Sexual Information Seeking on Web Search Engines

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ABSTRACT

Sexual information seeking is an important element within human information behavior. Seeking sexually related information on the Internet takes many forms and channels, including chat rooms discussions, accessing Websites or searching Web search engines for sexual materials. The study of sexual Web queries provides insight into sexually-related information-seeking behavior, of value to Web users and providers alike. We qualitatively analyzed queries from logs of 1,025,910 Alta Vista and AlltheWeb.com Web user queries from 2001. We compared the differences in sexually-related Web searching between Alta Vista and AlltheWeb.com users. Differences were found in session duration, query outcomes, and search term choices. Implications of the findings for sexual information seeking are discussed.

INTRODUCTION

HUMAN SEXUALITY and the Internet is a growing area of research in the social sciences,[1] highlighting, for example, gender differences in Internet sexuality.[2] Sexual information seeking falls within the realm of human information behavior theory and models. From an examination of Figure 1, which shows the context of human information behavior,[3] we can see that sexual information seeking is not considered to be task or occupation oriented. Sexual information seeking, with its connection to reproduction and mate seeking, is related to the wider concerns of everyday life, social adaptation, and survival in the information age. In particular, seeking sexual information on the Internet forms a subset of human information behavior (HIB) research that attempts to explore all aspects of information-connected human behaviors.[4,5]

Spink and Cole[6] integrate the diverse information behaviors using principles from evolutionary psychology. From the evolutionary psychology perspective, human information foraging is fundamental to human adaptation and survival. Driven by this need, humans engage in a constant foraging of their environment for data/information that will facilitate their adaptation and survive. Such information behavior can occur without human attention, and may occur and be attached to information the user finds while seeking information for the satisfaction of other physiological, affective or cognitive needs.[3]

Seen in this light, the seeking of sexual information on the Internet and elsewhere in the environment may occur not only for the fundamental human purpose of mating and the propagation of the species, but also for the diverse information behavior mechanisms concerned with adaptation and survival. These mechanisms may perhaps be discerned via an examination of sexual information seeking.

Here we start at the beginning, analyzing sexual information seeking behavior on the Internet. The base-line elements in Internet sexual information

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INFORMATION ENVIRONMENT

MICROCULTURES/SMALL WORLDS

CHANNELS

HUMAN INFORMATION BEHAVIOR
Stages

Everyday Life   Occupation-School
Information Seeking   Information Seeking
ₗ[[Coherence]]ₗ   ₗ[[Gap]]ₗ

Information
Searching/Retrieval
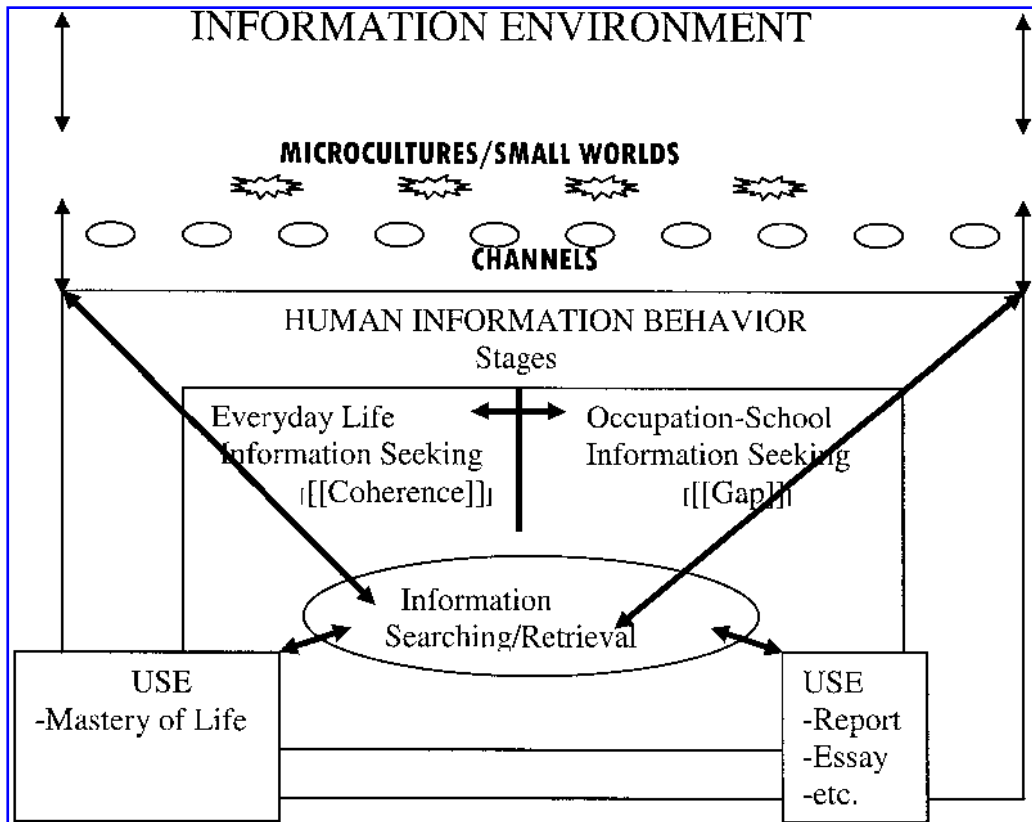
USE
-Mastery of Life

