



DREAMING, INSOMNIA, AND CHOREOGRAPHIC CREATIVITY OF YOUNG FEMALE DANCERS: A CROSS-SECTIONAL PRELIMINARY STUDY

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Abstract. Human creative activities have been postulated to be related to insomnia and dreaming during sleep. The current preliminary cross-sectional study investigated the associations between insomnia, dreaming, and creativity of choreography in young female dancers. Forty-six female contemporary dancers were included in the present online study and divided into two groups, creative choreographic dancers and non-choreographers, according to their experienced professional roles. The frequency and contents of dreams and nightmares were collected from the participants. In the choreographer group, the frequency of nightmares was significantly correlated with sleep duration and quality among Athens insomnia scale variables. Choreographers also exhibited a significant correlation between the frequency of nightmares and positive thinking tendencies. The non-choreographer group similarly revealed a significant correlation between the frequency of nightmares and Athens insomnia scale variables. The present results suggest that creativity in dance choreography is related to dream frequency, although it is less associated with dream content. Nightmare is less associated with subjective insomnia in creative choreographic dancers than in non-creative dancers, implying the involvement of neuro-psychological mechanisms related to the resilience process. Future research should explore the characteristics of creativity and regular sleep quality and could benefit from including external physiological measures to evaluate sleep propensities.

Keywords: choreograph, creativity, dance, dream, nightmare, sleep.

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1. Introduction

Dreaming is one of the most unique and mysterious aspects of sleep, including nightmares, which disturb appropriate sleep. Nightmares are also commonly reported in the general population, with a prevalence of 4%–6% depending on nightmare frequency and intensity (Wang et al., 2021). Dream content is typically scary and vivid, related to negative themes that result in disturbed, fragmented sleep. According to the both *Diagnostic and Statistical Manual of Mental Disorders* and the International classification of sleep disorders, nightmare disorder is defined by the repeated occurrence of nightmares that cause clinically significant distress or impairment in social, occupational, or other important areas of functioning (American Psychiatric Association, 2013; American Academy of Sleep Medicine, 2014). Frequent nightmares are associated with disrupted sleep, insomnia, and other mental complaints (Giesemann et al., 2019). Thus, nightmares can generally cause insomnia because of fear of falling asleep through dread of nightmare occurrence, resulting in impaired daily functioning, including occupational or academic achievement mandatory to creativity.

Insomnia is commonly observed in the general population, with prevalence estimates ranging between 15% and 20% (Morin & Jarrin, 2022; Sivertsen et al., 2021). Insomnia is defined as the repeated difficulty with initiating or maintaining sleep, despite adequate time and circumstances for sleep, that effects daytime functioning (American Academy of Sleep Medicine, 2014). Converging evidence has shown that insomnia is generally detrimental to health and performance. Chronic insomnia is associated with higher mortality risk (Ge et al., 2019), and comorbid health consequences (Bhaskar et al., 2016) may lead to reduced quality of life (Olfson et al., 2018). Insomnia prevalence is considerably associated with an increased risk of depression, which is recognized as the leading global burden of disease (Li et al., 2016). Moreover, a recent meta-analysis demonstrated that insomnia is related to impairment in objective and subjective cognitive performance (Wardle-Pinkston et al., 2019).

Indeed, insomnia and nightmares are considerably associated and likely to be detrimental to daily life functioning. Nonetheless, nightmare sufferers are more creative than those who dream without terror, involved in broader than normal emotional semantic networks (Carr et al., 2016). Dreaming has conventionally been postulated to have a pivotal role in the creative process and problem-solving (Barrett, 2017), involved in neurophysiological networks represented by the default mode network (Vallat et al., 2022). It appears contradictory that nightmares, which often manifest in insomnia and impaired daytime performance, increase creativity, demanding a higher level of cognitive and executive abilities. However, numerous episodes are associated with historical figures of great creativity who suffered from insomnia, such as writer Marcel Proust (Perciaccante & Coralli, 2016), painter Henri Matisse (Zeidler, 2021), and composer Pyotr Ilyich Tchaikovsky (Tchaikovsky, 2004). Several studies showed the possible link between insomnia and creativity. Healey and Runco (2006) demonstrated that highly creative children had significantly higher levels of sleep disturbance compared with the control children. Some authors also showed that global insomnia had minor negative effects on creative achievement assessed by divergent thinking tasks (Beaty et al., 2013). The available documents suggest that creativity is related to insomnia and dreams, including nightmares. However, the relationship has not been clearly explained because creative activity varies widely and depends on the content of the dreaming.

