Assessment of a Spanish version of the Mannheim Dream questionnaire (MADRE) in a young adult Spanish sample

Mar Mediano[1], Pedro R. Montoro[2], María José Contreras[2], and Julia Mayas[1]

[1]Department of Basic Psychology II, Faculty of Psychology - UNED, Spain
[2]Department of Basic Psychology I, Faculty of Psychology - UNED, Spain

Summary. Background: Mannheim Dream Questionnaire (MADRE) is an instrument used to retrospectively measure various aspects of dreams. The current study has two objectives: First, to provide a reliable Spanish validation of the Mannheim Dream (MADRE) questionnaire related to the study of dreams, and second, to compare the actual recall frequencies with those derived from the questionnaire, distinguishing between high and low frequency recall. Methods: The MADRE questionnaire was translated from English to Spanish and sent to 87 participants, young adults (from 20 to 35 years) who were divided into two groups, experimental and control. All completed the MADRE questionnaire test and retest and the experimental group reported their dreams for 14 consecutive nights. Results: The findings of the present study indicate that the retest reliabilities of the MADRE questionnaire items were adequate and there were no significant differences between both groups. Related to the comparison between the means of dreams remembered in the two-week period, only LFR (Low Frequency Recall) participants in the experimental group have increased significantly from test to retest. As a whole, the participants underestimated their recall frequency. Conclusions: The test-retest correlation indices have been reasonably high. Our results showed that the record of sleep diaries itself influences the frequency of memories, mainly in the case of low-frequency reminders.

Keywords: Mannheim Dream Questionnaire, MADRE, Spanish version, Dream, Validation, retest reliability, Dream Diaries

1. Introduction

It seems that currently there is a general consensus regarding the definition of dreams as the subjective experiences that occur during sleep. Dreaming refers to the process of having such subjective experiences (Sikka et al., 2018). Those subjective events are highly varied and can be characterized as simple and static experiences (e.g., fragmentary images or sounds) but sometimes can also be complex and dynamic experiences (Sikka, 2020).

Nevertheless, from a cognitive point of view, Montangero (2018) presents a definition of dreams that deals more with general properties of dreaming than with specific content-based properties. He based this on the fact that people forget most of the dreams they produce for hours during each night of sleep. Thus, the hypothesis that he proposes is that dreaming can be a continuous process throughout each night, with variations in characteristics (vividness of images, story-like qualities, incorporations of types of waking life elements) (Montangero, 2018).

From another perspective, dreaming is a state of consciousness characterized by internally generated sensory, as well as verbal, cognitive and emotional experiences, which are often intense and possibly biased towards negative emotions (Desseilles et al., 2011). Aguado (2019) points out that the subjective experience of dreams often involves images of great vividness endowed with a powerful emotional charge accompanied by awareness of ourselves. According to Schredl (2010), dreaming is defined as a personal and subjective phenomenon that occurs during sleep and cannot be measured objectively. What differentiates dreams from other types of subjective experiences during sleep is having the experience of being spatially and temporally present or immersed in the dream (Sikka, 2020).

The function and memory of dreams have been issues of debate and controversy for centuries and still a mystery today. Leaving aside the old philosophical theories, by the late 19th century, Sigmund Freud proposed that dreams were wish fulfilment and that their function was being the "guardian of sleep," setting up the process in psychological causation (Freud, 1900/1955). On the other hand, in the second half of the 20th century, the interest of philosophers in dreams decreased considerably due, among other factors, to progress in the sciences of the mind and to Malcolm's sceptical theory, which held that dreams cannot be considered as experiences (Malcolm, 1962). According to his theory, experiences require consciousness and language that's use also shows that the speaker is awake. Therefore, they can only be waking experiences and are not worth studying. Despite this, researchers from other disciplines, such as psychology and neuroscience, continued to get involved and theories such as Hobson and McCarley (1977) emerged. These authors presented their activation-synthesis hypothesis, in which they tried to make sense of the neuronal activity that takes place during sleep. Also, they showed a high level of criticism of Freud's dream theory. Nevertheless, the activation-synthesis model was similarly highly criticized by other authors like Solms (2003) for considering that it repre-

Corresponding address:
Mar Mediano - SGAC. C/ Pinar de Dona Consuelo, 11 – 28220 Majadahonda (Madrid), Spain.
Email: mar.mediano@sgac.es

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sents excessive physiological reductionism. Even, based on a study of patients with brain injuries, Solms (2003) showed that dreams are not due to such the activation-synthesis of the brain regions model, proposed by Hobson and McCarley (1977).

