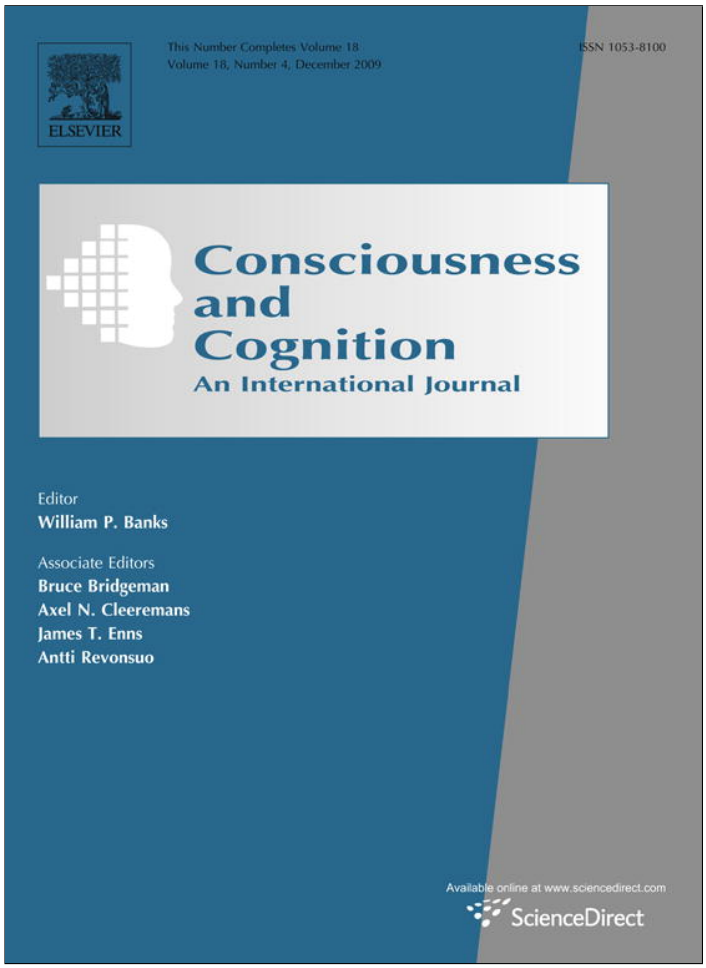

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Seeking patterns in dream content: A systematic approach to word searches

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ABSTRACT

This paper systematizes the word search potential of DreamBank.net (Domhoff & Schneider, 2008a, 2008b) by formulating and testing a set of word strings that can be used as default analytic categories in future investigations. The word strings are applied to the 981 dream reports of college students gathered by Hall and Van de Castle (1966) and the 136 dream reports of an 80-year old male gathered by Bulkeley (2008a). The results show a basic compatibility with the frequencies identified by Hall and Van de Castle's labor-intensive method of content analysis employing teams of human coders. These findings support the expanded use of word search technologies for the scientific study of dream content and its relation to forms of waking consciousness.

1. Introduction

This paper takes its point of departure from two recent articles by Domhoff and Schneider (2008a, 2008b) in which they argue that dream content is meaningfully and predictably connected to the major concerns of the individual's waking life. They advocate the use of word search technology available on the DreamBank.net website as a quick and reliable means of identifying these patterns of dreaming-waking continuity. By using that technology they claim "it is possible to determine normative baselines, and it is then possible to make studies of sets and series that are above these baselines" (2008a, 1242). The goal of this paper is translating that possibility into an actual tool of dream research. It aims to systematize the word search potential of DreamBank.net by formulating and testing a set of word strings that can be used as default analytic categories in future investigations. As the findings in this paper show, the word search method can provide a helpful addition to the scientific study of dreams if it is used prudently, systematically, and in coordination with other modes of research. Its limitations are discussed in the conclusion of the paper.

1.1. Method and participants

A systematic list of word strings was developed after a lengthy period of testing different search strategies. This list offers a template for identifying baseline frequencies for several elements of dream content. During the construction of the list several coding systems devised by other investigators were consulted, including the content analysis method of Hall and Van de Castle (1966), Domhoff (1996), and the many researchers brought together by Winget and Kramer (1979), along with the cognitive research of Kahan (1994) and Hunt (1989), all of whom have contributed to the collective enterprise of a more pre-

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cise mapping of dream phenomenology. I also referred to *Roget's Thesaurus* for additional linguistic possibilities. The full list of word strings appears in Appendix A.

The word strings concern important topics in dreams that might lend themselves to an objective approach. The choice of these terms reflects a judgment as to their relevance to current dream research literature, common features of human experience, and the particular demographic characteristics of the dream reports at hand. Because most of the reports available on DreamBank.net have been gathered from Americans and Europeans over the past 100 years, the word strings include some terms (e.g., reading/writing, technology, Christianity) that might not be used in the study of dreams from different cultures, language groups, or historical eras.

The first set of categories concerns the frequency of references to the senses (sight, sound, touch, taste, smell) and qualities of perception (intensity, color, esthetic evaluation), which are of interest because the senses have been studied in normative research on sighted individuals (Zadra, Nielsen, & Donderi, 1998) and also in the dreams of the blind (Hurovitz, Dunn, William Domhoff, & Fiss, 1999).

Five major emotions (fear, anger, sadness, confusion, happiness) are included because of their psychological prominence as vital forces in human behavior. Emotions have been frequently studied using content analysis (Hall & Van de Castle, 1966; Strauch & Meier, 1996), and they have already been studied with word strings (Domhoff & Schneider, 2008a). In order to maintain the focused comparison of word search and content analysis results, the present paper adopts without change the word strings for the five emotions adapted by Domhoff and Schneider from categories in the Hall and Van de Castle (hereafter HVDC) system. This choice of five emotion categories inevitably limits the compatibility of the results with the findings of other researchers who have used different frameworks for analyzing dream emotions (Fosse, Stickgold, & Hobson, 2001; Kahn, Ed Pace-Schott, & Hobson, 2002; Schredl & Doll, 1998). The use here of the five emotions from the original HVDC content analysis system does not preclude future development of more nuanced methods of studying this dimension of dreaming.

