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Factors of home dream recall: a structural equation model

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SUMMARY Previous research has indicated that personality factors such as openness to experience, creativity, visual memory, attitude toward dreams, and sleep behavior is related to home dream recall frequency (DRF). However, a study investigating all areas simultaneously within one sample in order to determine the percentage of variance explained by all variables and to take intercorrelations between the influencing factors into account has not been performed till now. The present study with 444 participants fills this gap. Using several indicators for each of the variables mentioned above, a structural equation model was tested. Although the model fit was satisfying, the four factors which were significantly related to DRF: personality (openness to experience, thin boundaries, absorption), creativity, nocturnal awakenings, and attitude toward dreams, explained only 8.4% of the total variance. As this value is considerably lower than those of studies investigating a single influencing factor and using similar measurement instruments in similar samples, one might speculate about possible expectancy effects in these previous studies, an effect which has been demonstrated for DRF in the laboratory setting. In addition, the small percentage of explained variance of each single factors (<3%) may indicate that other, in this study unmeasured, variables such as sleep duration (state aspect), introspection, and cognitive functioning immediately upon awakening (sleep inertia) show substantial covariance with the interindividual differences in DRF. Future studies should focus on longitudinal aspects in order to differentiate between state versus trait factors (although methodologic issues, e.g. the effect of the measurement technique on DRF itself, have to be clarified) and investigate additional variables which might be associated with DRF (see above).

KEYWORDS attitudes toward dreams, creativity, dream recall frequency, personality, visual memory

INTRODUCTION

Dreaming which can be defined as subjective experience during sleep (cf. Schredl 1999a) is solely accessible by recollection of the dreamer after awakening. The investigation of the dream recall process and the factors which might affect this process is thus a core issue for the entire field of dream research. Systematic correlations between dream recall frequency (DRF) and personality measures, for example, might bias the findings regarding the relationship between dream content and the respective personality dimension. To measure DRF, three methods are commonly applied: questionnaire scales, dream diaries, and laboratory awakenings (cf. Schredl 1999b). Each of these methods has its pros and cons: a problem of the questionnaire approach is the possible bias of the retrospective estimation of DRF due to erroneous or incomplete recollection. On the other hand, the actual DRF will not be affected by the measurement. For dream diaries (e.g. Cory *et al.* 1975) and laboratory awakenings (e.g. Cohen and MacNeilage 1974), a dramatic increase of DRF, especially for low dream recallers, has been demonstrated. For laboratory awakenings from REM sleep recall rates varied from 80 to 90% (cf. Nielsen 2000), whereas young adults report on average dreams on one to two mornings per week in the home setting (Belicki 1986;

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Schredl 2002a,b). As a gold standard of measuring DRF cannot be defined, it seems advisable that research studies apply more than one method.

A comprehensive literature review of Schredl and Montasser (1996–97a,b) compiled the empirical data regarding factors influencing DRF. The most important factors which were found to be correlated fairly consistently with DRF are the following: personality dimensions such as openness to experience (Hill *et al*. 1997), thin boundaries (e.g. Hartmann 1989) and absorption (e.g. Schredl *et al*. 1997b), creativity (Schechter *et al*. 1965; Schredl 1995), visual memory (Cory *et al*. 1975; Schredl *et al*. 1995), frequency of nocturnal awakenings (Schredl *et al*. 1997a, 1998a), and attitude toward dreams (Cernovsky 1984; Robbins and Tanck 1988; Schredl *et al*. 1996a). Regarding the effects of stress on DRF the results are conflicting (cf. Armitage 1992); if subjects, however, have been asked for factors which might be associated with periods of heightened DRF, they often report that stress is one of these factors (Cartwright 1979; Herman and Shows 1984).

The empirical data support the arousal–retrieval model of dream recall (Koulack and Goodenough 1976), especially the arousal component which states that it is important to wake up immediately after the dream experience in order to transfer the information from short-term memory into long-term memory, and the life-style hypotheses of Schonbar (1965) who conceptualized DRF as part of a general life style (creativity, openness to experience, introspection, fantasy and proneness). Consistent findings regarding the contribution of the repression hypothesis (Freud 1987/1900), the interference hypothesis (Cohen and Wolfe 1973), the salience hypothesis (Cohen and MacNeilage 1974) and the functional state–shift model (Koukkou and Lehmann 1983) for explaining interindividual differences in home dream recall have not been reported (cf. Schredl and Montasser 1996–97a, b).