USE
-Report
-Essay
-etc.

FIG. 1.   Human information behavior context.

seeking are the searching characteristics of the on-line user. One such search characteristic is the query the user selects to access sexual information on the Net. Query-oriented studies are just beginning, and there is a need for studies examining sexually-related queries to further identify the characteristics of sexual Web searching. The study reported in this paper explores sexually related human information searching on the Web via a statistical examination of Web queries containing sexual terms.

Human sexuality and the Internet

Pornography or sexually related materials are available widely on the Web, including online sex shops.[7] Rimm[8] found that pornographic images were widely available on the Web, particularly on bulletin boards and USENET. A 1998 study estimated the existence of 22,000 pornographic Web sites.[9] These studies are part of an ongoing debate regarding the accessibility of sexually related material on the Web.[10] Li[11] discusses this debate, including the issues of obscenity, child pornography and

filtering, and the studies conducted particularly in relation to libraries.

A growing body of studies is strongly contributing to our understanding of human sexuality in the new frontier of the Internet. Human internet sexuality is a growing area of research in the social sciences.[1,12–14] Cooper et al.[15] and Goodson et al.[16,17] highlight the divergent views of Internet sexuality or "cybersex." The *pathological perspective* focuses on Internet sexuality as deviant, addictive, or criminal behavior.[18–22] In the *adaptive-perspective, sexual expression* is a more adaptive view that places Internet sexuality within the context of sexual human development and exploration, and love and romance.[23–25]

Studies also show gender differences in Internet sexuality.[2,15] Cooper et al.[15,26] found that men are more dominant in online sexual activities, such as sexually related chat rooms and pornographic Website use, Internet abuse and sexual problems. The researchers also found that heavy Internet users, or about 8% of users, who spend the most time online for sex, also reported significant problems associated with compulsive disorders and addiction. The goal of their research is to recom-

mend treatments for outreach prevention programs. Cooper et al.[15] also identify "paraphilics" as dependent on cybersex as a source of stimulation and satisfaction for often unconventional sexual desires.

Sexually related web searching

Recent studies have also begun to examine the nature of sexually related information seeking on Web search engines. Goodrum and Spink[27] found that 25 of the most frequently occurring terms in multimedia related queries terms submitted to the Excite commercial Web search engine were clearly sexually related. Spink et al.[28] found that although sexually related searching by users of the Excite Web search engine represented only a small proportion of all queries and terms (>5%), about one in every four terms in the list of 63 highest used terms can be classified as sexual in nature.

Spink and Ozmutlu[29] also found that terms such as "sex," "nude," and "naked" were high frequency terms submitted to the Ask Jeeves commercial Web search engine. Spink et al.[30] examined large-scale Excite Web query data sets from 1997, 1999 and 2001. They found that sexually related queries decreased as a proportion of all Web queries from the second largest category (16.8%) in 1997 to fourth largest category (7.5%) in 1999 and the fifth largest category (8.5%) in 2001. Web queries related to business, computers and people increased as a proportion of all Web queries.

Spink et al.[31] compared the topics of United States Excite search engine users versus European AlltheWeb.com search engine searches in 2001. They found that sexually-related queries were the fifth largest Excite topic category (8.5%) and the fourth largest category (10.8%) on AlltheWeb.com. Spink et al.[31] compared the topics of United States Excite search engine users versus European Fast search engine searches in 2001. They found that that sexually related queries was the fifth largest Excite topic category (8.5%) and the fourth largest Fast topic category (10.8%).