Cognition is included as an important aspect of dream experience involving sophisticated mental activities usually associated with waking consciousness (Hall, 1966; Kahan, LaBerge, Levitan, & Zimbardo, 1997; Kahn & Hobson, 2005a; Wolman & Kozmova, 2006). These features require careful reading by human coders to gauge the full range of their expression. Nevertheless, this study developed several cognitive search terms (awareness, speech, imagination, planning, effort, choice, and reading/writing) that provided results mostly free of false positives.

Natural phenomena and objects are relatively neglected topics in dream studies, but ones that lend themselves to study with word searches. Many dreams containing references to weather, fire, air, water, and earth can be identified in this way, enabling more detailed study of their literal and metaphorical significance. The classic dream themes of flying and falling are included because they provide literal and possibly metaphorical references to gravitational forces in nature.

Almost all dreams have a social dimension involving one or more characters other than the dreamer. In many cases the characters interact with the dreamer in aggressive, friendly, and/or sexual ways. Word strings for family, animals, and fantastic beings were developed in parallel to the HVDC categories for these characters. The same attempt was made with the HVDC categories for social interactions, and satisfactory results could be gained from word strings for friendliness, physical aggression, and sexuality. These word strings do not, however, perfectly match the HVDC social interaction categories in their entirety. For example, the sexuality terms do not include the activities covered by the S1 and S2 HVDC codes because those activities (sexual fantasies and overtures) could not be identified by word searches without an unacceptably high number (>5%) of false positives. The same was true of the HVDC category of non-physical aggressions.

The final set of topics—school, transportation, technology, money, Christianity, and death—revolve around cultural objects, activities, and concerns that are common to the waking lives of late 20th century North Americans and Europeans. These topics have been generally neglected in scientific dream research because of the extensive amounts of time required by individual coders to study them. The religious content scale developed by Krippner, Jaeger, and Faith (2001) and adapted by Domhoff and Schneider (2008a) was not used in this study. Instead, a more focused word string was developed for words relating specifically to Christianity. The narrower approach has the advantage of targeting the actual religious demographics of the HVDC men and women (living in a majority-Christian culture) while avoiding the methodological problem of using English, Christian-influenced words and concepts to make claims about non-Christian religions and spiritual traditions (Bell, 1992; Carrette, 2001).

This study begins with the HVDC norm dreams (Hall & Van de Castle, 1966) because they have already been coded with a system that provides baseline frequencies for comparison with the findings from word searches. Hall and Van de Castle gathered five dreams each from 100 male and 100 female American college students at Baldwin Wallace College and Case Western Reserve University from 1947–1950. Their codings are based on these 1000 dreams, 981 of which survived to become available for inclusion on the Dreambank (491 M, 490 F). Although this set of dreams cannot be taken as the definitive representation of all human dreaming, the HVDC findings have been replicated in many subsequent analyses of college student and other adult samples (Domhoff, 1996, 2003).

To further test the usefulness of the word search approach, it was applied to a very different kind of dream data, a year-long dream journal from an 80-year old male, "Paul," born in Canada and living in America since early childhood. His 136 dream reports were transcribed from his handwritten journal. The reports tend to be short (most were 75 words or fewer, with only two reports longer than 140 words), raising the question of how much his descriptive style limits perception of his deeper-lying dream patterns. However, Paul ended up recalling more dreams (2–3 per week) than he estimated in a pre-journal questionnaire, so this series might represent for him a relatively expanded version of his dream life.

Although Paul is not a demographic match with the college students who provide the reports for most content analysis research, his dream series provides a good source of material to test the effectiveness of word searching in comparison to traditional content analysis. In contrast to the anonymity of the HVDC norms, a great deal of personal information is available about Paul from interviews, questionnaires, and a home visit (Bulkeley, 2008a). Furthermore, the Paul series has been analyzed by human coders for traditional HVDC categories, enabling comparison of the word search findings with the HVDC results and the details of Paul's life as gleaned from the interview data. These multiple sources of information allow a more precise determination of what the word search method can and cannot reveal.

The procedure for making the searches on Dreambank.net went as follows. With the matching mode set in "or," the given word string was entered into the query box, followed by clicking "search." To check the dream reports for false positives, "abbreviate dreams" was selected, followed by "show dreams" to produce a display of all the dreams on the right hand column with the search terms highlighted in yellow. If the use of a term was judged a false positive (defined as a typographical error, non-dream association, or post-dream comment; two research assistants helped in this process), the green check in the top left corner of that dream was clicked to remove it. After all the dreams had been read and checked in this way, the "redisplay" button at the very bottom of the right hand column was clicked, followed by a click on "repeat the search," also at the bottom of the right hand column. The resulting numbers in the "terms found" box in the middle of the left column were taken as the final result of the search.

2. Results

Table 1 provides the results of the word searches as applied to the HVDC male and female norm dreams.

Table 2 shows the results of four major HVDC categories (characters, social interactions, emotions, fortunes) as applied to the 136 dreams of the Paul series, coded by two independent assistants (intercoder reliability 73%), with differences resolved by the author consulting the HVDC coding rules. The results of these categories for the HVDC male norms are provided for comparison.

Table 3 shows the results of word searches on the Paul series, with the word search results from the HVDC male norms as comparison.

3. Discussion

The discussion of these findings starts with the HVDC norm dreams, focusing on comparisons of male and female frequencies with content analysis results from HVDC and others.

The word searches on the five senses produced results corresponding to earlier studies regarding the general sensory profile of dreaming. Vision occurs the most often in these dreams (37.9% M, 47.1% F), followed by hearing (12.2% M, 12.7% F), with occasional sensations of touch (6.5% M, 8.4% F) and almost no smell or taste (1% or less; see Van de Castle (1994), 293 ff. for a summary of comparable findings on the senses). Both men and women in the HVDC norms share this basic pattern of proportional frequency, suggesting a deeper psychological structure to dreaming perception.

Both men and women included a high number of words relating to perceptual intensity, especially the women (34.6% M, 46.3% F). The men used fewer color words than did the women, 7.9% vs.17.1% chromatic (red being the most often cited, 4.3% for men and 5.5% for women) and 7.5% vs. 11.4% achromatic, though it was also true that 81.6% of the HVDC dream reports (86.2% M, 75.1% F) do not contain any color references. It remains to be seen whether these findings reflect an absence of color in dreams or a failure of the individual to mention in his or her report the colors that were indeed part of the dream. The women were more likely than the men to mention esthetic appearances (12.6% M, 20.2% F). This difference, combined with the differences on vision, perceptual intensity, and color (a pattern also found in the HVDC coding system), point to a greater experiential vividness in the women's dream reports compared to the men's reports.