From another point of view, several studies have investigated the relationship between dream content and memory consolidation and the role of dreams in the process of learning, memory and regulation of emotions (Perogamvros & Schwartz, 2012). According to the Threat Simulation Theory (TST) (Revonsuo & Valli, 2019), dreams allow the functional practice of social skills. Also, dreaming, as a cognitive function, had survival value in prehistory, since it increased threat avoidance skills, thus improving the chances of successful reproduction. However, adaptive models are also being criticized by researchers such as Mageo (2019) who proposes a mimetic perspective. Through a study with undergraduate American dreamers, this author found that participants thought mimetically about the cultural models through which people understand waking concerns and social bonds. They did so by copying visual metaphors for models that circulate in a social world and altering these images.

Wang et al. (2020) propose that dreaming is concerned with a process of selection for waking-life experiences related to one's life. They conducted a study with 30 participants who recorded their dreams and waking-life experiences for 7 days in a spreadsheet at home. Their results showed that waking-life experiences that were incorporated into dreams were more emotional and more meaningful and had more impact on one's life than those that were not incorporated into dreams.

For Perogamvros and Schwartz (2014), understanding the functions of dreams is difficult, in part, due to the fact that the neural correlates of the dreaming state still remain undetermined due to methodological issues, derived from the used techniques in dream research (e.g., limited number of EEG electrodes, neuroimaging studies specific to sleep but not to dreams).

Another model is Control-Mastery Theory (CMT; Fimiani et al., 2020), from a psychoanalytic origin. According to this theory, dreams represent our unconscious attempts to find solutions to emotionally relevant problems. It is a cognitive-dynamic relational theory that emphasizes how dreams reflect the person's efforts to adapt to reality.

Despite previous models and discussion, the interest of science in the processes of sleep and dreaming is growing. Dreaming has evolved from being a curiosity for scientists to an object of study, both in laboratory and through diaries and questionnaires. These studies are receiving full recognition from the scientific community.

Dream recall is the ability to remember dreams after awakening (Bloxham, 2018) and is a prerequisite for dream research, although the basic mechanisms of storing dream experiences into memory during the awakening process are not well understood (Schredl, 2019). Content analysis is one of the methods applied in dream research (Hoss & Valli, 2019) for which recall is needed. However, a central problem is the fact that most dreams are forgotten, raising the question of how dreams can be studied independently of recall (Windt, 2015).

One of the most studied variables about dreams is the frequency with which they occur (DRF: Dream Recall Frequency), as well as their general characteristics and content. For instance, Nielsen (2012) analysed DRF according to age and gender finding DRF increased from adolescence (ages 10-19) to early adulthood (ages 20-29) and gradually decreased over the next 20 years. Interestingly, that pattern of decline was different between men and women. Significant differences were observed for the 10-19 and 40-49 age groups. However, there was a range in which the frequency in men was higher than women, but only for the 10-19 age group. Other studies have also confirmed that the frequency of dream recall decreases with age and is higher in women (Schredl & Piel, 2003; Schredl & Reinhard, 2008).

Nevertheless, there are also many other aspects of dreams under investigation such as the attitude towards dreams or the interest in dream literature (Schredl et al., 2014). Regarding the study of dreaming activity, different types of questionnaires have been developed over the years which analyse participants beliefs and attitudes about dreams, as well as the intensity of dreams (Yu, 2010), but none are used very often.

Schredl et al., (2014) created the Mannheim Dream questionnaire (MADRE) which focused on collecting the most relevant aspects of dreaming and developing reliable items for their measurement. The MADRE questionnaire studies characteristics such as the measurement of aspects of memory, different types of dreams (nightmares, lucid dreams), attitudes towards dreaming, what dreamers do with their dreams (narrating dream, recording dream) and effects of dreams on waking life (creative dreams, problem-solving dreams, déjà vu experiences based on dreams). The MADRE questionnaire also includes aspects like nightmare frequency in childhood and age at lucid dream onset. It could be considered one of the most comprehensive dream questionnaires widely used by different research approaches. Due to this questionnaire looking at diverse aspects of dreams, it is an interesting and useful tool for dream studies.

The MADRE questionnaire was developed in both German and English by Schredl et al. (2014), and it has been translated into different languages. Moreover, its validity has been tested with participants from several countries.

Initially, Schredl et al. (2014) carried out an online questionnaire and a retest study was performed. Their results showed a high retest reliability for all items with values between r = .717 and r = .842.

Dyck et al. (2017) used the MADRE questionnaire trying to replicate the retest reliability coefficients in a new independent sample. The averaged retest-reliability coefficients ranged from .775 to .971, with the exception of the recording dreams variable (r = .706) having improved the previous ones.

Shahabian et al. (2017) translated the Persian version of the questionnaire from the English version (Schredl et al., 2014), changing some items and the consistency between them was confirmed by the authors. The reliability testing on a Persian adaptation of the MADRE questionnaire has also shown good internal consistency for all items: Cronbach's alpha r = .75.

The English version was also translated into French by Scapin et al. (2018) using the same items in a Belgian sample. Both the Persian and French versions showed high validity and reliability. The reliability of the French version of the MADRE questionnaire, with values between r = .560 and r = .866, was weaker than the one of Schredl et al. (2014).