As stated above, creativity has a close association with dreaming accompanying anecdotal and neuroscientific aspects. Conventionally, the creative process has four parts: preparation, incubation, illumination, and verification (Wallas, 1926). Creativity is thought to be required for various activities such as products of arts or sports performances. Past research has focused on the creativity of the general population typically examined by psychological test battery (Kaufman & Sternberg, 2010; Simonton, 2015), with less research within expertise domains. Contemporary dance requires the communication of creative ideas (Burrows, 2010) involving the perception of an audience (Wang, 2024). Choreography or dance making is certainly a creative process that requires practice, besides the knowledge of how the process functions (Carey et al., 2019). A recent study indicated that personal experience of the choreographic process impacts creativity assessment compared to dance class participation (Clements et al., 2018). These multiple perspectives highlight an association between dancers' choreographic creativity and sleep propensities such as dreaming, nightmare, or insomnia, calling for greater scientific attention to this unique domain of creativity.

The current study aims to explore subjective insomnia assessments and dream reports using self-administered questionnaires. The Athens insomnia scale (AIS) was used to evaluate degrees of insomnia. The frequency of dreaming and nightmare were also measured using self-administered questionnaires. We compared acquired variables between choreographers and dancers to verify the difference in terms of creativity. Additionally, correlations with variables were also calculated in each group, providing the implication that dreams and nightmares of insomnia affect choreographic creativity.

2. Methods and materials

2.1. Participants and procedure

The participants were recruited through social media (*Instagram*) and electronic mails to young female dancers. Inclusion criteria were based on the participants being currently involved in hip-hop dancing in a university or high school dance club or a group. Forty-six female participants (mean age 21.63, standard deviation (SD) = 2.36) were enrolled in the present study.

In addition to the years of individual dance experience, the online survey comprised the questionnaire about dreaming and insomnia was posted on *Google Forms* between July 1, 2021 and September 1, 2021. Links to forms were delivered to the participants on *Instagram*. The participants were also asked for self-judgment to determine whether they were primarily choreographing or dancers who performed the choreography as instructed. The Academic Research Ethical Review Committee of Waseda University, Japan, approved all activities (IRB # 2021-482).

2.2. Dream questionnaire

The dream questionnaire included questions about the frequencies of overall dream recall, dream recall of dancing, and nightmares. The frequencies were measured as the number of times per week during the past month. Dream contents were assessed based on if dancing was involved, referring to the experience of making up choreography in a dream. Additionally, the extent of positive thinking was also evaluated on a five-point Likert scale (1 – not at all; 2 – somewhat; 3 – moderate; 4 – strong; 5 – very strong).

The Cronbach's alpha coefficient was used to assess the extent to which multiple items measuring the similar underlying construct are consistent with each other (internal consistency) (Bland & Altman, 1997). Internal consistency was high for all items with the mean value of Cronbach's alpha ranging between 0.800 and 0.851, exceeding in both instances the minimum criterion of 0.70.

2.3. Sleep questionnaire

AIS was assessed to evaluate subjective insomnia symptoms. AIS are commonly used questionnaires, authorized self-rating scales of insomnia symptoms, consisting of eight components (Soldatos et al., 2000). In the present study, an assessment of insomnia was performed by using a Japanese version of the AIS (Okajima et al., 2013). Each factor was evaluated for the analysis, as well as the combined total score.

2.4. Statistical analysis

The collected data were analyzed using *SPSS* version 27 (*International Business Machines Corporation* in Armonk, New York, United States). Descriptive statistics were expressed as mean and SD. After confirming the non-normality of distribution by the Shapiro–Wilk test, a comparison of variables was performed using the Mann–Whitney U test. Spearman’s rank correlation coefficient was used to examine the relationship between dream-related indices and AIS scales. Furthermore, the analysis between dream-related variables and AIS items was calculated. The magnitude of the correlation was determined as trivial: $r < 0.1$; low: $0.1–0.3$; moderate: $0.3–0.5$; large: $0.5–0.7$; very large: $0.7–0.9$; nearly perfect > 0.9 ; perfect: 1 (Hopkins et al., 2009). The level of significance was set at $p < 0.05$.