The word searches produced results for the emotions that mirror the proportions found from HVDC content analysis coding. Fear occurs the most often, sadness the least, with confusion, anger, and happiness in between. Both methods found considerably more emotion words among the women than the men. The evidence that fear is the most frequently occurring dream emotion may have important implications for understanding the functions of dreaming (Hartmann, 1998; Jung, 1974; Revonsuo, 2000), and so may the corollary result that 58.5% of HVDC dream reports (66% M, 51% F) include no mention of any emotion words, a finding that casts doubt on the idea that dreaming is always accompanied by heightened emotionality.

Turning to the categories for cognitive terms, references to awareness and speech were found much more often than the other cognition categories. The frequency of people reporting acts of noticing, realizing, or discovering something (20% M, 18.8% F) in their dreams suggests the active presence of a cognitive center within the dream state where, just as in waking, multiple aspects of the environment are selectively processed and identified (Fosse & Domhoff, 2007). The frequencies were considerably lower in the case of cognitive functions like imagination (2% M, 3.5% F), planning (4.1% M, 5.1% F), choice (5.5% M, 11.4% F), and effort (1.8% M, 1.6% F), which may reflect the limits of word searching to study dream cognition. The low number of references to reading and writing (6.7% for both M and F) in a sample of college students who are presumably doing a great deal of both activities each day seems noteworthy. This finding adds evidence to Hartmann's claim that the "three R's" are largely absent from dreaming (Hartmann, 2000).

Table 1
Results of word searches on HVDC norm dreams.

Category	Male frequency (%)	Female frequency (%)	*h*	*p*
Perception				
Vision	37.9	47.1	−.19	*.004
Hearing	12.2	12.7	−.02	.813
Touch	6.5	8.4	−.07	.256
Smell	1	.4	.07	.248
Taste	1	1.4	−.04	.564
Intensity	34.6	46.3	−.24	**.000
Chromatic color	7.9	17.1	−.28	**.000
Achromatic color	7.5	11.4	−.13	*.036
Esthetic evaluation	12.6	20.2	−.21	**.001
Emotion				
Fear	16.1	27.8	−.28	**.000
Anger	6.7	9.8	−.11	.076
Sadness	2.2	4.9	−.15	*.020
Confusion	7.5	10.2	−.10	.135
Happiness	6.1	10.8	−.17	**.008
Cognition				
Awareness	20	18.8	.03	.635
Speech	37.1	45.1	−.16	*.011
Imagination	2	3.5	−.09	.147
Planning	4.1	5.1	−.05	.454
Choice	5.5	11.4	−.22	**.001
Effort	1.8	1.6	.02	.808
Reading/writing	6.7	6.7	0	1.000
Nature				
Weather	7.1	5.5	.07	.301
Fire	5.3	2.9	.12	.055
Air	3.5	2.4	.07	.307
Water	13.8	16.9	−.09	.178
Earth	4.7	6.7	−.09	.175
Flying	4.5	2.4	.12	.068
Falling	9.6	7.1	.09	.156
Characters				
Family	26.7	39.2	−.27	**.000
Animals	11.2	11	.01	.921
Fantastic beings	.8	.6	.02	.706
Social interactions				
Friendliness	37.1	50	−.26	**.000
Physical aggression	26.5	13.9	.32	**.000
Sexuality	11	3.7	.29	**.000
Culture				
School	14.5	24.1	−.24	**.000
Transportation	26.9	22.9	.09	.147
Technology	8.4	7.3	.04	.522
Money	8.6	7.1	.06	.382
Christianity	3.7	4.5	−.04	.527
Death	4.9	6.7	−.08	.226

Note: The percentages for the male and female frequencies indicate how many dreams include at least one usage of the given words. The h statistic refers to the effect size between the two percentages. The p statistic refers to the significance of the differences between the two percentages, with * indicating significance at less than .05% and ** indicating significance at less than .01%.

A high degree of social cognition is present in dream reports as indicated by the frequency of speech and the accurate, effective use of oral language to communicate with other characters (37.1% M, 45.1% F). The cognitive skills of written literacy may appear in relatively few dreams, but the cognitive skills associated with spoken communication appear much more often, usually with no loss of ordinary functioning. As further suggested by the results on characters and social interactions discussed below, social cognition may be an especially good topic for studying the robust activation of sophisticated mental processes in sleep (see Kahn & Hobson, 2005b; Strauch & Meier, 1996).

Considering now the natural world, weather plays a small but discernible role in the HVDC norm dreams (7.1% M, 5.5% F). Words referring to one of the four classical elements (earth, air, fire, water) were also found in a modest number of dreams. Of these, water appeared the most often for both men and women (13.8% M, 16.9% F). It seems plausible that using elemental word searches in the comparative analysis of long-term dream journals will some day enable researchers to identify relatively "fiery," "airy," "earthy," or "watery" qualities to an individual's dream content. In what exact ways these aspects of dream content relate to waking life remains to be seen.

Table 2
Results of content analysis on Paul series.

Category	Paul series ($N = 136$) (%)	HVDC male norms ($N = 491$)	h	p
Characters				
Male/female	56	67	−.23	*.019
Familiar	33	45	−.25	*.011
Friends	21	31	−.23	*.018
Family	10	12	−.06	.509
Dead/imaginary	0	0	0	1.000
Animals	2	6	−.21	*.029
Social interactions				
Aggression/friendliness	28	59	−.64	**.000
Physical aggression	59	50	.18	.062
Negative emotions	71	80	−.21	*.030
Dreams with at least one				
Aggression	23	47	.51	**.000
Friendliness	65	38	−.55	**.000
Sexuality	8	12	−.13	.167
Misfortune	26	36	−.22	*.025
Good fortune	15	14[a]	.03	.769

[a] Figure from Bulkeley (2006).