Spink and Ozmutlu[29] and Spink et al.[5] found that sexual and non-sexual-related queries by Excite users exhibited differences in session duration, query outcomes, and search term choices. They also identified a more limited vocabulary used in sexual queries when compared to non-sexual queries. Sexual queries involved fewer unique terms. Many sexually related terms were repeated frequently in queries, for example, nude, sex, and naked. They found that sexually-related Web search sessions and queries were longer than non-

sexual search sessions, and contained more queries.

Sexual queries were generally longer than most non-sexual queries and there was a high probability that a sexual session could be longer than 20+ queries. People seeking sexual information were willing to expend the time and effort to create longer queries and to use more queries. Sexual searchers viewed more pages than non-sexual searchers. Most non-sexual searchers do not view much beyond the first or second page of ten Web sites. For example, a typical sexual information seeker was also seeking images of nude women and may view more than 20 pages of Websites.

Sexual sessions may also longer because images often take quite some time to download. The findings may also relate to the Cooper et al.[15] identification of heavy Web users who exhibit "paraphilic" behaviors and are dependent on cybersex as a source of stimulation and satisfaction.

In the current study, we further investigate the nature and characteristics of sexually related Web searching.

Research goals

The objective of our study was to enhance our understanding of sexually related information seeking on the Web, including the following:

1. Identify the proportion of sexually-related queries.
2. Compare the characteristics of sexual queries submitted by Alta Vista and AlltheWeb.com users.

MATERIALS AND METHODS

Web query data sets

We qualitatively examined random samples of 6000 Alta Vista and 5000 AlltheWeb.com Web queries. We extracted a random set of queries from the two query-logs of 1,025,910 queries from February 2001. Alta Vista and AlltheWeb.com are major Internet companies that offer free Web searching and a variety of other services. Alta Vista users in the query set were largely from the US and AlltheWeb.com users were largely Europeans from Germany and Norway.

Each query contained three fields. We could locate each user's initial query and recreate the chronological series of actions during each user session, including: *User Identification*: an anonymous user

code assigned by Web server. *Time of the day*: second, minute, hour, day, month and year are given in adjacent format. *Query terms*: the terms entered by the users.

Sexual query classification

Web queries were qualitatively examined for sexual content by two researchers. We classified each query as either a sexually-related query or a nonsexually-related query. To judge the query intent as sexual or pornographic, strong evidence of such intent had to be present in the query log. If queries did not include explicitly sexually-related (including pornographic) key words, they were not classified for the study. We judged queries as related to sexual (including pornographic) needs if the queries explicitly requested sexual information, visual images or textual descriptions of sexual behavior. Queries that were more health or medical related, such as "sexually transmitted diseases" or "sexual herpes", were not counted as sexual queries.

Inter-coder agreement is defined as the similarity in which each coder in the study decided whether a query was sexual. To check coding consistency, each researcher recoded 2000 queries previously classified by the other researcher. The researchers met again in order to make final decision about how the classifications. The two researchers discussed each disputed query until a classification consensus for that query was reached.

RESULTS

This paper extends previous results reported by Spink and Ozmutlu[4] and Spink et al.[5]

AlltheWeb.com queries

Table 1 shows the most frequent terms in AlltheWeb.com sexually-related queries. Table 2 shows the terms per AlltheWeb.com sexually-related query. Table 3 shows the queries per AlltheWeb.com sexually-related session.

Our analysis of the alltheWeb.com query data showed:

- 273 queries in 143 AlltheWeb.com sessions contained searches for sexual material.
- Sex was the most frequently occurring term in the AlltheWeb.com sessions.
- 273/6000 = 4.5% of AlltheWeb.com queries were identified as sexually-related
- Mean of 1.7 terms per sexually-related query
- Mean of 1.9 queries per sexually-related session
- 19/143 = 13.3% of the sessions included reformulated queries
- 68/143 = 47.6% of the sessions showed the user searching also for non-sexual material.
- 9/273 = 3.3% of the sexually-related queries were for child pornography. This only included searches that explicitly stated terms for child pornography. Because of the vague nature,

