



# Lucid dreaming patterns in a large Brazilian sample: an epidemiological study

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## 1. Introduction

On sleep and sleeplessness by Aristotle contains an early account of the possibility to become aware of a dream while dreaming; in 1913, Van Eeden [1] named this phenomenon lucid dreaming (LD). Scientific studies on LD started with Stephen LaBerge and colleagues, who developed a technique that consists of instructing subjects to convey an objective signal through ocular movements (e.g. two consecutive left-right turns) whenever they became lucid while dreaming [2-4]. This is possible because eye muscles are not in atonia during rapid eye movement sleep (REMS) [5, 6], the sleep stage most associated with dreaming [7].

Intriguingly, LD prevalence vary substantially across distinct populations: 26% of an Austrian (n = 1,000) [8] and 51% of a German (n = 919) [9] representative samples reported LD at least once in life. Studies focused on student samples in Japan, United States, Holland, Germany and China found LD prevalences of 47% (n = 153) [10], 71% (n = 268) [11], 73% (n = 189) [12], 82% (n = 439) [13] and 92% (n = 348) [14] respectively. At present and to our knowledge, there are no studies regarding LD prevalence among Latin Americans. To fill this gap, we set out to investigate the characteristics of dreams, nightmares and LD in a large Brazilian sample (n = 3,427) through an online questionnaire.

