Quantum field structure of dream spacetime

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Summary. Self transforms between physical and dream spacetimes, but dream spacetime entities and events appear weird, bizarre, or like psychosis. Language, entities, and events of dream narratives were analyzed to determine the geometry and attributes of dream spacetime. Dream narratives were collected from medical students and subjects of Dream Database. Dream spacetime language was compared with tweets, novels, and novellas. Dream narratives and dream corpora were embedded in multidimensional vector space, projected to two dimensional vector space, and clustered using K-means algorithm. Elapsed times of dream events were compared with expected duration in physical spacetime. Mean age (25 % IQR) of 285 undergraduates, 160 males and 125 females, was 25 years (23–26). There were 1,428 dream narratives, 2,072 tweets, and 28 novels or novellas. Vocabulary of dream corpora had similar size, diversity, and density as novels and novellas. Dream narratives clustered into semantic categories, while dream corpora clustered with corpora of fiction, satire, humor, farce, and comedy genre. Terms, entities, and events of medical practice occurred significantly in medical students' dream spacetime. Physical spacetime entities and events are transformed to dream spacetime, but manifold, time dimension, and attributes are not usually preserved. The past, present, and future are perceived in dream spacetime. Time reversal symmetry, non-locality, entanglement, teleportation, and relativistic velocity close to the velocity of light indicate that dream spacetime has quantum field structure. Thus, physical spacetime reality is not symmetrical with dream spacetime reality.

Keywords: Dreams, bizarreness, psychosis, spacetime, quantum, relativity, manifold

1. Introduction

Dream spacetime entities and events are mostly derived from physical spacetime (Oluwole, 2019), but the manifolds of entities differ significantly between the two spaces. Human manifolds may transform to animals or inanimate objects in dream spacetime. The transformations may be static, or the entities may deform progressively and return to initial form. Attributes of entities are also not always preserved in dream spacetime (Revonsuo, 1995; Salmivalli, 1995), where Self may fly, unable to move, or gain supernatural knowledge. Perception may occur without visual, auditory, or other sensory input, while communication between Self and entities may be non-verbal. Time flow is not unidirectional, while events in dream spacetime events are typically fleeting, re-ordered (Scarone et al., 2007), or compressed into shorter duration. The geometry and attributes of dream spacetime, which have been compared to psychosis (Hobson, 2004), and bizarreness (Boag,2006; Hunt, Ruzycki-Hunt, Pariak, & Belicki, 1993; Revonsuo, 1995; Salmivalli, 1995), suggest that Self oscillates two distinct realities.

Bizarreness and weirdness of dream spacetime suggest that geometries of entities that are stored in memory do undergo extreme transformations in dream spacetime. The geometries of physical spacetime entities that are stored in cognitive spaces of neocortices (Montagrin, Saiote, & Schiller, 2018; Warglien, Gärdenfors, & Westera, 2012) are the major sources of dream images (Oluwole, 2019), but these geometries are not veridical of observed entities and physical spacetime (Gilinsky, 1951; Loomis, Philbeck, & Zahorik, 2002; Ono, 1979) due to multiple transformations. Retina images, which are the first neural input of visual experiences, are conformal transformations (Nadiia & Valentin, 2018; Schwartz, 1977) which preserve angles and direction, but not distance. These images are further transformed in the lateral geniculate nuclei and visual neocortices (Hurdal & Stephenson, 2004; Schwartz, 1977) to Riemannian manifolds (Indow, 1991; Koenderink, Van Doorn, Kappers, & Todd, 2002; Koenderink, Van Doorn, & Lappin, 2000; Luneburg,1950; Mesulam, 1998). Consciousness and cognition have been modeled as quantum field system, (Wolf, 1996, 2018), rather than as classical mechanical system. Consciousness system has been modeled as superposition of quantum bases vectors or qubits (Wolf, 2018). The dream spacetime, however, is external to consciousness and its manifold, which are projected or transformed to it. Problems of physical spacetime have been solved (Mazzarello, 2000; Rothenberg, 1995), and future of physical spacetime has been perceived in dream spacetime. Language, entities, and events of dream narratives were analyzed to determine the geometry and attributes of dream spacetime.

2. Methods

This study defined Self as the manifold of the physical body and consciousness. Self, therefore, appears unchanged in dream spacetime when transformation or projection is translational. To determine the geometry and attributes of dream spacetime, medical students who performed similar daily routines, and lived in the same Hall of Residence were studied. Details of these subjects, who were randomly selected from the list of students in the Hall of Residence, had been published (Oluwole, 2019). All subjects interacted with spacetime entities like Hospital and University build-

ings, lecture rooms, and with person entities like nurses, doctors, and patients. Spacetime events included lectures, ward rounds, emergency medicine, and examinations. Subjects kept dream diaries, which were recorded on awakening, for two weeks. All entities and events in the dreams were recorded. Dream narratives of a 2015 survey in dream database (Bulkeley, 2019) were sampled to serve as controls. The number of narratives in dream database corpus was randomly chosen to match the number of narratives in medical students' dream corpus.

Tweets, which are fragments of spacetime events, were randomly selected from the database of Nigerian tweets. Total number of tweets matched the number of sentences in a dream corpus. Similar number of sentences were randomly sampled from two novels, Emma by Jane Austen and Passion in Rome by Morley Callaghan, which served as controls for size, diversity, and density of vocabulary.

2.1. Text Preprocessing

Corpora were tokenized to sentences or words using NLTK of Python programming version 3.7.4, 2019. Tokens were lower cased, stripped of white spaces, double words, contractions, and punctuations. Hashtags, urls, smileys, and emojis were removed from tweets. To calculate lexical density, tokens were parts of speech tagged to identify proper nouns, nouns, adjectives, verbs, adverbs, coordinating conjunctions, determiner, and punctuations using the Spacy module of Python programming.