3. Results

The dance history of the choreographer was significantly longer compared to that of the non-choreographer ($p < 0.001$). There were no statistically significant differences between the choreographer and the non-choreographer with respect to the mean frequency of dreams and nightmares ($p = 0.010$). The choreographer experienced significantly more frequent dancing dreams compared to the non-choreographer ($p < 0.001$). Dreaming recalls of dances with music or creating choreography was more common in the choreographer than in the non-choreographer (Table 1).

Table 1. Comparison of dream-related variables in choreographer and non-choreographer (source: created by authors)

Variable	Choreographer (n = 22)		Non- choreographer (n = 24)		Mann–Whitney U test	p
	Mean	Standard deviation	Mean	Standard deviation		
Dance history	14.6	5.0	7.4	5.2	84.0	< 0.001
Mean frequency of dream (per week)	3.2	1.6	2.7	1.9	218.0	0.270
Dream of dancing (%)	95.5		70.8			
Frequency of dancing dreams	2.6	1.0	1.7	0.8	92.0	0.010
Positive thinking	3.9	1.1	3.3	1.2	200.0	0.143
Frequency of nightmare	2.3	1.2	2.6	1.3	236.5	0.532
Dream of dancing to an experienced music (%)	81.8		50.0			
Dream of dancing to an unexperienced music (%)	59.1		29.2			
Experience of creating choreography in a dream (%)	59.1		12.5			

Table 2. Comparison of Athens insomnia scale and sleep-related variables in choreographer and non-choreographer (source: created by authors)

	Choreographer (n = 22)		Non-choreographer (n = 24)		Mann–Whitney U test	p
	Mean	Standard deviation	Mean	Standard deviation		
Athens insomnia scale						
Sleep induction	0.9	0.8	1.1	1.1	241.0	0.591
Awakenings during the night	0.4	0.6	0.4	0.6	249.5	0.698
Final awakenings earlier than desired	0.5	0.6	0.3	0.5	229.5	0.360
Total sleep duration	1.2	0.7	1.0	0.7	219.0	0.281
Overall quality of sleep	1.0	0.6	1.1	0.9	252.0	0.771
Sense of well-being during the day	0.3	0.6	0.4	0.6	238.5	0.494
Functions during the day	0.5	0.8	0.3	0.5	236.0	0.467
Sleepiness during the day	1.5	0.7	1.1	0.6	176.5	0.027
Total scores	6.6	3.0	5.7	3.4	212.5	0.253
Sleep variables						
Wake-up time (hour, minutes)	9:09	1:27	8:41	1:48	204.5	0.010
Bedtime (hour, minutes)	2:38	2:51	2:17	2:23	240.5	0.312
Preferred time to peak performance (hour, minutes)	18:27	6:10	18:45	4:21	261.0	0.897

Note: wake-up time, bedtime, and preferred time to peak performance were self-reported.

In a comparison of AIS scores, there were no statistical differences in total AIS scores between choreographers and non-choreographer ($p = 0.253$). Among the items of AIS, sleepiness during the day was significantly higher in the choreographer compared to the non-choreographer ($p = 0.027$). Furthermore, the wake-up time was significantly later for the choreographer compared to the non-choreographer ($p = 0.010$) (Table 2).

In the correlation analysis among dream and sleep-related variables of the choreographer group, the mean frequency of dreams was positively correlated with the total sleep duration ($\rho = 0.492$, $p = 0.020$). The frequency of dancing dreams exhibited no significant correlation with AIS scores and dream-related variables. Frequency of nightmares showed a significant positive correlation with total sleep duration ($\rho = 0.591$, $p = 0.004$) and overall sleep quality ($\rho = 0.656$, $p = 0.001$). Inversely, frequency of nightmares was negatively related to positive thinking tendency ($\rho = -0.555$, $p = 0.007$) and sleepiness during the day ($\rho = -0.460$, $p = 0.031$) (Table 3).