## 2. Methods

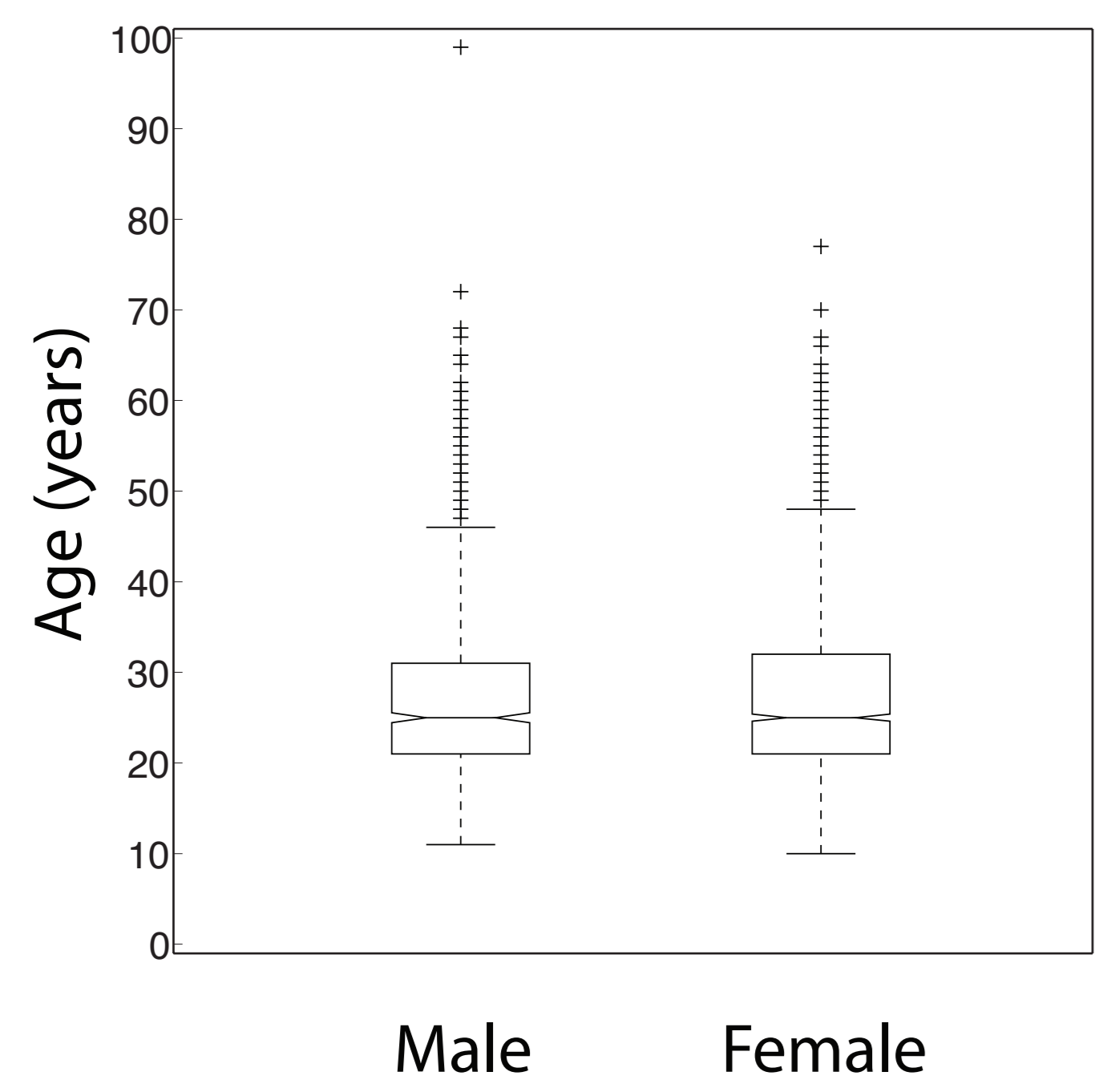
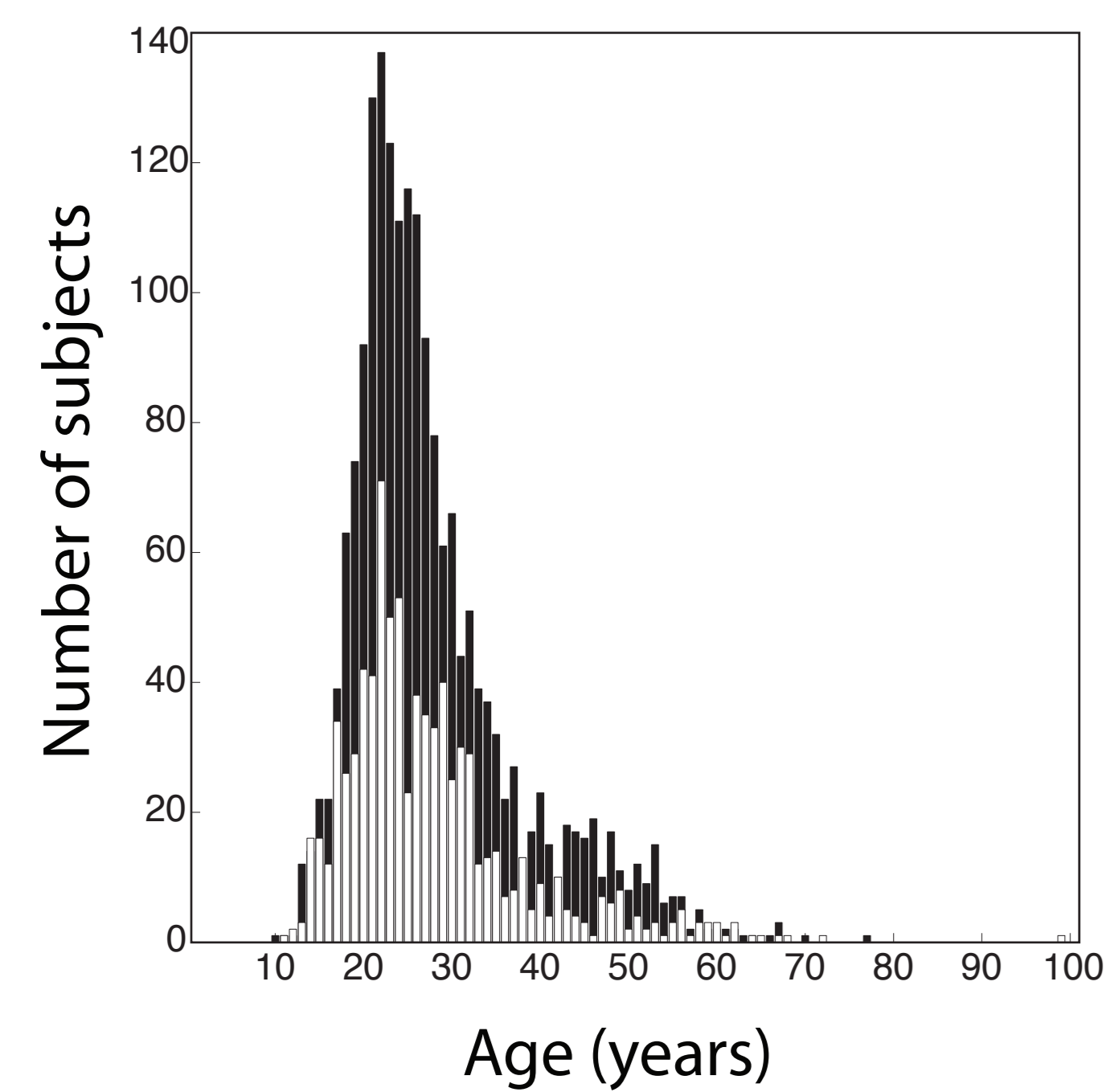
### Subjects

Subjects were invited to respond the questionnaire directly by an email, or indirectly by Facebook or TV program ads. Subjects who did not answer a given question were excluded from the analysis of this question. We also excluded the subjects that answered less than 90% of the first part of the questionnaire (final sample = 3,427 subjects). The study was approved by the Research Ethics Committee of the Federal University of Rio Grande do Norte (permit #061/2008). As stated by the Ethics Committee, all subjects (n = 3909) completed an online informed term of consent before completing the questionnaire.

