Comprehensive analysis of the dream content of people with blindness, using the Hall and Van de Castle system

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Summary. Dreams result from brain activity during sleep, and they can be similar to experiences during the day. The brain changes extensively in response to sensory deprivation to adapt to the environment. The main goal of this study is to analyze the content of dreams of blind people—those lacking one of the primary senses. A total of 135 dreams were collected from 17 blind people. Dreams were coded using the Hall and van de Kessel method. The frequency of each category in dreams was calculated and compared with sighted people. The reports of physical aggression interactions, misfortunes, and seeing activity were more common in the group of sighted people than in blind people, and non-physical interactions and good fortune were more common in blind people than in sighted people. The ratio of aggressive to friendly interactions in sighted men and women and blind men was over 50%. The frequency of success and failure groups was not significantly different between the two groups of sighted and blind people. The hypothesis of dream continuity could support some of the findings, and various dream elements may be connected to and impact one another, but further research is required to understand these relationships fully.

Keywords: Coding system, dreams, blindness

1. Introduction

Dreams are a wide range of involuntary, recurring mental experiences that happen when one is asleep; when dreaming, the mind might experience things that resemble conscious experiences (Domhoff & Fox, 2015; Elce et al., 2021; Nir & Tononi, 2010).

The initial hypothesis regarding dreams was primarily based on Freud's studies, which suggested that latent desires form the basis of dreams. Current research, however, indicates that dreams assist with memory processing, problem-solving, emotion regulation, and psychological adaptation (Eiser, 2005; Glucksman, 2001; Meir H. Kryger, 2021).

One of these theories is the continuity hypothesis. This hypothesis states that a significant percentage of the experiences and events we see in dreams are the result and continuation of waking life events (Hall & Nordby, 1972). Studies (Elce et al., 2021; Ma et al., 2022) also stated that dreams are a new scenario in which salient elements related to our waking life concerns and experiences are shown in combination with each other. Also, the emotions of waking life can affect dreams, and the emotions of dreams can affect the waking life the next day. The more intense these emotions are, the greater the effect is (Schredl & Reinhard, 2010).

Although some cognitive processes may not be represented in dreams compared to waking life (Schredl & Hofmann, 2003).

The compensation hypothesis states that dreams provide a safe environment in which the dreamer can re-experience the emotions, shortcomings, and events he had in his waking life and could not resolve (Mathes & Pietrowsky, 2022). According to a study (Malinowski, 2015), thoughts that are suppressed during the day can appear in dreams.

Blindness and dreaming

Visual impairment can be more uncomfortable than any other disability or disorder. Thirty-nine million people worldwide are blind. Blindness is a global problem that creates many limitations and issues for people (Bhuvaneswari et al., 2016; He et al., 2020; Tunde-Ayinmode et al., 2011). However, this issue can also cause extensive changes in the structure of the brain.

These extensive changes in the structure and function of the brain help the blind person to better adapt to the environment. For example, these people make better use of their other senses and process sound, touch, and smell more deeply. Several studies have shown that the part of

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the occipital cortex, which is responsible for processing visual information, reacts at different levels to non-visual inputs, especially auditory information (Hawellek et al., 2013). It is even a participant in language processing (Lane et al., 2015). When primary visual stimulation is absent, tactile and auditory sensory inputs, in addition to vision, can influence the functioning of the occipitotemporal visual system. The reason for this is that during the growth and maturation of the brain, the cerebral cortex shows compensatory flexibility (Andrade, 2021).

How dreams, which are not under the individual's control, adapt to changes in the sensorimotor system is controversial. Studies have shown that congenitally blind people who have no visual perception of their surroundings can also have visual images in their dreams (Bértolo et al., 2003). Studies in this field are not very extensive; for this reason, it is still unclear how and to what extent vision loss can affect the integration of sensory information or the form of reporting elements in a dream (Kang et al., 2023).

Dream content Analysis

Quantifying dreams for statistical research and analysis is better because they are qualitative data. Daily dream reports, written or spoken that the dreamer provides after awakening are one of the primary methods of gathering data from dreams (Elce et al., 2021).

There are different systems for quantifying dreams; one such system is the Hall and Van de Castle system (HVDC) coding system, which is the best-validated system and allows scoring and comparing different dream elements (Hall & Van de Castle, 1966; Holzinger et al., 2020).

