accessible free to the population of the community. Supporting the public in the community has always been identified as a core function or mission of public libraries. And now, along with regular children's programs, early literacy programs have become an integral part of public libraries. Agosto (2007) studied the various reasons why teens use public libraries and what the roles of public library are in modern society. The author concluded that teens use public libraries as combined information gateways, social interaction/entertainment spaces, and beneficial physical environments. Agosto et al. (2016) indicated that teens tended to think of libraries as largely outdated institutions with little connection to their technology-focused daily information practices. Howard (2011) studied what young teens think about the public library and highlighted the lack of relationships with library staff, appealing facilities, an appealing teen library website, and teen involvement and participant as key barriers to library use.

However, Esmailzadeh et al. (2018) showed that when looking at where to start searching for health information, 232 of 293 adolescents (59.2%) used the Internet to get health information about high-risk behavior. 52.8% of them chose "search engine" and 16.3% chose "social media" as the place where they usually start searching on the Internet. Vargas (2008) pointed out that teenagers turn to the Internet, chat rooms, and bulletin boards for health information, but are concerned about issues of quality of information and confidentiality. The author concluded the importance of how librarians can develop Web-based sites to help meet teenagers' health information need. Skopelja et al. (2008) pointed out that the Internet has become one of the most important source about health and medical issues but many adolescents have limited searching skills or problems with literacy and other issues that may make it difficult for them to locate and understand authoritative information.

Considering the reasons why adolescents prefer the Internet as a source for health information search, there may be various reasons but the importance of the role of librarian and libraries has been emphasized. Luo and Park (2013) indicated that the two biggest challenges public librarians face when providing consumer health information services are the difficulty in interpreting customer questions and the lack of knowledge of available, reliable and appropriate medical/health information sources. They concluded that acquiring the necessary skills, knowledge, and competencies through education can effectively and efficiently provide consumer health information services in public libraries and ultimately create an optimal customer experience. Morgan et al. (2018) studied public library staff as community health partners in terms of training problem design

and evaluation. They reported a significant increase in comfort, confidence and readiness when supporting vulnerable customers across all subject areas. Gillaspay (2000) pointed out that since most public librarians do not have a specialty in medical information, actually establishing a consumer health service in public libraries can be a daunting task. Rubenstein (2016a; 2016b) studied health information and health literacy in public library practices, challenges, and opportunities. The author found out that librarians recognized several challenges in providing health information and developing the program, including the difficulty of staff conducting reference interviews, and lack of awareness of patron for library resources. Luo (2018) studied health information programming in public libraries seeking to strengthen the professional understanding of how public libraries can contribute to health literacy improvement through effective programming, and help other libraries gain insights on health information program planning and implementation.

Walter (2003) reported on four significant questions related to public library service to children and teens in public libraries: 1. How have public library services to children and young adults developed over time? 2. How and why do young people use public libraries? 3. How can we evaluate the effectiveness of public library service for young people? 4. Why should policy makers fund public library services for children and young adults?

The above publication provided strong evidence of the need for education in consumer health information services for public librarians, and also underscored the importance of the role of librarians and public libraries. Whitney et al. (2017) stated that libraries and librarians can be effective partners in conducting health literacy research and in building sustainable health literacy programs within organizations and communities. Parents, teachers, school nurses, health professionals, librarians, and web designers that influence the development of adolescents' health knowledge and skills in information seeking, health decision making, and health literacy should be aware of the issues dealing with health information in adolescence. They also need to work together to make sure that adolescents can access and use quality health resources on the web (Skopelja et al., 2008).

3. Methodology

The purpose of this research is to examine and describe the experience of thoughts, feelings, and actions of adolescents' health information seeking behaviors. This study is exploratory, as qualitative research methodologies are considered appropriate to facilitate the acquisition of in-depth information when researchers are trying to identify and theorize important issues (Casula et al.,

2020). Ragin (1994) discussed that “qualitative methods are appropriate for in-depth examination of cases because they aid the identification of key features of cases.” (p. 79). Therefore, a qualitative design with an interpretative perspective was used because this can best link participants' subjective thoughts, feelings, and actions with their health information seeking behaviors for this study. The qualitative method generated data from semi-structured interviews and thematic analysis was used for data analysis.

3.1 Participants

Forty middle school students (P1-P40) from S city in South Korea were recruited for interviews about their experiences of health information seeking behaviors and public library use. Recruiting students was conducted randomly to middle school students in front of several middle schools and public libraries. There were 28 females and 12 males aged between 12 and 14 years who had prior experience of searching health information and using public library services. The selection of participants is important. Since the focus is to explore the early adolescents' experience of health information seeking behaviors, the choice of participants South Korea middle school students as a target group is justified by the fact that South Korea is a developed country where the usage of the Internet services and mobile technologies is considered as well developed. Since adolescents are frequent users of online and mobile technology, a better understanding of information seeking behaviors of adolescents is critical for designing health information technology interventions. Also, there is growing number of public libraries in South Korea. According to Yonhap news (2020), the number of public libraries reached 1,134 as of 2019. The characteristics of interview questions are summarized in Table 2. The data were not be related to participants' identity in any ways and only investigator accessed it. The data was stored in a safe place with a password protected. The analysis and interpretation of the data are presented below.

