

Article

**Influencing Factors of Online Health
Information Seeking in Selected
European Countries**DOI: 10.47368/ejhc.2021.002
2021, Vol. 2(1) 29-55
CC BY 4.0**Analysis of Country Specifics****Elena Link** , **Eva Baumann** 

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Abstract

Patients' participation in healthcare requires comprehensive health knowledge and can benefit from online health information seeking behaviours (O-HISB). The internet is a particularly vital source for seeking health-related information in many regions of the world. Therefore, we take a European cross-country comparative perspective on O-HISB. We aim to compare the importance of personal, health(care)-related, and cognitive determinants of using the internet for health-related purposes in four European countries. We conducted online surveys among the

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German, Swiss, Dutch, and Austrian public and described patterns of health information seeking online.

The internet seemed to be a widely used source of health information in the four selected European countries. The explanation patterns of personal, health(care)-related, and cognitive factors differ by country and between selecting the internet as a source of health information and the frequency of online use. Using online media appeared to be more common for women and for current health problems. Respondents' willingness and competencies are essential for online health information seeking. To prevent the increase of social and health-related disparities, there is an urgent need to support underprivileged population groups and increase motivations and eHealth literacy to use the internet for health-related purposes.

Keywords

Online health information seeking, influencing factors, Europe, cross-country perspective, eHealth literacy

Since the 2010s, patients have been increasingly challenged to play an active role in their healthcare and health provision, become empowered, and make informed health-related decisions (Chewning et al., 2012; Rummer & Scheibler, 2016; Smith et al., 2013). Therefore, they should ground their involvement and decision-making on accurate and profound health information (Johnson & Case, 2012). This is also needed for individuals' coping with health-related uncertainties and helpful in finding strategies for living with health threats. Even though there is increasing health information available, particularly online, some populations do not sufficiently benefit from the availability of these resources. As informational self-perceptions and online health information seeking behaviours (O-HISB) are known to be connected to social and health inequalities (Viswanath & Kreuter, 2007), online informational disparities raise the risk of increasing those inequalities (Bonfadelli, 2019; Cornejo Müller et al., 2020; Neter & Brainin, 2012). Thus, access to and adequate use of online health information is crucial, especially when individuals face health threats or severe diagnoses. Through research on O-HISB information disparities, deficits, and misperceptions and their causes could be revealed. Their knowledge will help to find more effective ways to provide and distribute health information to specific groups and improve individuals' empowerment. Both are critical efforts in health promotion (Kreps, 2008).

Taking the role of O-HISB for informed health-related decisions, health provision, and prevention into account (Nelson et al., 2004), we aim to explain O-HISB by focusing on personal and situational influencing factors that have proven relevant (Wang et al., 2020). Furthermore, we apply a European cross-country comparative approach, because the evidence on O-HISB from countries beyond the USA is sparse and questions about the validity of influencing factors concerning different cultural and healthcare system aspects triggering different O-HISB remain unanswered (Higgins et al., 2011; Wang et al., 2020; Zschorlich et al., 2015). We aim to reveal cross-country similarities and differences in background factors of O-HISB and country-specific as well as global influencing patterns of O-HISB focusing on four European countries as a starting point for a broader European perspective on O-HISB. A better understanding of the underlying

conditions of country specific online behaviours can be crucial for health prevention and promotion by addressing barriers and initiating Europe-wide learning and support processes. This can further help to pinpoint problems in health information provision and areas of healthcare where the system is not performing, and prompt a search for ways to improve.

Theoretical Framework

Online Health Information Seeking Behaviours (O-HISB)

Health information seeking is understood as an active and purposeful behaviour undertaken by an individual to find health information from selected information channels and sources (Zimmerman & Shaw, 2020). HISB is a complex, often multi-staged process that can be defined by its triggers, use, and confidence in different channels, types of information sought, and outcomes (Galarce et al., 2011).

Health information seeking includes information related to but not limited to disease – it covers information about medical procedures and treatment, public health, unhealthy and healthy lifestyles (Cao et al., 2016). Among the multitude of interpersonal sources and media channels providing health information, the internet occupies a prominent position. It enables, for some parts of the population, an easy and convenient, fast, and low-cost, needs-and-problem-oriented, self-determined opportunity to find relevant health information and discuss health-related issues with others (e. g., Cline & Haynes, 2001; Hartoonian et al., 2014; Kreps, 2017). Providing access to numerous bundles of health content and community help, the internet offers a broad range of information, e.g., about specific illnesses, symptoms, and therapies or medical procedures but also about prevention and wellbeing (Cao et al., 2016; Goldner, 2006; Morahan-Martin, 2004). Thus, from a layperson's view, the internet may give access to a large amount of tailored information on a broad range of issues, facilitate interaction with others, offer feedback, provide complementary information to physicians, and support empowerment and health-related decisions (Jiang & Street, 2017; Miller & Bell, 2012).

European Perspective on O-HISB

Health issues are among the most searched information overall. Online health information is of increasing relevance in the USA and Europe (e.g., Higgins et al., 2011; Kummervold et al., 2008; Kummervold & Wynn, 2012; National Cancer Institute, 2017; Zschorlich et al., 2015). So far, many publications on O-HISB focus on the USA, whereas data from other countries remain sparse (Higgins et al., 2011; Zschorlich et al., 2015). The absence of, and need for, a European perspective is associated with cultural, social, and healthcare system-related differences between Europe and the USA as well as within Europe itself (e.g., Hofstede, 1993; Ridic et al., 2012; see also Jürges, 2006; Mackenbach et al., 2008; Morahan-Martin, 2004).

A European cross-country comparison gives reason to expect similarities due to joint major health threats like cancer, diabetes, or Covid-19. Differences are presumed because Europe is diverse and characterised by an “East-West health divide” (Mackenbach et al., 2013), which is assumed to be associated with differences in health information seeking. Alvarez-Galvez et al.

(2020) and Bachl (2016) report on data from 2014 of the 28 EU member countries, indicating that across all European countries, an average of three-quarters of internet users searched for health information online (see also Andreassen et al., 2007). While O-HISB has increased across Europe, there are several indications of country-specific differences related to the quantity and sources of O-HISB (e.g., Alvarez-Galvez et al., 2020; Andreassen et al., 2007; Bachl, 2016; Kummervold et al., 2008; Kummervold & Wynn, 2012; Reifegerste et al., 2017; Santana et al., 2011). Potential explanations of differences include cultural values (e.g., preoccupation with health and illness), the characteristics of the healthcare system affecting the quality and accessibility of general health services, internet access, or the number of accessible websites in local languages (Andreassen et al., 2007; Mackenbach et al., 2013; Morahan-Martin, 2004). However, besides the potential reasons for this variety of manifestations of O-HISB, research of the specifics of European countries remains limited.