Aim

Dream studies are essential to our understanding of how the brain works. Sensory inputs, especially vision, absent in blind people, are the basis for forming dreams since dreams are primarily visual. On the other hand, the studies conducted so far on the dreams of blind people are few and limited and have not comprehensively investigated the dreams of these people. Therefore, a comprehensive analysis of the dreams of blind people can help expand our knowledge about the content of dreams, how they change in different conditions, and better understand the various existing hypotheses.

2. Method

2.1. Participants and Procedure

Initially, several people who were blind were asked to introduce us to any blind people they knew who would be willing to participate in the project. Then, the method and purpose of the study were explained to the participants. Participants willing to cooperate were assessed for psychiatric disorders using DSM5 criteria. Their physical condition, excluding blindness, was checked through history and examination. In this study, pregnant women, shift workers, and people who had severe mental disorders or physical problems disturbing sleep were excluded from the study. Cronbach's alpha coefficient for the Persian version of this questionnaire is 0.87 and has good validity and reliability (Ebadi M et al., 2002). After obtaining informed consent, eligible subjects were included in the study. Subjects could withdraw from the study if they did not wish to continue cooperation.

2.2. Dream collecting

One of the primary and efficient methods of investigating dream content is the report given by the dreamer after waking up. Collecting verbal reports every day for several weeks makes it easier for the dreamer to gather and report the experiences, making the description of the dream report more accurate.(Elce et al., 2021).

Each participant received a number. The subjects recorded their dreams using their phones within the first five minutes of waking up every morning for a month. The author then received the recordings and wrote down every sound. The first step involved analyzing the person's dreams to confirm that what was reported was just the person's dream. "I dreamed that" was the beginning of every dream. Then, the dreams entered the MAXQDA 2018 software.

2.3. Dream coding

This study is descriptive and based on a qualitative strategy (content analysis). The sample size was 135 dreams; each person reported at least seven dreams. Because many elements in dreams occur in less than half of all dream reports, at least 100 to 125 dream reports from each group or individual are required for a comprehensive study (William Domhoff & Schneider, 2008).

The content analysis system developed by Hall and Van de Castle, which is extensively described in the book Content Analysis of Dreams, was used to examine the collected dreams (Hall & Van de Castle, 1966). Statistical analysis and A coding system based on this system can be found online at www.dreambank.net (Schneider & Domhoff, 2001).

After carefully reading the book and completing the exercises, two trained writers in this field started coding the dreams using all ten of the system's scales outlined in this book. The authors did the coding process manually because the reported dreams were in Farsi, and the systems designed so far to code dreams were for dreams in English. Except for the negative scale, data from the dream pertinent to the waking world and that the dreamer had not seen in the dream—such as those where the dreamer compared what he saw in the dream to the waking life—were identified and not coded. The authors used the ten categories described by HVDC for the second analysis, which focused on the content of the dream reports.

These ten categories are:1) Characters, 2) Settings, 3) Objects, 4) Achievement outcome, 5) environmental press, 6) Emotions, 7) Social Interactions, 8) Activities, 9) Descriptive Elements, 10) Theoretical scale

Research has indicated that a person's gender can influence dreams' content (Hall et al., 1982). To compare each study group with its same-sex normal, we separated them into male and female gender categories. How to calculate percentages and report them is taken from the book "Finding Meaning in Dreams" (Domhoff, 1996), which is given in the following table..

2.4. Date analysis

Data were examined using SPSS software, version 26. The calculated percentages were compared with the calculated values of the dream content analysis book. The One-Sam-

ple Proportions Test was used to compare percentages. This test compares the incidence rate among groups. For the data to be more accurate, as mentioned at the bottom of the tables on how to calculate each group, the raw numbers obtained from each group must be divided by the total amount of their group. In this way, the obtained numbers can be compared with each other. This test helps us determine if the ratio obtained from our study sample differs from the normative numbers obtained from the sample of sighted people.

3. Results

In this study, 17 individuals older than 18 were included. Every participant had at least a diploma, ranged in age from 21 to 58, and was completely medically blind. The average age of the participants was 2.09 ± 35.

