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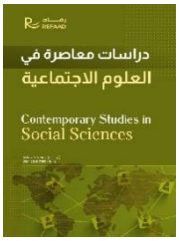

Analyzing the Intersection of Skill Assessment and Health Information Seeking Behavior for Individuals with Learning Disabilities: A Human Right

تحليل تقاطع تقييم المهارات وسلوك البحث عن المعلومات الصحية لدى الأفراد ذوي صعوبات التعلم: حق من حقوق الإنسان

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Abstract:

Objectives: This research examines adults with learning disabilities' (LD) approach to finding information about their health. More specifically, how their literacy and numeracy skills influence their health-related source preferences. It further examines the potential effect of demographics on source of choice.

Methods: This study used U.S. data from the Programme for the International Assessment of Adult Competencies (PIAAC), analyzing responses from 3,660 adults, including 316 who self-identified as individuals with LD. The analysis was guided by Wilson's Information Seeking Behavior (ISB) model. Regression models were used to assess the impact of cognitive and demographic factors on preferred health information sources.

Results: Adults with LD most frequently relied on the internet, healthcare professionals, and family for information regarding their health and utilized printed materials such as magazines and brochures significantly less than their peers without LD. Further findings indicated that adults with learning disability scored substantially lower in literacy and numeracy skills than general population. When it came to health related questions, women were more likely than men to consult people directly. Participation in lifelong learning was also lower among adults with LD (49%) compared to others (55%).

Conclusions: The findings underscore the need for accessible digital and interpersonal resources that align with the cognitive strengths of adults with LD. They also suggest the importance of promoting digital literacy, which could be achieved through lifelong learning participation. Additionally, the findings highlight the need to improve the way health-related information is distributed to adults with learning disabilities.

Keywords: *Skill Assessment; Information seeking; learning disability.*

الملخص:

الأهداف: تهدف هذه الدراسة إلى فحص كيفية بحث البالغين من ذوي صعوبات التعلم (LD) عن المعلومات الصحية، وكيف تؤثر مهاراتهم في القراءة والحساب على تفضيلاتهم لمصادر هذه المعلومات، بالإضافة إلى تقييم مشاركتهم في التعلم مدى الحياة.

المنهجية: استخدمت هذه الدراسة بيانات من الولايات المتحدة مأخوذة من برنامج التقييم الدولي للكفاءات لدى البالغين (PIAAC)، حيث تم تحليل إجابات 3660 بالغًا، من بينهم 316 شخصًا عرّفوا أنفسهم بأنهم من ذوي صعوبات التعلم. استند التحليل إلى نموذج "سلوك البحث عن المعلومات" لويلسون (ISB)، وتم استخدام نماذج الانحدار لتقييم تأثير العوامل المعرفية والديموغرافية على تفضيل مصادر المعلومات الصحية.

النتائج: أظهرت النتائج أن البالغين من ذوي صعوبات التعلم اعتمدوا بشكل أكبر على الإنترنت، والمتخصصين في الرعاية الصحية، وأفراد الأسرة للحصول على المعلومات الصحية، في حين استخدموا المواد المطبوعة بدرجة أقل بكثير مقارنة بنظرائهم من غير ذوي صعوبات التعلم. كما ارتبطت المهارات الأعلى في القراءة والحساب بزيادة استخدام الإنترنت. وكانت النساء أكثر ميلاً من الرجال إلى استشارة الأشخاص مباشرة. وكانت نسبة المشاركة في التعلم مدى الحياة أقل بين ذوي صعوبات التعلم (49%) مقارنة بالآخرين (55%).

الخلاصة: تُبرز النتائج الحاجة إلى موارد رقمية وتفاعلية يسهل الوصول إليها، وتتماشى مع القدرات المعرفية للأشخاص من ذوي صعوبات التعلم. ويمكن أن يسهم تعزيز المهارات الرقمية والتعلم مدى الحياة في تحسين الوصول إلى المعلومات الصحية، وبالتالي تعزيز الثقافة الصحية لدى هذه الفئة.