As a starting point for a European comparative study, we selected four western European countries. Using an explorative approach, we started with a rather homogeneous regional subsample to investigate country specifics of O-HISB. We selected Germany, Austria, the Netherlands, and Switzerland, because their social structure is characterised by a high net income and a comparable, rather low-income inequality (OECD, 2019). A common feature of their healthcare systems is that they are based on a Bismarckian model of statutory health insurance (Nolte et al., 2012). Even if the implementation differs (e.g., the number of insurances, the ratio between public and private insurances), all systems are characterised by almost universal coverage and social solidarity (Nolte et al., 2012), and are rated from good to excellent (Björnberg & Phang, 2019). However, in a comparison of the four countries, the healthcare system in the Netherlands is rated more positive concerning patient rights and information as well as the range and reach of the service provided, while accessibility and outcomes of the Swiss healthcare system are particularly highly valued.

Similarities between the four countries are prevalent regarding internet access, which in terms of internet penetration varies between Austria (90%) and the Netherlands (98%) (Eurostat, 2019).

Comparing the countries using the six dimensions of cultural values which represent collective mind-sets that distinguish one group (e.g., a nation) from another (Hofstede, 1993), all four appear to be rather individualistic and have low scores on power distance, but high scores on uncertainty avoidance and long-term orientations. However, a key disparity concerns *masculinity*. Whereas culture in Germany, Austria, and Switzerland is more success-oriented, the dominant values in Dutch culture are caring for others and quality of life. These two aspects might guide individuals in dealing with health issues and have an impact on attitudes towards, and perceptions of, health and healthcare.

Explaining O-HISB in Germany, Austria, the Netherlands, and Switzerland

Our aim is to use known influencing factors of O-HISB related to the variations between the selected countries to describe and explain country-specific O-HISB. Existing models and analyses of O-HISB consider a broad range of O-HISB determinants (Wang et al., 2020; Zimmerman & Shaw, 2020), amongst which personal and situational factors are recognised as the particularly relevant ones (Johnson & Case, 2012; Lambert & Loiselle, 2007; Wang et al., 2020).

Personal Influencing Factors. Personal factors include sociodemographic and socioeconomic factors. In line with theoretical models of HISB like the Risk Information Seeking and Processing Model (RISP; Griffin et al., 1999) or the Comprehensive Model of Information Seeking (CMIS; Johnson & Meischke, 1993) as well as concept analysis and overview articles (Lambert & Loiselle, 2007; Wang et al., 2020; Zimmerman & Shaw, 2020), sociodemographic and socioeconomic factors are often considered influences on (O)HISB with European-comparative research on determinants of O-HISB also relying on them. Although a fully developed rationale for including personal influencing factors in models examining O-HISB is missing (Kahlor, 2007; Kahlor, 2010), a recent meta-analysis supports the role of sociodemographic and socioeconomic factors for O-HISB (Wang et al., 2020).

For our study, personal influencing factors of O-HISB are essential to identify and understand potential online information disparities and existing informational inequalities in the selected countries. Considering informational inequalities across the four countries resulting from whether specific populations are less willing or able to engage in O-HISB is an important supplement to knowledge about the social structure of the countries. Comparative studies reveal that females, younger people, and those with a higher SES show a higher likelihood of O-HISB in Europe in general and in Germany, Austria, the Netherlands, and Switzerland specifically (e.g. Alvarez-Galvez et al., 2020; Bachl, 2016; Santana et al., 2011; Zschorlich et al., 2015). As the most recent database of Alvarez-Galvez et al. (2020) dates from 2014 and studies considering changes in time suggest that personal factors had increasingly predictive effects on O-HISB (Li et al., 2016), our study aims to build on those results and investigate the role of sociodemographic and socioeconomic influencing factors using current data which is also important in view of the continued growth of internet access in Europe overall (Eurostat, 2019).

Situational Influencing Factors. Situational factors triggering O-HISB are often health(care)-related and mainly individual-level cognitive factors (Johnson & Case, 2012; see also Griffin et al., 1999; Kahlor, 2010).

Health(care)-related factors of O-HISB include health status (Li et al., 2016) and healthcare uptake (Goldner, 2006; Oh & Cho, 2015). Differences in the perceived range and reach of healthcare provided, the accessibility of healthcare (Björnberg & Phang, 2019), and potentially culturally determined health perceptions underline the relevance of including both factors for cross-country comparison.

By way of comparison, Germans perceive their health status worse than the Dutch, however healthy life years are longer in Germany than in the Netherlands, Austria, and Switzerland (Eurostat, 2018). Current research on health status as a determinant of O-HISB has inconclusive findings. Some studies report that individuals with worse health or chronic disease appear less likely to search for health information, e.g., on the internet (Bachl, 2016; Basnyat et al., 2018; Hartonian et al., 2014), other studies showed increased motivation to search for information (Baumann et al., 2017; Kelly et al., 2009; Li et al., 2016; van Stee & Yang, 2018).

The uptake of healthcare also varies between the sample countries. The populations of the Netherlands and Germany more often consult health professionals than those in Switzerland and Austria (OECD, 2019), which might be associated with characteristics of the healthcare system

and perceptions of health professionals. These variations highlight the relevance of considering health(care)-related factors regarding their impact on O-HISB in the selected countries.

Individual-level cognitive factors are among the best-supported determinants of HISB in general (Griffin et al., 1999; Kahlor, 2007; 2010). Cognitive factors comprise attitudes towards information seeking or single information sources like trust (Johnson & Meischke, 1993; Kahlor, 2010; Wang et al., 2020), interest in health information, and competencies like health literacy to find, understand and make use of health information (Griffin et al., 1999; Kahlor, 2010; Sørensen et al., 2012). To our knowledge, there is neither any comprehensive nor comparable data reflecting cognitive determinants of O-HISB in cross-country comparison. Only health literacy is analysed using a comparative approach (Sørensen et al., 2015) showing that the distribution of health literacy varied substantially across countries. The mean average in the Netherlands was highest and differed significantly from all other countries (Sørensen et al., 2015), but the underlying conditions and causes of these differences are not understood. Cross-country differences in health or eHealth literacy, trust, and interest as well as their country-specific influences on O-HISB might be attributed to cultural reasons, specifics of healthcare systems, or the available amount and type of websites in the respective language (Wang et al., 2020). Hence, we use an explorative approach aiming to identify and test for factors triggering O-HISB. We asked for the relevance of personal, health(care)-related and cognitive influencing factors to explain O-HISB in Germany, Austria, the Netherlands, and Switzerland.

Research Objectives

The potential of O-HISB to empower individuals to take responsibility for health-related decisions and health promotion (DeLorme et al., 2011; Marstedt, 2018; National Cancer Institute, 2017) points to the need to analyse health-related internet use and identify influencing factors for O-HISB in a cross-country comparison. In the first phase, we focus on four selected countries in western Europe. In a future second phase, we will broaden the scope across other parts of Europe. Our first research objective is to describe and compare the status quo of O-HISB in Germany, Switzerland, Austria, and the Netherlands regarding the share of people seeking health information, its frequency as well as the types of health information sought, and the online sources used. Our secondary focus is to compare the health(care)-related and cognitive O-HISB determinants between the sample countries. Comparing them can provide important hints for explaining different O-HISB as information on the variations between countries remains sketchy. Our third objective is to identify the specifics of each country regarding influencing patterns of the aforementioned determinants of gaps between health-onliners (henceforth *h*-onliners, people who use the internet to search for health information) and health-offliners (people who use non-digital channels) as well as the frequency with which people seek health information online (Baumann et al., 2017). Thus, we developed three research questions:

RQ 1: How does O-HISB (the use of the internet for health-related purposes, its frequency, selected online sources and types of health information sought) differ between the selected European countries?