Among the participants, 64.7% were congenitally blind, and 35.3% had developed blindness during their lifetime after age eight. Each person reported 7.94 dreams on average. We examined 135 dreams in total. When there was a disagreement among the scale subgroups, we arranged a session to discuss their coding and give each other feedback. At the end of the session, a final score was assigned for coding. Two participants stated that they dreamed several times during one night, and each time the person said, "My dream ended here and entered another dream," the other dream was scored separately. The Hall/Van de Castle dream content analysis system was applied to Case Western Reserve University's male and female dreams (500 female and 500 male dreams). The results of that study formed a set of "norms" listed in https://dreams.ucsc.edu/Norms. In this study, these data were used for comparison with blind people.

Table 1 shows the mean frequency of reporting at least one case of each category in blind men and women, along with their standard deviation (S.D).

Table 2 compares the frequency of each category, and its subgroups in blind men and women to the findings considered normative for sighted men and women.

4. Discussion

In studying large samples, it is good to know what percentage of dream reports have "at least one" of each category (Domhoff, 1999).

In the present study, the percentage of participants' dreams with at least one achievement outcome was lower in women than in men, and the rate of dreams of participants with at least one emotion was lower in men than in women.

The quantitative analysis of the data and dream content in this study revealed that, rather than acquaintances and family, most of the characters that both blind men and women saw in their dreams were friends who were of their own gender.

Compared to sighted women, the ratio of non-physical aggression in the group of blind women is significantly higher; however, in their dreams, the proportion of physical aggression and overall aggression was much lower. According to the theory (Crick & Mitchison, 1983) that dreaming eliminates specific unwanted memories, it may be said that this is the cause of aggression in dreams Because aggression is a type of interpersonal interaction that aims to harm another person (Nelson & Trainor, 2007), but this involvement is dangerous for the organism (Chen & Hong, 2018). Therefore, in waking life, a person tries as much as possible to avoid these processes.

Table 1. The reporting at least one item from each of the categories

	Women		Men	
	mean	SD	mean	SD
Locations	85.71	18.07	84.06	19.71
Character	92.86	11.96	92.85	9.59
Object	97.62	5.83	96.75	5.86
Interactions	73.81	22.89	70.71	15.76
Activities	95.24	7.38	97.4	5.78
Achievements outcome	52.38	26.60	32	14
Environmental press	54.76	33.10	48.76	16.42
Emotions	38.10	35.76	56.28	26.43
Negative	83.33	21.03	70.87	22.57
Descriptive element	80.95	21.51	81.34	19.35
Temporal	26.19	16.7	14.59	10.24
Theoretical scale	71.42	20.20	53.52	14.4

Locations= (Dreams with at least one location÷ Number of dreams) ×100
Characters= (Dreams with at least one character ÷ Number of dreams) ×100
Objects= (Dreams with at least one object ÷ Number of dreams) ×100
Interactions= (Dreams with at least one interaction÷ Number of dreams) ×100
Activities= (Dreams with at least one activity÷ Number of dreams) ×100
Achievements outcome= (Dreams with at least one Achievements outcome ÷ Number of dreams) ×100
Environmental press= (Dreams with at least one Environmental press ÷ Number of dreams) ×100
Emotions= (Dreams with at least one emotion ÷ Number of dreams) ×100
Negative= (Dreams with at least one negative ÷ Number of dreams) ×100
Descriptive elements= (Dreams with at least one Descriptive element ÷ Number of dreams) ×100
Temporal=) Dreams with at least one temporal ÷ Number of dreams) ×100
Theoretical scales= (Dreams with at least one Theoretical scale ÷ Number of dreams) ×100

Since sighted people have fewer physical limitations than blind people and interact more with others and their surroundings, and most of the interactions of blind people are verbal, based on the hypothesis of "continuity" of the dream (M. Schredl & F. Hofmann, 2003) it can be expected that aggression in sighted people is more of a physical type. In blind people, it is often of a non-physical type.

Bodily Misfortunes are diseases, injuries, physical defects, or mental problems that a person sees in a dream and are calculated by dividing the total number of category 5 and 6 misfortunes by the total number of misfortunes seen in a dream. This category can signify psychological damage (Domhoff, 1996). Although it had been expected that blind dreamers would report a higher percentage of bodily misfortunes because of their incapacity to see, the percentages did not differ significantly. Blindness is a problem that carries heavy emotional and psychological stress. The research (Voss et al., 2011), which looked into the theories of the continuity and discontinuity of dreams, revealed that the structure and content of dreams in individuals with sensory impairments—such as congenital paraplegia and deafness—do not differ from those of healthy control subjects. This finding supports the theory that physical defects are not always expected to appear in dreams.