Ghorayeb et al. (2019) did a new translation of the questionnaire into French and tested it in French adults. Most of the items showed frequency distributions and averages close to those formerly reported (Schredl et al., 2014). Their retest reliability correlation coefficients ranged from .700 to .800, and they were all significant. They reached quite similar retest reliability correlation coefficients compared to Schredl et al. (2014).

Settineri et al. (2019) translated the MADRE Questionnaire from English to Italian, corresponding precisely to the original version. They conducted a study in Italian-speaking participants, aimed at pointing out possible similarities among the different above-mentioned previous adaptations. Yet, they did not perform the retest analyses.

All those extensions represent a consistent implementation for the reliable Persian, French and Italian-speaking populations.

However, to the best of our knowledge, no validated Spanish version of this questionnaire is currently available. In addition, in recent years it has been used in different investigations on dreams in their diverse aspects. For instance, Karia et al. (2016) used it to analyse the relationship between insomnia, suicidal behaviour and dreams. Schredl et al. (2017) used it in a study about pain dreams in patients with chronic back pain, for eliciting dream frequency, and administered it to 100 patients with chronic lower back pain and 270 controls. They concluded that pain dreams might be instigated by actual pain. Whereas, for healthy persons, pain dreams might be pain memories (self-experienced pain and/or seeing persons in pain).

Klepel et al. (2019) studied the influence of personality traits in creative and problem-solving dreams using the MADRE questionnaire. They found that personality traits, especially Openness to Experience, affect the frequency of creative and problem-solving dreams, while Agreeableness and Conscientiousness were negatively correlated with creative ideas in dreams.

Schredl and Basak (2020) studied contentless dreams (waking up with the impression of having dreamed but unable to recall any specific dream content) and used the six-item scale of the MADRE in a sample of 69 students for measuring attitude towards dreams. Napias et al. (2021) used the validated French version of the MADRE questionnaire to examine the discrepancies between humanities and science students and about many of their aspects and beliefs regarding dreams. They observed important discrepancies between these two groups of students. Rimsh (2021) used the MADRE questionnaire to assess the intense and vivid emotionality of dreams in outpatients with anxiety disorders in a sample of outpatients with anxiety disorders. He concluded that there are generally relationships between anxiety and anxiety disorders and dreams. The study by Schredl et al. (2019) included 925 participants who were assessed twice over a 5-year period and showed that dream recall frequency and attitude toward dreams is very stable over time (trait-like). There was a positive correlation between changes in dream recall frequency and changes in the Dream Attitude Scale.

From another point of view, Schredl (2002) investigated the relationship between selected measures of dream content (and self-ratings) derived from questionnaires vs. dream diaries. This study was designed to examine in detail the relationship between dream recall frequency, measured by questionnaire and by dream diaries besides the pattern of high and low dream recallers. DRF over a few months was measured by a Dream Questionnaire using a seven-point scale (0 = never, 1 = less than once a month, 2 = about once a month, 3 = twice or three times a month, 4 = about once a week, 5 = several times a week and 6 = almost every morning) which is the same as the MADRE scale (Schredl et al., 2014). Participants completed the Dream Questionnaire and kept the dream diary were given orally over a two-week period. After that, they were divided into three subgroups according to their Dream Questionnaire DRF scores: Low recall (1, 2), Medium recall (3, 4) and High recall (5, 6). Diary dream recall was defined as number of mornings with recall of an explicit dream. The correlation coefficient between dream recall (questionnaire) and dream recall (diary) was $r = .557$ ($p < .0001$).

Schredl (2002) found that DRF was not elevated by the diary procedure, although the relationship between questionnaire and diary was mediated by dream recall frequency, because there was a different pattern depending on the initial DRF. Comparison between questionnaire and diary data revealed that low and medium dream recallers tended to increase their dream recall frequency, whereas a decrease was found for high dream recallers. Also, those relationships were much weaker for low dream recallers.

Other researchers, such as Aspy et al. (2015), have investigated the disparity between retrospective measures in the frequency of dream recall and the information obtained from logbooks. They reached the conclusion that such disparity is likely to be confounded with a wide range of variables that may have little or no relationship to true dream recall rates. Later, Aspy (2016) conducted an empirical study using several retrospective and logbook measures based on different time periods used to assess general dream recall as well as recall of nightmares, bad dreams, lucid dreams and flying dreams. Also, he used three different types of logbooks: a Checklist logbook, a Narrative logbook and a “Quantity logbook”. His results provided the strongest evidence to date that dream recall is underestimated by retrospective measures and enhanced by logbooks.

Zunker et al. (2015) conducted a study with a questionnaire about dreams and emotions during the day in the beginning phase of the study. The participants were then asked to keep a checklist diary for two weeks. Their results showed an increase in nightmare frequency using diary measures instead of retrospective questionnaires which might be a result of the increase in overall dream recall frequency.