Flying and falling dreams are categorized here as references (literal and metaphorical) to the natural force of gravity. There were very few dreams, less than one percent, in which the dreamer flew, floated, or glided in a magical, non-mechanical fashion, which replicates an earlier finding by Domhoff and Schneider (2008a). The high number of false positives that had to be discarded before identifying these dreams means the results for this word string cannot be taken as a reliable index of the frequency of flying dreams in the classic sense.

However, the results do accurately identify dreams with literal and metaphorical references to objects and characters flying, floating, and gliding in any form, either naturally, mechanically, or magically. HVDC norm dream references to falling occurred more often than flying, though not as often as might be expected given the high numbers of people who say they have experienced falling dreams (e.g., in Nielsen et al., 2003). Flying and falling are often included in lists of "typical" dreams, but the findings here suggest that what makes such dreams typical is not a function of their high frequency in the ordinary course of people's dream lives.

The results of word searches for characters corresponded closely to the content analysis coding results. Family terms appeared most often in the word searches, especially in the women's dreams (26.7% M, 39.2% F). Animals were mentioned less often, equally among the men and women (11.2% M, 11% F). Fantastic beings (including vampires, witches, monsters, aliens, etc.) appeared very rarely for either gender (<1%). This pattern of character frequency matches the results of HVDC content analysis: family characters the most frequent (for women more than men), animals less, and fantastic characters least of all. In light of their very different starting points, the convergence of results from word searches and content analysis suggests the two methods are both pointing to the same social patterns in dream phenomenology.

Word strings for social interactions of friendliness, physical aggression, and sexuality also found similar patterns identified by HVDC content analysis: much more physical aggression than sexuality, and more of both among men than women (26.5% and 11% M, 13.9% and 3.7% F). The word search found a bigger gender gap on friendliness (37.1% M, 50% F) than did HVDC content analysis (in which 38% of the men's dreams and 42% of the women's had at least one friendly social interaction).

The women used considerably more school-related words than did the men (14.5% M, 24.1% F), which might be connected to their higher frequency of family and friendliness words. More than a fifth of both men's and women's dreams referred to a specific, recognizable form of transportation (26.9% M, 22.9% F). The reports included fewer references to technology (8.4% M, 7.3% F), but enough to recognize a discernible impact of the material reality of this group's cultural world on their dreaming imaginations. Likewise with the frequency of money-related terms (8.6% M, 7.1% F), which reflect a basic familiarity with life as a consumer in a capitalist economy.

The frequency of Christian words was low for both the men and women (3.7% M, 4.5% F), comparable to the low frequencies found in another study of religious dream content (Bulkeley, 2009). However, in that latter study the few dreams with religious content were found (via interviews with the participants) to reflect accurate features of their religious ideas, feelings, and practices in waking life. This suggests that low frequencies do not necessarily denote practical or theoretical insignificance. In fact, some dreams with a strong impact on the dreamer involve unusual, infrequently appearing elements of content (Hunt, 1989; Knudson, 2001; Kuiken & Sikora, 1993). Word search methods can help researchers sift through large bodies of data to find statistically rare reports containing elements of content and process often associated with experientially powerful dreaming.

References to death occurred in a modest number of the HVDC norm dreams, slightly less for the men than the women (4.9%, 6.7%). The subjective impact of death-related dreams and their close connection with religious and spiritual belief

Table 3
Results of word searches on Paul series.

Category	Paul series frequency (%)	HVDC male frequency (%)	*h*	*p*
Perception				
Vision	9.6	37.9	−.70	**.000
Hearing	.7	12.2	−.55	**.000
Touch	5.1	6.5	−.06	.536
Smell	0	1	−.20	*.039
Taste	0	1	−.20	*.039
Intensity	25	34.6	−.21	*.030
Chromatic color	0	7.9	−.57	**.000
Achromatic color	1.5	7.5	−.31	**.001
Esthetic evaluation	13.2	12.6	.02	.853
Emotion				
Fear	8.1	16.1	−.25	*.010
Anger	1.5	6.7	−.28	**.004
Sadness	0	2.2	−.30	**.002
Confusion	2.2	7.5	−.26	**.008
Happiness	6.6	6.1	.02	.832
Cognition				
Awareness	21.3	20	.03	.740
Speech	16.9	37.1	−.46	**.000
Imagination	.7	2	−.12	.230
Planning	3.7	4.1	−.02	.831
Choice	9.6	5.5	.16	.106
Effort	4.4	1.8	.15	.113
Reading/writing	3.7	6.7	−.14	.159
Nature				
Weather	2.9	7.1	−.20	*.042
Fire	.7	5.3	−.30	**.002
Air	0	3.5	−.38	**.000
Water	6.6	13.8	−.24	*.013
Earth	1.5	4.7	−.19	*.048
Flying	0	4.5	−.43	**.000
Falling	2.9	9.6	−.29	**.003
Characters				
Family	16.9	26.7	−.24	*.014
Animals	3.7	11.2	−.30	**.002
Fantastic beings	0	.8	.05	.588
Social interactions				
Friendliness	35.3	37.1	−.04	.699
Physical aggression	6.6	26.5	−.56	**.000
Sexuality	8.1	11	−.10	.307
Culture				
School	20.6	14.5	.16	.097
Transportation	13.2	26.9	−.35	**.000
Technology	2.2	8.4	−.29	**.003
Money	3.7	8.6	−.21	*.032
Christianity	10.3	3.7	.27	**.006
Death	0	4.9	−.45	**.000

makes this another category with low frequency but high personal meaning and potential theoretical significance (Bulkeley, 2008b).

Turning to the Paul series, the word search results can be compared and evaluated in relation to (a) traditional content analysis of his dreams, (b) word search results for the HVDC males, and (c) verifiable details about his personal life. For the purpose of this paper, the Paul series is used as a good source of dream material to test the word search process. Much more could be said about the distinctive features of Paul's dreams in relation to his waking life, but that will have to await future investigation.

As shown in Table 2, which provides frequencies generated by traditional content analysis, Paul mentioned fewer male characters than did the men in the HVDC norms, and fewer characters of all types. His dreams involved much less aggression than the HVDC males, a bit less sexuality, and much more friendliness. He has slightly less emotional negativity and fewer misfortunes.