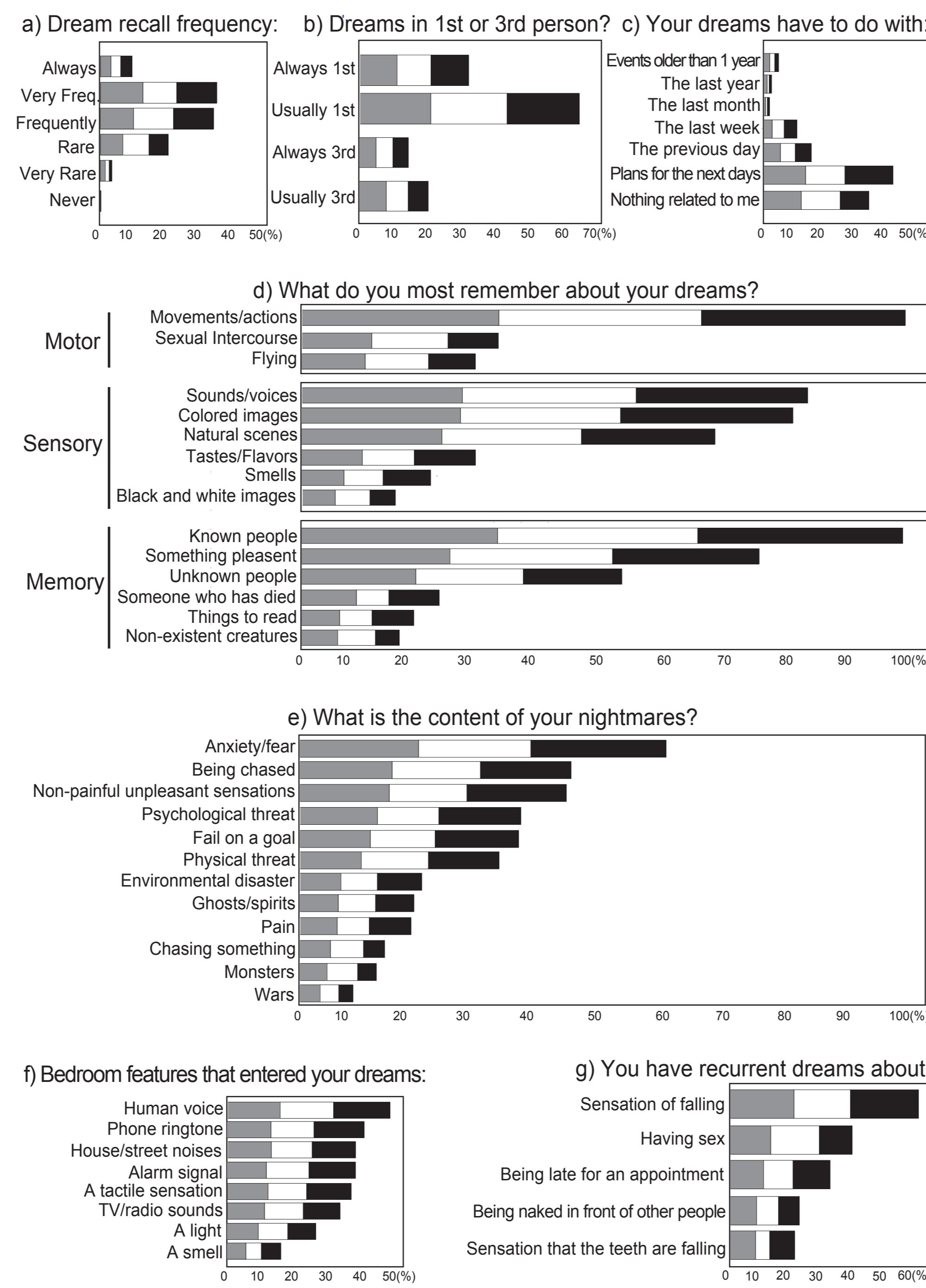
### Questionnaire

## 3. Results

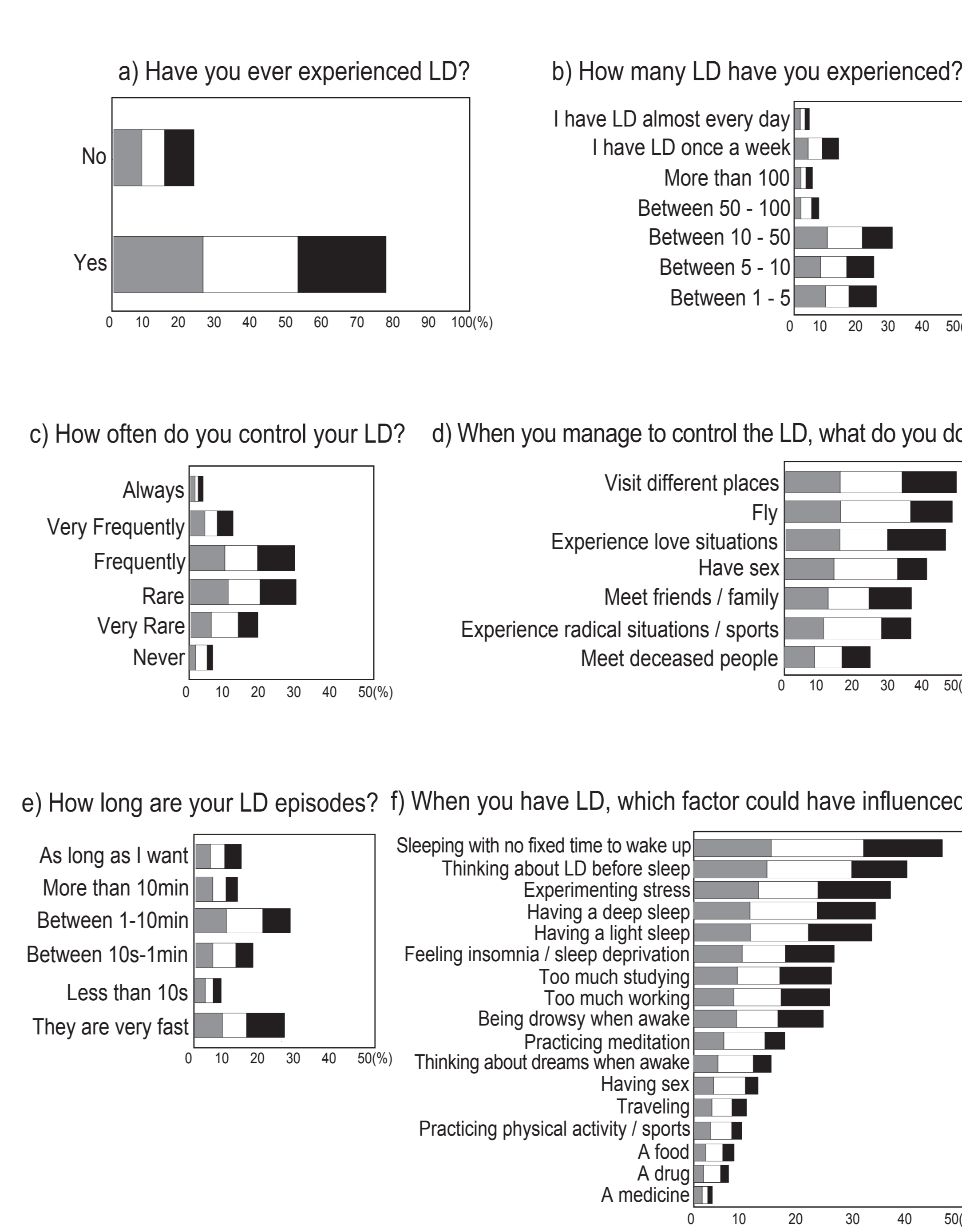
### Epidemiological characteristics of the sample