TABLE 1.   MOST FREQUENT TERMS IN ALLTHEWEB.COM SEXUALLY-RELATED QUERIES

Sexually-related term	% of all terms	Term	% of all terms
Sex	9.4%	Animal	1.03%
Nude	6.6%	Ass	1.03%
Porn	2.8%	Babes	1.03%
Free	2.6%	Black	1.03%
Teens	2.6%	Boobs	1.03%
Amateur	2.06%	Boy	1.03%
Girl	2.06%	Jobs	1.03%
XXX	2.06%	Lesbians	1.03%
Anal	1.8%	Pornstar	1.03%
Naked	1.8%	Stories	1.03%
Tits	1.8%	Asian	0.8%
Big	1.6%	Gallery	0.8%
Nudist	1.4%	Videos	0.8%
Pics	1.2%	With	0.8%
Pictures	1.2%	Beastiality	0.6%
Shemale	1.2%	Women	0.6%

TABLE 2.   TERMS PER ALLTHEWEB.COM
SEXUALLY-RELATED QUERY

Number of terms	%
1	24.5%
2	48.7%
3	20.5%
4	4.03%
5	1.1%
6	0.0%
7	0.37%
8	0.0%
9	0.0%
10+	0.0%

TABLE 4.   MOST FREQUENT TERMS IN ALTA VISTA
SEXUALLY-RELATED QUERIES

Term	%	Term	%
Sex	6.4%	Amateur	1.1%
Free	6.08%	Teen	1.1%
Nude	4.2%	Agony	0.8%
And	3.9%	Erotica	0.8%
Stories	2.9%	Naked	0.8%
Pics	2.7%	Tits	0.8%
Gay	2.4%	Back	0.6%
Her	1.8%	Movie	0.6%
Lolita	1.8%	Of	0.6%
Porn	1.8%	Penis	0.6%
Lesbian	1.6%	Porno	0.6%
Pictures	1.6%	Preteen	0.6%
Gallery	1.4%	Thumbnails	0.6%
Girls	1.4%	Video	0.6%
In	1.4%	Wet	0.6%
Erotic	1.3%	Whore	0.6%
Adult	1.1%	Women	0.6%

queries including the word "teen" were excluded from this number.

Alta Vista queries

Table 4 shows the most frequent terms in Alta Vista sexually-related queries. Table 5 shows the terms per Alta Vista sexual query. Table 6 shows the sexually related queries per Alta Vista session. Table 7 shows the distribution of Alta Vista sexually-related queries throughout the day.

Our analysis of the Alta Vista query data showed:

- Sex was the most frequently occurring term
- 178 queries in 160 sessions were for sexual material
- 178/5000 = 3.5% of the sampled queries were for sexual material.

- 3.4 mean terms per sexually-related query
- 1.1 mean queries per sexually-related session
- 6/160 = 3.7% of the sessions included reformulated queries
- 24/160 = 15% of sexual sessions showed the user searching also for non-sexual material
- 10/178 = 5.6% of sexual queries searched for child pornography. This only included searches that explicitly stated terms for child pornography. Because of the vague nature, queries including the word "teen" were excluded from this number.

TABLE 3.   QUERIES PER ALLTHEWEB.COM
SEXUALLY-RELATED SESSION

Queries per sexually-related session	%
1	67.1%
2	12.6%
3	4.9%
4	6.2%
5	4.2%
6	2.1%
7	0.7%
8	0.0%
9	0.7%
10+	1.4%

TABLE 5.   TERMS PER ALTA VISTA SEXUAL QUERY

Number of terms	%
1	7.3%
2	27%
3	35.4%
4	14.6%
5	7.3%
6	2.8%
7	1.6%
8	0.5%
9	0.0%
10+	3.3%

TABLE 6.   SEXUALLY RELATED QUERIES PER
ALTA VISTA SESSION

Number of queries	%
1	91.3%
2	6.8%
3	1.2%
4	0.6%
5	0.0%
6	0.0%
7	0.0%
8	0.0%
9	0.0%
10+	0.0%

TABLE 7.   DISTRIBUTION OF ALTA VISTA
SEXUALLY-RELATED QUERIES THROUGHOUT THE DAY

Time frame	%
6:00 am–2:00 pm	30.3%
2:00 pm–10:00 pm	30.9%
10:00 pm–6:00 am	38.8%

DISCUSSION

Our data showed a slightly higher percentage of searches for sexual material by the European AlltheWeb.com users. Alta Vista users submitted more terms per sexually-related query, but submitted fewer queries per session than the AlltheWeb.com users. In both AlltheWeb.com and Alta Vista sexually-related queries, the term "sex" was the most frequently occurring term, but shared many of the most frequently used terms, but with a different percentage of use. We also found differences in the distribution of terms per sexually-related query. Alta Vista users entered a greater number of terms, whereas AlltheWeb.com users had the majority of their term distribution as five or less terms per query. The exact opposite is true when looking at the distribution of queries per sexually-related session. The AlltheWeb.com data was more widely distributed, while Alta Vista's distribution was from four or less queries per session.