In the present study, although data was obtained from all the participants on all the items in the MADRE questionnaire, our research is focused on evaluating the frequency of dream recall. It was also important to know if keeping a dream diary had any influence. For this reason, we have performed test-retest correlations for all items, but the background and discussion focus exclusively on those aspects related to the frequency of dream recall. In addition to the frequencies of dream, the MADRE questionnaire measures various aspects of dreaming, such as recall, telling dreams, nightmares, lucid dreams, reading about dreams, effects of dreaming on future waking life as well as attitude towards dreams and overall emotional intensity of dreams. Nevertheless, our objectives are only focused on the use of the questionnaire to measure the effects of different aspects on the frequency of dream recall. For further details and references on the rest of the variables affected, see Schredl et al. (2014).

Study aims

The current study has two main objectives for exploratory purposes. First, it aims at evaluating a Spanish version of the MADRE questionnaire and assessing whether the retests coefficients obtained in the original version could be replicated in a Spanish-speaking young adult's sample. Second, to examine the relationship between diary and questionnaire responses in regard to the frequency of dream recall. Finally, the two groups of high and low dream recall frequency were differentiated. The aim is knowing whether the relationship is increased by the diary procedure or not, as well as if any different measurements between high and low dreams recallers occur.

2. Method

2.1. Research Instrument

In the current study, the authors have translated the original English version into Spanish, following the guidelines of the International Test Commission (2017). We added certain items about sleep habits, which are not discussed in this paper because they are the subject of another study (Mediano et al., 2021). This translated version is exactly the same as the original English version.

The scales of the questionnaire were coded according to Schredl et al. (2014). The Spanish version of the MADRE questionnaire without the additional items is available in the appendix of this article.

2.2. Participants and Procedure

Overall, 87 young adults (range: 20 to 35 years), 49 women (56.3%) and 38 men (43.7%) with a mean age of 25.78 ± 4.50 years participated in this study (snowball sampling). No one received any compensation for participating. All of them signed the consent form to collaborate.

They were divided into two groups, an experimental group of 58 participants (43 women-56.9% and 25 men-43.1%; mean age 25.59 ± 4.87 years) and a control group of 29 participants (16 women-55.2% and 13 men-44.8%; mean age 26.17 ± 3.72 years).

All participants completed the MADRE questionnaire test and retest, but participants in the control group did not keep a dream diary. Every participant was asked to fill in the Spanish Mannheim Dream questionnaire (MADRE) between January and April 2021. Afterward, only participants in the experimental group reported their dreams and other sleep aspects for 14 consecutive nights. After three weeks from the first execution of the MADRE questionnaire, all participants were asked to complete questionnaire again, which was received around 21-28 days after the first. They did it online, through the Google Forms application.

Data was coded in the same way as Schredl et al. (2014) and the analysis was carried out with the IBM SPSS Statistics 21 program.

3. Results

In this section the main results are shown, and we will especially emphasize the differences between the two groups when appropriate. Our sample contained a sole age range (young adults) with no difference to gender. Therefore, we do not provide outcomes differentiated by age. Regression was not taken into account in this study.

The test distributions of the recall frequency in the preliminary test for each group and for the whole observation sample are shown in Table1.

In DRF there was no significant difference between the experimental and the control group ($chi^2 = .2200$; $p = .821$). The distributions of lucid dreaming frequency as well as the current nightmare frequency and nightmare frequency in childhood (inter-correlation $r = .390$; $p < 0.001$) are depicted in Table 2 and distributions for the six scales measuring different aspects of dreaming are depicted in Table 3.

No correlation was found between the attitude scale and dream recall frequency ($r = .155$; $p = .151$; $N = 87$).

Tables 4 and 5 show the reliability indices for each group. Table 4 shows the first set of dream variables and Table 5 the second set, which depend more or less on dream recall frequency, e.g., telling or recording dreams.

For determining retest reliability, three indices were used: exact agreement for binary items, Spearman Rank correlations for ordinal scales, and Pearson correlation for interval scales in order for the results to be comparable to Schredl et al. (2014).

Except for the two items on emotional content, most of the indices ranged from approximately .600 to .800 in both groups, which are lower than those of previous studies (Schredl, et al., 2014; Dyck et al., 2017). Moreover, there were no significant differences between both groups. Consequently, these variables have had no effect due to participating in dream diaries. The variable Problem-solving dreams in the control group showed a low index, which has remained unexplained.

Although all variables explored showed indices indicating

Table 1. Dream recall frequency (DRF).