<Table 2> Example questions of semi-structured interview

Topic	Example questions
1. Experiences with and perceptions of adolescents' health information seeking and use	What/ How do you typically search for health information? What is your preferred source and use of information for health-related information need?
2. Factors that help and hinder adolescents' health information seeking and use	What enables you to fulfil your health information need? What prevents you from searching for health information?
3. Ways (Factors) to use public library in seeking health information	How have you used public library to meet your health information needs?

3.2 Data collection and analysis

The study was carried out a qualitative design based on individual interviews made up of adolescents in 2019. A semi-structured interview was designed to explore what experience in participants' health information seeking behaviors was made and how perceptions of this experience emerged in the use of public library. The questions in context of health information needs of adolescents and the perceptions of public library were designed to elicit students' experiences about their thoughts, feelings, and actions as they sought information and draw more information from personal public library experiences. Average duration of each interview lasted less than 30 minutes, and each interview was recorded and later transcribed to content analysis.

Data was organized and analyzed according to thematic analysis. Thematic analysis is widely used as a "method for identifying, analyzing, and reporting patterns (i.e., themes) within data" (Braun & Clarke, 2006, p. 79) and was chosen because this research focused on exploration of both predetermined themes and perceptions of the participants (Aspers & Corte, 2019; Clarke & Braun, 2013).

According to the six-phase coding scheme (Nowell et al., 2017), 16 variables were identified from the transcriptions and then these were sorted to three categories: thoughts, feelings, and actions (See Table 3).

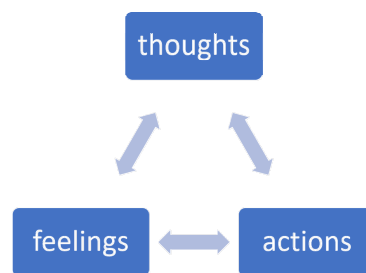
<Table 3> Description of thematic analysis

Descriptors	Description	Thematic analysis
Considering possible topics of interest, Relating information needs to prior knowledge and learning, Experiencing relevance and increase redundancy	This involved an idea or opinion produced by thinking, the process of thinking, or occurring in the mind.	Thoughts
Uncertainty, Confusion, Doubt, Anxiety, Satisfaction, Disappointment, Confidence in ability to complete task, Increased interest, Sense of relief	This involved an emotional state or reaction, a belief, especially a vague or irrational one.	Feelings
Talking with/ asking others, Browsing the Library, Searching/Navigating/Locating/Reading relevant information using Internet, Collecting pertinent information using Internet	This involved the state or process of doing something or being active.	Actions

4. Findings and discussion

In Kulthau's sixth stage of information search process, thoughts, feelings, and actions, these

three elements are simultaneous and common empirical elements (Kuhlthau, 1991). To this end, three themes were derived using thematic analysis method and investigated (See Table 3). Simply put, when information need arises, one has thoughts about the facts of that information search process. Those thoughts trigger feelings, and based on those feelings one may engage in information behaviors which in turn impact the information behavior either positively or negatively, and the cycle may continue in both directions (See Figure 1).



〈Figure 1〉 Iterative process on cognitive, affective, and actions of Health Information Search

4.1 Cognitive aspects: Thoughts

Kuhlthau (2021) described that “... thoughts that begin as uncertain, vague, and ambiguous become clearer, more focused, and specific as the search process progresses.” Thoughts in this study are related to the participant’s cognitive aspects and activities considering possible topics of interests, information needs, and resources and relating prior knowledge and learning to their information needs. The concepts of prior knowledge of subject content, information search skills, how to determine relevance, and strategies for identifying useful keywords and writing queries are among the important cognitive variables in students’ information seeking (Bilal & Kirby, 2002). Participants described the needs and prior knowledge of searching for health information as they attempted to access to information sources or resources.

4.1.1 Considering topics of interests of adolescents’ health information needs

Rolinson (1998) studied health information needs for the teenage years concluding that there is the shift of emphasis of the adolescent’s need for information about medical conditions to information relating to body image and sexuality. This is still true for this current study confirming that a large majority of participant are interested in sexuality and body image for their information

needs. We can see that the majority of participants are starting to search for health information with an interest in their body-related symptoms or changes in their body appearance. Kim and Syn (2014) studied research trends in teen's health information behavior by analyzing articles published between 2000 and 2012. They (2014) examined the distribution of health topics, among 82 studies, sexual health topics have been most frequently studied followed by eating issues and nutrition, mental health topics, and alcohol, drug and tobacco.