It was also interesting to look at the percentage of sexually-related sessions that contained reformulated queries. Only 3.7% of Alta Vista data sexually-related sessions contained any query reformulation. Alternatively, some 13.3% of AlltheWeb.com sexually-related sessions contained reformulated queries. One reason could be that the Alta Vista queries contained better search terms that found what users were looking for sooner. The exact opposite could be the case as well. Perhaps Alta Vista users were simply too impatient and gave up when they did not find the desired information.

Another interesting difference between Alta Vista and AlltheWeb.com users is the fact that nearly half the AlltheWeb.com users searched for non-sexual material in the same session as sexual material. In the Alta Vista data, only 14.8% of the sessions searched for non-sexual material in addition to the sexual material. The Alta Vista data also showed a slightly higher percentage of queries that were searching for child pornography. However, the difference between Alta Vista and AlltheWeb.com was only about 2%. The numbers also do not explicitly show the use of Boolean connectors. None of the AlltheWeb.com queries for sexual information contained Boolean connectors of any sort. Alta Vista, on the other hand, had several queries. In fact the word "and" was the fourth most frequent term in sexual queries.

This study contributes to the empirical knowledge base research is building on the nature of user queries to Internet search engines generally, and for sexual information specifically. Generally speaking, we know that a user queries a search engine in a session, which can be made up of various iterations of the same query, called reformulation, or entirely different queries from the initial or opening query the user makes when entering the search engine. These different queries can be on an entirely different topic than the initial query.

For sexual information seeking, an initial query which is sexual in nature can be followed by subsequent queries that are non-sexual in nature. There are other elements of sexual information seeking that we also know due to query studies such as the present study. Sexual information seeking is declining as a percentage of total information seeking on the Internet.[30] There appears to be differences in quantity of sexual information seeking from search engine to search engine, and from one geographical region to another. Further studies focusing on these aspects of sexual information seeking would be of interest for various reasons.

Sexual information seeking and evolutionary psychology

We also briefly touch on the broader issues of sexual information seeking. The primary evidence of interest is the extremely high conversion of sexual information seeking to non-sexual information seeking on the AlltheWeb.com search engine.

Slightly less than 50% of the query sessions on AlltheWeb.com were found to be in this category. For the Alta Vista search engine, the figure is 14.8%, much lower than the European search engine but nonetheless surprising given the image we hold of the "need"-driven character of the user seeking sexual information on the Net.

If sexual information seeking is analyzed from a broad perspective of overall human information behavior (HIB), then the transformation of sexual information seeking to non-sexual information seeking in one user session, evidenced in the AlltheWeb.com query statistics especially, indicates that for humans there may be an overall information condition where a human seeks information at various levels for a variety of purposes, both attentional and non-attentional, at the same time. We have alluded to non-attentional information foraging for human adaptation and survival, and that information seeking for a purpose may also include an aspect of information seeking that is non-purposeful and non-attentional.

Sexual information seeking on the Web may serve as a sort of vehicle for what evolutionary psychology calls an "inter-modular flow of data," from one part or module of our brain to another module.[32,33] Evolutionary psychologists hypothesize separate modules in the brain for religion and technology,[34] and that impossibilist transformation of the way humans view their world and the environment,[35] and the adaptation that results, may increase their chances of long term survival. Prehistorical funeral rites where our ancestors modified natural materials for funeral purposes, may have led to "impossibilist" technological innovations in the military and transportation spheres.[36] The view that such a cognitive mechanism needs a plenitude of seeming unrelated bits of data is posited on the notion that the human organism naturally and continuously forages for data for purposes of adapting to the environment for survival.

If the hypothesis of the modular brain held by evolutionary psychologists is true, then sexual information seeking on the Net and elsewhere may stimulate further information processes of a non-sexual nature, leading to a non-sexual query in a sexually initiated session with an Internet search engine.

CONCLUSIONS

The analysis reported here gives a broad overview of sexual information seeking on these two search engines which are primarily different by the geographical location of their primary user groups (North American for Alta Vista and Norway and Germany for AlltheWeb.com). We are currently conducting further studies comparing sexual queries from AlltheWeb.com and Alta Vista, including trends in sexually related Web searching.

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