الكلمات المفتاحية: *تقييم المهارات؛ البحث عن المعلومات؛ صعوبات التعلّم.*

Citation

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1 Introduction

Managing one's health heavily relies on staying informed, however adults with a learning disability (LD) frequently experience educational challenges including self-directed information seeking. Health literacy increases one's ability to obtain accurate health information, which is one of the most important aspects of maintaining one's health. Health literacy is often referred to as having the ability to read, understand, and navigate within a health care system (Hines et al., 2011). Centers for Disease Control and Prevention (CDC, 2020) defines health literacy as an individual's ability to locate, comprehend, and apply information and resources to make informed decisions and take appropriate actions related to their own health. Individuals with learning disabilities may have limited health literacy, which could potentially affect their health information-seeking behavior.

Promoting healthy behavior and managing one's health-related needs starts with skills in seeking information followed by accurate understanding of the provided information, which requires a certain degree of numeracy and literacy skills (Coben & Alkema, 2017; Ginsburg, 2017; Ivanitskaya, O'Boyle, & Casey, 2006). Existing research has mainly focused on examining patient's health seeking behavior, mainly motivated by a stressful health issue and utilizing Internet for their health-related questions (Ayers & Kronenfeld, 2007; Baker et al., 2003).

To better present health-related information to individuals with a learning disability, it is necessary to investigate their preferred mode of searching for information. Considering that most health-related information is presented through written information, understanding one's health is heavily dependent on one's literacy skills, especially in digitally rich environment. Despite the unique characteristics of the individuals with a learning disability (Patterson, 2022) and the existing differences in how adults seek information (Morel, 2015), there is a paucity of research on the ways adults with a learning disability seek health-related information.

Rowlands et al. (2015) stated that written health information is often difficult for people with average reading skills to understand. This difficulty is greater for people with learning disabilities (LD), who face challenges in reading and processing information. While most existing literature on health information seeking behavior (HISB) focus on general population and often is based on locally developed surveys and convenient sampling with limited statistical reliability and validity (e.g., Rao, Tighe, Feinberg, 2022), the PIAAC data provides an excellent opportunity to characterize individuals with a learning disability. PIAAC provides a statistically reliable and valid data about health-related information of general population as well as individuals with LD. While this study focused on individuals with LD, the article presents comparison analysis with those without LD diagnosis (NLD).

The purpose of this study is to investigate the way adults with learning disability seek health-related information in relationship to their cognitive skills as evaluated by PIAAC data. We further investigated other cognitively stimulating activities such as participating in lifelong learning. This study attempts to answer the following research questions:

- Where do adults with LD obtain their health information and is it different from individual without LD diagnosis?
- How does adults with LD's preferred source of information differs based on their gender, race, literacy and numeracy skills?
- How does PIAAC describes individuals with LD's participation in lifelong learning?

2 Theoretical Framework

Wilson's (1999) Information Seeking Behavior (ISB) is utilized as this study's theoretical framework. By considering ISB the interplay of cognitive, motivational, social, and environmental factors, researchers and practitioners can develop targeted interventions, accessible information resources, and support systems to empower individuals with learning disabilities to make informed decisions about their health and consequently sense of calm, security and well-being. Additionally, this framework may serve as a basis for future empirical research and the design of inclusive health communication strategies for the population.

ISB theorize the process individuals experience to search for, attain, and use information to fulfill a particular need. Information Seeking Behavior Model is applied in number of fields to study how people search for information in different contexts, such as academic research, professional related research, and consumers of health information. This research utilizes ISB model to gain insights into factors that influence information-seeking behavior, including individual characteristics, information sources, education, and other individual factors.

Based on the 2019 population, an estimated 20% (approximately 65.6 million individuals) in the United States have learning and attention difficulties (U.S. Census Bureau). Learning disabilities are often lifelong conditions and some people can have several overlapping learning disabilities, which leads to frequently experiencing educational challenges such as staying informed and managing one's health (Centers for Disease Control and Prevention, 2022; Learning Disabilities Association of America, n.d.).

