

Mental health, physical self and lucid dreaming: A correlational study in sport students

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Summary. It has been suggested that the ability of lucid dreaming is positively associated with both mental health and physical fitness, which in turn seem to also be interrelated. The present study of a sample of sport science students ($N = 72$) investigated the relationships between lucid dream frequency, mental well-being and physical self-concept. Marsh's Physical Self-Description Questionnaire (PSDQ) was used to measure physical self-concept as an indicator of physical fitness and two measures of mental well-being were employed, the Warwick Edinburgh Mental Well-Being Scale (WEMWBS) and Ryff's Scale of Psychological Well-Being (RPWB). Lucid dreaming was found to be negatively associated with physical self-concept. Although mental well-being was not related to lucid dream frequency, it was strongly associated with physical self-concept. Future research should explore the relationships in a less physically active sample, and could benefit from including external physical measures.

Keywords: Dreaming, Lucid Dreaming, Mental Well-Being, Physical Self Concept, Nightmares

1. Introduction

There is substantial evidence showing that physical activity and exercise has positive effects on mental health both in clinical and nonclinical populations (Paluska & Schwenk, 2000; Stephens, 1988; Taylor, Sallis, & Needle, 1985). Many studies have found negative correlations between physical activity and both depression as well as anxiety (Byrne & Byrne, 1993; Dunn, Trivedi, & O'Neal, 2001). For example, Tyson, Wilson, Crone, Brailsford, and Laws (2010) investigated three groups of healthy students with low, medium and high levels of physical activity and found that physically active students score lower on depression scales. A large portion of studies have focused more on exercise-based treatment of mental well-being in people suffering from depression, with positive results particularly for people with mild to moderate depression according to a review of the current literature (Paluska & Schwenk, 2000). While the evidence is limited, there are some indications for a dose-response relationship between amounts of physical activity and reduction of depression (Dunn et al., 2001). Furthermore, physical activity has positive effects on self-esteem (Sonstroem, 1984).

On the other hand, exercise is perceived as one of the most important factors for improving the quality of sleep (Urponen, Vuori, Hasan, & Partinen, 1988). Indeed, aerobic physical activities, such as cycling, walking or running on a treadmill, or playing football can improve sleep parameters: shorten sleep latency, increase efficiency and decrease number of awakenings (Brand, Beck, Gerber, Hatzinger,

& Holsboer-Trachsler, 2009; Reid et al., 2010; Youngstedt, 2005). Involvement in exercise and sports is also reflected in dreams: Sport students dream more about sports than psychology students do and the time spent in sports activities is directly related to the percentage of sports dreams (Erlacher & Schredl, 2004; Schredl & Erlacher, 2008). The ability to recall dreams seems also to have some relationship with mental health: Schredl and Doll (2001) found that, for males, elevated dream recall was associated with increased mental health, being more free of complaints, increased self-assertiveness and self-confidence.

One special type of dreams are lucid dreams – dreams in which individuals are aware of the fact that they are dreaming and often have the ability to consciously influence their content (LaBerge, 1985). Lucid dreams, for example, can be used to deliberately practice sports skills (Tholey, 1981, 1990) and about one out of five lucid dreamers seem to take advantage of this opportunity (Schädlich & Erlacher, 2012). Furthermore, practice in lucid dreams may enhance subsequent performance in wakefulness (Erlacher & Schredl, 2010). Interestingly, while the prevalence rate of lucid dreaming in athletes is similar to the general population, a rough estimate of percentage of the frequency of lucid dreams as compared to all recalled dreams in athletes may be as much as twice higher at 14.5% than in the general population at just 7.5% (Erlacher, Stumbrys, & Schredl, 2011-2012). Higher lucid dream frequency has been associated with a more acute vestibular system (Gackenbach, Snyder, Rokes, & Sachau, 1986; Leslie & Ogilvie, 1996) and better physical orientation/balance (Hunt, 1989). Lucid dreaming frequency has also been linked to various personality dimensions such internal locus of control, field independence, openness to experience, higher creativity and need for cognition (Blagrove & Hartnell, 2000; Blagrove & Tucker, 1994; Gackenbach, Heilman, Boyt, & LaBerge, 1985; Gruber, Steffen, & Vonderhaar, 1995; Patrick & Durndell, 2004; Schredl & Erlacher, 2004; Yu, 2012). Moreover, personality traits are believed to be one of the best predictors of mental well-being (Steel, Schmidt, & Shultz, 2008) which has been supported

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by a number of correlational studies (see meta-analysis by Deneve & Cooper, 1998).