In this study, participants' needs for health information range from simple things like "I need to be in a good shape" to complex things like "I need to know better about feminism or scoliosis". One participant (P1) noted: "I'm interested in losing weights. A lot of people go on a diet, so I want to do it". Another (P13) stated: "I just want to wear pretty clothes, but it's hard because I don't have a good shape, so I want to make a good shape. And since I'm taking a graduation photo soon, I want to appear in the picture well". One interviewee (P17) stated: "Recently, there have been many changes in my body, and I am curious about my interest in the body". Another (P5) explained: "I have dysmenorrhea or ovulation pain, so I want to know how to care for it".

According to the youth health behavior of Korea Centers for Disease Control and Prevention (2020), adolescents' health information needs are diverse including smoking, drinking, physical activity, eating habits, obesity and weight control, mental health, damage and safety awareness, oral health, and sexual behavior. One participant (P4) specified: "I want to learn more about anemia. I know a little about adjusting food habits to prevent it, and I have been diagnosed with anemia in a hospital". Another (P9) specified: "I have a very stuffy nose and I want to know the solution to this. When I'm sick, I try to solve the problem without going to the hospital because I have a cold now and my nose is stuffy". Another participant (P12) added: "... dark circles are severe under my eyes these days, so I wonder why they appear. I am also wondering how I can sleep well because I haven't been sleeping well these days. Maybe they are related to insomnia".

The majority of the participants focused on sexual health topic, while the rest covered a variety of health topics that are diverse, complex and multifaceted. It can be said that the health information needs that participants are curious about are consistent with nine items, including sexual behavior, physical activity, diet, obesity, and weight control, which the Centers for Disease Control and Prevention annually surveys.

Table 4 shows that the comments from participants affirm that their health information needs are diverse with a variety of interest.

〈Table 4〉 Reasons identified for health information needs

Reasons	Frequency
Feminism or gender equality	1
Concerns about sexual characteristics (e.g., sex, menstruation, changes in the body, etc.)	15
Opposite sex friend	8
Diet	3
Dark circles	1
Insomnia	1
Relief and cope with cold symptoms	2
Interest in unknown and difficult diseases	1
Concerns about general health	2
Stuffy nose	1
Anemia	1
Scoliosis	1
Knee pain	1
Height	2

4.1.2 Relating information needs to prior knowledge and learning

A searcher can be a learner in seeking meaning not just looking for relevant information. Rieh et al. (2016) proposed a new perspective on searching as a learning process focusing on comprehensive search. Searchers' prior knowledge can help or hinder learning in which they learn and build on what they already know and have come to understand through their search experiences (Ambrose et al., 2010; Ghosh et al., 2018).

Recent study showed that inaccurate prior knowledge affects children's learning and calibration (Loon et al., 2013). They (2013) investigated whether activation of inaccurate prior knowledge before study contributes to children's commission errors and overconfidence in these errors when learning new concepts. Kerstetter and Cho (2004) studied prior knowledge, credibility and information search to assess the relationship between them. They (2004) found that prior knowledge may be a multidimensional construct; that when addressed independently, it does influence individuals' search for information; and that source credibility is the strongest predictor of type of information sources used.

The results of this study showed that the majority of participants had little or no prior knowledge of the health information they were looking for. In particular, the majority of participants pointed that their prior knowledge through friends, family, and school was all but inadequate or incomplete.

〈Table 5〉 Participants' prior knowledge to seeking health information of interests

Level	Frequency
No prior knowledge	22
Little prior knowledge	9
Some prior knowledge	6
A lot of prior knowledge	3

Participant (P31) stated that “I don’t think there is any prior knowledge of the information I was trying to find. Nobody taught me about it before.” Participants believed that quality new health care education at school was important. Participant (P28) also mentioned that education in school could also inspire new directions: “I think it is necessary for the school to provide us with a quality new health information education for our generation.” Participants appear to be calling for a new approach to the ability to use health information to understand the diverse and complex information needs and develop appropriate health-related decision-making skills. This awareness of the importance of education helped to understand the difficulties of education for prior knowledge: “I don’t know about prior knowledge. And I don’t even know the details of it, except for the terms I’ve often heard (P6)”. Another participant (P16) explained:

Since health care education at school itself is too formal, there is not much to learn in detail. I think we need to know more detailed information in a special way by employing education such as effective training methods, information literacy, database and information search training.

I don’t know... Even during sex education at school, the information I wanted to know was not well educated. I think we need a new sex education for our generation. [participant 17]

In fact, I have very little prior knowledge. Although there was a health care education at school, it wasn’t fun. So, I didn’t concentrate well in the program and then I had almost nothing from it. So, I just try to pass the education if I can. [Participant 24]

It seems that school health care education still shows the limitations of the effectiveness of education to a certain extent rather than systematically and effectively providing education to participants. This spontaneous mention of health care education and quality learning suggests that the participants realized the benefits of the health care education and the impact of quality

learning of the health information. Participants with little or no prior knowledge seem to have influenced the decision-making by the opinions of parents or friends in the form of passively accepting the opinions of others rather than cooperation through consultations with various organizations on the use of health information.