Despite the large number of DRF studies (cf. Schredl and Montasser 1996–97a,b), investigations including several areas of influencing factors, e.g. personality, cognitive factors, stress, sleep behavior, creativity, and attitude toward dreams in order to determine the percentage of variance explained by the above-mentioned factors have not been carried out. In addition, it can be assumed that several influencing factors such as openness to experience and creativity are intercorrelated and, thus, these relationships should be integrated in any model explaining the variability of DRF. A special role can be attributed to the attitude toward dreams variable which is strongly related to DRF as well as to distinct personality dimensions (Schredl *et al*. 1996a; Hill *et al*. 1997). However, it must be taken into account that nearly all instruments designed for measuring attitude toward dreams include items which are directly related to the person's DRF, e.g. the frequency of speculating about the meaning of one's dreams (Robbins and Tanck 1988). In the present study, the questionnaire items were grouped by factor analysis into items with high correlation coefficients to the included recall measures and items which reflect a more general attitude toward dreams.

Figure 1 depicts the working model of dream recall on which the present study is based. While the personality (openness to experience, thin boundaries, and absorption), creativity, visual memory and attitude toward dreams factors are directly related to DRF, it was assumed that the effect of stress is mediated by a disturbed sleep pattern (more frequent nocturnal awakenings). Research indicate that stress is associated with poor sleep (e.g. Schredl *et al*. 1998b) and DRF is related to the frequency of nocturnal awakenings (see above). As mentioned above, intercorrelations between the various factors have been integrated in the model, e.g. the correlation between personality and creativity (cf. Hartmann 1991).

The aim of the present study was an empirical test of this model via the technique of structural equation modeling in order to assess the contribution of the single factors, and the percentage of explained variance of all factors taken together.

METHOD

Measurement instruments

Dream recall frequency measures and attitude toward dreams scale

Several scales measuring DRF were applied. The first DRF scale, a seven-point rating 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) measuring DRF of the last months, was presented twice within a dream questionnaire and within a sleep questionnaire. The retest reliability of this scale for an average interval of 70 days is $r = 0.83$ ($n = 39$; Schredl 2002b). In order to obtain units of mornings per week, the scale was recoded using the class means ($0 \rightarrow 0$, $1 \rightarrow 0.125$, $2 \rightarrow 0.25$, $3 \rightarrow 0.625$, $4 \rightarrow 1.0$, $5 \rightarrow 3.5$, $6 \rightarrow 6.5$). The second scale was adopted from Zadra and Nielsen 1996, 1999) and slightly modified in order to measure the number of

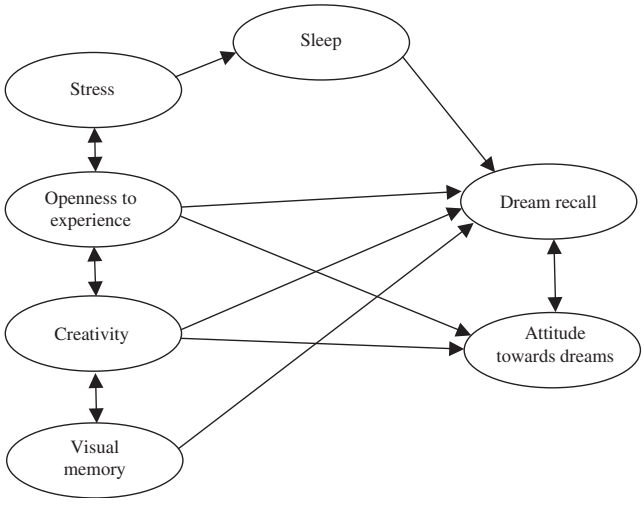

Figure 1. Working model of dream recall.

mornings with explicit dream recall within the last 28 days. The third scale is part of the SF-B sleep questionnaire (Görtelmeyer 1986). This five-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often) measures the DRF of the last 2 weeks. The last measurement instrument for assessing DRF was a dream diary kept over a 2-week period. The number of mornings with explicit dream recall was included in the analysis.

The questionnaire measuring attitude toward dreams includes 25 five-point Likert items and was adopted from Schredl *et al*. (1996a) and Schredl and Doll (2001). A factor analysis were carried out in order to extract two factors: Items with direct relationship to dream recall and items which measure general attitudes toward dreams (Schredl *et al*. 2002). The internal consistency of the 10-item scale of positive attitude toward dreams was $r = 0.784$ (Schredl *et al*. 2002). For the structural model analysis, the scale was divided in three groups of items.