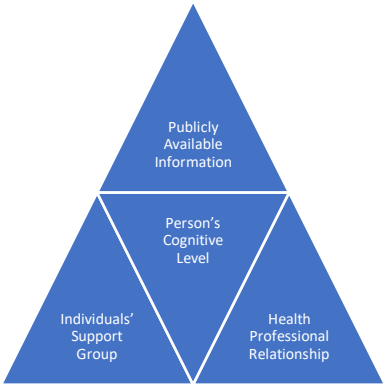

Figure 1. A conceptual presentation of the theoretical model

2.1 Literature Review

2.1.1 Information Needs and Health Literacy

Individuals with learning disabilities often need a unique approach for obtaining health information, which can be influenced by their cognitive and communication challenges. Health literacy includes the ability to comprehend and utilize health-related information. It is essential to examine the varying health literacy levels within this population and how these levels impact their approach to seeking health information. The cognitive and sensory characteristics of individuals with learning disabilities significantly affect their capacity to process and understand information. Consequently, these factors may influence their preference for specific information formats, such as visual aids, simplified language, or multimedia presentations.

To gain a comprehensive understanding, it is crucial to explore the diverse information sources utilized by individuals with learning disabilities, including healthcare professionals, online resources, support groups, and multimedia materials. Moreover, investigating the factors that influence their preference for specific sources and their ability to critically evaluate the credibility of information obtained is essential. By identifying these influential factors, appropriate measures can be implemented to enhance health information accessibility and comprehension for individuals with learning disabilities.

Health literacy is defined as having the ability to read, understand, and navigate within a health care system (Hines et al., 2011). For individuals, including those with learning disabilities, managing their health-related needs requires adequate skills in numeracy and literacy (Coben & Alkema, 2017; Ginsburg, 2017). Promoting healthy behavior starts with the ability to seek information and accurately understand the provided information (Ivanitskaya, O'Boyle, & Casey, 2006). According to data from 2020-21, 7.2 million students aged 3-21 received special education services under the Individuals with Disabilities Education Act (IDEA), with specific learning disabilities being the most common category (33 percent). Education not only impacts individuals' economic success but also plays a significant role in their overall health (Grossman, 2008).

In recent years, the internet has become the primary source of health information for many individuals. The frequency of internet use has shifted the way people seek health information from printed materials and in-person communication to web-based sources. Patients can now manage their health care by finding, understanding, and using freely available health information on the web without consulting a health care professional (Rao, Tighe, & Feinberg, 2022). While the internet has gained popularity as an information source, clinical health providers remain the most credible source of information. Lifelong learning is essential for individuals' preventive and ongoing health care (Lopes & McKay, 2020). In this context, lifelong learning refers to an ongoing learning activity aimed at improving knowledge, skills, and competence. It encompasses formal, informal, and non-formal ways of learning (Smith, 2002, p. 49).

The overarching impact of a learning disability on everyday life could suggest an impact on individuals' ability to interact with contents presented in digital form. One of the areas that have received increasing attention in recent years is how people with disabilities access and use technology for obtaining information

(World Wide Web Consortium, n.d.). Technology can offer many opportunities for learning, communication, and entertainment, but it can also pose difficulties and barriers for people with learning disabilities (Seale, Nind, Tilley, & Chapman, 2015). Finding, understanding, and applying health information can be challenging for people with learning disabilities who may struggle with digital literacy, processing information, navigation, and comprehending technical language.

Assessing the skills of individuals with learning disability in technology-rich environments and understanding their health information-seeking behavior is essential in promoting their health and well-being. Technology-rich environment has the potential to provide opportunities for individuals with learning disabilities to learn and develop their skills. However, they may face challenges in using technology effectively, which highlights the need to assess their skills and provide appropriate interventions. Furthermore, limited health literacy among individuals with learning disabilities can impede their health information-seeking behavior, underscoring the need for accessible and comprehensible health information to support both literacy and engagement.

3 Method

The primary data used in this study is the Programme for the International Assessment of Adult Competencies (PIAAC) dataset. The PIAAC data used in this study originates from an expansive survey developed by the Organisation for Economic Co-operation and Development (OECD) in collaboration with several participating countries.

PIAAC, meticulously designed to assess the proficiencies of adults across a broad range of cognitive skills. It measures skills in essential domains like literacy and numeracy in a digital environment. PIAAC considers the skills necessary for success in modern societies. Participants engage in cognitive tasks simulating real-world challenges, evaluating their ability to apply literacy and numeracy skills to various daily life, work, and educational scenarios. Through comprehensive assessments, PIAAC provides extensive information about individuals' proficiency levels in these critical competencies. The PIAAC test is administered using computer-based technology, allowing participants to interact with tasks and questions dynamically.