Participants seemed to have heard some information roughly through their school or family, but felt that education about the health information they wanted to know was not being educated properly at school. Participant (P22) stated that "I heard it through friends or family. But, I'm not so sure about it. There was no education at the school about the information I wanted to know." Another (P32) stated: "I have heard some stories from friends and acquaintances about things I wanted know. So, I think I know them well in advance. ... but I would say stories are not believable..." This view of sharing information through social or collaborative information seeking by participants suggests the importance of understanding friends, peers, or family as resources that support the quality of health information and ultimately support successful decision-making. However, in this case, it is difficult to judge and guarantee whether the shared prior knowledge is appropriate and correct.

Interestingly, participants who had prior knowledge seem to find necessary health information by using public libraries. It seems that the more prior knowledge held by a participant, shown through the awareness of public library use, corresponded to higher access and use of public library resources. Participant (P8) stated: "I think I have a lot of prior knowledge. ... If I'm curious about something my body at home, I'm mostly trying to solve it, so I'm looking for an anatomy book to look at all, or to see a book, full of photos. In this case, I usually go to the library and try to find what I wanted more." Another (P35) stated: "I think I know a lot about it. I found out by reading a book or watching a video in the library." Participant (P20) specified: "I would say I have some prior knowledge. ... Just ask for a librarian. The librarian helped me to find information I need in the public library".

The comments from the participants affirm that they did not have prior knowledge, rather than interacting with health care experts and seeking help, and they showed the behavior of health information in the form of "individual and passive" in which the roles of information professionals, medical professionals, and students are separated.

4.1.3 Experiencing relevance and increase redundancy

Esmailzadeh et al. (2018, p. 1) examined the most important barriers to seeking adolescent health information were mentioned as follows: "difficulty in determining the quality of information

found”, “absence of appropriate information”, and “concerns about the disclosure of their problems or illness to other”. Looking at the comments of participants, the key concept that they have the most difficulty in finding health information can be “relevance judgement” as to diminishing relevance and increasing redundancy. Determining relevance for adolescents is not always straightforward because some health content is neither relevant or easy and relevance comes from multidimensional factors. Xu and Chen (2006) studied the factors affecting relevance judgment and proposed a five-factor mode of relevance: topicality, novelty, reliability, understandability, and scope. Liu et al. (2020) identified three patterns for relevance criteria including 1) data topicality judgment as the first step or starting point, 2) data reliability judgment as the necessary process and 3) data utility judgment as final purpose. Cusack et al. (2017) claimed that lack of awareness of assessing the accuracy of health information and claims make them vulnerable to distorted and misleading health information. In this study, Credibility and reliability are found to be two essential relevance criteria. Topicality and accuracy are also found to be significant as well as understandability. A recent study (Kim & Kim, 2021) revealed teens prefer trusted sources and have patterns of reviewing and comparing content between different sources to ensure the quality of the information. While female teens value privacy and confidentiality, male teens want to get information with their peers and see it as an opportunity to exchange experiences and thoughts.

Participants described the challenges of making relevant judgments as they attempted to search for useful health information. They found it difficult to isolate the good quality information from wrong information. Since the majority of participants described a lack of prior knowledge about their health information, meeting information needs may not always be enjoyable. They often wanted to know how to identify and distinguish if information found was relevant to their needs. This shows that participants are well considering information accuracy aspects before they are used.

I don't know if the contents of the search are real or fake, so I can't tell. Trusting information seems to be the most difficult. It's hard to believe because it may not be accurate. It's hard to tell what's up there because there are so many personal opinions from non-professionals. [Participant 18]

Significantly, one theme that emerged from the majority of participants was the credibility and relevance judgment of health information search. Participant (P37) stated:

I think it's a part of the credibility of the search results. The part of the Internet that I think is

simple content can get information quickly, but I think it is problematic to absorb and accept 100% because I think it is less reliable because I hear from people rather than experts about specific information.

When I ask a friend, I think it's not accurate because it may be different from person to person. I think that's difficult for me to compare between what I have been told and what I will have to find. [Participant 19]

Although participants are aware of the inaccuracy of information, they appear to be using inappropriate information search paths in response to their health-related questions.

I ask 'Naver' intellectuals directly, or look at the answers to other people's questions. I'm trying to find what people in my situation asked. But I don't know if I can trust everything because it's something I found on the Internet. If you look at the answer, there are many advertisements, and even the non-professional responds, which is the most uncomfortable. [Participant 3]

Reliability in search is important. Because if I look for ways to relieve pain related to genitals on the Internet, there are many articles written by bloggers and women's oriental clinics who are promoting to sell medicine on the Internet. [Participant 5]

Today, digital health information has increased explosively, but as a result, searching for quality information requires information technology skills, and it is analyzed that the population of participants' ages does not have many means and opportunities to learn it. The cause of difficulties in solving the problem such as satisfying information needs are, among others, relevance judgment criteria, credibility and accuracy of information, and quality of information. Therefore, the comments from the participants affirm that health information literacy is needed and should be promoted using their school libraries. To this end, librarians and medical professionals such as nurses should be able to arrange health care literacy education for students.