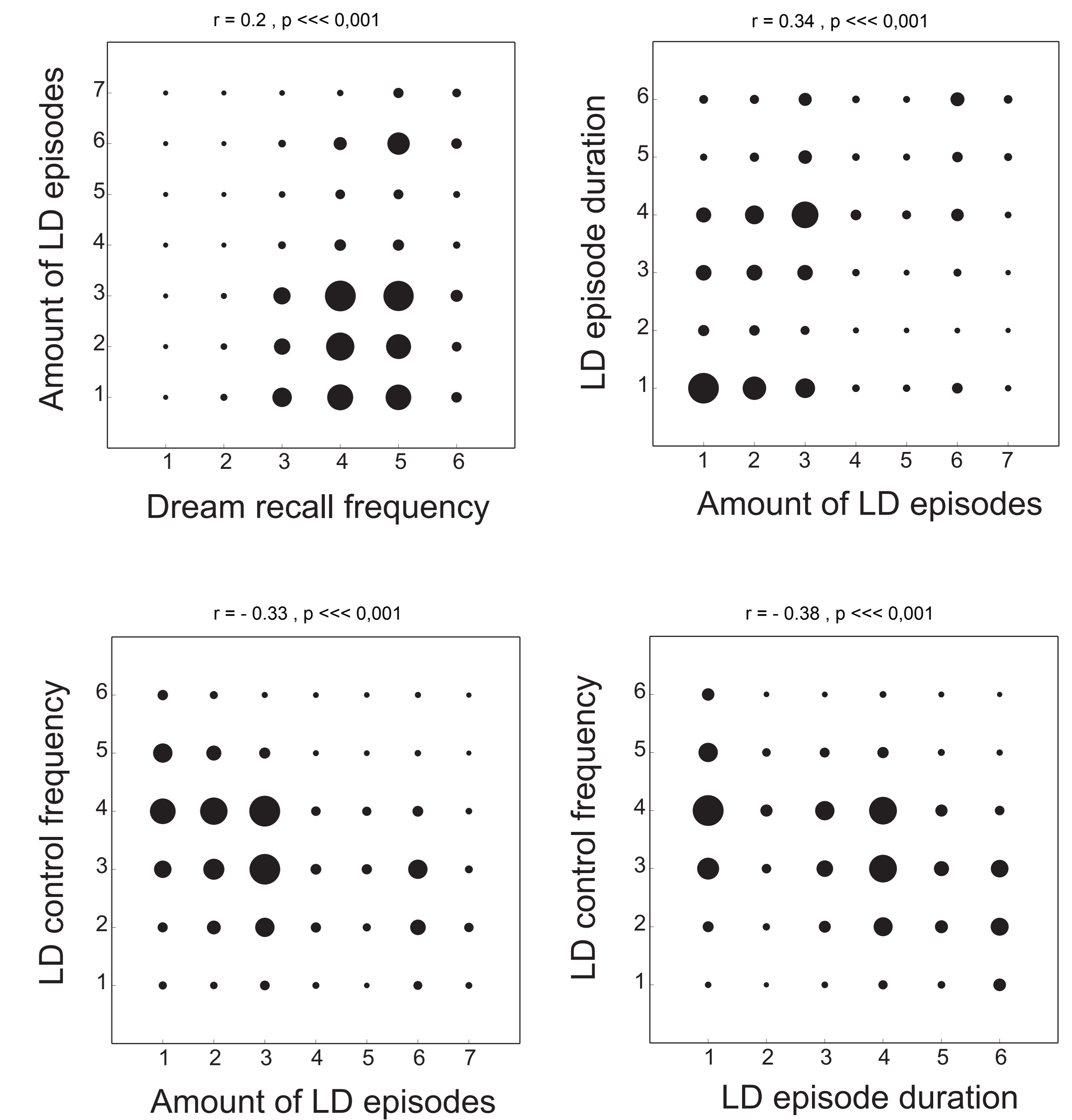
### Dream features



### Lucid dream features



### Correlations between dream and lucid dream features



## 4. Conclusions

The data suggest that dreams and nightmares can be evolutionarily understood as a simulation of the common situations that happen in life, and that are related to our social, psychological and biological integrity. The results also indicate that LD is a relatively common experience (but not recurrent), often elusive, difficult to control, and facilitated by the possibility to sleep with out a fixed time to wakeup (which increases REMS duration) and stress (which increases REMS transitions into wake) suggesting that LD is a state between REMS and wake. Moreover, despite the variability of LD prevalence among North Americans, Europeans and Asians, our data from Latin Americans strengthens the notion that LD is a general phenomenon of the human species.

## 5. References

[1] Van Eeden F (1913) [2] LaBerge S (1980) [3] LaBerge S, Nagel L, Dement WC, Zarcone V (1981) [4] LaBerge S, Dement WC (1982) [5] Aserinsky E, Kleitman N (1953) [6] Dement W, Kleitman N (1957) [7] Hobson JA, Pace-Schott EF, Stickgold R (2000) [8] Stepansky R et al. (1988) [9] Erlacher D, Schredl M (2011) [10] Erlacher D et al. (2008) [11] Palmer L (1979) [12] Blackmore SJ (1982) [13] Schredl M, Erlacher D (2004) [14] Yu CKC (2008)

## 6. Financial Support