The background questionnaire (BQ) is central to the data collection process. It effectively compiles a wide range of relevant information. The BQ collects essential demographic details from participants. It covers inquiries about age, educational history (including highest educational attainment, non-formal learning experiences, and training activities), overall health perceptions, health information-seeking behaviors, and many more relevant information.

The OECD selects a representative sample of adults from participating countries. This sample is designed to reflect the diversity of the adult population in terms of age, gender, education, and other relevant characteristics. This study focused on the third round of PIAAC data collected between March 2017 and September 2017, employing a nationally representative sample of U.S. adults aged 16-74. The dataset included 3,660 participants, among which 316 (8.3%) self-reported having learning disabilities diagnosis using a variable in PIAAC's background questionnaire (I_Q08USX3, self-reported diagnosis of LD). Complex sampling and psychometric designs were integrated into the analysis to ensure the accuracy and reliability of the results (Hogan et al., 2016). To support the validity and reliability of the results, the analysis considered the complex sampling techniques and carefully designed psychometric methodologies.

3.1 Skill Variables and Categorization

The PIAAC numeracy and literacy skill domains are estimated using 10 plausible values, employing the "plausible value" methodology to effectively address potential individual-level measurement errors. Each plausible value is derived from a latent regression model incorporating a range of academic and nonacademic background variables. This approach enhances the precision of skill performance estimation for individuals (von Davier, Sinharay, Oranje & Beaton, 2006). Both literacy and numeracy skills are scored within the range of 0 to 500, and they are categorized into distinct skill levels as follows: Below Level 1 (0-175), Level 1 (176-225), Level 2 (226-275), Level 3 (276-325), Level 4 (326–375), and Level 5 (326-500) (OECD, 2013; Rampey et al., 2016).

For conducting regression analysis and addressing limited frequencies observed across various skill levels, both literacy and numeracy skills were consolidated into two broad categories: low and high numeracy and literacy skills. This approach is consistent with previous research on PIAAC data (e.g., Batalova & Fix, 2015; Feinberg, Greenberg, & Frijters, 2015). Individuals scoring below Level 4 (ranging from 0 to 325) were designated as having "Low-Level Literacy" and "Low-Level Numeracy" skills, while those scoring at or above

Level 4 (ranging from 326 to 500) were classified as having "High-Level Literacy" and "High-Level Numeracy" skills. However, to explore disparities between groups of individuals with and without LD diagnoses both literacy and numeracy skills were categorized into three levels: "low" (below 226), "medium" (226-325), and "high" (above 326), This refined stratification enables a more detailed analysis of group distinctions based on skill levels. These aggregations were because of the low sample sizes for individual with LD at the higher level of cognitive skills.

For the dependent variables, this study used PIAAC's rich background questionnaire, which contains items related to the sources individuals use to learn about health-related information. The responses to these questions were treated as the dependent variables. The participants were asked 'How much information about health issues do you get from…" (1) newspapers, (2) magazines, (3) Internet, (4) radio, (5) television, (6) books or brochures, (7) family members, friends, or co-workers, and (8) talking to health care professionals. The participants answered each question separately as an individual survey question. Each question was designed as a four categorical Likert-type variable. The response choices were "A lot = 4", "Some = 3", "A Little = 2", and "None = 1." Other demographic questions were included as independent variables including sex. Sex was coded as a dichotomous dummy variable (1 = female, 0 = male). Additionally, PIAAC provides the opportunity to extend the human capital measure to information on adults' participation in lifelong learning (A.L.L) and a direct measure of cognitive skills, rather than having to rely exclusively on formal educational attainment.

4 Results

Before addressing the research questions, the characteristics of the individuals with a learning disability were analyzed, followed by a series of descriptive statistics. Table 1, summarizes the sample and the related population size of individuals reporting themselves as individual with a learning disability (LD) diagnosis with regards to their gender. The results indicated that the number of male (10.96%) with a learning disability is slightly higher than females with a learning disability (7.17%), while the differences were not statistically significant, it provides additional information about the discrepancies between genders and LD diagnosis.