Doll et al. (2009) investigated the relevance of lucid dreaming as a factor of mental well-being and found that the frequency of lucid dreaming was indeed associated with better mental health, being free of complaints, higher assertiveness, autonomy, and self-confidence. They argued that lucid dreaming may positively influence waking life as a result of improved management of mental conflicts. The skill of lucid dreaming seems to possess therapeutic properties due to increased experience of awareness and control (Gackenbach & LaBerge, 1988). For example, it has been found that individuals who regularly have nightmares are able to relieve their suffering by developing lucid dreaming abilities (Spoonmaker, van den Bout, & Meijer, 2003; Spoonmaker & van den Bout, 2006; Zadra & Pihl, 1997).

All together these findings support the view advanced by LaBerge (1985) and Gackenbach and Bosveld (1990) that lucid dreaming is positively associated with both mental health and physical fitness. Yet, these links are not unambiguous. A recent study by Taitz (2011) found a positive association between lucid dream frequency and depression. Furthermore, associations with lucid dreaming have been only established with vestibular and balancing abilities but not with other aspects of physical fitness. The aim of the present study was to shed more light on how the dimensions of mental well-being, physical fitness and lucid dreaming might be interlinked.

2. Method

2.1. Participants

Seventy-two subjects (47 male, 25 female) aged 19 to 43 years ($M = 23.08$, $SD = 3.15$) participated in this study. All participants were sport science major students at Heidelberg University and were selected in response to an advertisement for the study. The participation was voluntary and unpaid.

2.2. Materials

2.2.1 Dream questionnaire

The dream questionnaire included questions about dream recall, lucid dream and nightmare frequencies. Lucid dreaming and nightmare frequencies were measured with an eight-point rating scale: 0 = never, 1 = less than once a year, 2 = about once a year, 3 = about 2-4 times a year, 4 = about once a month, 5 = 2-3 times a month, 6 = about once a week and 7 = several times a week. To ensure the clear understanding of lucid dreaming, the following definition was provided for lucid dreaming: "In a lucid dream, one is aware that one is dreaming during the dream. Thus it is possible to wake up deliberately, or to influence the action of the dream actively, or to observe the course of the dream passively". Re-test reliabilities for lucid dream and nightmare frequency scales were found to be high (lucid dreams: $r = .89$, nightmares: $r = .75$, $p < .001$, $N = 93$, Stumbrys, Erlacher, & Schredl, 2013). A similar seven-point rating scale was used to measure overall dream recall frequency with the following options: 0 = never, 1 = less than once a month, 2 = about once a month, 3 = two or three times a month, 4 = about once a week, 5 = several times a week, 6 = almost every morning. This scale also showed a high re-

test reliability ($r = .85$, $p < .001$, $N = 198$, Schredl, 2004). In order to obtain units in frequency per month, the scores of the lucid dream frequency and nightmare frequency scales were transformed using class means as follows: 0 → 0, 1 → 0.042, 2 → 0.083, 3 → 0.25, 4 → 1, 5 → 2.5, 6 → 4, 7 → 18 (Stumbrys et al., 2013). To obtain units of mornings per week, the seven point rating scale for dream recall frequency was recorded similarly: 0 → 0, 1 → 0.125, 2 → 0.25, 3 → 0.625, 4 → 1, 5 → 3.5, 6 → 6.5 (Schredl, 2004).