The rate of failure and success in both groups of blind men and women was not significantly different compared to sighted people, and the rate of failure in both groups of sighted and blind women was higher than that of blind men.

Table 2. Comparisons of dream content subcategories with normative results HVDC system based on gender differences.

		Men (42 dreams)	Men Norms (500 dreams)	Two-Side p	Women (93 dreams)	Women Norms (491 dreams)	Two-Side p
Character	TOTAL	136	1180		268	1423	
	Most frequent (Percent)	1MKA (19.85%)			1FKA (19.77%)		
Aggression	Physical (8-5)	39.4%	50%	.223	14.5%	34%	.001
	Non-physical (1 -4)	60.6%	50%	.229	85.5%	66%	.001
Interaction	Aggression	49.3%	55.4%	.348	38.73%	50.75%	.004
	Friendliness	43.3%	34.5%	.136	59.2%	46.4%	.002
	Sexuality	7.5%	10%	.516	2.1%	2.9%	.644
	Aggression/Friendliness	52.8%	59%	.365	44.2%	51%	.188
Environmental press	Misfortune	79.4%	87.2%	.196	56.7%	87.7%	.000
	Good fortune	20.6%	14.9%	.358	43.3%	12.3%	.000
	Misfortunes to dreamer	85.2%	71%	.099	73.5%	67%	.430
	Good fortunes to dreamer	100%*	90%	.810	100%	79%	.624
Misfortune	Bodily Misfortunes	33.3%	29%	.613	35.3%	35%	.958
Achievement outcome	Success	41.4%	50.3%	.344	41.9%	41.3%	.936
	Failure	58.6%	49.7%	.344	58.1%	58.7%	.937
	Dreamer-involved successes	91.7%	89%	.860	76.9%	87%	.311
	Dreamer-involved failures	76.5%	86%	.284	83.3%	83%	.979
Emotion	Most frequent	AP (31/8%)	AP (34%)		HA (32/5%)	AP (37%)	
	Negative Emotion	86.4%	80%	.487	67.5%	80%	.010
Activities	Most frequent	V 34/2%	P 27%		V 31.1%	V26%	
	Visual	8.5%	12%	.050	6.5%	12%	.000
Modifiers	Most frequent	I+ 31.1%	I+29/4%	.688	I+ 36.6%	I+30/1%	.037
Castration anxiety	Castration anxiety percent	73.91%			65.38%		
	Castration	17.4%			26.9%		
	Penis envy	8.7%			7/7%		
Castration anxiety	Most frequent	CA1= 76.47%			CA2= 58.8%		
Penis envy	Most frequent	PE 1= PE2= 50%			PE 1= 100%		
Oral reference	Most frequent	OI = 90%			OI = 83.87%		
Regression	Most frequent	RE1= 67%			RE1= 45.45%		

* In all the good fortunes that happened to men, the dreamer was also present.
Friends Percent = known characters ÷ all human characters
Physical or non-physical aggression percent= Physical or non-physical aggression ÷ total number of aggression
Aggression or Friendliness or sexually Percent= dividing the number of each aggressive, friendliness or sexuality interactions by the total number of aggressive and friendly and sexuality interactions
Aggression/Friendliness Percent= Dreamer-involved aggression ÷ (D-inv. aggression + D-inv. friendliness)
Misfortunes to dreamer= Misfortunes that dreamer involve ÷ total number of Misfortunes
Bodily Misfortunes Percent= (M5 + M6) ÷ all misfortunes
Dreamer-involved successes or failure= dreamer-involved successes or failure ÷ (dreamer-involved successes + dreamer-involved failures)
Negative Emotion Percent= negative emotions (AN + AP + SD + CO) ÷ (negative emotions + positive emotions)
Visual percent= Visual activities ÷ all activities

The study (Glucksman & Kramer, 2017) showed that depressed people dreams contain more failures. Perhaps it can be said that because the criteria of failure and success are subjective concepts, they are related to a person's view of himself and life, and diseases that affect mood can change the content of success and failure. Since the mental health of our participants was not a problem, such results can be expected, but general conclusions in this field need more studies.