To generate word-cloud and named entities, tokens were lemmatized and digits were removed. Phrases like mother in law, and HIV positive were hyphenated to mother-in-law, and HIV-positive. Similarly, phrases in medical students' dream corpus like Senior Registrar, Blood Bank, and Ward Rounds were hyphenated to single words, while phrases like high school, parking lot, swimming pool, grocery store, living room in dream database corpus were also hyphenated to single words. Generally, phrases like United States of America, United Kingdom were reduced to hyphenated words. Narratives for sentence embedding were not lemmatized.

2.2. Vocabulary and Named Entities

Vocabulary size and frequency of words in corpora were determined using Textacy and NLTK modules of Python Programming. Lexical diversity was defined as the proportion of unique words in the corpus. It was, however, calculated using the measure of textual lexical diversity (MTLD) (McCarthy & Jarvis, 2010), which corrected for length of text. Lexical density was defined as the proportion of lexical words in the corpus. Lexical words, which are content or information carrying words, include nouns, verbs, adjectives, and adverbs, while grammatical words are determiners, pronouns, prepositions, auxiliary verbs, numerals, and conjunctions. Lexical density, therefore, measured the amount of information carrying words in the corpus.

Named entities, which included persons, animals, places, organization, climate and others, were determined using pretrained model in the Spacy module of Python programming. Specific place entities like Hospital and University buildings, Hall of Residence, lecture Halls were added to the model. Specific person entities like colleagues, nurses, doctors, patients were also added to the model.

2.3. Embedding and Clustering

To determine if there are clusters of experiences in dream spacetime, dream narratives were embedded in multi-dimensional vector space. Embedding was done using the Bidirectional Encoder Representations From Transformers (BERT), which was implemented in Tensorflow module of Python programming (Devlin, Chang, Lee, & Toutanova, 2018). Multidimensional scaling, a manifold learning algorithm, was used to project the embedded space to two dimensional space, which was clustered using K-means algorithm. The optimal number of clusters was determined using the silhouette algorithm.

To determine if dream corpora were similar to corpora of diverse genre, novels and novellas were downloaded from the Guttenburg Project and from the Brown Corpora of natural language tool kit (NLTK). Sentences were randomly sampled from each novel or novella to match the number of sentences in dream corpus. The two dream corpora, the

Table 1. Distributions of Entities in Corpora

Entities	Medical Students n (95% CI)	Dream Database n (95% CI)	Tweets n (95% CI)	Emma n (95% CI)	Passion n (95% CI)
Persons	505 (22.5–26.2)	137 (5.5–7.7)	82 (3.1–4.8)	265 (11.4–14.2)	133 (5.4–7.5)
Animal	47 (1.6–3.0)	31 (1.0–2.0)	7 (0.0–1.0)	6 (0.0–1.0)	20 (1.0–1.4)
Time	49 (1.7–3.0)	32 (1.0–2.1)	17 (0.0–1.2)	98 (3.8–5.6)	96 (3.7–5.5)
Food	14 (0.3–1.0)	12 (0.3–1.0)	0 (0)	1 (< 0)	7 (0.0–1.0)
GEO[1]	230 (10.0–13.0)	131 (5.3–7.4)	21 (1.0–1.4)	68 (2.5–4.0)	56 (2.0–3.4)
GPE[2]	92 (3.6–5.3)	20 (1.0–1.4)	58 (2.1–3.5)	4 (< 0)	21 (1.0–1.4)
Sport	19 (1.0–1.3)	5 (< 0)	28 (1.0–1.8)	0 (0.0)	3 (< 0)
Violence	47 (1.6–3.0)	37 (1.2–2.4)	32 (1.0–2.1)	2 (<0)	13 (0.0–1.0)
Climate	6 (0.0–1.0)	10 (0.0–1.0)	0 (0)	17 (0.0–1.2)	7 (0.0–1.0)

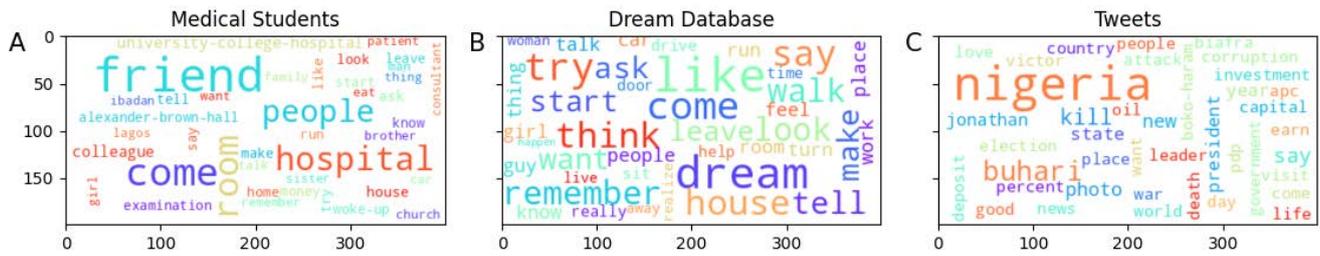[1]GEO is Geographical Entities, [2]GPE is Geopolitical Entities

Figure 1. Frequent words in corpora of dreams and tweets.

corpora of novels and novellas, and the corpora of tweets were embedded in multi-dimensional vector space. Multidimensional scaling was also used to project the embedded space to two dimensional space, which was clustered using K-means algorithm.