Category	Experimental group (n = 58)		Control group (n = 29)		Total (N = 87)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Almost every morning	10	17.24%	6	20.69%	16	18.39%
Several times a week	20	34.48%	12	41.38%	32	36.78%
About once a week	12	20.69%	5	17.24%	17	19.54%
About 2 to 3 times a month	9	15.52%	2	6.90%	11	12.64%
About once a month	2	3.45%	2	6.90%	4	4.60%
Less than once a month	5	8.62%	2	6.90%	7	8.05%
Never	0	0.00%	0	0.00%	0	0.00%

Table 2. Current nightmare frequency, childhood nightmare frequency, and lucid dreaming frequency .

Category	Current nightmares (N=87)	Childhood nightmares (N=78)	Lucid dreaming (N=87)
Almost every morning	0.00%	8.97%	10.34%
About once a week	24.14%	10.26%	10.34%
Two to three times a month	24.14%	16.67%	8.05%
About once a month	0.00%	20.51%	9.20%
About two to four times a year	24.14%	20.51%	26.44%
About once a year	13.79%	8.97%	9.20%
Less than once a year	6.90%	10.26%	12.64%
Never	6.90%	3.85%	13.79%

a strong positive correlation, a few do not reach the .700 criteria. Of all variables, seven of them showed values ranging from .700 to .800.

From another point of view, a recoding for the Dream Recall Questionnaire (Q) scale was done, following Schredl (2002), to obtain estimates for the frequency over a two-week period: 0 = .1, 1 = .25, 2 = .5, 3 = 1.3, 4 = 2.0, 5 = 7, 6 = 13 mornings with dream recall per two weeks. Participants were divided into two other subgroups according to their Dream Questionnaire DRF using the following criteria: LRF (Low recall frequency) (0 to 4) and HRF (High recall frequency) (5, 6) (see Introduction).

Table 6 shows the comparison between the means of dreams remembered in the two-week period, specifying each of the referred subgroups. In this way, comparing the experimental group and control group, allows us to know if participation in the dream diary has had any effect on these means. On the other hand, by separating both groups between high and low recallers, it is possible to know if this variation of means is different, according to the previous DRF.

Results show that LRF experimental group is the only subgroup where the means have changed significantly from test to retest. This leads us to the fact that participation in our experimental research (Mediano et al., 2021), which is fundamentally the daily recording of dreams, has influenced significantly to LRF to increase the number of remembered dreams. This confirms the results of Schredl (2002) and, even there has been a slight decrease in the HRF test/retest of the experimental group in line with his outcomes, although in our case it is not significant.

Finally, we compared the means obtained in the experimental group from the diary records with those obtained from the test and retest questionnaires, previously recoded according to Schredl (2002). Results are shown in Table 7.

In this case, there are significant differences, between DRF diary and questionnaire test and retest, and both in HRF and LRF. This indicates that, as a whole, the participants underestimated their recall frequency.

4. Discussion

In the present work we have accomplished two objectives related to the study of dreams. First, we have carried out a Spanish version of the MADRE questionnaire (Schredl et al., 2014) and have validated it in a sample of Spanish-speaking young adults. Second, we have carried out a record of the dreams of a group of participants for two weeks, which has allowed us to compare the data of the dreams really remembered with the estimates of the participants about their memories, obtained from the questionnaire.

Regarding the first objective, our results have shown a frequency distribution of dream memory with many similarities to the German version of Schredl et al. (2014) and Dyck et al. (2017). However, it is striking that none of the participants in our study have stated that they never remember dreams, since, from the diary records, we have been able to verify that a few of them did not remember any dreams in those two weeks. Furthermore, this has not happened in the French (Scapin et al. 2018; Ghorayeb et al., 2019) and Italian (Settineri et al., 2019) validations. The Persian validation was carried out with a different, specific methodology so we do not discuss any comparisons.

The participants and data for this study were obtained from the research carried out by Mediano et al. (2021), which combined information from three different sources. First, they used questionnaires, including the MADRE questionnaire. Second, dream diaries were obtained from the participants for 14 consecutive days. Third, physiological data related to heart rate, sleep phases and the time of nocturnal awakenings during the night were obtained through biometric control bracelets. This last source of data was a limitation in terms of the number of participants in the study, since it depended on the number of bracelets and the time that we had them. The objective was to reach the amount

Table 3. Frequency distribution of different dream variables (N=87).

Category	Telling dreams	Recording dreams	Daytime mood affected	Creative dreams	Problem solving dreams	Déjà vu experiences
Almost every morning	19.5%	1.1%	4.6%	0.0%	2.3%	4.6%
About once a week	14.9%	2.3%	6.9%	3.4%	0.0%	5.7%
Two to three times a month	19.5%	2.3%	10.3%	6.9%	5.7%	21.8%
About once a month	14.9%	2.3%	12.6%	10.3%	4.6%	14.9%
About two to four times a year	16.1%	0.0%	10.3%	16.1%	21.8%	28.7%
About once a year	6.9%	0.0%	12.6%	23.0%	16.1%	9.2%
Less than once a year	8.0%	11.5%	14.9%	18.4%	18.4%	8.0%
Never	0.0%	80.5%	27.6%	21.8%	31.0%	6.9%

Table 4. Retest reliability for dream variables.