Looking at Table 3, the word searches also identified fewer characters of all types in Paul's dreams compared to the dream reports from the HVDC males. Paul's dreams had much less physical aggression and somewhat less sexuality. He used fewer descriptive terms for all types of perception and emotion, with the exception of happiness. His dreams include an equal or higher frequency of awareness, effort, and choice, with lower frequencies on the other cognitive categories. He

has fewer references to transportation, technology, and money than the HVDC males, but markedly more words relating to school and Christianity. His dreams make little mention of weather, the elements, or falling, and none at all to flying or death.

The parallel results of content analysis and word searching appear more striking when considered in light of the basic biographical details of Paul's life. At the age of 18 he became a Roman Catholic priest and lived in accordance with a strict monastic code until the age of 49, when he left the priesthood to marry a former nun and start a family. He worked as a school administrator until he retired in his mid-60's. He remains healthy, fit, and active. Following the continuity hypothesis (Domhoff, 1996) that frequency of appearance in dreaming reflects thoughts and concerns in waking life, several connections may be discerned between Paul's dream patterns and his waking circumstances. The word search findings on his school and Christianity references (not flagged by the content analysis) immediately and accurately identify the major institutional involvements of his life. His relatively positive emotions and social interactions mirror the actual tenor of his current waking life. The lower number of characters and external-world references reflect the cloistered perspective of his 31 years as a priest, although this may also be a function of his short reporting style.

A *dis*continuity between dreaming and waking appears with the sexual dreams. Paul himself expressed surprise at the high number of sexual references in his dreams, which he assured me were not accurate representations of waking world activities.

4. Conclusion

The results of this word search approach point to a basic compatibility with the findings of HVDC content analysis as shown by a comparison with both normative findings on men and women and the analysis of Paul's individual dream series.

Applied to the HVDC norm dreams, both word searches and content analysis highlight the same relative frequency and distribution of sensory perceptions (sight the highest, smell and taste the lowest), emotions (fear the highest, sadness the lowest), social interactions (more aggression than sexuality), and characters (more family than animal references). Both methods reveal gender differences possibly associated with the stereotypical social roles of American men and women (more aggression among the men, more emotions, esthetics, and social references among the women). Both provide evidence that dreaming involves some degree of activation of high-level cognitive skills, particularly in the areas of awareness and social intelligence.

The brief study of the Paul series strengthens the case for using word searches as a tool of dream research. Not only did the word searches yield the same general portrait of Paul's dream patterns as did the content analysis method, but it identified several details missed by content analysis that turn out to be highly significant in relation to his waking life (e.g., his experiences with school and Christianity).

These findings support the expanded use of word search technologies for the study of dream content and its relation to forms of waking consciousness. Detailed studies can now be made of lengthy dream journals in order to understand more fully how dream content relates to waking thought and experience. Such studies would be rare and time-consuming if they had to rely on standard coding systems.

The success of word searching does not eliminate the need for content analysis. On the contrary, the two methods may complement each other in at least two ways. First, word searches enable a more effective concentration of human-coding resources on those areas of dream content that elude automatic analysis (e.g., cognitive activities). Second, word searches can be used to quickly pinpoint instances of particular types of dream content (e.g., technology, colors, death) in large bodies of dream reports which may then be examined in greater depth by human coders using the HVDC or any other content analysis system.

However, the word search approach has several limitations, including the twin challenge of minimizing false positives (elements flagged by the word search that do not actually relate to the main search term) and false negatives (elements *not* flagged by the word search that *do* relate to the main search term). Reliability questions creep in whenever judgments are made in determining what is and is not a false positive. Fortunately this limitation may be overcome by anyone with access to the Internet who goes to Dreambank.net to read and evaluate the dreams for themselves according to the standard used here. Regarding false negatives, they can be reduced by further refinement of the word strings. But there may come a point of diminishing returns when the additional gains are outweighed by the increasing likelihood of false positives.

Word searches cannot easily distinguish metaphorical from literal references. In this study all references to the target terms were counted as long as they were not typographical errors, non-dream associations, or post-awakening comments.

Ultimately, success in using this approach depends on the quality of data. The more carefully participants are instructed about the details to include in their dream reports, the more fruitful will be the word search analyses of those reports.

Until researchers have gathered many more high-quality reports from a wide variety of people (ideally accompanied by multiple sources of biographical data), we cannot make any definitive declarations about the universal features of human dreaming. But the results of this study suggest several testable hypotheses:

1. Dreaming perception is primarily visual, with less hearing and touch and almost no smell or taste.
2. All emotions are represented in dreams, with fear the most frequent.
3. Many types of cognitive activity occur in dreaming, especially those associated with awareness and social intelligence.
4. Aggression is more frequent than sexuality, and both are more frequent for men than for women.

Further hypotheses regarding differences in gender, age, religion, and other aspects of the cultural and natural environments can also be developed out of these findings. For example, future research may find a metaphorical connection between nature-related words in dreams (e.g., weather, elements, animals) and emotions in waking life (following Lakoff, 2001; Lakoff & Johnson, 1980). More study of references to social cognition in dreaming (speech, characters, aggressive/friendly/sexual interactions) could reveal new features of the innately social orientation of the human mind (Wilson, 2000). Research with people who practice a mental discipline like meditation might find continuities with higher frequencies of awareness and perceptual intensity and lower frequencies of characters and social interactions. These and other hypotheses can now be put to the test using simple word search strategies. General patterns in dreaming that contain unexpectedly high or low frequencies may make it possible to see more clearly where there is continuity and discontinuity between dream content and people's waking lives.