When considering the entire information search process, vague thoughts on the participant become clearer, the participant may be interested in the topic and the participants' thoughts may lead to positive behavior. Conversely, if the participant has difficulty solving the problem, interest can be indifferent, which can turn into inactivity, negative behavior. Thoughts serve as a decisive trigger that possibly divides feelings into two main branches: positive and negative feelings.

4.2 Affective aspects: Feelings

Feeling, in psychology, is the perception of events within the body, closely related to emotions (Britannica, 2021). While emotions are associated with bodily reactions that are activated through neurotransmitters and hormones released by the brain, feelings are the conscious experience of emotional reactions (Britannica, 2021). Kuhlthau (2021) described that “... as the search process progresses, feelings of anxiety and doubt become more confident and certain.” However, this claim can only be established only if the search results are pertinent and relevant to a searcher’s information need. Feelings in this study are related to participants’ affective aspects such as degree of frustration, degree of confidence, degree of difficulty, or degree of satisfaction. Therefore, variables related to affective aspects were coded to feelings. Participants described their affective aspects roughly in two ways such as good or bad, and positive or negative as they remembered their experiences on health information seeking.

Since this paper is not a task-based, there is a weakness in examining changes in feelings or emotions at the moments and stages of information search process. Savolainen (2014) states that even though affective factors such as feelings and emotions are ubiquitous elements of information seeking, their study has been largely neglected in information science. Therefore, this paper focused on how participants felt about the retrospective health information search in light of their experiences. When analyzing the comments of participants, there were two sides of feelings: negative and positive feelings (See Table 6).

〈Table 6〉 Two sides of feelings

	Positivity	Negativity
Component	Optimism, Confidence, Sense of relief, Satisfaction, Increased interest, Realization	Disappointment, Frustration, Difficulty, Uncertainty, Confusion, Anxiety, Doubt

The evaluation of positive views can be viewed as a desirable and positive form of evaluation that calls for interaction. This can be analyzed as a competent interaction that evokes emotional boundaries or triggers another action. Unlike the evaluation of the positive opinion, the evaluation of negative opinion can be regarded as causing the expression of insensitivity or negative feelings, ignorance and no action, in which participants no longer think. Negative emotions do not induce reactions such as interaction, cooperation, or coordination, but lead to passive behavior, indicating that later searchers can complete the entire process of searching for information without additional

information.

4.2.1 Negative feelings: Frustration and difficulties

Frustration comes from uncertainty and anxiety that stems from the feeling that a searcher is unable to meet her own information needs (Wikipedia, 2021). When the needs of participants' individual health information were blocked and unsolved, more frustration seemed to arise. To address participants' negative feelings, participants described how they were frustrated with their information search progress. Frustration that participants generally felt while searching for health information could be divided into three types.

Firstly, it is difficult to judge the credibility, quality, and reliability of the selected information source. Participants were talking about the difficulty of quality and reliability, which is the difficulty of selecting whether the information found is correct or incorrect. Participants described that although they selected health information that they were curious about from the Internet, they did not believe that all the information was true, but they were cautious and questioned and more frustrated. This showed that the curiosity of the participants was not fully resolved or that limited uncertainty was resolved. As such, when the participants felt the most burdened and skeptical about the information, it was the judgment of the quality of the retrieved information. Almost all participants recognized that the accuracy and reliability of the information was not easy.

Internet is a bit ..., I think when I am not sure if it is a little certain or correct on the internet, it is questionable and frustrating. Sometimes curiosity is somewhat relieved, but somehow, I don't believe all is true... It's hard to know the truth of stories that go around on the Internet, and I don't look for them with a light on my eyes. [Participant 1]

I look it up on 'Naver', but I'm not sure if this is the correct information... It doesn't seem to work out well. In that case, I just leave it as is. So, I still have questions. [Participant 9]

When I ask friends, it may be different from person to person, and I guess it's not accurate. I think that's difficult and that's why I don't believe everything as it came out, so there are a lot of times when my questions aren't solved. When that happens, just pass it by or let it go. [Participant 5]

In other words, it was the difficulty in selecting the correct information source and determining the suitability and reliability of the selected information source that the participants mentioned

most in relation to the evaluation of the health information they found in the interview process and emphasized its importance. Many participants responded almost synonymously with the selected health information and the accuracy of it, and one participant (P14) responded with another expression of accuracy, “uh... there is also a lot of redundant information.”

When I search, it is difficult for me to find the correct information. Somewhere people say this, and somewhere they say that... I don't know what's real. It goes back and forth. [Participant 2]

Uh... the information I wanted... Something unrelated is coming out. So, after all I feel something is still vague and confused. [Participant 15]

It seems difficult to distinguish whether the information obtained by searching is correct or just incorrect information, and it seems that there is too much information and a lot of bad information that does not feel accurate, so it is not easy to select the appropriate information. [Participant 8]

Secondly, it is difficult for adolescents to know the health-related medical terms. Medical jargon is difficult for them to understand when searching for relevant information. eHealth literacy is “the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem” (Norman & Skinner, 2006, p. 2). Limited eHealth literacy can pose a risk to adolescent safety and low eHealth literacy affects those who have a problem understanding medical terminology. Hastrup et al. (1992) studied adolescents' knowledge of medical terminology and family health history. They (1992) concluded that adolescents' age was a major predictor of knowledge of medical terms. It is the clarity of health information that requires participants' information literacy skills. Park and Kwon (2021) studied the digital health literacy instrument for adolescents and identified potential problems that might affect health information literacy related to clarity that includes unclear wording, undefined technical terms, vague terms, and difficult vocabularies.