Variable	Experimental group (n=58)		Control group (n=29)		Total (N=87)	
	Correlation	p	Correlation	p	Correlation	p
Dream recall frequency[1]	.658	.001	.832	<.0001	.703	<.0001
Emotional intensity[1]	.363	.005	.682	<.0001	.467	<.0001
Overall emotional tone[1]	.602	<.0001	.363	.053	.509	<.0001
Nightmare frequency (current)[1]	.602	<.0001	.834	<.0001	.672	<.0001
Nightmare frequency (childhood)[1]	.795 (n=49)	<.0001	.833 (n=29)	<.0001	.812 (N=78)	<.0001
Nightmare distress[1]	.632 (n=44)	<.0001	.578 (n=29)	.001	.609 (N=73)	<.0001
Recurring nightmares (Yes/No)[1]	82.76%	-	86.21%	-	83.91%	-
Percentage of recurring nightmares[3]	.734 (n=21)	<.0001	.591 (n=18)	.010	.658 (N=39)	<.0001
Lucid dreaming freqency[1]	.717	<.0001	.737	<.0001	.721	<.0001
Age of first lucid dream[2]	.980 (n=12)	<.0001	.827 (n=9)	<.0001	.889 (N=21)	<.0001

[1]Spearman Rank correlation, [2]exact agreement, [3]Pearson correlation

of 60 participants in the experimental group. In addition, we considered it necessary to collect data from the questionnaires for a control group, which we intended to be at least half 30 people. However, in the experimental group, two participants dropped out of the study, so the sample was reduced to 58 participants. Regarding the control group, the data of one participant had to be excluded for being aberrant, so this group was reduced to 29. The total sample was 87 participants.

The Spanish validation of this questionnaire through the test-retest correlation, has recruited a similar sample size (87 participants) as Dyck et al. (2017) validation (110 participants) and Scapin, et al. (2018) French validation (90 participants), while all of them are smaller than the second French translation (Ghorayeb et al., 2019; 170 participants). Although the sample size of our study is relatively smaller than previous validations, the results of the test-restest realiability analyses are quite similar to those derived from other adaptations of the Madre questionnaire to other languages Therefore, our sample size does not seem to have had a significant impact on our results in this aspect, and we consider that they are comparable to those of the adaptations of the questionnaire to other languages. It must be taken into account that we have focused exclusively on the aspects related to the frequency of dreams, and that it was not our intention to carry out statistical analyses such as logistic regression or factor analysis carried out in other adaptations.

In our study, the test-retest correlation indices have been reasonably high, and although they are mostly lower than

Table 5. Retest reliability for dream variables.

Variable	Experimental group (n=58)		Control group (n=29)		Total (N=87)	
	Correlation	p	Correlation	p	Correlation	p
Meaningfulness[1]	.727	<.0001	.819	<.0001	.758	<.0001
Attitudes towards dreams[2]	.796	<.0001	.662	<.0001	.766	<.0001
Telling dreams[1]	.797	<.0001	.891	<.0001	.842	<.0001
Recording dreams[1]	.819	<.0001	.721	<.0001	.759	<.0001
Dreams affecting daytime mood[1]	.604	<.0001	.697	<.0001	.620	<.0001
Creative dreams[1]	.574	<.0001	.639	<.0001	.593	<.0001
Problem solving dreams[1]	.571	<.0001	.396	.034	.519	<.0001
Déjà vu experiences[1]	.815	<.0001	.631	<.0001	.762	<.0001
Reading about dreams[1]	.786	<.0001	.774	<.0001	.778	<.0001
Helpful dream literature[1]	.621	<.0001	.855	<.0001	.700	<.0001
Dreams provide impulses waking life[1]	.498	<.0001	.533	.003	.506	<.0001

[1]Spearman Rank correlation, [2]Pearson correlation

Table 6. Dream recall Questionnaire (Q. test & retest).

Experimental/ Control group	Recall group	Dream recall (Q. test) recoded		Dream recall (Q. retest) recoded		
		M	SD	M	SD	t-test (Q. test-Q. retest)
Experimental Group	Low recall (n=28)	1.36	.68	3.62	.68	t=-4.14 p<.0001
	High recall (n=30)	9.00	2.88	7.98	4.11	t=1.31 p=.202
	Total Experimental Group (n=58)	5.31	4.39	5.87	4.29	t=-1.07 p=.288
Control Group	Low recall (n=11)	1.28	.77	1.75	1.86	t=-.944 p=.368
	High recall (n=18)	9.00	2.91	7.50	3.55	t=1.96 p=.066
	Total Control Group (n=29)	6.07	4.46	5.32	4.12	t=1.42 p=.17

those of the German and both French versions, our work supports the high internal consistency of the attitude towards dreams scale shown by Schredl et al. (2014).