2.4. Relativistic Velocity

To determine if there is time dilation in physical spacetime with respect to dream spacetime, the duration of dream events were compared to expected elapse times for such events in physical spacetime. The duration of dream spacetime events were inferred from the study which showed that average duration of rapid eye movement (REM) sleep was 20 min (Aserinsky & Kleitman, 1953). Elapse times of all dream spacetime events were assumed to be 20 min. Only dream narratives of medical students' dream corpus, which had suffcient details were used to estimate elapse times. Relativistic velocity was calculated using the formula $\Delta\tau=\gamma\Delta t$, where the Lorentz factor $\gamma= 1/(1-\sqrt{(v2/c2)})$ and $\Delta\tau$ is elapsed time of the fast moving reference frame and Δt is elapsed time in slow moving reference frame. The relativistic velocity (v/c) is $\beta=\sqrt{(1-(\Delta\tau/\Delta t))^2}$

2.5. Ethics

The study complied with the APA ethical principles regarding research with human participants. Ethical clearance was obtained from the local Institution. All subjects understood the basis for the research and were assured of confidentiality of their narratives. Participation was free of inducement or cohesion.

3. Results

There were 285 Nigerian undergraduates, 160 males and 125 females. Mean age (25 % IQR) was 25 years (23–26). Subjects of Dream Database were anonymous adults. There were 1,428 dream narratives, 714 in medical students' dream corpus, and 714 in Dream Database corpus.

3.1. Vocabulary and Named Entities

Vocabulary sizes of corpora were 3,097 for medical students, 3,819 for dream database, 4,041 for Tweets, 3,889 for Emma, and 4,333 for Passion in Rome. MTLD lexical diversities were 59 for all undergraduates, 100 for dream database, 279 for tweets, 117 for Emma, and 121 for Pas-
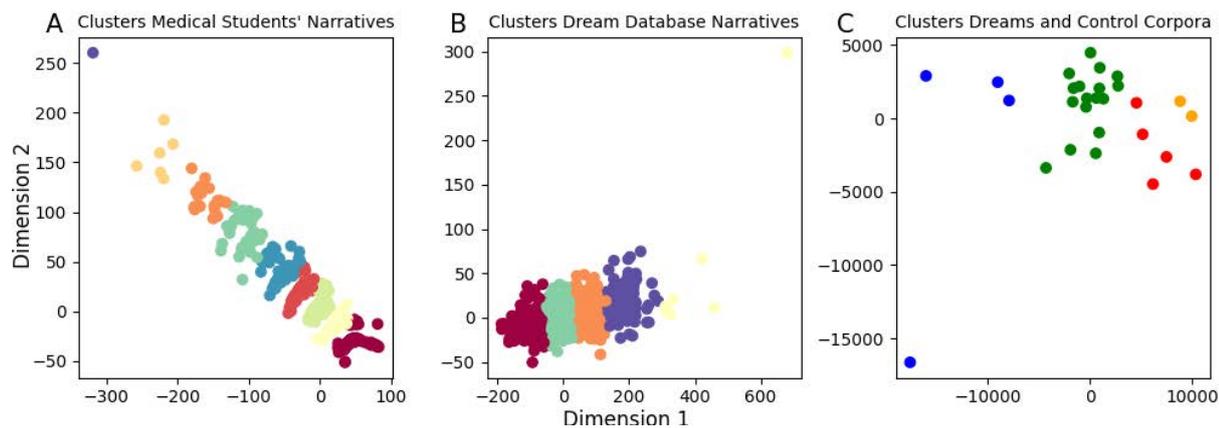

Figure 2. Semantic categories of narratives and corpora.

Figure 2C shows:
(a) **Blue dots** are Little Women by May Alcott, Wizard of Oz by Frank Baum, Sense and Sensibility by Jane Austen, and Letter Montaigne by Michel de Montaigne which are from the genre fiction, tale, and essay.
(b) **Green dots** are Dracula by Bram Stoker, Adventures of Huckleberry by Mark Twain, Brother Karamozov by Fyodor Dostoyevsky, Adventures of Sherlock Holmes by Arthur Conan Doyle, Gulliver's Travels by Jonathan Swift, Great Expectations by Charles Dickens, Heart of Darkness by Joseph Conrad, War of Worlds by HG Wells, War and Peace by Leo Tolstoy, Leviathan by Scott Westerfeld, Iliad Homer by Homer, The Awakening by Kate Chopin, Tale of Two Cities by Charles Dickens, Oliver Twist by Charles Dickens, The Jungle by Upton Sinclair, Treasure Island Louis Stevenson, and The Republic by Plato from the genre fiction, adventure, fantasy, poetry, satire, allegory, horror, and humor
(c) **Red dots** are Devil's Dictionary by Ambrose Bierce, Duty of Civil Disobedience David Thoreau, DD Corpus, Importance of Being Earnest by Oscar Wilde, Ulysses by James Joyce, Tweets, which are from the genre satire, humor, fiction, farce, comedy
(d) **Orange dots** are Medical Students' Dream corpus, and Dream Database corpus within the Red Cluster

sion in Rome. Lexical densities (95% CI) were 53 (52–54) for medical students, 54 (53–55) for dream database, 66 (65–67) for tweets, 55 (54–55) for Emma and 54 (53–55) for Passion. Frequent words in the corpora are shown in Figure 1A for medical students, Figure 1B for dream database, and Figure 1C for tweets. The most frequent words were *friend*, *come*, *room*, *hospital*, *people* for medical students, *like*, *dream*, *come*, *try*, *say* for dream database, *Nigeria*, *Buhari*, *kill*, *say*, *photo* for tweets, *Mr*, *Emma*, *say*, *Mrs*, *Miss* for Emma, and *say*, *like*, *come*, *know*, *make* for Passion in Rome. The number of medical words and procedures (95 % CI) in 2,072 sentences were 26 (0.008–0.017) for medical students' dream corpus, but 3 (0.0–0.003) for dream database corpus.