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Appendix A. Word strings

Perception

VISION

^see^ ^sees^ ^seeing^ ^saw^ ^sights?^ ^visions?^ ^stare^ ^stares^ ^staring^ ^stared^ ^visuals?^ ^gaze^ ^gazes^ ^gazing^ ^gazed^ ^watch^ ^watches^ ^watching^ ^watched^ ^views?^ ^viewing^ ^viewed^ ^peeks?^ ^peeking^ ^peeked^

HEARING

^hears?^ ^hearing^ ^heard^ ^listens?^ ^listening^ ^listened^ ^sounds?^ ^sounding^ ^sounded^ ^noises?^ ^noisy^ ^loud^ ^loudly^

TOUCH

^touch^ ^touches^ ^touching^ ^touched^ ^holds?^ ^holding^ ^held^ ^hugs?^ ^hugging^ ^hugged^ ^embraces?^ ^embracing^ ^embraced^

SMELL

^smells?^ ^smelling^ ^smelled^ ^odors?^ ^aromas?^ ^stinks?^ ^stank^ ^stinking^ ^stench^ ^stenches^

TASTE

^tastes?^ ^tasting^ ^tasted^ ^sweet^ ^salty^ ^bitter^ ^salty^ ^delicious^ ^disgusting^

PERCEPTUAL INTENSITY

^very^ intense strong powerful tremendous extreme bright radiant brilliant shine glow overwhelm

CHROMATIC COLOR

^red^ ^reddish^ ^orange^ ^yellow^ ^blue^ ^indigo^ ^violet^ ^purple^ ^green^

ACHROMATIC COLOR

black gray white

ALL COLORS

^red^ ^reddish^ ^orange^ ^yellow^ ^blue^ ^indigo^ ^violet^ ^purple^ ^green^ black gray white

ESTHETIC

beauty beautiful beauties lovely attractive elegant gorgeous magnificent handsome ^cute^ fashionable excellent splendid sublime appealing nice ^good_looking^ ^good-looking^ ^well-built^ good

Emotion

FEAR

(?<!not_|n't_)(^apprehens(ive|ion)^|^afraid^|^fear(|ed|ing|ful)^|^anxi(ety|ous)|^guilt(|y)^|^embarrass(|ed|es|ing)^|^terrif(y|ies|ied)^|^horrif(y|ies|ied)^|^frighten(|s|ed)^|^scar(es|ed|ing)^|^worr(y|ies|ied|ying)^|^nervous(|ly|ness)^|^panick?(|s|ed|ing)|^alarmed^|^uneasy^|^upset^|^remorseful^|^regret(|ted|ful)^|^sorry^|^apologetic^|^ashamed^)

ANGER

(?<!not_|n't_)(^ang(er|ers|ered|ry)^|^annoy(s|ed|ing)|^irritat|^mad^|^provoked^|^furious^|^enrag(|e|ed|es|ing)^|^incensed^|^disgust(|s|ed)^|^indignant^|^peeved^|^infuriat(e|es|ed|ing)^|^pissed^)

SADNESS
(?<!not_|n't_)(^sad(|ly|ness)^|^disappoint(ed|ing)^|^distress(es|ed|ing)^|^depress(ed|ing)^|^lonel(y|iness)^|^misera
ble^|^hopeless(|ness)^|^heartbroken^|^unhapp(y|ily|iness)^)
CONFUSION
(?<!not_|n't_)(^confus(e|es|ed|ing|ion)^|^puzzl(ed|ing)^|^perplex(|es|ed|ing)^|^bewilder(s|ed|ing|ment)^|^undecided^|
^mystif(y|ied|ies|ying)^|^surpris(ed|es|ing)^|^astonish(|es|ed|ing)^|^amazed^|^awestruck^)
HAPPINESS
(?<!not_|n't_)(^happy^|^contented|^pleased^|^relieved^|^amused^|^cheerful(|ly)^|^glad^|^(feel|feels|feeling|felt|
very)_relaxed^|^gratified^|^(feel|feels|feeling|felt)_wonderful^|^elated^|^joyful(|ly)^|^exhilarat(e|es|ed|ing)|^ecsta
(sy|tic)^)
ALL EMOTION WORDS
(?<!not_|n't_)(^apprehens(ive|ion)^|^afraid^|^fear(|ed|ing|ful)^|^anxi(ety|ous)|^guilt(|y)^|^embarrass(|ed|es|ing)^|^terrif
(y|ies|ied)^|^horrif(y|ies|ied)^|^frighten(|s|ed)^|^scar(es|ed|ing)^|^worr(y|ies|ied|ying)^|^nervous(|ly|ness)^|^panick?
(|s|ed|ing)|^alarmed^|^uneasy^|^upset^|^remorseful^|^regret(|ted|ful)^|^sorry^|^apologetic^|^ashamed^|ang(er|ers|
ered|ry)^|^annoy(s|ed|ing)|^irritat|^mad^|^provoked^|^furious^|^enrag(|e|ed|es|ing)^|^incensed^|^disgust(|s|ed)^|
^indignant^|^peeved^|^infuriat(e|es|ed|ing)^|^pissed^|^sad(|ly|ness)^|^disappoint(ed|ing)^|^distress(es|ed|ing)^|
^depress(ed|ing)^|^lonel(y|iness)^|^miserable^|^hopeless(|ness)^|^heartbroken^|^unhapp(y|ily|iness)^|^confus(e|es
|ed|ing|ion)^|^puzzl(ed|ing)^|^perplex(|es|ed|ing)^|^bewilder(s|ed|ing|ment)^|^undecided^|^mystif(y|ied|ies|ying)^|
^surpris(ed|es|ing)^|^astonish(|es|ed|ing)^|^amazed^|^awestruck^|^happy^|^contented|^pleased^|^relieved^|^amused
^|^cheerful(|ly)^|^glad^|^(feel|feels|feeling|felt|very)_relaxed^|^gratified^|^(feel|feels|feeling|felt)_wonderful^|^elated^|
^joyful(|ly)^|^exhilarat(e|es|ed|ing)|^ecsta(sy|tic)^)