This study showed that the most common emotion reported in blind and sighted men was apprehension, while blind women reported more happiness. Compared to the entire female population, the female participants of the study group showed lower levels of negative emotions. According to the study (Maggiolini et al., 2020), adults often worry about losing control or being unable to fulfill their obligations in waking life. However, the study's findings also demonstrated that Emotions experienced in waking life can be repeated directly in dreams, which the hypothesis of continuity of dreams can justify. According to a study (Fabik, 2023) showed that repressed or unresolved emotions persist in waking life and manifest in dreams. Studies have shown that both dreams affect the emotions experienced the next day, and the emotions experienced affect dreams (Zhang et al., 2024). Blind female participants in our study reported feeling more happiness than other emotions in their dreams. Perhaps this is related to the type of interactions reported in these people's dreams. Friendly interaction in the group of blind women was higher than aggressive in-

teraction. These results may indicate the impact of the quality of interactions on the emotions experienced.

Verbal activity was the most frequent in both groups of blind men and women and sighted women, followed by character movement in second place. Physical activity had the highest percentage of activity in the dream of sighted men. The study (Chauhan et al., 2022) showed that dreams can reflect the body and its activities in the waking world. To compensate for their disability, blind people are less likely to engage in physical activities that require them to move around a lot. These people use the sense of touch to discover and understand their surroundings and use language to express their wishes (Chebat et al., 2020). The study's findings indicate that what links this group of people to the outside world is recurring in their dreams.

The report of the verb "seeing" in the dream of blind people was less than that of sighted people. Examining dreams more closely, the highest frequency of "seeing" reports among blind people was reported by a woman who had been blind since birth. The EEG study of congenitally blind people showed that people who have never had visual experiences can have dreams of a visual nature. This study (Lopes da Silva, 2003) considers the activation of the cortical areas responsible for visual representations as the reason for the existence of such images. In sum, another study (Meaidi et al., 2014) conducted on evaluating dream content in blind and sighted groups stated that congenitally blind people had dreams of a less visual nature than other groups.

Modifiers include adjectives and adverbs used to describe something. Compared to other groups in this category, intensity + group was the most reported modifier in women and men (sighted and blind). Also, this group was more among blind people than sighted people.

During dreams, external sensory inputs are blocked, internal impulses intensify, and the dream imagery state increases (Tsunematsu, 2023). It may be said that sensory deprivation in blind people strengthens other impulses, activating parts of the brain that are not used much during waking hours. On the other hand, dreams involve complex imaginary scenes based on memory. The hippocampus, which is responsible for creating details in dreams, facilitates this process (Wamsley, 2020).

According to the study (Leporé et al., 2009), due to the adaptive response to sensory deprivation and increased demands on the memory system in specific locations for blind people, these people have larger hippocampal areas than sighted people. People who are blind have to memorize a lot of information to compensate for their lack of spatial awareness. Perhaps these people report the events that happen in their dreams with more accuracy and detail because their hippocampus is more active.

The frequency of the Achievement outcome category (Success and Failure) did not differ much between the sighted and blind groups, especially since the frequency of this group was almost the same between sighted and blind women.

Information on the frequency of castration anxiety category in sighted people was not available. In the groups of blind women and blind men, the frequency of CA1 was higher in men and CA2 in women. This finding means that castration anxiety in men's dreams was more of the type of harm or threat to their own body and, in women, more of the kind of harm or defect in belongings.

Domhoff reported that the dreams are often related to the past or, in other words, "regressive" in nature. This category was created to examine these states quantitatively. It consists of seven simple subcategories that include events such as being younger, being in areas not recently visited, and seeing someone the dreamer has not seen in over a year (Domhoff, 1996). In the Regression category, men and women dreamed of a situation they hadn't been in for at least a year.

5. Limitations

This study focused on analyzing the content of reported dreams. The small number of people studied due to social problems and the difficulty of blind people's cooperation caused the information obtained from them to be small. This research was conducted only on blind people in Iran. We suggest that in the next studies, the sample size should be increased, and the study should be done multi-centered, using different cultures. On the other hand, due to the study's limitations, these people's cortical activity could not be evaluated while dreaming, which is recommended to be investigated in future studies.

Another limitation of this study was that we did not simultaneously sample sighted people in our community. Therefore, we used the standard numbers from Hall and Van de Castle's Dream Content Analysis book.

6. Conclusions and Future Directions

The study's findings indicate that the various elements of dreams are connected and have the potential to influence one another, but further research is needed to understand these relationships fully.

With so many studies on the subject, it appears that dreams are no longer just a byproduct of sleep but rather a significant concept that can be measured individually. In the future, it may even be possible to use dreams as a paraclinical finding in diagnosing and following certain diseases.

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