The number of entities expressed as proportion of 2,072 sentences in each corpus (95 % CI) were 97 % (96–98) for medical students, 47 % (45–49) for dream database subjects, 37 % (35–39) for Tweets, 70 % (68–72) for Emma, and 45 % (43–48) for Passion in Rome. Human, animal, geographical, and geopolitical entities were significantly commoner in the dream spacetime of medical students than in dream database corpus, and in corpora of novels (Table 1). Sport entities were significantly commoner in the dream spacetime of medical students, but time, food, violence and climate entities were not. Hospital personnel and place entities, examinations, friend, brother, father, Church activities, and partying were significantly higher in the dream spacetime of medical students, while occurrence of sister, mother, and counting entities were not (Table 2).

Table 2. Dream Spacetime Entities and Events

Entities	Medical Students n (95% CI)	Dream Database n (95% CI)
Hospital Personnel		
Colleague	76 (2.8–4.5)	0 (0)
Doctor	46 (1.6–2.9)	4 < 0.0
Nurse	6 (0.0–1.0)	2 < 0.0
Family		
Brother	46 (1.6–2.9)	8 (0.0–1.0)
Sister	33 (1.0–2.0)	9 (0.0–1.0)
Mother	21 (1.0–1.4)	12 (0.0–1.0)
Father	18 (0.0–1.3)	5 < 0.0
Friend	213 (9.0–12.0)	27 (1.0–2.0)
Place Entities		
Hospital	109 (4.0–6.2)	6 (0.0–1.0)
University	26 (1.0–2.0)	2 < 0.0
Events		
Examination	57 (2.0–3.5)	0 (0.0)
Church	29 (1.0–2.0)	0 (0.0)
Partying	18 (0.0–1.3)	3 < 0.0
Counting		
Cardinal	124 (4.5–7.0)	124 (4.5–7.0)
Ordinal	24 (1.0–1.6)	37 (1.2–2.4)

3.2. Clusters of Dream Narratives and Dream Corpus

Medical students' narratives had nine semantic categories (Figure 2A). Cluster 1 had 279 narratives, Cluster 2 had 112, Cluster 3 had 116 narratives, Cluster 4 had 75 narratives, and Cluster 5 had 62 narratives, which totaled 654 narratives (92 % of all narratives). Clusters 6–9 had total 60 narratives. Dream database narratives had five semantic categories shown in Figure 2B. The number of narratives in clusters were 66, 231, 272, 3, and 142, respectively. Clusters one, two, and four had 645 narratives (90 % of all narratives).

There were three clusters in 28 corpora (Figure 2C). The first cluster had four corpora from the genre fiction and tale; the second cluster had 17 corpora from the genre fiction, adventure, fantasy, poetry, satire, allegory, horror, and humor; while the third cluster had the two dream corpora, tweet corpus, and five corpora from the genre satire, humor, fiction, farce, and comedy.

3.3. Dream Narratives

Dream narratives which illustrate improbable events, spatial and time dimensions, and events not sourced from memory are shown below.

3.3.1 Implausible, Improbable, and Modified Events Narratives

(1) "I sat on the floor along a corridor propped up against a pillar and reading a medical textbook. About a yard away the Consultant in my Unit and a Student in Medicine Three were collating some data together. I noticed I was dozing as I tried to read but occasionally gave some helpful detail to the pair across me. The Consultant gave me smiles which I could not help but return. I finally stood up to find somewhere else to read because it seems impossible that my reading there would be profitable due to my posture which was making me sleep"

(2) (From dream database) "My family and I went up to meet the Josh Daggs at Sand Lake. I broke open a jar of larvae, which quickly turned into dragonflies that flew around me. I ran to an old train in the forest, where I met Forrest Gump, who was in love with me, even though I wanted to be just friends. Then I got off the train and into my health/earth science class, taught by the most boring person on the planet. It was the second to last day of the class. I passed.   It gets fuzz after that, but I know drama be suited"

(3) "I watched a football which I had missed in real-life because of Hospital Ward Round. The team Arsenal won although in real life they lost"

3.3.2 Spatial Dimension Dreams

(4) " I walked through the whole of University College Hospital with the best friend of mine, a male. We were dressed in regular clothes, shirts and trousers. We started from Alexander Brown Hall down to the Sports Field, School of Nursing, the Hospital Complex, Casualty, the Orchard, and back to Alexander Brown Hall. We bought some bread and akara along the way and ate. We talked about various things what the future holds our girlfriends. It all seems real."

(5) "My cousin who does not know how to drive picked me up in the University of Ibadan, and drove from the Catholic Church through Education to Benue road. I thought she would drop me in Sankore, but she stopped at Benue Bus Stop. I asked why she did so? She answered she could not manouevre her way up, but that my brother will take over. My brother took over and we drove to Sankore"

(6) " I was in University of Ibadan Hall of Residence. I was looking for someone in a particular room. The place was hell of bends and curves and could not remember when University of Ibadan Hall of Residence became like that. I got to one room that looked like it but the person I met said that it was not the room. I kept on trying ..."