Concerning the time interval between the test and the retest, in our study it ranged from three to four weeks, which is similar to the second French version (Ghorayeb et al., 2019), four weeks, and Dyck et al. (2017), whose retest was performed weekly for three weeks after the first performance. This interval was longer in the first French validation (Scapin et al. 2018), in which the retest was carried out between 48 and 110 days. However, this does not seem to have influenced the correlation indices, since those of our study have been lower than the previous ones.

Previous studies intended to test whether an increased DRF in HRF could be associated with grey or white matter density specificities in brain regions previously associated (at the theoretical or experimental level) with dream recall and/or production, namely the amygdala, hippocampus, MPFC and TPJ (Eichenlaub et al., 2014a,b). VBM analyses of the anatomical scans of 44 HRF and 44 LRF revealed a significant difference between the two groups in the white matter of the MPFC. This result adds an anatomical dimension to numerous experimental findings showing differences in brain function between HRF and LRF (Eichenlaub et al., 2014a,b).

In relation to the influence of participation in the experimental group on the DRF, in our study there was an increase in the retest indices of recall frequency, but only in the LRF. For this subgroup, the fact of participating in the dream diaries clearly caused a significant increase in the frequency of recall, measured in the retest. This makes sense based on studies such as Aspy (2016) providing evidence that dream recall is underestimated by retrospective measures and enhanced by diaries. The novelty in our case is that this difference has not been replicated in the entire experimental group but only in the LRF. The DRF in HRF group, despite the participation in the registry by diaries, has not been affected. This seems to indicate that such participation in dream diaries has led to a change in the attitude of lower recallers and, following the conclusions of Schredl et al. (2019), has led to an increase in the frequency of recall. However, for the HRFs, participation in the experimental study did not influence their attitude towards dreams and, therefore, their recall frequency was not affected in the retest response.

Hence, we can conclude that participation in dream diary studies has affected recall frequency, but only when people started with low DRF.

5. Strengths and limitations

Interestingly, our study provides two new features compared to previous versions. Firstly, the participants have been divided into two groups, one of these was subject to daily dream registration (experimental group) and the other simply filled out the MADRE questionnaire twice. As Sikka (2020) points out, the different data collection and analysis methods can lead to very different results and conclusions regarding the phenomenology of dream affect. Therefore, having a control group, who has only done the questionnaire, improves previous methods because we can compare what has occurred in the study in order to examine if making diaries influences the memory of dreams.

Secondly, the experimental group has carried out twice the questionnaires and reported a diary for two weeks, which allows evaluating the participants' estimates of their recall frequency through the actual data that emerges from the diaries. This is similar to what was done by Schredl (2002), though in that case there was not validation but rather a comparison of these two research methods. Our method in this concept is similar to that of Schredl and Basak (2020). Nevertheless, it has other purposes. Zadra and

Table 7. Dream recall Recoded Questionnaire (Q) and Diary.

Experimental group	Dream recall (Diary)			
	M	SD	t-test (Q.Pre-Diary)	t-test (Q.Retest-Diary)
Low recall (n=28)	4.89	3.52	t=5.56 p<.0001	t=-2.54 p=.02
High recall (n=30)	12.13	5.73	t=3.29 p=.003	t=-4.76 p<.0001
Total Control Group (n=58)	8.64	5.99	t=5.78 p<.0001	t=5.10 p<.0001

Robert (2012), as well as Schredl (2002), pointed out the way in which the data is collected can influence the results, especially regarding the frequency of dream recall. Therefore, our process could help to better understand the effects of the technique used. In this sense, our results have confirmed those of Schredl (2002) that the realization of sleep diaries itself influences the frequency of memories, mainly in the case of low-frequency reminders. This information is important because it affects the results and must be considered when using these tools.

From another point of view, our interest focused on an age range reduced to young adults, as this is the time of life in which greater dream recall occurs and in order to avoid the effect of age on the results of our study. This is a limitation for the purposes of the total evaluation of the MADRE questionnaire, and we propose that new studies in Spanish should be carried out with larger samples and covering a wider age range. Likewise, at that age, no gender differences have emerged, but we cannot be sure that extending the age range would not result in the appearance of such differences. Consequently, new studies and validations will be necessary in different samples to confirm the results.

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Appendix

Spanish version of the Mannheim Dream questionnaire (MADRE)

MANNHEIM DREAM QUESTIONNAIRE (MADRE)

CUESTIONARIO DE SUEÑOS – VERSIÓN EN ESPAÑOL

Este cuestionario tiene como objetivo obtener una buena visión general de diferentes aspectos sobre los sueños.

Se tarda entre 5 y 10 minutos en completarse.

Por favor, tómese su tiempo y responda todas las preguntas con cuidado y de forma completa.

Edad: _____años Género: O masculino O femenino
Ocupación / disciplina de estudio (estudiantes): _____

1. ¿Con qué frecuencia ha recordado sus sueños recientemente (en los últimos meses)?