2.2.2 Physical self-concept

Physical self perception was assessed with a short form of the Physical Self-Description Questionnaire (PSDQ-S) (Marsh, Martin, & Jackson, 2010). The questionnaire includes a total of 40 items within eleven scales measuring different components of the physical self-concept. The subscales include: (1) physical activity, (2) appearance, (3) body fat, (4) coordination, (5) endurance, (6) flexibility, (7) health, (8) sport competence, (9) strength, (10) general physical self-concept and (11) self-esteem. Each scale consists of three to five items representing declarative statements that are scored on a six-point true/false scale. The original version (70 items) has shown high values of reliability across all eleven scales with a median coefficient alpha of .92 and high test retest reliability over three ($r = .83$) and 14 months ($r = .69$) (Marsh, 1996b). The questionnaire scales show good convergent validity with measures of external criteria, including body composition, physical activity, endurance, strength, and flexibility (Marsh, 1996a). The reliability of the short form of the questionnaire (PSDQ-S) was tested across various cultural groups, elite athletes, adolescents, university and senior subjects. Internal consistency was high for all groups with the mean value of Cronbach's alpha ranging from .84 to .91, making the PSDQ-S a reliable instrument to measure physical self-concept (Marsh et al., 2010). The German translation of the questionnaire was validated by Stiller and Alfermann (2007).

2.2.3 Mental well-being

Two instruments were used to measure mental well-being: Ryff's Psychological Well-being scale (RPWB) and the short form of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS).

RPWB (Ryff, 1989) measures the following six constructs of psychological well-being: (1) self-acceptance (positive attitude and feelings towards oneself and past life); (2) positive relations with others; (3) autonomy (independence, ability to resist social pressures); (4) environmental mastery (ability to effectively manage the environment); (5) purpose in life (goals, sense of directedness and meaning to past and current life); and (6) personal growth (continuing development, openness to new experiences). The questionnaire is based on statements evaluated on a six-point rating scale (strong agreement to strong disagreement). A high score in any one domain indicated that the individual has high mastery of that specific area, whilst low scores indicate struggle. Various versions of PBWB are used, ranging from the original scale with 120 items (20 items per dimension) to the very short adaptation with 18 items (3 items per dimension) (Ryff & Keyes, 1995). The present study used the 84 item version (14 items per dimension), which was shown to correlate highly with the original scale ($r = .97-.98$) and to have a good internal consistency ($alpha .82-.90$) (Ryff, Lee, Essex,

Table 1. Intercorrelations between the main scales

	DRF	NMF	PSDQ	RPWB	WEMWBS
LDF	.445***	.222	-.328**	-.197	-.183
DRF		.480***	-.319**	-.070	-.083
NMF			-.260*	-.241*	-.268*
PSDQ				.468***	.352**
RPWB					.740***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Abbreviations: LDF = Lucid Dream Frequency, DRF = Dream Recall Frequency, NMF = Nightmare Frequency, PSDQ = Physical Self-Description Questionnaire, RPWB = Ryff's Psychological Well-Being Questionnaire, WEMWBS = Warwick-Edinburgh Mental Well-Being Scale.

& Schmutte, 1994). The German translation was adapted from Risch (2009).

WEMWBS (Tennant et al., 2007) is a one-dimensional scale focusing on positive aspects of mental health. The answers are based on a five-point Likert scale ranging from a score of 1 (none of the time) to 5 (all of the time). The original 14-item scale showed internal consistencies of Cronbach's alpha = .89 for student and .91 for population samples together with a test-retest reliability of .83 (Tennant et al., 2007). Recently, the 14 item scale has been shortened further to a seven-item scale (SWEMWBS) (Stewart-Brown et al., 2009). The two scales correlated highly ($r = .95$) and the SWEMWBS was more robust compared to Rasch model expectations. Therefore the present study employed the short version, translated to German by the Research Institute of the Red Cross in Vienna (Bachinger & Lang, 2013).

2.3. Statistical analysis

IBM SPSS 20 Statistics software was used for the statistical analysis. Two-tailed statistical tests were applied with $\alpha = .05$.