Table 1: Individuals self-reported LD categorized by gender

Variables	Sample Size	Population Size	Percent (SE)
Male With LD	181	11,542,442	10.69 (.88)
Male Without LD	1,436	96,480,790	89.31 (.88)
Female With LD	135	8,100,158	7.17 (.86)
Female Without LD	1,724	10,4802,526	92.83 (.86)

Next, the five levels of cognitive skills were aggregated into three broader categories to reduce sparse frequencies in the higher levels. A three level skill for both literacy and numeracy skills were aggregated as follows level 1 (below 226), level 2 (226-325) and level 3 (above 326). The results showed that literacy and numeracy skills for majority of individuals with LD (63% for literacy and 52% for numeracy) is within 226-325 as shown in Table 2. PIAAC defines skills within 226-325 level as ability to read passages with basic vocabulary and cycle through or integrating two or more pieces of information within a written passage. Skills above 375 level as ability to complete multiple-step tasks to integrate, interpret, or synthesize information from a lengthy written passage. While there is a pattern between numeracy and literacy, the results shows that individuals with LD have more difficulties with numeracy skills than literacy skills (Table 2).

Table 2: individuals with a learning disability's assessed numeracy and literacy skills

Skill Level	Percent (SE) Literacy	Percent (SE) Numeracy
< 226	29 (3.77)	47 (3.74)
226-375	70 (3.96)	52 (3.48)
> 375	.20 (.32)	.5 (1.48)

Next, individuals with LD and general population were compared (Table 3). A comparison between the two population showed that a higher percentage of general population (80% for literacy, 70% for numeracy) is at the proficiency level (level 2) for both literacy and numeracy skill than individuals with LD (63% for literacy and 52% for numeracy). However, these differences are more prominent for numeracy skill. A higher percentage of individuals with LD are below proficiency at level-1 (47%) than general population (29%).

Table 3: Individuals with a learning disability's assessed numeracy and literacy skills

	Literacy				Numeracy			
Skill Levels	**Sample Size-LD**	**Percent-LD (SE)**	**Sample Size -WLD**	**Percent-WLD (SE)**	**Sample Size-LD**	**Percent-LD (SE)**	**Sample Size -WLD**	**Percent-WLD (SE)**
< 226	97	29 (3.77)	589	19 (1.06)	140	47 (3.74)	930	29 (1.20)
226-375	219	70 (3.96)	2,543	80 (1.06)	160	52 (3.48)	2201	70 (1.27)
> 375	1	.20 (.32)	28	1 (.27)	15	.5 (1.48)	29	1 (.25)

4.1 Preferred sources of health information

The first research question focusses on examining the preferred health-related resources used by individuals with Learning Disabilities (LD) and a comparison of the preferences between individuals with LD and individuals without a learning disability. Data were analyzed from responses to eight items on a background questionnaire, assessing the frequency of use for various print and non-print health information sources. Participants rated their use of print sources (newspapers, magazines, pamphlets) and non-print sources (healthcare professionals, family members, internet, TV, radio) to obtain health information on a 4-point Likert scale. For an ease of comparison, the responses were dichotomized: "A Lot" and "Some" were coded as "Use," and "A Little" and "None" were coded as "Not_Used". This aggregation allowed the researcher to make a distinction whether or not a person used the resource frequently as a source of information seeking.

Table 4: Comparison of using the 8-sources of resources among individuals with LD and general population (NLD)

Source	**Use (SE)**	**Not_Used (SE)**	**Use (SE)**	**Not_Used (SE)**	**Use Diff**	**P-Value**
	LD	**LD**	**NLD**	**NLD**	**LD-NLD**	**LD-NLD**
Internet	77% (2.50)	23% (1.61)	82% (.67)	18% (.66)	5.4% (2.38)*	< .05
Radio	30% (2.28)	70% (2.91)	32% (1.09)	68% (1.08)	2.2% (2.83)	> .05
TV	49% (2.51)	51% (2.36)	54% (1.13)	46% (1.13)	4.9% (3.14)	> .05
Health Profession	80% (3.39)	19.6% (2.89)	79% (.71)	21% (.71)	1.4% (3.12)	> .05
Family	68% (2.73)	32% (2.82)	66% (1.05)	34% (1.05)	2.4% (3.12)	> .05
Books-Brochures	40% (2.18)	60% (2.33)	54% (1.03)	46% (1.03)	3.8% (2.99)	> .05
Magazines	24% (1.12)	76% (3.25)	31% (1.13)	69% (1.13)	7.4% (1.3)*	< .05
Newspaper	16% (3.12)	84% (3.81)	24% (.98)	76% (.98)	8.4% (3.33)*	< .05