(7) " My colleagues and I in the same unit were involved in a battle with some people. We were led by the Unit Captain. We were initially a pride of lions, but somehow we all became human in the course of the battle. The fight was triggered by my killing the daughter of one lion. We fought with elastic metallic whips, but there was no bleeding or death"

(8) (From dream database) " I was with someone who looked familiar but I do not remember clearly. We heard babies crying. On tracing the sound we saw two dogs of different breeds. They seemed like puppies, but they were big. The dogs were the ones crying. They were like babies to me though they were in the form of dogs. They were quite glad to see me and they played with me. Their owner who happened to be a known person came to get them"

(9) (From dream database) "Someone I cared about was in the hospital. A grandmother like figure. When I went to visit, it morphed into mom. She was really fragile. I hugged her and asked if she was in pain. She said no because of the meds, so I said that's good"

3.3.3 Timed Events

(10) "I was on take with my roommate in SE-3 Ward, University College Hospital. We overslept and woke up 10 minutes later than expected. We ran down to the College and jumped into the lift. The lights went off. We were stuck until morning. While in the lift we flashed our friends because both of us had no calling credits. We fell asleep in the lift and woke up in the morning. I woke up the next morning for Ward Round"

(11) "I was fighting an old friend over a laundry iron in my old house. I quickly went in to pick my clothes. I was distracted by my father for about five minutes. When I came back National Electric Power Authority had already taken power. I got angry"

(12) "I was in the Ward in University College Hospital with my colleagues. We waited for two hours before the Registrar who was to teach us showed up. He offered no apologies."

(13) "It was a Saturday morning. I was at home in Ebonyi State. Every member of the family had woken up. The normal Saturday activities of cleaning washing cooking were going on. There was a knock at the gate. We had

a visitor from Benue State. He brought the news of my cousin's death. He slumped while receiving a telephone in his house. The whole house went dead as everyone was sad. Suddenly everyone began to laugh as it was April fool's day"

(14) "I was with my half-brothers and sisters preparing to go to our home town from Benin. It was rather late at 5.30 pm since we were going by public transport. One of my half-brothers said he was going to hire a bus. I do not know how, but we got home. The following day my parents picked up a quarrel with me because of my faith saying they will see what the civilization and Christianity will earn me. I told them I was returning to school. They did not give me anything"

3.3.4 Day Residues

(15) "I saw a Painter trying to paint my room in Alexander Brown Hall yellow, which is the color of my room. I had spoken to a Painter before going to bed to get me the Hall Carpenter"

(16) "My brother in the United States of America sent me a stethoscope. But, the same stethoscope was received the previous day"

(17) ,"I made up with a friend of mine whom we had quarreled earlier in the day. We got talking and went out to eat at Alhaja's Restaurant"

(18) "I was at a eating place that had a variety of snacks. Being a snack lover I ordered for some of it and I ate to my fill. I had not eaten all day before I slept"

(19) "I saw a scene of the woman who died in the ward yesterday. It felt like I was in the mind of her child. I seemed to be with them at home as they lamented. I was trying to explain to them that it was inevitable"

(20) "I was in Accident and Emergency Unit in University College Hospital. What I experienced during the day was relayed how cases were brought in and treated"

3.3.5 Past Events

(21) "I was back in the hostel of my secondary-school with my friends. We committed an offense and were being flogged"

(22) "I was in my old secondary-school. There was war and people were running everywhere. We were asked to join the red-cross. I wore my white secondary school uniform. I later found myself running and running"

(23) "A woman disciplined me. I assumed she was my principal in the secondary school. I cannot remember the offense. I apologized and was pardoned"

(24) "I saw myself at home about ten years ago. It was my cousins tenth birthday anniversary. I ate drank and subsequently had acute diarrhea. We later went to Church. I prayed to God to heal me and it immediately stopped"

3.3.6 Future Events

(25) "All the lifts in University College Hospital were repaired and the place was computerized. It was like the Hospital in movies. I was a Consultant"

(26) "I was with my family in a future home."

(27) "I was in the future. I looked very happy"

(28) (From dream database) "We were in Margaliot waiting for more family members to arrive. There were giant hot springs that were formed somehow by movement of the earth. There were three big ones but those kept shifting. At and around those big pools were people who were considered the enemy, but who we weren't fighting at every given moment. They were like a potential fight waiting to happen. It was obvious that there is a general confrontation going on. At some point I went on a futuristic flying vehicle that flew at high speed and that I didn't know how to use or stand it. It had an orange color on it. The person that took me with him was flying it. We were flying over the area (looked like Kiryat Shmona in the future), and at some point we were shot down or crashed. There were people running around and also big robots or fighting machines"

3.3.7 Fleeting Scenes

(29) "At a stage I was in University College Hospital with colleagues. Then it shifted to University of Ibadan, and then to my Secondary School"

(30) "I was close by the Orchard in University College Hospital. I was in the company of a friend discussing matters I do not remember. After a few seconds I found four of my old friends and acquaintances. I went to them and we exchanged greetings"

(31) "I was being pursued by a heard of cattle. I could not explain why I was being pursued. All of a sudden I ran into a house that appeared when I was running. When I got in my brother was inside. He was repairing his car. When I told him I was being pursued we came outside but there were no cattle. What we saw was an expressway that led to Lagos. Before we could step out I noticed that my brother's house was now in Lagos. All of a sudden a big truck now drove towards the house as if it wants to bring the house down. But before it hit the house ..."