RQ 2: How do health(care)-related and cognitive background characteristics differ between the selected European countries?

RQ3: Are there country-specific influencing patterns of sociodemographic, health(care)-related and cognitive determinants for (a) O-HISB and (b) frequency of O-HISB?

Method

We conducted online surveys ($N = 6,106$) in Germany ($n = 3,000$), Switzerland (only for the German-speaking part; $n = 1,000$), the Netherlands ($n = 1,106$), and Austria ($n = 1,000$). The participants in each country were recruited via Online Access Panels by regional market research companies using stratified samples by age (18-69 years), gender, education, and region. The stratification demographic characteristics was based on representative samples of internet users for each country.

Sample

In Germany, Austria, and the German-speaking part of Switzerland, women and men were almost equally represented. In the Netherlands, 46.4% of the participants were women (see Table 1). The average age was lowest in Switzerland ($M = 43.3$; $SD = 14.2$) and highest in the Netherlands ($M = 46.5$; $SD = 14.8$), with Germany and Austria in between with a mean age of 44.3 years ($SD = 14.3$) in Germany and 44.4 years ($SD = 14.4$) in Austria. However, regarding the level of education, Switzerland and Austria had significantly fewer low-educated participants. Both countries were characterised by a very high proportion of participants with a medium level of education. Comparing the four countries, Germany showed the most even distribution and also had the highest proportion of highly educated respondents.

Table 1. Overview of the Samples

	Country			
	Germany $n = 3,000$	Switzerland $n = 1,000$	Netherlands $n = 1,106$	Austria $n = 1,000$
Gender ¹				
% Female	50.0	50.4	46.4	49.4
Age ²				
<i>M</i>	44.3	43.3	46.4	44.4
(<i>SD</i>)	(14.3)	(14.1)	(14.8)	(14.4)
Education ³				
Low	30.4%	11.5%	26.8%	13.7%
Medium	33.3%	61.3%	46.3%	73.2%
High	36.3%	27.2%	26.8%	13.1%

Note. ¹ Differences in the share of female/male respondents between the countries: $F(3, 6,102) = 1.94, p \leq .121, \eta^2 = .001$. ² Differences in the mean age of respondents between the countries: $F(3, 6,102) = 11.15, p \leq .001, \eta^2 = .005$. ³ Differences in level of education between the countries: $F(3, 6,102) = 22.84, p \leq .001, \eta^2 = .011$.

Measures

The questionnaire was partly adapted from the USA's and Germany's HINTS (Health Information National Trends Survey) and the German Health Care Monitor (Bertelsmann Foundation) and extended using theoretical frameworks explaining O-HISB. For conducting the survey in the Netherlands (the sole non-German speaking sample country), we hired a professional service to translate the questionnaire into Dutch, which was audited by the Dutch research team. Beyond national adjustments for country-specific features, which are explained in more detail in the respective part of the measurement section, the same instrument was used in all four online surveys.

Dependent Variables. Our main objective was to compare O-HISB between the four sample countries and to identify country-specific determinants of O-HISB. To describe respondents' O-HISB, we asked whether they had searched for health issues on the internet during the past 12 months. Also, the participants were asked to state the number of days during the past month they had practiced O-HISB to assess its frequency (Flynn et al., 2006). To depict O-HISB in more detail, we asked about the use of specific online sources and the types of information sought. Respondents rated how often they used eight information sources when conducting O-HISB (see Figure 1). The list of online sources included online dictionaries and online communities. Respondents were also asked to rate how often they searched for or received information from a list of seven health issues (see Figure 2), which included areas of disease and healthcare, health and wellbeing, healthcare policy, and healthcare system(s). Both lists of sources and types of information sought were based on the 22nd survey of the German Health Care Monitor (Baumann & Czerwinski, 2015). The frequency of use of individual sources and of searching for specific types of information was recorded on a five-point Likert-type scale ranging from 1 (*never*) to 5 (*very often*).

Independent Variables.

Cognitive Influencing Factors of O-HISB, such as competencies to search for health information online, interest in health information, and trust in health information from the internet, were measured. The eHealth Literacy Scale (eHEALS; Norman & Skinner, 2006; Soellner et al., 2014) was selected to determine the self-assessment of each participant's competencies. The measure consists of eight items describing perceived knowledge and abilities to find, evaluate, and apply online health information (e.g., "I know how to find helpful health resources on the internet"). The participants reported their responses on a five-point Likert-type scale (1 = *does not apply at all* to 5 = *does apply fully*). The scale showed high internal consistency ($\alpha = .92$). For further analysis, the mean index was calculated ($M = 3.5$; $SD = 0.8$).

Participants' overall *interest in health information* was assessed using three reverse coded items of the Information Avoidance Scale (Howell & Shepperd, 2016). The selected items express the amount of interest expressed by respondents to know everything about their health and their desire to be informed about health issues (e.g., "I want to know everything about my health"). The applicability of these statements was measured on a five-point Likert-type scale (1 = *does not apply at all* to 5 = *does apply fully*). The adaption of the scale showed sufficient internal consistency ($\alpha = .89$) and was compressed to a mean index ($M = 3.6$; $SD = 1.0$).

To assess each participant's attitude toward the internet as a source for health information, the perceived *trustworthiness of online health information* was evaluated with a single item using a five-point Likert-type scale ranging from 1 (*not at all*) to 5 (*very strong*).

Health(care)-Related Influencing Factors. The subjective *health status* was measured by self-reporting (Goldner, 2006). According to the HINTS questionnaire, the respondents were asked to rate their general health status on a five-point Likert-type scale ranging from 1 (*very bad*) to 5 (*very good*). *Healthcare uptake* was assessed by the number of visits to health professionals in the past 12 months. In addition, respondents were asked whether they were currently undergoing treatment for physical or psychological problems.

Sociodemographic and Socioeconomic Influencing Factors. Age, gender, education, and income were included as relevant factors. To indicate the formal level of education, country-specific adjustments were applied, according to different school systems and the labelling of academic degrees. For each country, the academic degrees were grouped into low, medium, and high education. Income was captured via the net household income. It was a uniform query for Germany, the Netherlands, and Austria, which distinguishes between five income classes. An adaptation was made for Switzerland due to the nation's non-Euro currency.

Data Analysis Procedures

To compare O-HISB (RQ1) as well as the values of background factors of O-HISB (RQ2) between the countries, we conducted ANOVAs with the different measures of O-HISB (general health-related internet use, frequency of O-HISB, used online websites and services, types of health information sought) and the background characteristics as dependent variables and countries as the independent factor. To examine which influencing factors were associated with country-specific internet use for health-related purposes and the frequency of O-HISB (RQ3), we conducted several logistic and linear regression analyses. To answer RQ3a, a stepwise logistic regression analysis per country was conducted. In the first step, sociodemographic and socioeconomic factors were included. In the second step, health(care)-related factors like health status and uptake of treatment were considered, whereas the third and last step included cognitive influencing factors. To answer RQ3b about the influencing factor of the frequency of O-HISB, four stepwise linear regression models were conducted with the subsamples of *h*-onliners. As before, sociodemographic and -economic, health(care)-related as well as cognitive determinants were included as potential influencing factors of O-HISB frequency.