Cognition

AWARENESS
aware beware conscious ^senses?^ ^sensing^ ^sensed^ ^notices?^ ^noticing^ ^noticed^ ^observes?^ ^observing^ ^ob-
served^ ^realizes?^ ^realizing^ ^realized^ ^discovers?^ ^discovering^ ^discovered^
SPEECH
speech speeches ^speaks?^ ^speaking^ ^spoke^ ^talks?^ ^talking^ ^talked^ ^says?^ ^saying^ ^said^ ^talks?^ ^talking^
^talked^ ^discusses?^ ^discussing^ ^discussed^ ^whispers?^ ^whispering^ ^whispered^ ^yells?^ ^yelling^ ^yelled^
^shouts?^ ^shouting^ ^shouted^ ^calls?^ ^calling^ ^called^ ^utters?^ ^uttering^ ^uttered^ ^mentions?^ ^mentioning^
^mentioned^
IMAGINATION
imagination expectation anticipation prediction fantasy intuition ^imagines?^ ^imagining^ ^imagined^ ^envisions?^
^envisioning^ ^envisioned^ ^expects?^ ^expecting^ ^expected^ ^anticipates?^ ^anticipating^ ^anticipated^ ^predicts?^
^predicting^ ^predicted^ ^foresees?^ ^foreseeing^ ^foresaw^ ^forecasts?^ ^forecasting^ ^forecasted^ ^awaits?^ ^await-
ing^ ^awaited^ ^pretends?^ ^pretending^ ^pretended^ ^fantasizes?^ fantasizing^ ^fantasized^ ^intuits?^ ^intuiting^
^intuited^
PLANNING
^plans?^ ^planning^ ^planned^ ^prepares?^ ^preparing^ ^prepared^ ^intends?^ ^intending^ ^intended^ ^designs?^
^designing^ ^designed^ ^organizes?^ ^organizing^ ^organized^ ^arranges?^ ^arranging^ ^arranged^ ^invents?^
^inventing^ ^invented^
EFFORT
^efforts?^ ^struggles?^ ^patience^ ^self-control^ ^willpower^ ^persistent^ ^determined^ ^concentrates?^ ^concentrat-
ing^ ^concentrated^ ^focus^ ^focuses^ ^focusing^ ^focused^ ^meditates?^ ^meditating^ ^meditated^ ^contemplates?^
^contemplating^ ^contemplated^ ^prays?^ ^praying^ ^prayed^
CHOICE
^choices?^ ^chooses?^ ^decides?^ ^deciding^ ^decided^ ^accepts?^ ^accepting^ ^accepted^ ^approves?^ ^approving^
^approved^ ^prefers?^ ^preferring^ ^preferred^ ^judges?^ ^judging^ ^judged^ ^selects?^ ^selecting^ ^selected^ ^rec-
ommends?^ ^recommending^ ^recommended^
READING/WRITING
^read^ ^reads^ ^reading^ ^letters?^ ^sentences?^ ^paragraphs?^ ^chapters?^ ^books?^ ^magazines?^ ^newspapers?^
^writes?^ ^writing^ ^wrote^

Nature

WEATHER
weather tornado hurricane ^storms?^ thunder lightning blizzard ^winds?^ ^windy^ ^gusts?^ ^rains?^ ^rainy^ ^raining^
^rained^ ^snows?^ ^snowing^ ^snowed^ ^fog^ ^foggy^ ^sunny^ ^sunshine^
FIRE
^fires?^ ^fiery^ ^heats?^ ^heating^ ^heated^ ^flames?^ ^flaming^ ^flamed^ ^burns?^ ^burning^ ^burned^ ^combusti-
ble^ ^combustion^ ^suns?^ ^sunny^ ^stars?^ ^starry^ volcano volcanic ^lava^

WATER
^waters?^ ^watery^ ^watering^ ^watered^ ^wets?^ moist ocean ^seas?^ ^lakes?^ ^rivers?^ ^ponds?^ ^streams?^ ^creeks?^ ^rains?^ ^snows?^ ^ices?^ ^icy^ ^sleets?^ ^fog^ ^foggy^ ^mists?^
AIR
^airy?^ ^winds?^ ^windy^ ^gusts?^ tornado ^breathes?^ ^breathing^ ^breathed^
EARTH
^earthy?^ ^soil^ ^mud^ ^muddy^ ^dirty?^ ^rocks?^ ^rocky^ ^stones?^ ^gems?^ ^diamonds?^ ^crystals?^
FLYING
^fly^ ^flies^ ^flew^ ^flying^ ^floats?^ ^floated^ ^floating^ ^glides?^ ^gliding^ ^glided^
FALLING
^falls?^ ^fell^ ^falling^ ^collapses?^ ^collapsed^ ^collapsing^ ^drops?^ ^dropped^ ^dropping^
Characters
FAMILY
family families ^marriages?^ ^mothers?^ ^moms?^ ^fathers?^ ^dads?^ ^sisters?^ ^brothers?^ ^cousins?^ ^aunts?^ ^uncles?^ ^nephews?^ ^nieces?^ ^grandmothers?^ ^grandfathers?^ ^sons?^ ^daughters?^ ^grandsons?^ ^granddaughters?^ ^ancestors?^ ^parents?^ ^grandparents?^ ^in-laws?^
ANIMALS
^animals?^ ^birds?^ ^boars?^ ^chickens?^ ^deer^ ^cows?^ ^elephants?^ ^fish(es)?^ ^horses?^ ^fox(es)?^ ^pigs?^ ^pheasants?^ ^serpents?^ ^snakes?^ ^squirrels?^ ^turkeys?^ ^tigers?^ ^turtles?^ ^wol(f|ves)? ^the_bears?^ ^a_bear^ ^apes?^ ^monkeys?^ ^gorillas?^ ^lions?^ ^ducks?^ ^crocodiles?^ ^giraffes?^ ^pythons?^ ^pony^ ^ponies^ ^colts?^ ^mares?^ ^turtles?^ ^alligators?^ ^frogs?^ platypus ^rhinos?^ ^hippos?^ dinosaurs?^ ^mouse^ ^mice^ ^rats?^ ^rodents?^ ^owls?^ ^spiders?^ ^hamsters?^ ^skunks?^ ^rabbits?^ ^worms?^ ^lizards?^ ^bees?^ ^insects?^ ^bugs?^ ^goose^ ^geese^ ^eagles?^ ^hawks?^ ^ravens?^ ^sparrows?^ ^crows?^ ^canaries^ ^zebras?^ ^antelopes?^ ^bulls?^ ^sheep^ ^lambs?^ ^goats?^ ^panthers?^ ^leopards?^ ^bobcats?^ ^jackals?^ ^hyenas?^ ^(cat|kitten|kitty|kittie|feline)s?^ ^donkeys?^ ^raccoons?^ ^(dog|doggy|doggie|puppy|puppies|canine)s?^ ^vultures?^ ^pumas?^ ^lynx(es)?^ ^gerbels?^ ^hamsters?^ ^sea_lions?^ ^seals?^ ^whales?^ ^dolphins?^
FANTASTIC BEINGS
^vampires?^ ^ghosts?^ ^ghouls?^ ^spirits?^ ^demons?^ ^devils?^ ^monsters?^ ^werewolfs?^ ^werewolves?^ ^zombies?^ ^ogres?^ ^trolls?^ ^fairy^ ^fairies^ ^aliens?^ ^extraterrestrials?^ ^robots?^ ^cyborgs?^ ^androids?^ ^witch^ ^witches^ ^wizards?^ ^fiends?^