3. Results

3.1. Descriptive statistics

In the present sample 75% of participants ($n = 54$) reported at least one lucid dream in their lives and 30.6% ($n = 22$) had lucid dreams once a month or more often and therefore could be considered as frequent lucid dreamers according to Snyder and Gackenbach (1988). The average lucid dream frequency was 1.16 ± 3.13 a month. On average the subjects experienced 1.02 ± 2.37 nightmares a month and reported to recall dreams on 2.07 ± 2.03 mornings a week. The means of the overall scores for each questionnaire were calculated for descriptive purposes. The mean score for the RPWB scale was 4.58 ($SD = .45$), for PSDQ 4.83 ($SD = .47$) and for WEMWBS 3.7 ($SD = .51$). Intercorrelations between the main scales are depicted in Table 1.

3.2. Lucid dream frequency and physical self-concept

Significant correlations were found between the PSDQ overall score and lucid dream frequency as well as overall dream recall frequency (Table 1). On a closer examination of the subscales it was revealed that lucid dream frequency was related to endurance, body fat, general physical self-

concept and appearance (Table 2). Consistent with lucid dream frequency, overall dream recall frequency was associated with two of the same subscales, namely, endurance ($r = -.307, p = .010$) and body fat ($r = -.262, p = .028$). As lucid dream frequency was highly correlated with dream recall frequency, further analysis was conducted controlling for dream recall frequency, i.e. by calculation of partial correlations (r_{part}). The analysis revealed that when dream recall frequency was controlled for, lucid dream frequency was still significantly associated to the overall PSDQ score ($r_{part} = -.267, p = .036$) and two of the subscales: endurance and appearance. Nightmare frequency was negatively associated with the overall PSDQ score and one of the subscales: self-esteem ($r = -.258, p = .031$). However, these associations did not remain significant when controlled for dream recall frequency (PSDQ: $r_{part} = -.125, p = .326$; self-esteem: $r_{part} = -.158, p = .213$).

3.3. Lucid dream frequency and mental well-being

As would be expected, two mental well-being scales were highly associated with each other (Table 1). Lucid dream frequency neither correlated significantly with the WEBWBS nor with the RPWB scale nor with any of its subscales (Table 3). Neither of the psychological well-being scales correlated with overall dream recall frequency or lucid dream frequency when the latter was controlled for dream recall frequency. On the other hand, nightmare frequency was associated with both of the mental well-being scales and some of the subscales: autonomy ($r = -.250, p = .037$), self-acceptance ($r = -.252, p = .037$) and self-esteem ($r = -.258, p = .031$). When controlled for dream recall frequency, significant correlations remained between nightmare frequency and the WEBWBS scale ($r_{part} = -.312, p = .014$) and the RPWB subscale of self-acceptance ($r_{part} = -.279, p = .028$).

3.4. Physical self-concept and mental well-being

The overall PSDQ was positively related to both mental well-being scales (Table 1) and to all of the RPWB subscales: autonomy ($r = .242, p = .049$), environmental mastery ($r = .291, p = .017$), personal growth ($r = .249, p = .044$), positive relationships with others ($r = .343, p = .005$), purpose in life ($r = .425, p < .001$) and self-acceptance ($r = .461, p < .001$). The WEMWBS scale was positively associated with PSDQ subscales of self-esteem ($r = .302, p = .011$), sport competence ($r = .257, p = .032$) and general physical self-concept ($r = .299, p = .012$). Further, the overall RPWB score was positively associated with PSDQ dimensions of strength

Table 2. Correlations between lucid dream frequency and dimensions of physical self-concept (PSDQ)

	LDF		LDF (controlled for DRF)	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Health	-.036	.770	-.012	.924
Strength	-.143	.242	-.080	.515
Flexibility	-.047	.700	-.019	.879
Endurance	-.346	.004	-.245	.044
Self-esteem	-.147	.224	-.065	.595
Coordination	-.174	.150	-.140	.252
Physical activity	-.124	.307	-.034	.780
Body fat	-.266	.026	-.173	.155
Sport competence	-.156	.202	-.119	.335
General physical self-concept	-.281	.019	-.206	.092
Appearance	-.357	.004	-.318	.010

Note. Statistically significant correlation coefficients are emphasized by bold face. Abbreviations: LDF = Lucid Dream Frequency, DRF = Dream Recall Frequency.