Results

Differences in the Share and Frequency of O-HISB Between the European Countries

RQ1 asked about differences in O-HISB between the four selected European countries. The findings showed that countries differ significantly, but slightly regarding O-HISB (see Table 2). In particular, the share of *h*-onliners was lowest in Germany (72.0%) and highest in the Netherlands (84.5%). The number of *h*-onliners in the Netherlands, Switzerland (82.0%), and

Austria (79.6%) was significantly higher than in Germany. However, the frequency of health-related internet use measured by the number of days in the last month showed other patterns than the general use of online health information (see Table 2). In Austria ($M = 3.5$; $SD = 4.5$) and Germany ($M = 3.4$; $SD = 4.1$), the internet was significant more frequently used for health purposes compared to the Netherlands ($M = 2.6$; $SD = 4.2$). The German-speaking part of Switzerland ($M = 3.0$; $SD = 3.7$) did not significantly differ from the other countries.

Comparing the Preferred Online Sources and Health Information Sought Between the Countries

RQ1 also aimed to describe the *type of online sources* used and types of health information sought. Concerning the frequency of turning to different online information sources, there were also significant, albeit weak, differences between the countries. We observed similar patterns for the order of most-used sources, although the particular importance was different between the countries (see Figure 1). For three countries, access to health information via general health websites like netdoktor.de was most common. The exception was Switzerland, where the use of general health websites was lower. Online-dictionaries like Wikipedia were used second most often to search for health information in Germany, Switzerland, and Austria. While, in this case, the frequency of use was comparable between Germany, Switzerland, and Austria, online encyclopaedias were used less frequently in the Netherlands. Across the countries, the websites of physicians, hospitals, and health organisations were in third place. In Switzerland, such information services were used the least, while the most frequent use was found in Germany and Austria. The use of online pharmacies showed the most apparent discrepancies in the comparison of the four countries. In Germany, it was one of the most frequently used sources, while in the Netherlands, online pharmacies were only rarely consulted.

Compared to these rather traditional information sources and services, social media and interactive services were less important. In particular, in the Netherlands, health-related online communities, physician-rating websites, health-related YouTube videos, and social media were only rarely used. While there were rather small differences between Germany, Switzerland, and Austria concerning social media platforms, German respondents' interest in physician-rating websites and online communities appeared comparatively high (see Figure 1).

Table 2. Means and Standard Deviation of O-HISB for the Different Countries

Dependent variables	Country							
	Germany		Switzerland		Netherlands		Austria	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Health-related internet use ¹	.72 ^{abc}	.45	.82 ^a	.38	.85 ^{bd}	.36	.80 ^{cd}	.40
Frequency of health-related internet use ²	3.4 ^a	4.1	3.0	3.7	2.6 ^{ab}	4.2	3.5 ^b	4.5

Note. Same letter (^{abcd}) indicate significant differences ($p < .05$) in post-hoc tests. ¹ $N = 6,105$ in total; share of respondents using the internet for health-related purposes: $F(3, 6,102) = 32.54, p \leq .001, \eta^2 = .016$. ² $n = 4,710$ h-onliners; numbers of days of O-HISB during the last 30 days: $F(3, 4,707) = 11.25, p \leq .001, \eta^2 = .007$.

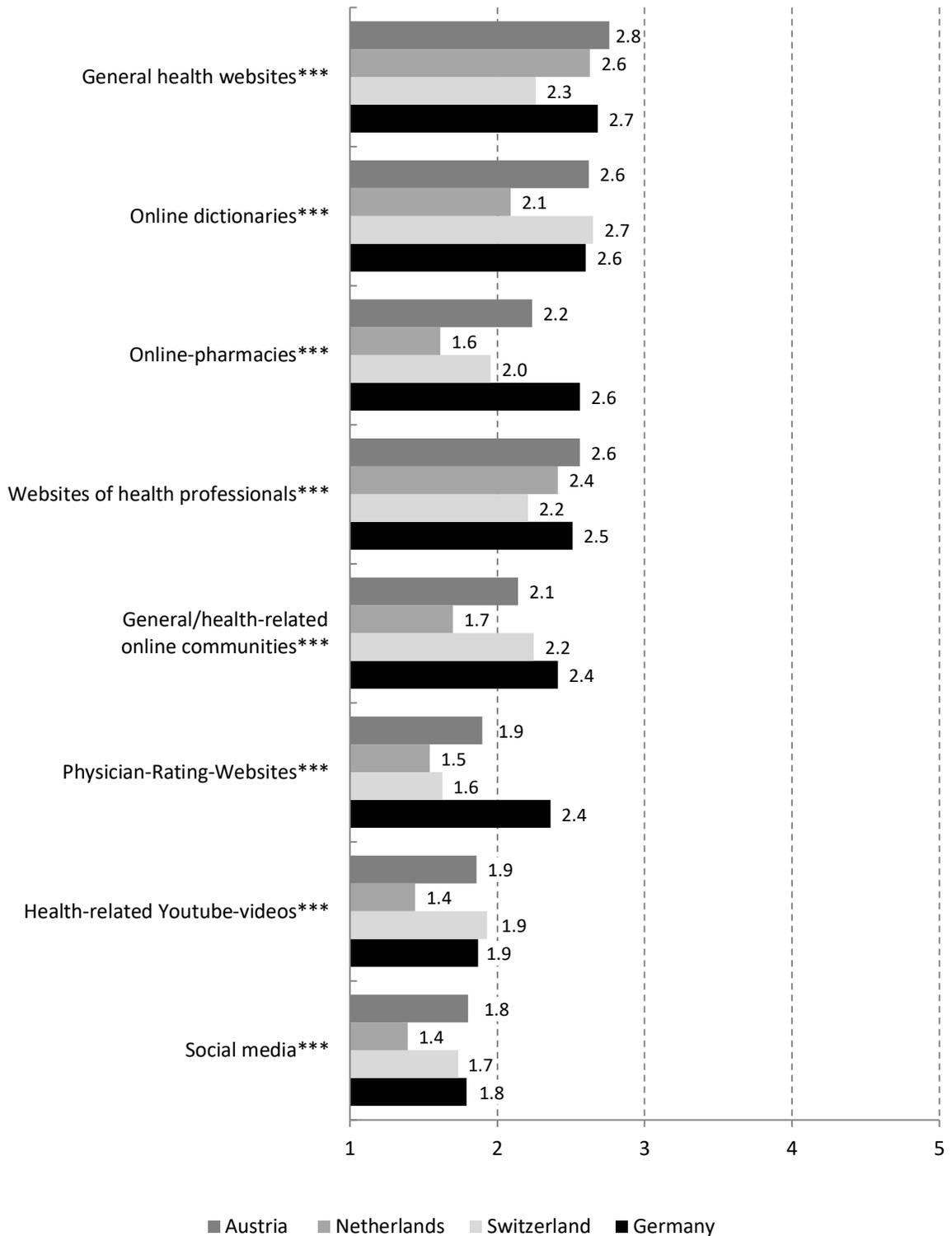


Figure 1. Used Online Sources and Services for Online Health Information Seeking
 Note. $n = 4,710$ (subsample of *h*-online), scale from 1 (*never*) to 5 (*very often*). Significant differences between the countries: *** $p < .001$.