Contrarily, the correlation analysis of the non-choreographer, the mean frequency of dreams was positively correlated with sleep induction ($\rho = 0.406$, $p = 0.049$), functioning of the day ($\rho = 0.419$, $p = 0.041$) and the total score of AIS ($\rho = 0.463$, $p = .023$). The frequency of dancing dreams exhibited no significant correlation with AIS scores and dream-related variables. The frequency of nightmare was positively correlated with overall sleep quality ($\rho = 0.576$, $p = 0.003$), sense of well-being during the day ($\rho = 0.469$, $p = 0.021$), functions during the day ($\rho = 0.505$, $p = 0.012$) and the total score of AIS ($\rho = 0.532$, $p = .007$) (Table 4).

Table 3. Correlations between dream scales and sleep variables in choreographers
(source: created by authors)

	Mean frequency of dream (per week)	Frequency of dancing dreams	Frequency of nightmare
Propensities			
Dance history	.285	.296	.093
Positive thinking tendency	.297	.197	-.555*
Athens insomnia scale			
Sleep induction	-.319	.256	.113
Awakenings during the night	.153	.082	.303
Final awakenings earlier than desired	.058	-.384	-.129
Total sleep duration	.492	-.205	.591*
Overall quality of sleep	.166	.031	.656*
Sense of well-being during the day	-.166	-.155	.018
Functions during the day	-.341	-.381	-.203
Sleepiness during the day	.183	.157	-.460
Total scores	.031	-.122	-.023

Note*: $p < 0.01$.

Table 4. Correlations between dream scales and sleep variables in non-choreographers
(source: created by authors)

	Mean frequency of dream (per week)	Frequency of dancing dreams	Frequency of nightmare
Propensities			
Dance history	-.319	-.358	-.025
Positive thinking tendency	.091	.197	.354
Athens insomnia scale			
Sleep induction	.406	.256	.393
Awakenings during the night	.321	.082	.130
Final awakenings earlier than desired	.058	-.384	-.129
Total sleep duration	.117	-.253	.221
Overall quality of sleep	.303	-.079	.576*
Sense of well-being during the day	.283	.057	.469
Functions during the day	.419	.288	.505
Sleepiness during the day	.318	-.015	.259
Total scores	.463	-.317	.532*

Note*: $p < 0.01$.

4. Discussion

The current study revealed that the choreographer recalled the dancing dream significantly more frequently compared to the non-choreographer. Additionally, daytime sleepiness was significantly stronger in the choreographer than the non-choreographer. In the choreographer

group, the frequency of nightmares was significantly correlated with sleep duration and overall quality among AIS variables. The choreographer also exhibited a significant correlation between the frequency of nightmares and positive thinking tendencies. Conversely, the non-choreographer group similarly revealed a significant correlation between the frequency of nightmares and AIS variables. However, there was no significant association between the frequency of nightmares and positive thinking tendencies. Furthermore, although the AIS score of the non-choreographer group was significantly correlated with the frequency of nightmares, there was no significant correlation between the frequency of nightmares and the AIS score in the choreographer group. To our knowledge, this is the first study to explore the relationship between creative choreography, insomnia, and dream, including nightmares in young dancers.

Choreographers have more dance-related dreams compared to non-choreographers. Although converging evidence showed a close association between creativity and dreaming (Brand et al., 2011; Schredl & Erlacher, 2007), the previous studies evaluated creativity by a psychological questionnaire or task, which examines divergent thinking (Drago et al., 2011). In the current study, creativity was determined based on the role and experience of whether the participants created the choreography, not the psychological task. While the view representing “choreographers-as-creative” and “dancers as reproducers” appears traditional and no longer out of place in the modern age, dreaming can be involved in the cognitive productive process of creating novel choreographies.

Dreaming predominantly occurs during rapid eye movement sleep (REMS), where the human subcortical substrates are activated (Nir & Tononi, 2010; Siclari et al., 2017). The creativity observed in active choreographers was involved in the networks incorporated into the neurophysiology of REMS. Some authors demonstrated that REMS facilitates the integration of unassociated information for creative problem-solving, not by the passage of time (Cai et al., 2009). REMS also plays an essential role in emotional memory processing (Nishida et al., 2009), which implements the details of creativity (Ivcevic & Hoffmann, 2017). Nevertheless, the frequency of nightmares revealed no significant difference between the two groups. A historical study investigated the personality of nightmare sufferers. It revealed that the frequent nightmare sufferers had artistic and creative tendencies and interests (Hartmann et al., 1987). Nightmare sufferers also have uncommon emotional semantic associations involving emotional priming that occurs during REMS (Carr et al., 2016). Despite these prior findings, creative choreographers did not report significantly more nightmares compared to non-choreographic dancers. Taken for granted that psychological stress may play a pivotal role in coping mechanisms (Freire et al., 2020), not only creative dancers but also non-choreographic dancers have presumably a similar extent of psychological stress. Furthermore, nightmares were defined in an equivocal description in the questionnaire, establishing that nightmares are powerful and unpleasant dreams associated with feelings of threat, anxiety, fear, or other negative emotions that are recalled upon awakening and that arise primarily during late-night REMS (Siclari et al., 2017). In future studies, the questionnaire should be descriptive, not resulted in individual differences in the interpretation of nightmares.