Note: *LD = Learning Disabilities; NLD = Non-Learning Disabilities; SE = Standard Error; *Significant at p < .05.*

Internet was the most frequently used source of health information among both LD and NLD individuals. For the LD group, 77% (SE = 2.50) reported using the internet "A Lot" or "Some," whereas 82% (SE = 0.67) of NLD individuals reported similar usage. The difference between these groups was statistically significant, with LD individuals using the internet 5.4% less frequently than NLD individuals ($p < .05$). This finding suggests a notable preference for digital resources among NLD individuals, possibly indicating a higher level of comfort or access to internet-based health information compared to those with LD.

Radio was used for health information by 30% (SE = 2.28) of individuals with LD and 32% (SE = 1.09) of NLD individuals. However, the difference in usage of this source was not statistically significant ($p > .05$) between LD and NLD group, indicating that radio is a minor source of health information for both groups. Television was utilized by 49% (SE = 2.51) of LD individuals and 54% (SE = 1.13) of NLD individuals. The difference in usage was not statistically significant ($p > .05$), suggesting that television is similarly less valued by both groups.

Books and Brochures were utilized by 40% (SE = 2.18) of individuals with LD compared to 54% (SE = 1.03) of NLD individuals. The difference was not statistically significant ($p > .05$). However, the lower usage rate among individuals with LD is substantive suggesting challenges in accessing or comprehending printed materials, which can be difficult for individuals with LD.

Magazines were used by 24% (SE = 1.12) of individuals with LD and 31% (SE = 1.13) of NLD individuals. This difference was statistically significant ($p < .05$), with LD individuals using magazines 7.4% less frequently.

This finding supports the notion that individuals with LD may have less engagement with print media, potentially due to issues with readability or interest. Newspapers were the least favored source of health information, with 16% (SE = 3.12) of LD individuals and 24% (SE = 0.98) of NLD individuals reporting usage. The difference between LD and NLD groups was statistically significant ($p < .05$), with LD individuals using newspapers 8.4% less frequently.

Healthcare Professionals were a prominent source of health information for individuals with LD, with 80% (SE = 3.39) reporting a high rate of usage. Similarly, 79% (SE = 0.71) of NLD individuals reported similar usage. The difference between the LD and NLD groups was not statistically significant ($p > .05$). However, the individuals with LD have a higher usage of healthcare professionals for accessing reliable health information, possibly due to difficulties in interpreting or navigating other sources of information.

Family Members were used as a source of health information by 68% (SE = 2.73) of individuals with LD and 66% (SE = 1.05) of NLD individuals. The difference in usage between the two groups was not statistically significant ($p > .05$), suggesting that family members play a similarly supportive role in providing health information for both groups.

The findings reveal distinct patterns in the utilization of health information sources among individuals with LD. Respondents with LD tend to avoid printed sources such as magazines, newspapers, and brochures, instead relying predominantly on interactive and auditory sources. The internet emerged as the most frequently used source, with 77% of LD respondents using it "A Lot" or "Some," suggesting a strong preference for digital platforms, which could potentially be due to their accessibility and ease of use.

Significant differences were noted between LD and NLD individuals in their use of the internet, magazines, and newspapers for health information ($p < .05$). Traditional media sources like TV and radio also saw moderate usage among both groups, though they were less preferred compared to digital sources and health professionals. Healthcare professionals were a primary source of health information for individuals with LD, with 80% reporting they consulted them "A Lot" or "Some," highlighting the critical role these professionals play in bridging informational gaps for this population.

4.2 Demographic Influences on the Preferred Source of Health Information Among Individuals with LD

The second research question focused on the influence of demographics on individuals' preferred source of information. Once the preferred sources of health information was identified, the research was focused on the potential influence of the preferred source based on their gender, race, literacy and numeracy skills. The previous analysis identified three sources of Internet, Family members, and health professionals to be the preferred source of health information for adults with LD.