The most recent *health information sought* in all four countries included symptoms and causes of disease as well as recommendations for a healthy lifestyle (see Figure 2). In Germany and Austria, people also quite frequently searched for information about medicine or health professionals compared to the Netherlands and Switzerland (see Figure 2). Similar among all countries, information about treatments, therapies, or check-ups as well as early detection options was among the less frequently searched issues, but tended to be more pronounced in Germany and Austria compared to Switzerland and the Netherlands (see Figure 2).

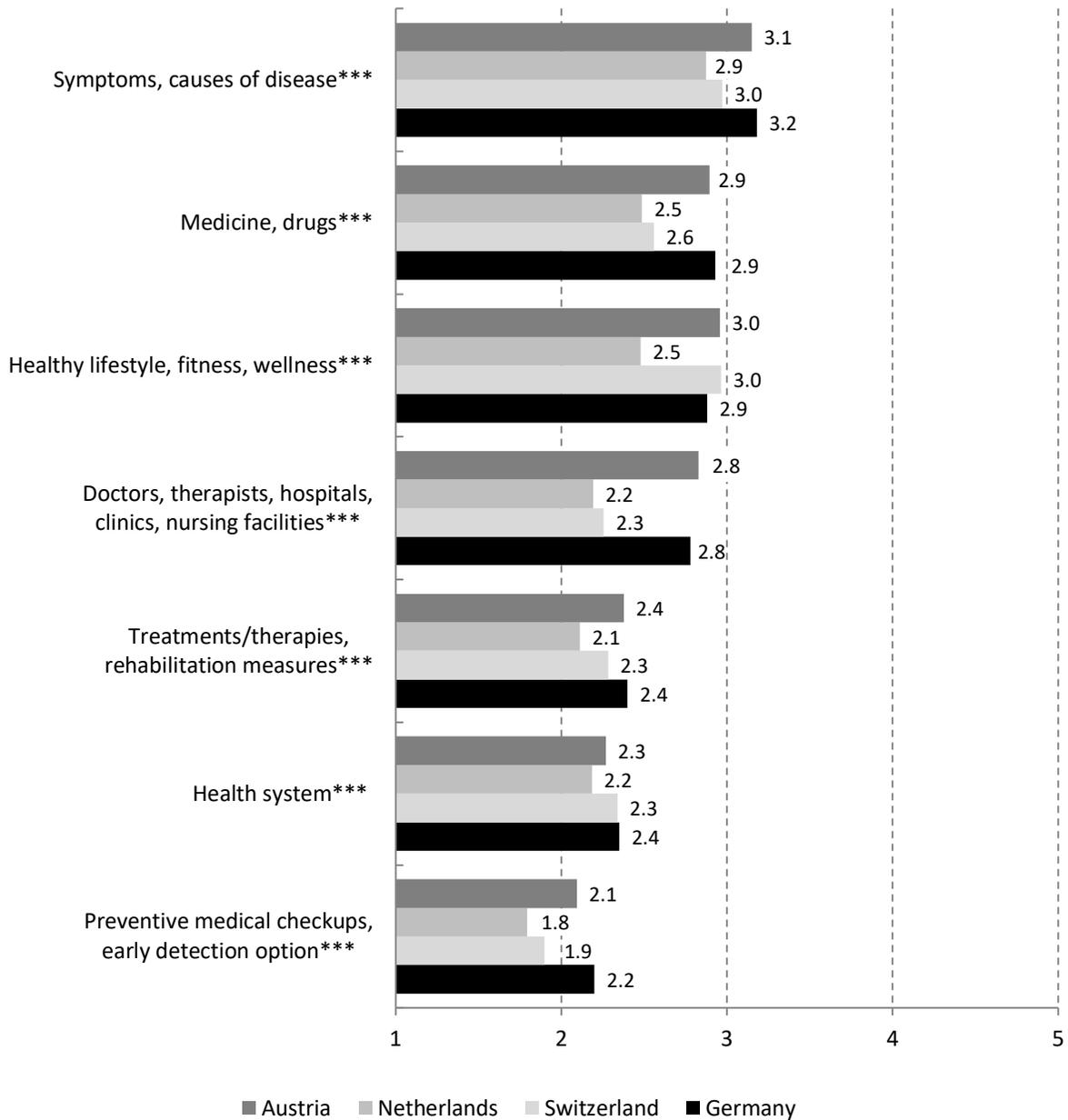


Figure 2. Types of Health Information Sought
 Note. $n = 4,710$ (subsample of *h*-online), scale from 1 (*never*) to 5 (*very often*). Significant differences between the countries: *** $p < .001$.

Differences Between the Background Characteristics of O-HISB in the Countries

RQ2 sought to determine to what extent health(care)-related and cognitive background characteristics of O-HISB vary between the countries (see Table 3). Except for the number of visits to health professionals during the last year, which ranges between $M = 5.4$ ($SD = 11.0$) in the Netherlands and $M = 6.5$ ($SD = 10.7$) in Austria, all facets differed significantly between the countries. Similar rankings were observed for the share of respondents undergoing treatment for physical or psychological complaints. The share of Germans undergoing physical treatment was highest (40%), but only differed significantly from Switzerland (34%). Psychological complaints lead to a therapy for 15% of the respondents in Germany, which differed significantly from lower shares in Switzerland (11%), the Netherlands (10%), and Austria (12%; see Table 3). The subjective state of health was rather good in all four countries. Corresponding to the more frequent use of treatment, the perceptions of the state of health was significantly poorer in Germany ($M = 3.5$; $SD = 0.8$) compared to the other three countries. In contrast, respondents in the German-speaking part of Switzerland assessed their state of health as significantly more positive ($M = 3.8$; $SD = 0.8$) than the others. The effect size ($\text{Eta}^2 = .03$) for the perceived state of health predicted by country was rather high in comparison to the influence on other health-related factors of O-HISB (see Table 3).