3.3.8 Sleep-Wake Transition and Out of Memory Events

(32) "I saw myself in a room where there was a bench. Immediately I sat down on the bench I noticed that I was not the only one sitting on the long bench. The people beside me were my colleagues. There was one of my Consultants actually standing in front of us asking questions. To my astonishment we were in a competition. But all of a sudden my Consultant was the winner of that competition and I could not really explain how it happened. Before I knew anything there were showers of rain. All of a sudden I woke-up from sleep and noticed that my friend spilled some water on me"

(33) "I was driving a 504 wagon and with me were three of my friends. I think we were travelling to Lagos for an event. But along the way we appeared in Benin. We decided to stop over and eat. But, as we parked a car came from nowhere and started honking. The honking was getting louder. Before I could turn to see the driver, I ended up waking to put off my alarm"

(34) "I found myself in a river with some of my friends. The river was situated in a village I never knew called Okini-Town. We actually went fishing in a canoe in this river in Okini-Town. Suddenly the canoe somersaulted and ..."

(35) "I was travelling to Abuja by road. I finally got to Abuja but I misplaced my wallet where the address I was to reside was. I was crying help, help! I woke up crying help which startled my friend who slept in my room"

(36) "I was on my way to Alexander Brown Hall when I saw two girls arguing over something I could not fathom. I wanted to settle the argument, but they turned and hit me on the head. I woke up with a headache, and went to the Staff Clinic"

(37) "I fell from a cliff. The fall was so sudden and rapid but I was not pushed. I woke up suddenly with a start breathing heavily I could hear my heart"

3.3.9 Long Elapsed Time Events

(38) "I went on an excursion with my colleagues and my Consultant. We took off from University College Hospital and headed for Olumo Rock in Abeokuta. We got there and we all climbed the Rock, and ate lafun, the Abeokuta indigenous traditional meal with vegetables. We had fun.' We were on our way back to Ibadan ..."

(39) "I was at a seaport twice to welcome some people. The interval between the two was approximately one year. The second time I went the entrance was overgrown with weeds. Some people had to clear the weeds right there in my presence. The ship did not arrive on time and some of the people I was expecting could not make it"

(40) "I was pregnant but because I am a man I had to undergo cesarean section. The child was a boy. I then found myself in a white country even though I had the surgery in Nigeria. I was with my child in a park playing and I allowed him to wander a little. I did not see him after a while but searched for him all over the place. I informed the police who searched for him as well, but could not find him. The search took them to a bus full of white people, but they were chased out by dogs in the bus".

3.4. Time Dilation and Relativistic Motion

Total 82 (11 %, 95 % CI 9–14) dream narratives had units of time in seconds, minutes, hours, days, weeks, weekend, months, or years. Day residues, which are dreams of previous 24 hours events, occurred in 13 (2 %, 95 % CI 1–3) dream narratives. Total 91 (13 %) dream narratives of medical students had sufficient details for estimation of event elapse times. The 50 % IQR of time dilation was 3–24 hours. The maximum time dilation was 2,190 days (six years). Relativistic velocities were 0.9428 for one hour time dilation, 0.9938 for three hour time dilation, 0.9984 for six hour time

dilation, and 0.9998 for 24-hour time dilation. Relativistic velocities were 0.9999 for one month time dilation, and 0.9999 for one year time dilation.

4. Discussion

The minimum vocabulary to understand 80–85 % of written English text contains 2,000 words (Hirsh & Nation, 1992). It has been shown, however, that vocabulary size of 2,600 is needed to be familiar with 95–97 % of Alice in Wonderland, The Pearl, and The Haunting novels (Hirsh & Nation, 1992). Therefore, vocabulary sizes of 4,041 for tweets, 3,889 for Emma, and 4,333 for Passion in Rome exceed the recommended. Similarly, vocabulary sizes of 3,097 for medical students' dream corpus, and 3,819 for dream database corpus also exceed the recommended. Thus, vocabulary size of dream spacetime language compares well with physical spacetime language.

Lexical diversity, which is the proportion of unique words in a corpus, is a metric of vocabulary richness. The MTLD (McCarthy & Jarvis, 2010) method of the metric corrects for length of text. MTLD of 59 for medical students' dream corpus, which is in the range for historical, legal, and administrative texts, indicates that the vocabulary compares well with offcial documents. MTLD of 100 for dream database corpus, however, is in the range for epistolary works, while MTLD of 279 for Tweets, 117 for Emma, and 121 for Passion in Rome are in the range for Poetry (Torruella & Capsada, 2013). Lexical density, which is the proportion lexical words in a corpus, is also a metric of vocabulary richness, but it assesses the amount of information carrying words like nouns, verbs, adjectives, and adverbs. Lexical density (95 % CI) of medical students' dream corpus 53 (52–54), which is significantly different only from tweets 66 (65–67), indicates that it has similar information content as dream database corpus and other control corpora. Thus, dream spacetime language has comparable vocabulary richness as official documents and classical novels.

The most frequent words in medical students' dream corpus, friend, come, room, hospital, people, include hospital which is absent in the most frequent words in dream database corpus, like, dream, come, try, say (Figures 1A–1B). Similarly, the most frequent words in tweets, Nigeria, Buhari, kill, say, photo (Figure 1C); in Emma, Mr, Emma, say, Mrs, Miss; and in Passion in Rome, say, like, come, know, make have no medical terms. Further, medical terms like asthma, hypertension, diabetes, and medical procedures like intravenous administration, cardiopulmonary resuscitation, and electrocardiography, which occur significantly more in medical students' corpus than in dream database corpus, indicate transformation of physical spacetime of medical students to dream spacetime. Thus, the vocabulary of dream spacetime indicates transformation of entities and events from physical spacetime.