($r = .282, p = .018$), flexibility ($r = .270, p = .024$), endurance ($r = .287, p = .016$), self-esteem ($r = .458, p < .001$), coordination ($r = .334, p = .004$), body fat ($r = .240, p = .044$), sport competence ($r = .337, p = .004$) and general physical self-concept ($r = .483, p < .001$). Intercorrelations between RPWB and PSDQ subscales are presented in Table 4.

4. Discussion

Overall, the findings of the present study do not support the view that lucid dreaming is associated with better general mental well-being and physical self-concept. In the present sport students sample, neither lucid dream nor overall dream recall frequency were significantly related to mental well-being, but both were associated with lower scores on the physical self-perception scale. However, nightmare frequency was related to lower mental well-being. Strong interconnections between the physical self-concept and mental well-being were replicated.

The proportion of frequent lucid dreamers (31%) to those who had at least a single lucid dream experience (75%), as well as the average frequencies of lucid dreams per month (1.16 ± 3.13), resemble the data from previous studies that used either sport students (cf. Stumbrys et al., 2013) or mostly psychology students (cf. Schredl & Erlacher, 2004). The average nightmare frequency per month (1.02 ± 2.37) was also similar to in the previous study with sport students (cf. Stumbrys et al., 2013), but was lower than for psychology students; additionally overall dream recall frequency was lower relative to psychology students (cf. Schredl & Erlacher, 2004). This might be explained by the fact that sport students are much more engaged in sport activities (cf. Schredl & Erlacher, 2008) which can have beneficial effects on sleep quality (Brand et al., 2009; Reid et al., 2010; Youngstedt, 2005), whereas both dream recall and night-

Table 3. Correlations between lucid dream frequency and dimensions of mental health (RPWB)

	LDF		LDF (controlled for DRF)	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Autonomy	-.007	.953	.034	.782
Environmental mastery	-.191	.112	-.164	.178
Personal growth	-.099	.419	-.175	.155
Personal relations with others	-.141	.249	-.101	.413
Purpose in life	-.226	.061	-.216	.077
Self-acceptance	-.204	.093	-.217	.076

Note. Abbreviations: LDF = Lucid Dream Frequency, DRF = Dream Recall Frequency.

mare frequency have been linked to poorer sleep quality (Levin, 1994; Schredl, 1999).

In the present study, lucid dream frequency was negatively correlated with physical self-concept, which is a somewhat surprising finding considering previous suggestions (Doll et al., 2009; Gackenbach & Bosveld, 1990; LaBerge, 1985) and the empirical evidence about the linkage of lucid dreaming to more acute vestibular system and better physical orientation/balance (Gackenbach et al., 1986; Hunt, 1989; Leslie & Ogilvie, 1996). In addition to the overall PSDQ score, the strongest negative links were observed for two its dimensions: en-durance and appearance. Regarding endurance, a possible explanation may be that an endurance sport, such as strenuous running, does not exclusively rely on the vestibular and spatial system (as gymnastics, for example). It is, however, more likely that endurance sports affect the subjects sleeping patterns more strongly than other activities, causing reduction of REM sleep, as found by Driver et al. (1994). For attraction, based on Freud's (1913/1899) wish-fulfillment theory, one could speculate that individuals who find themselves less attractive might seek their wish-fulfillment in their dreams (either lucidly or naturally), for example, finding a partner. This explanation is supported by a recent study by Stumbrys et al. (2014) which found that, besides flying and speaking to dream characters, sex was one of the most popular planned activities during lucid dreams. Furthermore, speaking to dream characters could be used as a substitution for a lack of social contact in waking life. Thus it may be that such individuals are paying more attention to their dreams and therefore are more able to re-call them (cf. Beaulieu-Prévost & Zadra, 2005).