Table 3. Means and Standard Deviation of Health and Healthcare-Related as Well as Cognitive Background Factors of O-HISB per Country

Background factors	Country							
	Germany		Switzerland		Netherlands		Austria	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
Health(care)-related factors								
Number of visits to HPs	6.0	(10.9)	5.7	(15.1)	5.4	(11.0)	6.5	(10.7)
Received physical treatment ^{1**}	.40 ^a	(.49)	.34 ^a	(.47)	.36	(.48)	.36	(.48)
Received psychological treatment ^{1***}	.15 ^{abc}	(.36)	.11 ^a	(.31)	.10 ^b	(.30)	.12 ^c	(.32)
Subjective health status ^{2***}	3.5 ^{abc}	(0.8)	3.8 ^{ade}	(0.8)	3.7 ^{bd}	(0.8)	3.7 ^{ce}	(0.9)
Cognitive factors								
Interest in health information ^{3***}	3.6 ^{ab}	(1.0)	3.6 ^{cd}	(1.0)	3.2 ^{ace}	(1.0)	3.8 ^{bde}	(1.1)
eHealth literacy ^{3***}	3.4 ^{ab}	(0.8)	3.5 ^{bc}	(0.7)	3.7 ^{acd}	(0.8)	3.5 ^d	(0.8)
Trust in online health information ^{3***}	3.1 ^a	(1.0)	3.1 ^b	(0.9)	3.0 ^c	(0.8)	2.9 ^{abc}	(1.0)

Note. $N = 6,106$; univariate ANOVAs. Numbers of visits to HPs during the past 12 month: $F(3, 6,105) = 1.65$, $p = .177$, $\eta^2 = .001$. Received physical treatment: $F(3, 6,102) = 4.99$, $p = .002$, $\eta^2 = .002$. Received psychological treatment: $F(3, 6,102) = 8.41$, $p \leq .001$, $\eta^2 = .004$. Subjective health status: $F(3, 6,102) = 65.58$, $p \leq .001$, $\eta^2 = .032$. Interest in health information: $F(3, 6,102) = 59.90$, $p \leq .001$, $\eta^2 = .029$. eHealth literacy: $F(3, 6,102) = 34.66$, $p \leq .001$, $\eta^2 = .017$. Trust in online health information: $F(3, 6,102) = 7.80$, $p \leq .001$, $\eta^2 = .004$. Same letters (^{abcd}) indicate significant differences ($p \leq .05$) in post-hoc tests. ¹ Measured as dichotomous query (1 = yes; 0 = no). ² Measured on a 5-point Likert-type scale from 1 (very bad) to 5 (very good). ³ Measured on 5-point Likert-type scales from 1 (does not apply at all/not at all) to 5 (does apply fully/very strong). ** $p < .01$, *** $p < .001$.

Regarding cognitive background factors of O-HISB, there were significant differences between countries concerning the interest in health information, subjective eHealth literacy, and trust in online health information. Interest in health information and the perceived eHealth literacy was generally mediocre. Differences appeared between Dutch people ($M = 3.23$; $SD = 0.95$), whose interest was significantly lower compared the other countries, particularly to the Austrians ($M = 3.80$; $SD = 1.05$). Germany and Switzerland showed neither pronounced nor weak interest in health information (Germany: $M = 3.58$; $SD = 1.03$; Switzerland: $M = 3.62$; $SD = 0.98$). Perceived eHealth literacy was comparatively less pronounced in Germany, Switzerland, and Austria compared to the Netherlands (see Table 3). With an average mean of 3.73 ($SD = 0.78$), significantly higher self-rated competencies were found in the Netherlands. Trust in online health information was mediocre in all four countries. The particularly small effect size reflects the marginal differences between the countries. Austrians doubted the trustworthiness of online health information the most ($M = 2.90$; $SD = 0.99$) and differed significantly from the other populations that perceived the internet as similarly trustworthy (see Table 3).

Country-Specific Influencing Patterns of Health-Related Internet Use

RQ3 aimed to identify the sociodemographic, socioeconomic, health(care)-related, and cognitive influencing factors of health-related internet use in the different countries (cf. RQ3a, Table 4). The amount of explained variance by the entire model was lowest in Switzerland (Nagelkerke $R^2 = 0.14$; $p \leq .001$), followed by the Netherlands (Nagelkerke $R^2 = 0.17$; $p \leq .001$), Germany (Nagelkerke $R^2 = 0.22$; $p \leq .001$) and Austria (Nagelkerke $R^2 = 0.27$; $p \leq .001$).

In all four countries, sociodemographic, health(care)-related and cognitive influencing factors contributed to the explanation of O-HISB. A comparison between the groups of determinants revealed that the most substantial explanatory power for health-related internet use in all four countries was provided by cognitive factors (ranging between $\Delta R^2 = .08$ in Switzerland and $\Delta R^2 = .14$ in Austria). Of secondary importance were sociodemographic and socioeconomic influencing factors like gender and age, but their importance varied considerably between the four countries (ranging between $\Delta R^2 = .04$ in Switzerland and $\Delta R^2 = .11$ in Austria). Health(care)-related factors had the lowest explanatory power for O-HISB (varying between $\Delta R^2 = .02$ in Switzerland and $\Delta R^2 = .05$ in Germany, see Table 4).

In the context of sociodemographic and socioeconomic influencing factors (Step 1; Table 4), the same patterns of influence were identified across the four countries. While health-related internet use decreased with increasing age, the relative likelihood of O-HISB was more definite for women compared to men and more pronounced with increasing formal education. Only in the Netherlands was the influence of age on O-HISB not significant. Furthermore, income was only a promoting factor for O-HISB in Germany and Austria (see Table 4).

In Step 2, health(care)-related influencing factors of O-HISB were considered and showed country-specific patterns. Data showed that undergoing mental health treatment did not have a significant influence on O-HISB. Only in Germany did the relative probability of internet use increase when respondents were currently undergoing therapy for physical complaints and if they comparably often visited health professionals (see Table 4) and only in the Netherlands was respondents' subjective health status a significant predictor of health-related Internet use. Dutch

women and men who perceived their health to be more positive showed a lower relative probability of O-HISB.

The last step of the regression analysis included the cognitive influencing factors of O-HISB. Across all countries, eHealth literacy and trust in online health information were influencing factors of turning to the internet. Higher eHealth literacy led to the most robust increase in the relative likelihood to use the internet for health-related purposes. The relative probability of health-related internet use increased by 60% to 95% per unit of eHealth literacy. Furthermore, trust in online health information positively influenced the probability of O-HISB. This influence of trust was lowest in Switzerland (a relative increase of 29%), while it was highest in Austria (an increase of 76%). General interest in health information was also a significant trigger to turn to online sources. Germans and the Dutch showed that higher interest increased the relative probability of turning to the internet to search for health information. In comparison, this kind of interest was not a significant factor in Switzerland and Austria (see Table 4).

Country-specific Influencing Patterns of O-HISB Frequency

As an additional aspect of RQ3, we also wondered whether country-specific influencing patterns of determinants for the frequency of O-HISB exist (cf. RQ3b). Data showed that the amount of explained variance of O-HISB frequency was generally lower than the amount of explained variance for health-related internet use. Above all, the predictors explained 8.1% of the variance in O-HISB frequency in Austria, 8.6% in the German-speaking part of Switzerland, 8.9% in the Netherlands, and 11.8 % in Germany (see Table 5).

In all four countries, sociodemographic, health(care)-related, and cognitive influencing factors had a similarly small influence on O-HISB frequency. The explanatory power of sociodemographic/-economic factors was lowest in Germany ($\Delta R^2 = .02$, $p \leq .001$) and highest in the Netherlands ($\Delta R^2 = .03$, $p \leq .001$). The share of explained variance of health(care)-related influencing factors varied between the countries to a greater extent. In Austria ($\Delta R^2 = .02$, $p \leq .001$), the Netherlands ($\Delta R^2 = .04$, $p \leq .001$) and Switzerland ($\Delta R^2 = .04$, $p \leq .001$) the impact of health(care)-related factors was lower than in Germany ($\Delta R^2 = .07$, $p \leq .001$). The cognitive influencing factors explained between $\Delta R^2 = .02$ ($p \leq .001$) in the Netherlands and $\Delta R^2 = .04$ ($p \leq .001$) in Austria (see Table 5).