4.1. Dream Spacetime Entities and Semantics

Human, animal, geographical, and geopolitical entities occur significantly more in medical students' dream corpus than in dream database corpus (Tables 1–2). This is consistent with transformations of physical spacetime of medical students, which include hospital wards, equipments, surgical theaters, buildings, and diverse human entities like consultants, doctors, colleagues, and nurses to their dream spacetime. Examinations, which feature strongly in the physical spacetime of medical students also feature significantly in their dream spacetime (Table 2). Although sports, partying, Church activities, friend, brother, and father are significant in medical students' dream corpus, sister, mother, time, food, violence, climate and counting entities are not (Tables 1–2). Clustering indicates that dream narratives form semantics and syntax categories (Figures 2A–2B). Entities and events of dream spacetime are, therefore, not random. Similar number of narratives in five clusters of both medical students' and dream database, however, indicates similar distributions of semantic categories. Clustering of the two dream corpora with satire, humor, fiction, farce, and comedy genre, therefore, indicates that semantics of dream spacetime are not unique (Figure 2C). Thus, dream narratives are coherent, although they do not replay sequence of events.

Although dream narratives of medical students and dream database are coherent and meaningful, they are not always probable or plausible in the context of physical spacetime reality. Dream 1, which shows Self sitting on the floor reading a medical textbook, a yard away from the Consultant, who was collating data with medical students is coherent, but highly improbable. Dream 2, which shows larvae quickly turning to dragonflies, meeting Forrest Gump who fell in love is implausible, while Dream 3 which shows that Arsenal won a match it lost in the real match inverts reality. Thus, novel reality is generated in dream spacetime.

4.2. Transformations of Spatial and Time Dimensions

Physical spacetime, its entities, and events may appear unchanged in dream spacetime, but often they undergo topological changes. Dream 4, where Self walked about the Hospital premises, which appeared unchanged, and engaged in events, which appeared real, indicates that topological symmetry may be preserved in dream spacetime. In Dream 5, however, topology of physical entities are preserved, but not the ability or skills of the sister who drove a car, while not a driver in physical spacetime. Dream 6, which shows a familiar place become hell of bends and curves, indicates topological transformations. Spatial transformation of Self and other humans to lions, which transformed back to humans and engaged in a battle, is shown in Dream 7, while in Dream 8 dogs cried like babies. In Dream 9, Self visited a hospital, but the sick person transformed to her mum. Thus, spatial transformation of physical entities and Self to dream spacetime may preserve or break symmetry with physical spacetime.

Presence of units of time, which indicates seconds, minutes, hours, days, weekends, months, and years in Dreams 10–14 indicates perception of passage of time. In Dream 10 Self overslept for 10 min, but subsequently got stuck in a lift until morning before a Ward Round. Self was distracted for 5 min in Dream 11, but waited for two hours in Dream 12. Events on a Saturday was noted in Dream18, but of clock hour in Dream 14. Unlike physical spacetime, however, where time passes in one direction, Self may traverse past, present, or future in dream spacetime. This may be illustrated by the character Stooge in Christmas Carol, a novella by Charles Dickens, who dreamt of many Christmasses past, Christmas present, and many Christmases into the future. Freud's day residues, which are dreams of previous 24 hours' events, occurred only in 2 % of medical students' dreams. Dreams 15–20 illustrates day residues. The Painter in Dream 15 was contacted the previous day to find a Carpenter, but was painting the room, while the stethoscope in

Dream 16 was received the previous day. In Dream 17 Self dined in restaurant with a friend that reconciled the previous day, while in Dream 18 Self ate varieties of snack, but had not eaten the previous day. Self felt like being in the mind of another person far away, and exchanged information with bereaved family in Dream 19.This dream, which indicates that Self can couple and exchange information with another Consciousness that is separated in space, illustrates entanglement and teleportation. Events in Accident and Emergency room of the previous day, which appeared in Dream 20, also illustrates day residue, but the word replay which appeared in the narrative suggest minimal distortion of the events. Self traversed the past in secondary schools in Dreams 21–23, but had acute diarrhea at a birthday ceremony ten years ago in Dream 24. Dreams 21-24, however, did not replay actual events in the settings of physical spacetime known to Self. Self was a Consultant in futuristic well computerize University College Hospital in Dream 25, while Dreams 26–27 were futuristic homes. Dream 28 shows high speed flying vehicle to the future. Thus, time reversal symmetry is present in dream spacetime, where Self has attributes of non-locality, entanglement, and teleportation.

While physical spacetime events are typically separated scenes, dream spacetime events transition rapidly or are fused. Dreams 29 shows scenes which transitioned from the Hospital to secondary school, while Dream 30 shows scenes which transitioned from the Orchard of the Hospital to the company of some friends. In Dream 31 Self was pursued by heard of cattle which suddenly transitioned to a House occupied by the brother, followed by sudden appearance of motorway to Lagos, and sudden appearance of home in Lagos about to be hit by a truck. Thus, time flows very rapidly in dream spacetime.

4.3. Transformations From Non-Memory Sources and Transitions to Physical Spacetime

External stimuli during sleep may generate or modify dream themes (Burton, Harsh, & Badia, 1988). Sensations that generate dream spacetime events include visual, auditory, olfactory, and tactile (Bloxham & Durrant, 2014; Nielsen, 1993; Sauvageau, Nielsen, & Montplaisir, 1998; Schredl et al., 2009). Although these sensory inputs undergo transformations to dream spacetime, they are not cognitively processed as in physical spacetime. The 1944 painting titled Dream Caused by the Flight of a Bee by Salvador Dali shows how the flight of a bee about a pomegranate lying close to a sleeping woman generated elaborate dream of fish spewing out flying tigers, elephant with flamingo legs, and bayonet pointing at the woman. Towards the end of several fleeting scenes in Dream 32, there were showers of rain, but water spilling on the physical body by the roommate was observed on awakening. A car honked in Dream 33, but the alarm was sounding on awakening. In Dream 34, however, Self was in an unknown Town where it fished in a canoe, but the Town exists. Self cried help, help towards the end of Dream 35, which continued until awakening to the surprise of the roommate. Dream spacetime events may also impact or influence physical spacetime events (Barrett, 1993; Pagel & Vann, 1992) as shown in Dream 36 where Self was hit on the head, and woke up with headache, which required hospital treatment. Self fell off a cliff in Dream 37, which was followed by fast pounding heart beats on awakening. Thus, entities and events of dream spacetime are not always from

memory sources, while events of dream spacetime may continue to physical spacetime.