First of all, it was a little difficult because there were a lot of jargon, and I'm not sure which site to go to and search. [Participant 38]

In the case of health, since there are many technical terms, medical terms are very difficult. That is why I think I have a lot of difficulties there. [Participant 11]

Thirdly, it is the difficulty of not knowing how to select an appropriate relevant information source. Participants described that they have difficulties where to go and how to search for what they need for their health information. It is analyzed that participants mainly use the Internet to find simple information on portal sites such as 'Naver', and furthermore, participants give up searching for information or take no action on a complex and special subject. One participant (P17) said that he did not know where and how to search for the desired information. Valenza (2006) described that students assume that the search engine understands the sentences and questions entered in the search bar in a natural language style instead of developing a search term in advance and identifying promising keywords and synonyms.

Despite using the Internet, they felt that they have difficult time to find relevant information, to choose from a variety of media, and to access to materials that are blocked by rated 19 and connected to commercials. Participant (P29) stated: "It's like where and what to look for. There are so many search media ... I do not know much about it". Another (P34) stated: "When the information I want doesn't come out, materials, I can't find what I want to find". Another (P12) participant noted, "... sometimes I can't find information because there are many words that are blocked when I try to find information somewhere." One interviewee (P1) further explained, "Even if I search on the Internet, I don't think the information I want is coming out easy. And when I look for a diet like what I am doing now, there are several, but even if I try them for my question, I have to find something else."

<Table 7> Participants' key concepts in difficulties to seeking health information of interests

Descriptors	Frequency
Judging relevance, credibility, assessing quality, and securing reliability	29
Understanding technical medical terms	5
Inability to find pertinent information source	6

Emotion is analyzed to be closely related to action. Positive emotions can be used as a trigger for a positive action, but negative emotions seem to lead to a negative behavior result in which no action is taken.

The quality of the information found wasn't good, so... I couldn't completely solve my questions.

Well, I just left it because I wanted it to be okay... It's frustrating. [Participant 36]

Honestly... I don't think I can find all the answers to the problem solving. It was so difficult to say... I was able to solve some of the questions I was curious about, but there was a case where I couldn't solve it because there was a lot of similar information. [Participant 15]

There were times when I was able to solve what I was wondering about, and there were times when I was not. When I couldn't solve the problem, it was a little stuffy. But that's not important to me, so it doesn't matter. [Participant 19]

Some participants expressed frustration at times when the evaluation of their information needs was limited or partially resolved, leading to the expression of negative emotions, neutral affect, ignorance, or inaction of them. Emotional signs of uncertainty, frustration, and confusion can lead to vague and inaccurate thoughts about a problem or topic. However, the shift to focused knowledge leads to reduced uncertainty and increased confidence (Orlu et al., 2017). Myrick and Willoughby (2019) examined how emotional states and education levels combine to influence online health information seeking. Their results (2019) indicated that those who are being angry all the time decreased the likelihood of information seeking. They (2019) also denoted that motional states, gender, and education individually and jointly impact information seeking tendencies.

4.2.2 Positive feelings: Satisfaction and confidence

Kuhlthau (2021) described that “formulation of a focus or a personal perspective of the topic is a pivotal point in the search process. At that point, feelings shift from uncertain to confident, thoughts change from vague to clearer and interest increases.” Savolainen (2014) pointed out that affective phenomena tend to be elusive and they are difficult to conceptualize exactly. Further, he (2014) stressed out that concepts such as interest, relevance, and uncertainty incorporate both affective and cognitive elements.

Some participants seem to have found a solution to the question that they are looking for to some extent, but in order to secure the credibility of the information, it seems that they look for what others have done and ask their surroundings. It is analyzed that participants try to solve the problem ‘actively’ while giving and receiving feedback through interaction in the process of taking information. One participant (P37) stated: “I feel good because I was relieved of curiosity and to know more”. It is analyzed that the evaluation of a positive opinion can lead to a connection between the expression of positive emotions and actions. Research shows that users experience anxiety and suspicion early in the search process, but they develop satisfaction and confidence

as the search progresses (Kuhlthau, 1999).

So, I just did this and I did that, but it didn't work, so I came to this in the end. I look for a lot of things that solved the similar problem in my case and find out how they did it. [Participant 26]

So, it was solved, but doubts remained. I was like Is this right? I was alert. So, I just keep looking or seeing a lot of cases like mine. I sometimes ask around. I thought I'd have to look it up again next time. [Participant 27]

I came to know to some extent what I wanted to know moderately, so I felt that my curiosity was somewhat resolved. Just because my curiosity was somewhat resolve, I thought I should search the Internet next time for that question. [Participant 10]

In this regard, some participants showed a 'passive' form of information seeking activities that do not seem to seek help from information professionals such as medical experts and librarians in the early stage of ISP, but rather 'active' in the completion of ISP by showing a change in the direction of solving problems through interaction.