Focusing on the impact of sociodemographic and socioeconomic factors on O-HISB frequency showed some similar influencing patterns across the countries. Education and income did not have any significant influence on O-HISB frequency. In contrast, women used the internet more frequently to seek health-related information than men (see Table 5). Additionally, age was a significant, albeit weak determinant in three of the four countries. The exception was the Netherlands, where greater age was associated with decreasing frequency of O-HISB (see Table 5).

In the context of the relevance of health(care)-related determinants of O-HISB, the analyses highlighted more differences than similarities between the countries. Consistent across all countries, respondents' subjective health status was not a significant determinant of O-HISB frequency. Being in current treatment for physical symptoms was associated with slightly more frequent internet use among the Germans respondents only. Undergoing psychological treatment

was rather weakly but positively related to higher internet use in Germany and Switzerland (see Table 5). The number of medical consultations was also significantly but weakly associated with higher frequencies for O-HISB in Germany, the Netherlands, and Austria. In Germany and the Netherlands, the number of visits to health professionals had the most substantial effect on the frequency of health-related internet use compared to the other considered determinants (see Table 5).

Table 4. Sociodemographic and Socioeconomic, Health(care)-Related and Cognitive Influencing Factors of Internet Use for Health-Related Purposes (Logistic Regression Analysis)

Predictor	Country							
	Germany		Switzerland		Netherlands		Austria	
	ΔR^2	$Exp(B)$						
Step 1: sociodemographic/ economic factors	.06***		.04***		.06***		.11***	
Age	0.98**		0.98*		1.00		0.97***	
Female gender (ref. male)	1.60***		1.70*		1.63*		1.75**	
Education	1.17***		1.06		1.16**		1.19*	
Income	1.06*		1.12		1.06		1.25*	
Step 2: health- related factors	.05***		.02		.02**		.02**	
Number of visits to HPs	1.05***		1.03		1.01		1.03	
Received physical treatment	1.48**		1.17		1.02		1.37	
Received psychological treatment	0.86		0.79		0.92		0.67	
Subjective health status	0.96		0.86		0.65**		1.00	
Step 3: cognitive factors	.12***		.08***		.09***		.14***	
Interest in health information	1.25***		1.17		1.28*		1.16	
eHealth literacy	1.60***		1.91***		1.69***		1.95***	
Trust in online health information	1.51***		1.29*		1.46***		1.76***	
Nagelkerke R^2	.22***		.14***		.17***		.27***	
Effect size f	.53		.41		.46		.61	
n	2,690		817		1,106		830	

Note. Blockwise logistic regression analysis. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

Table 5. Sociodemographic and Socioeconomic, Health(Care)-Related and Cognitive Influencing Factors of Frequency to Use the Internet for Health-Related Purposes (Linear Regression Analysis)

Predictor	Country							
	Germany		Switzerland		Netherlands		Austria	
	ΔR^2	$Exp(B)$						
Step 1: sociodemographic/ economic factors	.02***		.02***		.02***		.02***	
Age		-0.16***		-0.13***		-0.06		-0.09*
Female gender (ref. male)		0.05*		0.09*		0.10**		0.12**
Education		0.01		0.05		0.04		0.00
Income		-0.01		-0.03		-0.02		-0.06
Step 2: health- related factors	.07***		.04***		.04***		.02***	
Number of visits to HPs		0.19***		0.08		0.15***		0.11**
Received physical treatment		0.07**		0.00		0.04		0.04
Received psychological treatment		0.05*		0.12**		0.05		-0.01
Subjective health status		-0.05		-0.08		-0.01		0.02
Step 3: cognitive factors	.03***		.03***		.02***		.04***	
Interest in health information		0.07**		0.15***		0.06		0.10**
eHealth literacy		0.11***		0.05		0.10**		0.07
Trust in online health information		0.09***		0.04		0.08*		0.14***
Nagelkerke R^2	.12		.09		.09		.08	
Effect size f	.37		.31		.31		.30	
n	1,956		671		934		665	

Note. Only *h*-onliners. Blockwise linear regression analysis. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$.

For the cognitive influencing factors, a higher interest in health information was a significant, but rather weak determinant in Germany, Switzerland, and Austria, but not among the Dutch population. In Switzerland, interest in health information was the most influential factor of higher O-HISB frequency. eHealth literacy was only a relevant positive precondition of a more frequent health-related use of the internet in Germany and the Netherlands. In contrast, trust in online health

information increased the frequency of O-HISB in Germany, Austria, and in tendency, also in the Netherlands (see Table 5).

Discussion

The objective of this study was to compare health-related internet use in four European countries and supplement the current published research which focuses on the USA by providing data from European countries. We described and explained O-HISB among the German, Dutch, Austrian, and (German-speaking) Swiss public and focused on country-specific influencing factors determining people's use of online media for this purpose.

Comparing O-HISB in Germany, Austria, Switzerland, and the Netherlands

Our first research questions (RQ1) asked how O-HISB differs between the selected European countries. The findings acknowledge the vital role of the internet for health-related purposes. In all countries, the share of *h*-onliners was above 70%. Germany had the lowest share of *h*-onliners with 72%, while in the Netherlands, O-HISB was most common (84.5%). However, *h*-onliners in Germany and Austria used the internet more frequently than in Switzerland and the Netherlands. We can only speculate why this is the case. Bearing in mind that respondents from the Netherlands reported having the highest eHealth literacy, a lower frequency might be associated with perceiving more successful searches to find information that applies to their situation. Besides, cultural differences regarding healthcare (Hofstede Insights, 2021) might have an impact on the centrality of health motivating O-HISB. Further research is needed to test these assumptions.

Concerning the *online sources used*, only small differences in general patterns and country-specifics of the preferred sources were identified. General health websites, online dictionaries, and websites of health professionals were used relatively frequently, while online communities and social networking sites (SNS) were rarely visited. The minor role of SNS was particularly evident in the Netherlands, which might be related to their higher eHealth literacy which may lead them to select more trustworthy online sources. In general, these results suggest that the internet is mainly used for information acquisition. In contrast, the opportunity to discuss and interact with others appeared to be less important which may be explained by smaller and more specific groups of health-related SNS users, such as chronically ill people. Besides, sharing and talking about personal health issues may rather be a personal discussion with family and friends instead of unknown online users. The high importance of traditional online sources to acquire health information might be promising or calming concerning discussions about the quality of health information and risks of misinformation being shared faster and further online via SNS. However, as the selection of the type of source does not allow any generalisable conclusions about the quality of the acquired information, the high importance of corresponding competencies (e.g., eHealth literacy) for the selection and evaluation of information is to be emphasised. Being capable to identify trustworthy sources and knowing how to evaluate them is essential for adequate O-HISB empowering individuals and supporting health prevention and promotion.