4.4. Relativistic Motion in Dream Spacetime

The physical body moves minimally during dreaming (Dement & Wolpert, 1958), but Self moves freely in dream spacetime. This can be modeled as Self being in a fast moving coordinate frame, while the physical body is in a stationary coordinate frame. Special relativity indicates time dilation in the stationary coordinate frame where events, which appear instantaneous to observers in the fast moving frame, take longer time to elapse. While the duration of REM dreams ranged from 3–50 min (Dement & Wolpert, 1958), events running to decades can be experienced in a dream. Time, therefore, dilates when an event in Self coordinate frame frame S is viewed from the coordinate frame S′ of the sleeping physical body. All dream narratives where elapse times of events can be assertained show time dilation which ranged from hours to six years. Dream 38 which was an excursion that would have taken about 12 hours in physical spacetime, and Dream 39 where Self re-visited a seaport after a year, indicates that physical spacetime events are compressed to few minutes of dream spacetime. Dream 40 where a male became pregnant, delivered by cesarean section, traveled to a European country, visited a park and lost sight of the child also indicates that the clock ticks more slowly in dream spacetime. Assuming that dream events take average of 20 min, relativistic velocities of Self compared to the velocity of light would be 0.9428 for time dilation of one hour, 0.9938 for time dilation of three hours, and 0.9984 for time dilation of 6 hours. These indicate that motion in dream spacetime is near the speed of light. Relativistic velocities of 0.9998 for one day time dilation, 0.9999 for one month time dilation, and 0.9999 for one year time dilation, however, indicate that velocity of motion in dream spacetime is near constant. Thus, time dilation and the attributes of Self in dream spacetime indicate quantum field structure.

5. Conclusions

Dream spacetime, which has been described as weird and bizarre (Colace, 2003; Revonsuo & Salmivalli, 1995), has attributes of quantum field spacetime. Topological transformations, like horse becoming human or vice versa (Revonsuo & Salmivalli, 1995), illustrate bizarre attribute of dream spacetime which occurred in 43 % of women (Revonsuo & Salmivalli, 1995). Bizarreness, according to Freudian dream theory (Freud, 1900), is the difference between manifest content and latent content of dreams. The dream censor filters unwanted or repressed events, which are presented in disguise forms or as symbols in the manifest content (Freud, 1900). Although Freudian interpretation of dreams is not universal it may, however, be reformulated as transformations which break symmetry. The symbols of sex and other entities are, therefore, topological changes that may have no hidden desires or motives. Thus, bizarreness of dreams is attributable to transformations to quantum field of dream spacetime.

Psychosis, which has been compared with dreams, impairs perception and thought, and distorts the reality of physical spacetime (Arciniegas, 2015; Gaebel and Zielasek, 2015). Hallucinations occur when perception of sensory modalities like vision, auditory, olfactory, and tactile are in-

congruous with physical spacetime reality. Subjects may experience synesthesia, derealization, autoscopy, loss of ego boundary, and entities moving though walls or barriers (Arciniegas, 2015; Gaebel and Zielasek, 2015). Hallucinations, therefore, transform physical spacetime to quantum fields. Delusions occur when impaired perception leads the subject to express strong beliefs which contrast with the reality of physical spacetime. Delusions couple the subject to external entities or agents, which may manifest as persecutor, when the agent harms, grandiose, when the agent is authority figure or deity, referential, when the agent discusses the subject, thought control, when the agent controls thoughts of the subject, thought insertion, when the agent inserts thoughts into the subject, thought withdrawal, when the agent removes thoughts from the subject, and thought broadcasting, when the agent broadcasts the thoughts of the subject for all to hear (Arciniegas, 2015; Gaebel and Zielasek, 2015). Coupling and exchange of information between an agent and the subject, therefore, resemble entanglement and teleportation in quantum fields. Impairment of thought, which manifests as rapid or fleeting transitions of topics in speech, word salad, or merging of unrelated subjects and topics are alterations of time dimension, which are similar to the fleeting scenes and merging of unrelated subjects in dream spacetime. Thus, psychosis spacetime and dream spacetime share attributes of quantum field spacetime.

Vocabulary of dream spacetime language is as rich as physical spacetime language. Semantics of dream narratives indicates that subjects share dreams of similar content. Higher semantic similarity of dream narratives of medical students is, however, consistent with their homogeneous living and training lifestyles. Clustering of dream corpora with corpora of satire, humor, fiction, farce, and comedy genre indicates similarities with physical spacetime language. Dream spacetime entities and events are derived from memories of physical spacetime, but also from present and future of physical spacetime. Dream narratives are coherent and meaningful, but not always probable or plausible. Hospital geographical entities, human entities and procedures; Church activities, sports, and partying which occur significantly in medical students' dream spacetime are consistent with the physical spacetime of the subjects. Thus, dream spacetime entities and events are mostly transformations from physical spacetime, which do not always preserve manifold, time dimension, and attributes.

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