4.3 Physical aspects: Actions

The physical aspects include utilizing motor skills and the ability to act and coordinate them (Zeng et al., 2017). The physical aspects in ISP refers to actions that address physical access to the location of sources and information. Kuhlthau (2021) stated that "... through their actions, people seek information relevant to the general topic in the beginning stages of the search process and pertinent to the focused topic toward closure." Weiler (2005) found in his study of motivating factors behind students' dependence on television and the Internet for their information needs, that the Internet had become the first source of information, whether it be for personal, academic, or professional information.

In this study, selecting from relevant information to pertinent information mainly relies on the Internet as participants' primary source of access to health information. This study is consistent with the work of Weiler (2005), with one difference being that it uses mobile technology (i.e., smartphones) to search for health information over the Internet.

〈Table 8〉 Participants' source of health information

Source	Frequency
Internet (Naver, Blogs, or Forums, etc)	26
Friends or family members	6
Library resources	3

4.3.1 Internet search using smartphones

Ettel et al. (2012) discussed how adolescent access health information and found that most high school students used the Internet as resources for health care information. Gray et al. (2005) showed that internet health information was regarded generally as salient and its saliency was increased through active searching and personalization. Vogels et al. (2020) found that roughly half of Americans (53%) say the internet has been essential for them personally during the pandemic and another 34% describe it as “important, but not essential.” Even though it was targeted to adults, the same might be true for adolescents. The vast majority of Americans view the impact of the internet positively, and nearly nine-in-ten say it’s been an essential or important tool during the coronavirus outbreak. Hansen et al. (2003) revealed that participants used a trial-and-error approach to formulate search strings, scanned pages randomly instead of systematically, and did not consider the source of the content when searching for health information.

The most notable point as an information path and source of health information search is that almost all participants use internet search using smartphones. This seems to be a natural phenomenon that the Internet using smartphones, which is most frequently encountered by participants in adolescence, becomes the preferred route for information search. In addition, it is analyzed that this is because participants always have smartphones in their adolescence, so they can use them to quickly search for information that can be found through Internet access, which is simple, most frequently accessed, and convenient to use.

... I search the internet through my mobile phone. It’s probably closest to me, so I can use it often. I also think it’s the easiest and fastest way to do it. [Participant 9]

I search the internet on my mobile phone and find what I want a lot. That’s the easiest way to find information. Also, I search a lot on my computer. [Participant 13]

As such, it was found that participants mainly use digital media by searching the Internet

using smartphones, but it may be a 'limited' search that can bring up a problem of reliability that has to determine whether the information they find is reliable. In addition, despite the fact that participants consistently recognize that the 'reliability' for information is low, it can be seen that they prefer to search for information on the Internet in that it is easy to access, can obtain information to a certain extent quickly and easily, and guarantees anonymity.

... by browsing the internet. When I searched on the internet and visited the blog, they uploaded such and such information. As I said earlier, there are difficulties in the reliability of search, but I still prefer to search the Internet because still I can get a rough idea of the information I want, and I can quickly search and see it. [Participant 17]

I see a lot of "Naver Intellectuals" on the Internet. It's not accurate but easy to get information and people use it a lot. I think the important issue is the reliability of the search because we can get information quickly on questions that are considered simple, but I think it is not reliable to specific and special information because we listen from ordinary people, not experts. So, I think there is a problem with absorbing 100% and accepting it. [Participant 4]

It's easy to find it on 'Naver', so I look for information with it. There are a lot of hits on 'Naver'. The question is, are they reliable stories? I can see that elementary school students have posted a nonsense article. [Participant 40]

Some of the participants searched for information from nearby people or friends, but they also searched the Internet again. The media most frequently viewed by participants is "Naver blog" through the Internet search, and it seems that "Naver Intellectuals" and "YouTube" are also used. The reason is that anonymity is guaranteed, and only desired information can be quickly searched, and it is the most common and convenient to use. Participant (P5) stated: "I look for information on "Naver Intellectuals" and internet sites. And YouTube, these days, people have put this sex-related knowledge and contraception on YouTube well".

I think I get to know a lot through conversations with my friends. But I also search through the sites or search sources that my friends gave me. So, if I just type in a keyword on the portal with a mobile phone search, the answer that I am curious about comes up right away. I like it because it is convenient. [Participant 18]

I hear it from people around me and among friends, but I think there will be uncertain information, so I want to know only the information I want quickly, so I think I search a lot with my mobile phone. Still, I prefer to browse the internet on my mobile phone. Anyway, it's ambiguous and a little embarrassing to ask anyone, but since the internet is anonymous, I can ask all questions. [Participant 32]

I'm comfortable asking people around me, so I sometimes ask my friends or parents, but I also search the Internet again to find it. [Participant 22]

As can be seen above, the behavior of the participants' action seems to be pursuing the convenience of quickly searching through the Internet using smartphones to easily obtain necessary information. In particular, since the Internet is easy to unilaterally communicate or receive only the story of one side (e.g., sender or receiver), it is analyzed that it is not easy for adolescents to exchange, coordinate, and cooperate with each other because communication between both sides is not smooth. This unidirectional information seeking behavior has since been shown to give users 'limited' confidence or 'fragmented' confidence in determining the reliability and suitability of the selected information.