   - ○ Casi todas las mañanas
   - ○ Varias veces a la semana
   - ○ Una vez a la semana
   - ○ Dos o tres veces al mes
   - ○ Una vez al mes
   - ○ Menos de una vez al mes
   - ○ Nunca

2. ¿Cómo son de intensos sus sueños a nivel emocional?
   - ○ Nada intensos
   - ○ Casi nada intensos
   - ○ Algo intensos
   - ○ Bastante intensos
   - ○ Muy intensos

3. ¿Cuál es el tono emocional de sus sueños en general?
   - ○ Muy negativo
   - ○ Algo negativo
   - ○ Neutro
   - ○ Algo positivo
   - ○ Muy positivo

Spanish version of the Mannheim Dream questionnaire (MADRE)

4. ¿Con qué frecuencia ha tenido pesadillas recientemente (en los últimos meses)?

Definición: Las pesadillas son sueños con fuertes emociones negativas que provocan el despertar. La historia del sueño se puede recordar muy vívidamente al despertar.

- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

5. Si actualmente tiene pesadillas ¿cómo de estresantes son para usted?
   - ○ Nada estresantes
   - ○ Casi nada estresantes
   - ○ Algo estresantes
   - ○ Bastante estresantes
   - ○ Muy estresantes

6. ¿Experimenta pesadillas recurrentes que se relacionan con una situación que ha experimentado en su vida de vigilia?
   - ○ Si
   - ○ No

7. ¿Cuántas de sus pesadillas son recurrentes (en porcentaje)?

   _____ %

8. ¿Con qué frecuencia experimentó pesadillas durante su niñez (de 6 a 12 años)?

Definición: Las pesadillas son sueños con fuertes emociones negativas que provocan el despertar. La historia del sueño se puede recordar muy vívidamente al despertar.

- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

Spanish version of the Mannheim Dream questionnaire (MADRE)

9. Por favor, enumere los temas de sus pesadillas infantiles:

_____

10. ¿Con qué frecuencia experimenta los llamados sueños lúcidos (ver definición)?

Definición: En un sueño lúcido, uno se da cuenta de que está soñando durante el sueño. Por tanto, es posible despertarse deliberadamente, o influir activamente en la acción del sueño u observar el curso del sueño pasivamente.

- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

11. Si ha experimentado sueños lúcidos, ¿qué edad tenía cuando ocurrieron por primera vez?

_____ años

12. Actitud hacia los sueños

	Ninguno	Casi ninguno	Parcialmente	Algo	Totalmente
¿Cuánto significado atribuye a sus sueños?	o	o	o	o	o
¿Cómo de fuerte es su interés en los sueños?	o	o	o	o	o
Creo que los sueños son significativos	o	o	o	o	o
Quiero saber más sobre los sueños.	o	o	o	o	o
Si alguien puede recordar e interpretar sus sueños, su vida se verá enriquecida.	o	o	o	o	o
Creo que soñar es en general un fenómeno muy interesante.	o	o	o	o	o
Una persona que reflexiona sobre sus sueños es ciertamente capaz de aprender más sobre sí misma.	o	o	o	o	o
¿Tiene la impresión de que los sueños le proporcionan impulsos o indicaciones para su vida de vigilia?	o	o	o	o	o

Spanish version of the Mannheim Dream questionnaire (MADRE)

13. ¿Con qué frecuencia les cuenta sus sueños a los demás?
- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

14. ¿Con qué frecuencia escribe sus sueños?
- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

15. ¿Con qué frecuencia sus sueños afectan su estado de ánimo durante el día
- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

16. ¿Con qué frecuencia sus sueños le dan ideas creativas?
- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

Spanish version of the Mannheim Dream questionnaire (MADRE)

18. ¿Con qué frecuencia sus sueños le ayudan a identificar y resolver sus problemas?

- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

19. ¿Con qué frecuencia experimenta *Déjà vus* (ver definición)?

Definición: Durante una experiencia de *déjà vu*, uno está convencido de que está reviviendo una situación de la vida real que ya se experimentó en un sueño.

- ○ Varias veces a la semana
- ○ Alrededor de una vez a la semana
- ○ Dos o tres veces al mes
- ○ Alrededor de una vez al mes
- ○ Alrededor de dos a cuatro veces al año
- ○ Alrededor de una vez al año
- ○ Menos de una vez al año
- ○ Nunca

20. ¿Ha leído alguna vez algo sobre el tema de los sueños? [Libros o artículos de revistas]

- ○ No
- ○ Una o dos veces
- ○ Varias veces

21. ¿Le ayudó la literatura sobre los sueños / interpretación de los sueños a comprender mejor sus sueños?

- ○ Nada en absoluto
- ○ No mucho
- ○ Algo
- ○ Bastante
- ○ Mucho