The creative choreographer revealed a higher score of the global AIS score, though the difference did not reach statistical significance. Insufficient sleep substantially impaired the

performance of the divergent thinking task, assessing the cognitive process of creativity (Horne, 1988). Additionally, some authors showed that creativity was significantly related to arousal level, not the dimension of sleep (Narayanan et al., 1992). To date, no works of literature have actually provided a causal relationship between creativity and insomnia. The previous study showed the contribution of sleep disturbances to creative thought in children (Healey & Runco, 2006). These studies were conducted by means of psychological tasks which tested divergent thinking, which doubtfully corresponds to choreographic creativity. Insomnia can also be caused by comorbid psychiatric disorders or physiological phenomena, such as dreaming or nightmare (Sivertsen et al., 2021). Therefore, the form of creativity needs to be discussed, taking into consideration of comorbid psychiatric and medical conditions.

Nightmare has significant associations with total sleep duration and the quality of sleep evaluated by AIS, indicating that nightmare affect both duration and quality of sleep considerably in creative choreographing dancers. While nightmare has been postulated to be related to creativity (Carr et al., 2016; Hartmann et al., 1987), the present result demonstrated that nightmare deteriorated the overall sleep propensities, resulting in impaired daily function. Despite more sleepiness in creative choreographers, there is no association with the total AIS score for nightmares, representing subjective insomnia was less subject to the nightmare. Generally, nightmares tend to correlate with insomnia intensity (Gieselmann et al., 2019). However, there may be emotional processing that resolute psychological distress because of nightmares and complaints of subjective insomnia in those who are creative. Emotional processing during sleep representing nightmares, is likely involved in neural substrates (Sterpenich et al., 2020), implementing resilient mechanisms against psychological distress to yield creativity. Contrarily, the global AIS score was a significant correlation with nightmares in non-choreographic dancers. Despite less sleepiness, the extent of subjective insomnia was greater compared to creative choreographic dancers. Taken together, these results suggest that creativity plays a role in cognitive correction for subjective insomnia against disrupted sleep because of nightmares, underpinned that creativity can cultivate positive psychological functioning and flourish resilience (Conner et al., 2018; Fernández-Díaz et al., 2021).

Several limitations should be acknowledged in the current study. First, our study did not distinguish between those who create choreography and those who dance based on any established criteria. Since there is a greater overlap between those who create choreography and those who are being choreographed, a more elaborate categorization may be required. Second, our sample is limited to female dancers, excluding male participants. Previous research has reported a gender difference in nightmare frequency, with women reporting nightmares more often than men (Schredl, 2014); however, a recent study suggested less significant gender roles in nightmare frequency reflecting on masculinity/femininity (Schredl & Göritz, 2021). Finally, the psychometric characteristics of the participants were insufficiently evaluated. Further associations could have been further clarified with more elaborate assessments, such as measures of anxiety traits, depressive state, and creativity. Overall, research on creativity integrating sleep physiology and psychological features was warranted, to elucidate the unknown mechanism reliant on the creative role of dreaming.

5. Conclusions

In sum, although the impact of insomnia on creativity may be underestimated in the present study, our findings indicate a unique role in the creative process of choreographing. Although nightmares appear to impair the duration and quality of nocturnal sleep, the creative choreographic dancers may be implicitly leveraging inappropriate sleep from dreaming and nightmares against creativity, involving the resilience depicted in the cognitive process. Further studies are required for a better understanding of the factors associated with poor sleep insomnia and dream in populations with creativity related to arts or sports. These studies could result in new insight and approaches aimed at investigating the depth of creativity.

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