Lucid dream frequency in the present study did not correlate significantly with any of the mental well-being scales or subscales. This is in contrast to a previous study which reported links between personality, mental well-being and lucid dreaming (Doll et al., 2009). However, another recent study found a positive association between lucid dream frequency and depression, i.e. that subjects who present signs of depression experience more lucid dreams (Taitz, 2011). Considering the results of the present study, the findings from these three studies all together are somewhat ambiguous and further research is necessary to examine the pro-

Table 4. Correlations between the subscales of Ryff's Psychological Well-Being (RPWB) and the Physical Self-Description Questionnaire (PSDQ)

PSDQ subscales	RPWB subscales					
	Autonomy	Environmental Mastery	Personal Growth	Positive Relationships	Purpose in Life	Self -Acceptance
Health	.218	.224	-.013	.105	.092	.159
Strength	.188	.124	.109	.262*	.274*	.271*
Flexibility	-.014	.208	.210	.266*	.314**	.204
Endurance	.087	.210	.163	.300*	.271*	.235
Self-esteem	.230	.293*	.391**	.326**	.362**	.444**
Coordination	.112	.180	.277*	.407**	.255*	.267*
Physical activity	.144	.253*	.088	.050	.211	.178
Body fat	.202	.171	.112	-.010	.210	.339**
Sport competence	.179	.288*	.029	.408**	.253*	.303*
General physical self-concept	.226	.307**	.331**	.276*	.444**	.532**
Appearance	.269*	-.074	.155	.061	.159	.261*

Note. * $p < .05$, ** $p < .01$

posed link between mental well-being and lucid dreaming. Longitudinal studies might be especially useful in establishing causal connections. Taitz (2011), for example, argued that lucid dreaming may play a role in the functional theory of depression, which states that the symptoms of depression cause individuals to focus their analytical thinking on the source of depression leading to an increase in problem-solving orientated behavior. On the other hand, the present study found negative associations between mental well-being and nightmare frequency, which are in line with previous findings (Zadra & Donderi, 2000).

Furthermore, strong positive associations were found between physical self-concept and mental health. The PSDQ overall score was positively related to all scales and subscales scales used to measure psychological well-being, suggesting that individuals who consider themselves to be more physically fit are more mentally healthy. Mental well-being scales also were positively related to a number of PSDQ subscales. These results corroborate with previous research which have shown that exercise can improve both physical self-concept and subjective well-being (Alfermann & Stoll, 2000). Additionally, people with high physical self-concept appear to be better adjusted in life (Sonstroem & Potts, 1996).

There are several limitations in the present study that require to be acknowledged. The participants in the present study scored quite high on the physical self-concept scale ($M = 4.83 \pm 0.47$ on a 6-point scale) and therefore a ceiling effect might have occurred. It is not surprising that sport students scored very high on the physical self-concept scales, as physical fitness is a requirement to study sports, however further research is warranted for a less physically active and physically fit population. Another limitation of the present research is the relatively small sample size of 72 participants, which may have limited statistical power to reveal the associations between some constructs. Furthermore, it is important to note that despite high correlations

between the PSDQ and external measures (Marsh, 1996a), the questionnaire does not directly measure physical fitness and future research may benefit from including empirical measurements of physical fitness. For assessment of lucid dreaming, only the frequency of the phenomenon was used in the present study. While the frequency of lucid dreaming is one of the strongest predictors of lucid dream phenomenology (Stumbrys et al., in press), other measures of lucid dream experience, such as length of lucid dreams, ability to influence the lucid dream, emotions (positive/negative) in the lucid dreams, etc. can be included in future studies to get a more comprehensive picture.

In summary, the findings of the present study do not provide support for the view that lucid dreaming is associated with better mental health and physical fitness. Whereas no relationship was found between lucid dream frequency and mental well-being, lucid dream frequency was negatively related to physical self-perception. However, strong links between the physical self-concept and mental well-being were found. Future research should explore the links in a less physically active and fit sample and might benefit from including external physical measures.

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