The high importance of knowledge acquisition via traditional online sources compared to the lower importance of sharing user-generated content and experiences was also reflected in the

relevant types of information sought. Online health information seeking was most often used to acquire knowledge about symptoms and causes of disease, to learn about medicines, and to obtain recommendations for a healthy lifestyle and wellbeing. In Germany, Switzerland, and Austria, seeking disease-related information was equally essential as seeking issues related to prevention. Only in the Netherlands, seeking for symptoms and causes of diseases was more prevalent than for preventive issues. Thus, the results underline the wide range of online uses and the importance of the range of health information available on the internet (Goldner, 2006). This can be interpreted as the internet being able to offer informational support to distinct target groups from people interested in health to chronically or acutely ill patients.

Differences Between the Background Characteristics of O-HISB in the Countries

We also asked about differences in the values of the background factors of O-HISB between the four European countries (cf. RQ2). Here, the analysis showed several significant, but only marginal differences concerning the effect size. Country-specifics were found for the subjective health status, interest in health information, and eHealth Literacy. German respondents perceived their health as worse than respondents in other countries. In line with data from Eurostat (2018), this finding may be an indicator of a somewhat higher perceived health burden which can be caused by a culturally determined, more critical attitude towards the subjective health status, correlating with the higher frequency of therapy uptake and a higher awareness of health challenges.

Interest in health information was highest in Austria and lowest in the Netherlands, whereas we found the highest perceived eHealth literacy in the Netherlands which corresponds to findings about the status of health literacy in Europe (Sørensen et al., 2015). A better understanding of the underlying conditions and causes of these differences in interest and competencies and their impact on O-HISB is needed (e.g., Sørensen et al., 2015), as it can be crucial for the promotion of interest and corresponding competencies and Europe-wide learning and support processes. Starting points for a better understanding of differences in eHealth literacy could be systematic comparisons of educational systems or available support programmes.

Country-Specific Influencing Patterns of O-HISB

Focusing on the determinants of O-HISB (cf. RQ3a/b), the results showed differences between the relevance of influencing factors for health-related internet use in general and the frequency of health-related internet use. It becomes apparent that the involved factors can explain a higher proportion of variance for turning to the internet compared to the frequency of internet use for health-related purposes. The analysed sociodemographic and socioeconomic, health(care)-related, and particularly cognitive factors seem to be more decisive for relying on the internet as a source for health information in general and less for the extent to which it is used.

RQ3a showed that sociodemographic, health(care)-related, and cognitive factors have an impact on *online searches for health information*. In regard to sociodemographic factors, existing findings are confirmed that women, younger and better-educated people, are more likely to use the internet for health purposes (Bachl, 2016; Baumann et al., 2017; Reifegerste et al., 2017). Except for Germany, health-related factors seem to play a rather subordinate role for O-HISB. For Germany, however, it can be seen that treatments based on physical complaints are one reason for

online information searches. Thus O-HISB seems to be of importance, especially in combination with medical consultations (Andreassen et al., 2007), and points to the importance of discussing online information during consultations. Further research is needed to clarify if O-HISB is: caused by lower satisfaction with health professionals and unmet needs (Lee & Hawkins, 2010; Lee & Hornik, 2009; Tustin, 2010); used as preparation for medical consultations (Andreassen et al., 2007); or might be determined by either or both differences in healthcare systems and the type of doctor-patient relationship and communication.

Compared with sociodemographic and health(care)-related determinants, cognitive factors are supported as the strongest predictors of O-HISB (Griffin et al., 1999; Kahlor, 2010). Across all European countries, cognitive factors showed similar influencing patterns. In particular, trust in online health information and eHealth literacy make the difference for turning to the internet for health information.

The influencing factors of *O-HISB frequency* extend our findings about general health-related internet use (cf. RQ3b). Across all countries, a higher frequency of O-HISB is influenced by sociodemographics. Gender was identified as a constant influencing factor, while socioeconomic factors influenced the access to, but not the frequency of O-HISB which was also triggered by medical consultations or uptake of therapies and higher interest in health information.

A considerably lower proportion of the explained variance of O-HISB frequency compared to O-HISB, in general, indicates that further factors must be considered to explain the frequency. Based on HISB models (e.g., Brashers, 2001; Griffin et al., 1999; Kahlor, 2010), it can be assumed that factors like risk perception, affective risk responses, or uncertainty perceptions also may serve as important additional explanatory factors.

Lessons Learned About Barriers to O-HISB in Four Selected European Countries

There are several overlaps, but obviously, also some country-specifics in O-HISB existing, even if the countries do not significantly differ concerning their welfare and health status. Some potential barriers, causes of informational inequalities, and prerequisites of adequate use of online information are apparent across the sample countries. The influence of gender and a basic interest in health information, the impact of education, and the high importance of perceived competencies to find and evaluate health information online point to possible barriers of O-HISB. These barriers should be critically examined concerning informational, social, and health inequalities. It can be assumed that the internet can only contribute to a higher level of knowledge and empowerment if attention is drawn to the importance of health information offered, and if individual competencies are strengthened. Therefore, our findings underline the need to enhance health literacy and particularly address eHealth literacy with European and national interventions, health prevention, and promotion efforts. The comparison of the four countries shows that the Netherlands can serve as a role model in this respect.

Limitations and Resulting Tasks for Future Research

Although these results provide a first step towards a European perspective on influencing factors of O-HISB, the limitations of the study need to be considered. First, our analysis is limited to Germany and three western European countries bordering that nation. The restriction is a

limitation, mainly since these are exclusively wealthy countries. A critical extension for future international research is the inclusion of more countries from throughout Europe including economically challenged countries from south-eastern Europe.

Second, our theoretical framework and considered influencing factors should be extended. In general, multi-level factors related to the healthcare system and culture should also be considered. In particular, explaining O-HISB frequency might benefit from considering more situational influencing factors.

A third limitation is that we know rather little about national differences, and cultural factors are only rarely taken into consideration in models of HISB. This is accompanied by interpretations of national differences being invariably tricky. To identify crucial causes of those differences, also research comparing a more heterogeneous set of European countries considering cultural factors, identifying country-specific factors, and not only testing the influence of selected determinants across all countries is necessary. To align all that data, hypotheses about the possible causes for differences have to be derived and discussed. These could be manifold: economic background, healthcare system, general public health, cultural “mentalities,” jurisdiction, available (institutionalised) health education, or public health engagements.

Another limitation concerns our analysis, which was only focused on active seeking behaviours but does not distinguish if individuals seek health information for themselves or others (Reifegerste et al., 2017). Further work should consider surrogate-seeking as this could affect the role of health-related factors and might also be affected by cultural values (Hofstede, 1993; Hofstede Insights, 2021).

Main Conclusion

Our findings extended the evidence base on O-HISB by describing the status quo of sources used and types of health information sought as well as explaining O-HISB focusing on four European countries which is an initial step towards a European perspective on health communication. This approach highlights similarities and differences in behaviours and influencing factors and suggests to investigate cultural and systemic factors influencing O-HISB in the future. This is both relevant for the further development of models of HISB, but also provides impulses and indications for success factors in health prevention and promotion.

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