Personality measures

The German version of the NEO-PI-R (Ostendorf and Angleitner 1994) comprises 240 five-point items (coded: 0–4) measuring the Big Five personality measures (neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness). The sum scores (48 items) can range from 0 to 192. The internal consistencies of the scales are high ($r = 0.89$–92) and confirmatory Multitrait–Multimethod analyses replicated the findings of the English version (Ostendorf and Angleitner 1994).

The Absorption scale (Subscale of Tellegen and Atkinson's personality inventory; Tellegen and Atkinson 1974) consists of 34 Yes/No-items which measure the capacity to become absorptively involved in imaginative and aesthetic experience, e.g. 'I can be greatly moved by eloquent or poetic language.' Sum scores were computed. As all absorption items were scored in one direction (Yes-answers), 32 unrelated items measuring other personality dimensions were included in the questionnaire (as performed in previous studies: e.g. Belicki and Bowers 1981). The internal consistency of the German version amounted to $r = 0.854$ ($n = 51$; Schredl *et al*. 1997b).

The Boundary Questionnaire (Hartmann 1991) which was translated into German by the Institute of Psychology, University of Zürich, Switzerland, includes 145 five-point scales covering 12 areas (e.g. sleep/dreams, unusual experiences, thought/feeling/mood, and interpersonal relationships). The total score, reflective of boundary thinness, was derived by summing the ratings (ranging from 0 to 4) of 138 items, with item reversals when appropriate. The internal consistency of the German scale was $r = 0.93$ ($n = 152$), the same as reported by Hartmann (1991) for the English version ($r = 0.93$, $n = 966$).

Creativity/fantasy

For measuring visual imagination, a subtest of the 'Erfassungssystem Veränderter Bewusstseinszustände' (Test battery for altered states of consciousness; von Queckelberghe *et al*. 1992) was applied. The internal consistency of the 18 five-point items is high ($r = 0.92$; von Queckelberghe *et al*. 1992). The scale assessing attitude toward creativity was developed by Schredl (1995) and comprises 12 five-point Likert items. The internal consistency was $r = 0.668$ (Schredl 1995). In addition, the participants were asked whether they are engaged in creative activities such as painting, playing an instrument, doing needlework/handicraft in their leisure time. The number of creative activities was included in the analyses.

Visual memory

The first two memory tasks were taken from the LGT-3 of Bäumler (1974). First, 20 pictures of objects were presented simultaneously for 60 s. The subjects were asked shortly afterwards to recall as many objects as possible. Secondly, a city map with a specific route was shown for 60 s. Immediately after the presentation, the subjects were asked to reproduce the route on the now empty city map. The test score is the sum of correctly reproduced segments of the route (0–31). Finally, a 5-min sequence of the film 'Four rooms' of Allison Anders, Alexandre Rockwell, Robert Rodriguez and Quentin Tarantino was presented without sound. In the following 15-min period, the subjects wrote down the details they could recall. To measure the performance of one subject, the sequence was divided into 62 scenes and 33 details. An independent rater coded the film reports for presence of the scenes and details. The interrater reliability for 50 film reports varied from $r = 0.958$ (scenes) to $r = 0.980$ (details).

Sleep behavior

The frequency of nocturnal awakenings was assessed by two items. The first item included in the SF-B sleep questionnaire (Görtelmeyer 1986) is a five-point scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often). The LISST sleep questionnaire (Weeß *et al*. 1997) included a six-point scale for measuring the frequency of nocturnal awakening (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often, and 6 = always).

Stress measures

Three instruments have been applied to measure the actual stressors experienced by the subjects. The ATE-36 (Schmidt-Atzert 1989) assesses the occurrence of 19 negative events which are part of daily hassles, e.g. forgetting an important date, during the last 7 days. The second instrument (EBF-72/3; Kallus 1995) comprises 42 seven-point items measuring stress present in several areas such as social interactions, emotional stress, etc. during the last 3 days. The global stress score was derived as mean of the items. The Symptom-Checklist (SCL-90-R; Derogatis 1986) with a retrospective interval of 3 days was the third instrument of the present study. The general severity index (mean for all 90 four-point

items) was included in the analyses. Sufficient reliability and validity for these measures have been demonstrated by the test authors (Derogatis 1986; Kallus 1995; Schmidt-Atzert 1989).