For the regression analysis, the researcher used the original Likert responses for dependent variables. Next regression model used internet as the dependent variable. The results, presented in Table 5, indicate that both literacy and numeracy skills are significantly and positively correlated with the likelihood of using the Internet for health information seeking. Specifically, higher levels of literacy ($\beta = 1.00$, SE = 0.01, $p < 0.05$) and numeracy skills ($\beta = 1.02$, SE = 0.01, $p < 0.05$) were associated with a greater probability of individuals with learning disabilities (LD) utilizing the Internet to find health information. These findings suggest that individuals with higher literacy and numeracy skills are more proficient at using online resources for health-related purposes.

Gender differences were also observed, the results indicated that females were more likely than males to use the Internet to search for health-related information ($\beta = 0.34$, SE = 0.11, $p < .05$). This finding is consistent with previous research, which has noted gender disparities in technology adoption and health information-seeking behaviors (Venkatesh, Morris, & Ackerman, 2000). On the other hand, race did not have a significant impact on the likelihood of using the Internet for health information seeking ($\beta = .38$, SE = 1.44, $p > .05$) indicating no significant relationship between racial background and Internet usage among individuals with LD for health-related search.

Table 5: Regression Model for Using the Internet for Health Information

Independent Variable	Coefficient (SE)	Significance
Literacy	1.00 (0.01)*	$p < .05$
Numeracy	1.02 (0.01)*	$p < .05$
Race	0.38 (1.44)	$p > .05$
Gender (Male: Reference)	0.34 (0.11)*	$p < .05$

Next, a multiple linear regression analysis was conducted to examine whether race/ethnicity, gender, numeracy, and literacy skills predict using family members and health professional as a preferred source of health information among adults with learning disabilities (LD). For this analysis, the dependent variable was a composite score derived from participants' reported use of family members and health professionals, averaged to represent the dependent variable as a conversational approach to learning about health information. This score was compared with usage of the Internet, which is considered a modern, self-directed health information seeking. The regression model revealed that only gender was positively correlated with seeking information from health professionals and family members (Table 6). The results indicate that female participants ($\beta = .07$, SE = .05, $p < .05$) have a higher probability of consulting health professional and family members as a source of health information (Table 6).

Though all remaining independent variables were not statistically significant, there was an observable substantive difference in the way individuals with LD utilize verbal information seeking depending on their race and cognitive skills. While not statistically significant, race also played a role in consulting health information from personal interactions. Individuals from minority groups have lower tendency to obtain health information from health professionals ($\beta = .06$, SE = .20, $p > .05$). The results of the effect of the cognitive skills on health information seeking behavior indicated that those with higher numeracy skills ($\beta = .17$, SE = .001, $p > .05$). have a higher probability of engaging in discussion about their health-related information than those with lower numeracy skills. These results suggest that individuals with stronger literacy skills have a higher probability of learning about their health information independently.

Table 6: Regression Model for Using Health Professionals and Family Members for Health Information

Variables	Beta	Significance
Race (White = Reference)	- .06 (.20)	P > .05
Gender (Male = Reference)	.07 (.05)	P < .05
Numeracy	.17 (.001)	P > .05
Literacy	- .03 (.001)	P > .05

4.3 Participation in Lifelong Learning

The third research question focused on describing individuals with LD's participation in lifelong learning. To answer this research question, the background question on individuals' participation in "Education or training in the last 12 months" was utilized. The question had a dichotomized response (Yes, No). The analysis revealed a notable differences in lifelong learning participation rates between individuals with learning disabilities (LD) and the general population.

Frequency analysis of the data shows that while 55% of the general population participated in lifelong learning, only 49% of individuals with LD reported to attend in any form of lifelong learning activities. This is a substantive difference between the two groups. Additionally, the difference between those who attended LLL and those who did not participate in LLL was statically significant for individuals without LD diagnosis. However, that was not true for the individuals with LD. In other words, the general population has a high rate of attending LLL (Table 7).

Table 7: Participation in Lifelong Learning based on participants diagnosis of LD

	Participated in LLL % (SE)	Not Participated in LLL% (SE)	Sig
LD	49 (3.33)	51 (3.33)	> .05
No-LD	55* (.94)	45 (.94)	< .05

5 Conclusions

The findings of this study underscore several key insights regarding the health information seeking behaviors of adults with learning disabilities (LD), particularly concerning the influence of gender, literacy, numeracy skills, and race. Firstly, the positive associations between literacy and numeracy skills with the internet use for health information highlight the importance of cognitive abilities in accessing and utilizing self-directed online resources effectively. These skills enable individuals to effectively navigate complex health information online, thereby enhancing their autonomy in health decision-making.