4.3.2 Using public libraries for a source of health information

Participants' thoughts and views on public libraries were more general than concrete and special. For example, their views were largely about public libraries as physical places. The public library was considered a physical space as a place to study, a place for reading books and finding information, a quiet space to relax, a space to meet friends, and a space to watch movies, and others.

When analyzing the sources of the participants' health information, they appeared to be mostly using the Internet to access and use the information needed. Only a few participants considered public libraries to be the primary source of their health information. One participant (P27) stated: "... the librarian helped me to answer my questions". However, some participants approached the library as a source for health information search, but it was difficult for them to find the pertinent information by using library books on their own.

When I search the Internet, there are many cases or types that are similar to those of other people who have my concerns. So, I think it's good on the internet on one side, but when I find it in the library, I need specialized knowledge. About this point. It was a little difficult to find something like

that in the library. [Participant 23]

I may be able to find specialized information on the Internet, but most of the paths I approach are questions and answers. That's why... I heard that Wikipedia or something like that isn't accurate, so I think it's more accurate to find it in a book in the library here and there, so I find it with a book, but it's a bit difficult to find the information I want in the book. [Participant 33]

One participant (P24) further explained: "I don't know much about the library, so I don't know where to start and how to find it in the library. This makes me not go to the library often". Another participant (P39) specified: "I don't look for information in the library. Why? I can search everything on my smartphone and the library is too far away as well". That being said, it can be seen as a zone where the librarian can step forward and intervene to help them solve the problem.

Although online access to and use of health information by adolescent using the internet can play a key role in health-related decision-making, the Web should not be considered a main for using health information sources by adolescents. Inadequate access to and use of online health information in adolescence can have serious consequences, so it is considered that the intervention of information professionals and medical personnel in collaboration with public and school libraries is necessary. The zone of intervention should be accurate and appropriate digital health literacy education on access and use of online health information. The widespread and growing use of the Internet for adolescent health information seeking suggests the needs for health librarians to provide eHealth literacy education to improve health outcomes (Lee et al., 2021). McPherson et al. (2014) stated that children and young people demonstrated a need for more guidance around assessing trustworthiness of online information, indicating that a more appropriate quality assessment tool is warranted, which could usefully be collaboratively employed by librarians, health care professionals, and parents.

5. Conclusion

Due to the advance and growth of information communication and technologies (ICT), the question arises as to which factors may influence adolescents when considering to find relevant health information. This study has provided insight into thoughts, feelings, and actions of adolescents'

health information seeking behaviors in the ISP. Findings not only offer important empirical contributions for health information seeking research, but also provide practical implication for librarians, policy makers and stake holders.

The Kuhlthau's ISP model describes a user's experience as a set of thoughts, feelings, and actions as they search for information. When information needs arise, the user has thoughts about the facts of that information, and then those thoughts trigger feelings, and then based on those feelings we engage in actions which either positively or negatively impact the information needs, and the cycle continues to make iterative loops for both directions, but not linear.

Strategies for communicating and disseminating reliable health information in a form that adolescents can understand and use are essential. Until adolescents have appropriate eHealth literacy and pertinent knowledge to their health information needs, they remain vulnerable to inaccurate and misleading health information, which may result in serious problems. Public libraries and school libraries should consider providing more health information literacy programs to address the needs of adolescents' health information.

6. Limitations

The study has some limitations. First, the sample consists of middle school students in S city in South Korea and their experience may differ from students who do not use public libraries. The study participants consist of more female students (28) than male students (12). Although this may reflect the interests of health information needs from which the participants had, and the participation was voluntary, future research could work to strengthen gender parity. Also, the study participants only consist of middle school students. Future research needs to be more diverse in adolescent age groups.

Second, it is difficult to measure feeling as an expression of emotion that appears at any one moment in ISP. Thus, we relied on the expression of the participants' retrospective emotions in this paper. The study was retrospective so it is vulnerable to recall bias and it may not be suitable for direct application to health information behavior research based on Kuhlthau's 6-stage ISP model. The repertoire identified in this study by the information search process is bi-direction, negative and positive. This dichotomous sharing may not be able to discuss other affective factors. It would be a very interesting and valuable study if we could find the status of each stage of the emotions that appear in the sixth stage of Kuhlthau's ISP.

Third, since this paper is not focused on the correlation of the three categories of thoughts, feelings, and actions, we do not look at the correlations and suggest causal relationships between them. Thus, it is considered a very valuable study to find out their correlation in the future.

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