Social Interactions

FRIENDLY
^greets?^ ^greeting^ ^greeted^ ^welcomes?^ ^welcoming^ ^welcomed^ ^thanks?^ ^thanking^ ^thanked^ ^helps?^ ^helping^ ^helped^ ^advises?^ ^advising^ ^advised^ ^assists?^ ^assisting^ ^assisted^ ^encourages?^ ^encouraging^ ^encouraged^ ^saves?^ ^saving^ ^saved^ ^rescues?^ ^rescuing^ ^rescued^ ^praises?^ ^praising^ ^praised^ ^congratulates?^ ^congratulating^ ^congratulated^ ^congratulations?^ ^admires?^ ^admiring^ ^admired^ ^loves?^ ^loving^ ^loved^ ^friendly^ ^friendliness^ ^friends?^ ^boyfriends?^ ^girlfriends?^ ^hugs?^ ^hugging^ ^hugged^ ^embraces?^ ^embracing^ ^lends?^ ^lending^ ^loans?^ ^loaning^ ^loaned^ ^marry^ ^marries?^ marrying marriage wedding honeymoon ^loves?^ ^loving^ ^offers?^ ^offering^ ^commends?^ ^commended^ ^commending^ ^pity^ ^pities?^ ^pitying^ ^warns?^ ^warning^ ^warned^ ^protects?^ ^protecting^ ^protected^ ^acclaims?^ ^acclaiming^ ^acclaimed^ ^cheers?^ ^cheering^ ^cheered^ ^applauds?^ ^applauding^ ^applauded^ ^invites?^ ^inviting^ ^invited^ ^compliments?^ ^complimenting^ ^complimented^ ^visits?^ ^visiting^ ^visited^ ^honors?^ ^honoring^ ^honored^ ^engaged^ ^impressed^ generous generosity affectionate intimate ovation hello goodbye ^guests?^ ^hosts?^ hostess party parties partying ^gifts?^ social
PHYSICAL AGGRESSION
^kills?^ ^killing^ ^killed^ ^murders?^ ^murdering^ ^murdered^ ^punch^ ^punches^ ^punching^ ^punched^ ^shoots?^ ^shooting^ ^shot^ ^stabs?^ ^stabbing^ ^stabbed^ ^fights?^ ^fighting^ ^fought^ violent aggressive sadistic vicious pugnacious cruel antagonistic malice malicious ^attacks?^ ^attacking^ ^attacked^ ^robs?^ ^robbing^ ^robbed^ ^captures?^ ^capturing^ ^captured^ ^rapes?^ ^raping^ ^raped^ ^break_into^ ^breaks_into^ ^breaking_into^ ^broke_into^ ^wars?^ ^battles?^ ^battling^ ^battling^ ^invades?^ ^invading^ ^invaded^ ^quarrels?^ ^quarreling^ ^quarreled^ ^stabs?^ ^stabbing^ ^stabbed^ enemy enemies prisoner thief burglar criminal gangster mafia nazi jail prison ^hurls?^ ^hurling^ ^hurled^ ^by_force^ ^hits?^ ^hitting^ ^struggles?^ ^struggling^ ^pounces?^ ^pouncing^ ^bites?^ ^biting^ ^bitten^ ^pursues?^ ^pursuing^
SEXUAL
make_love makes_love making_love made_love intercourse love-making ^lover^ fool_around fools_around fooling_around fooled_around sleep_with sleeps_with sleeping_with slept_with necking ^kiss^ ^kisses^ ^kissing^ ^kissed^ ^sex^ ^sexy^ ^sexual^ ^sexuality^ have_sex has_sex having_sex had_sex flirt flirts flirting flirted arousal^ ^arousing^ erotic sensual horny seduce seducing masturbate ^erect^ ^erection^ ^incest^ ^incestuous^ orgasm ejaculate emission wet_dream ^nude^ ^naked^ unclothed undress disrobe scantily_clad

Common Culture

SCHOOL
^schools?^ ^schooling^ ^educates?^ ^education^ ^classrooms?^ ^students?^ ^teachers?^ ^professors?^ ^colleges?^ university universities academy academies ^kindergartens?^ ^graduates?^ ^graduations?^ library libraries ^textbooks^ ^academics?^ ^tests?^ ^testing^ ^tested^ ^exams?^ ^quiz^ ^quizzes^
TRANSPORTATION
^trucks?^ ^cars?^ ^automobiles?^ ^bus^ ^buses^ ^boats?^ ^ships?^ ^sailboats?^ ^bicycles?^ ^bikes?^ ^motorcycles?^ ^airplanes?^ ^planes?^ ^skateboards?^ ^trains?^ ^subways?^ ^carts?^ ^elevators?^ ^escalators?^
TECHNOLOGY
Technology technologies ^computers?^ ^printers?^ ^machines?^ machinery ^engines?^ ^mechanisms?^ email internet website fax modem ^typewriters?^ ^telephones?^ ^cell_phones?^ ^televisions?^ ^tvs?^ ^movies?^ ^films?^ ^videos?^ ^dvds?^ ^radios?^ ^ipods?^ ^iphones?^ ^telescopes?^ ^microscopes?^
MONEY
money cash dollar ^cents?^ ^coins?^ wealth ^rich^ poverty buy sell purchase expense expensive ^cost^ ^costly^ finance financial business ^invest^ economic economics
CHRISTIANITY
^jesus^ ^christ^ ^god^ ^Christians?^ ^christianity^ ^christmas^ ^religio ^church^ ^churches^ ^cathedrals?^ ^heaven^ ^hell^ ^devils?^ demons?^ ^satan^ bible ^prays?^ ^praying^ ^prayed^ ^nuns?^ ^monks?^ ^pope^ ^sacred^ ^holy^ ^altar^ ^priests?^ ^ministers?^ ^bishops?^ ^sermons?^ ^crucifix^
DEATH
death dead ^die^ ^dying^ deceased lifeless

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