Secondly, the observed gender difference, where males are more inclined to use the internet for health information compared to females, reflects broader societal trends in technology adoption and digital literacy.

Understanding these gender disparities is crucial for developing targeted health communication strategies that cater to the needs and preferences of both male and female individuals with LD.

Thirdly, the non-significant influence of race suggests that, within the context of LD, the barrier of learning disability take precedent to the racial backgrounds to accessing health information online. This finding contrasts with research in general populations, where disparities in internet access and health information-seeking behaviors by race have been documented (Lewis, 2017). It suggests a potential leveling of the playing field among individuals with LD in terms of online health information seeking.

For the most part, these findings are aligned with existing studies emphasizing the pivotal role of literacy and numeracy skills in health information engagement among vulnerable populations. Moreover, they underscore the need for tailored interventions that address both cognitive and gender-related disparities in accessing health information resources for adults with LD.

Future research could further explore the nuanced interactions between gender, literacy, numeracy skills, and other socio-demographic factors in shaping health information seeking behaviors within this population. Additionally, qualitative inquiries could provide deeper insights into the barriers and facilitators individuals with LD encounter when accessing health information online, thus informing more inclusive health communication strategies.

The results highlight the evolving landscape of health information-seeking behavior among individuals with LD, characterized by a reliance on digital and interpersonal sources. Understanding these preferences is crucial for tailoring health communication strategies to effectively reach and empower this demographic in making informed health decisions. The strong reliance on the internet and healthcare professionals suggests that these channels should be prioritized in health communication efforts (French-Lawyer et al., 2021).

Previous studies have identified numerous barriers for individuals with LD in accessing and understanding health information. This study underscores the importance of providing adequate time for individuals with LD to interact with healthcare professionals, which can enhance their understanding of health issues and prevention strategies. Ensuring that health professionals have the resources and training to communicate effectively with this population is essential for improving health outcomes.

Future research should explore the underlying reasons for these preferences and examine how digital platforms and healthcare professionals can be leveraged to improve health information accessibility and comprehension for individuals with LD. Additionally, understanding the barriers to using print sources and traditional media can inform strategies to make these mediums more accessible and user-friendly for this population.

5.1 Recommendations

This study revealed the important influence of skill level and gender on individuals with LD's choice of health related information. Individuals with LD showed a low participation in lifelong learning. A learning disability negatively influences individuals' ability to process, recognize, and respond to information, which as the result could potentially influence their propensity to attend LLL. These findings underscore the need for targeted interventions to enhance access and participation in lifelong learning opportunities for individuals with LD. The significantly lower participation rate among this group compared to the general population highlights potential barriers, such as lack of accessible resources or support systems, that need to be addressed to promote inclusive educational practices and lifelong learning for all.

One approach to this difficulty could be an ongoing lifelong learning to raise individual's skill in assessing where and how to seek information from and understand print and numbers related to health information. While advanced countries across the globe have gradually changing into a quantitative, information heavy and technologically driven society (Cummins, Yamashita, & Arbogast, 2018), a large number of individuals with LD exhibited a low numeracy skills.

The findings of this study have the potential to help public and private officials understand the approach and tendencies individuals with LD have to learn about their health. Such knowledge is important to know how to provide the best venue for providing information for preventive care as well as follow up healthcare for individuals with LD. Once we identify what health information venues individuals with LD prefer, policymakers can successfully guide and manage education and training systems, including the design and implementation of effective and well-informed educational policies.

If health-related industries work with entities such as Learning Disabilities Association (LDA) they can develop reliable infrastructures to produce high quality educational materials, resources, and programs dedicated to individuals with LD to improve their health literacy and improve health disparities. Health

information must be easy to navigate and understand. It should be high quality, accurate, and readily accessible to accommodate the needs of a diverse community of individuals with LD.

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Technology can offer many opportunities for learning, communication, and entertainment, but it can also pose difficulties and barriers for people with learning disabilities (Seale, Nind, Tilley, & Chapman, 2015).

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