Procedure and participants

Participants were recruited at the universities of Mannheim, Heidelberg and Landau for a study entitled 'Sleep, dreams, and personality'. They were paid for participation. First, the three memory tasks were carried out. Then the questionnaires and the dream diary were given to the participants who completed the questionnaires and the diary over a 2-week period and returned them to one of the experimenters. Of 457 participants, 444 persons returned their materials.

Statistical analyses were carried out with the SAS 6.12 software package (SAS Inc.) for Windows. For the structural equation modeling the EQS 5.7b software (Bentler 1995) was used. In general, structural equation modeling is a combination of factor analysis (latent variables are conceptualized as factors with the corresponding variables as empirical indicators) and regression analysis (relationship between latent variables). For a comprehensive introduction see Loehlin (1992) or Byrne (1994).

The sample included 444 persons whose mean age was 23.5 ± 5.7 years. There were 376 women and 68 men who were mainly psychology students.

RESULTS

Dream recall frequency measures

In Table 1, means and standard deviations of the DRF measures are depicted. The averaged DRF was about two to three mornings per week with dream recall. The mean of the SF-B scale could not be interpreted as the categories have been relative (e.g. sometimes, often). The mean of the DRF scale which was presented twice, differed significantly ($t = 3.1$, $P = 0.0013$); i.e. the averaged DRF was slightly lower if the DRF scale was presented in a general sleep questionnaire (LISST) in comparison with the presentation within a specific (self-developed) dream questionnaire. The internal consistency of the dream diary (14 days) amounted to $r = 0.743$ (Cronbach's alpha). The intercorrelations between the DRF measures were consistently high (see Table 1).

Structural equation model

A direct implementation of the DRF model (Fig. 1) within the framework of structural equation modelling was not possible as bi-directional pathways (correlations) between dependent latent variables are not allowed (cf. Bentler 1995). A model with two unidirectional arrows between DRF and attitude toward dreams could not be fitted as a negative variance was obtained for one variable of this model. In order to solve this problem, all pathways were conceptualized as bi-directional (see Fig. 2). The comparative fit index of this model was 0.936 ($\chi^2 = 467.0$; $P < 0.001$, d.f. = 217); a value which is seen as acceptable (cf. Hu and Bentler 1999).

The measurement models of the latent variables showed – as expected – highly significant coefficients (see Table 2). The correlations between the latent variables are depicted in Table 3. In accordance with the hypotheses, DRF was significantly related to attitude toward dreams, frequency of nocturnal awakenings, personality (openness to experience, thin boundaries, and absorption) and creativity. However, a substantial correlation between DRF and visual memory could not be demonstrated. Summing up the squared correlation coefficients, the variance explained by the four factors amounted to 8.4%. High correlation coefficients were found for the relationship between the attitude toward dreams variable, personality, and creativity. Similarly, the correlations between personality, stress and sleep behavior were substantial. Solely the zero correlation between visual memory and creativity was contrary to the prediction of the model. For the two DRF measures which were presented within the same questionnaire in direct sequence, the errors were significantly related (see Table 3).

DISCUSSION

The empirical test of the global DRF model (cf. Figs 1 and 2) has shown that the included factors: attitude toward dreams, sleep behavior, personality, and creativity (exception: visual memory; discussion see below), correlated substantially with DRF. However, the percentage of explained variance of the model was small (8.4%) and each factor explained less than 3%. These figures remained below the coefficients of most of the individual studies, e.g. $r = 0.40$ for thin boundaries and DRF (Hartmann 1989) or $r = 0.41$ for absorption and DRF (Schredl *et al.* 1997b), although a more pronounced pattern

Table 1 Dream recall frequency (DRF) measures: mean, standard deviations (SD) and intercorrelations

DRF scales	*Mean ± SD*	*DRF scale (DQ)*	*DRF scale (LISST)*	*Mornings with DR*	*DRF scale (SF-B)*
DRF scale, dream questionnaire (DQ; per week)	2.80 ± 2.08				
DRF scale, sleep questionnaire (LISST, per week)	2.58 ± 2.03	0.807			
Mornings with dream recall (0–28)	11.01 ± 7.38	0.857	0.796		
Five-point DRF scale (SF-B)	3.21 ± 1.01	0.647	0.715	0.693	
Dream diary (per 2 weeks)	4.76 ± 3.13	0.562	0.582	0.547	0.524

For all correlations: $P < 0.0001$. DRF, dream recall frequency.

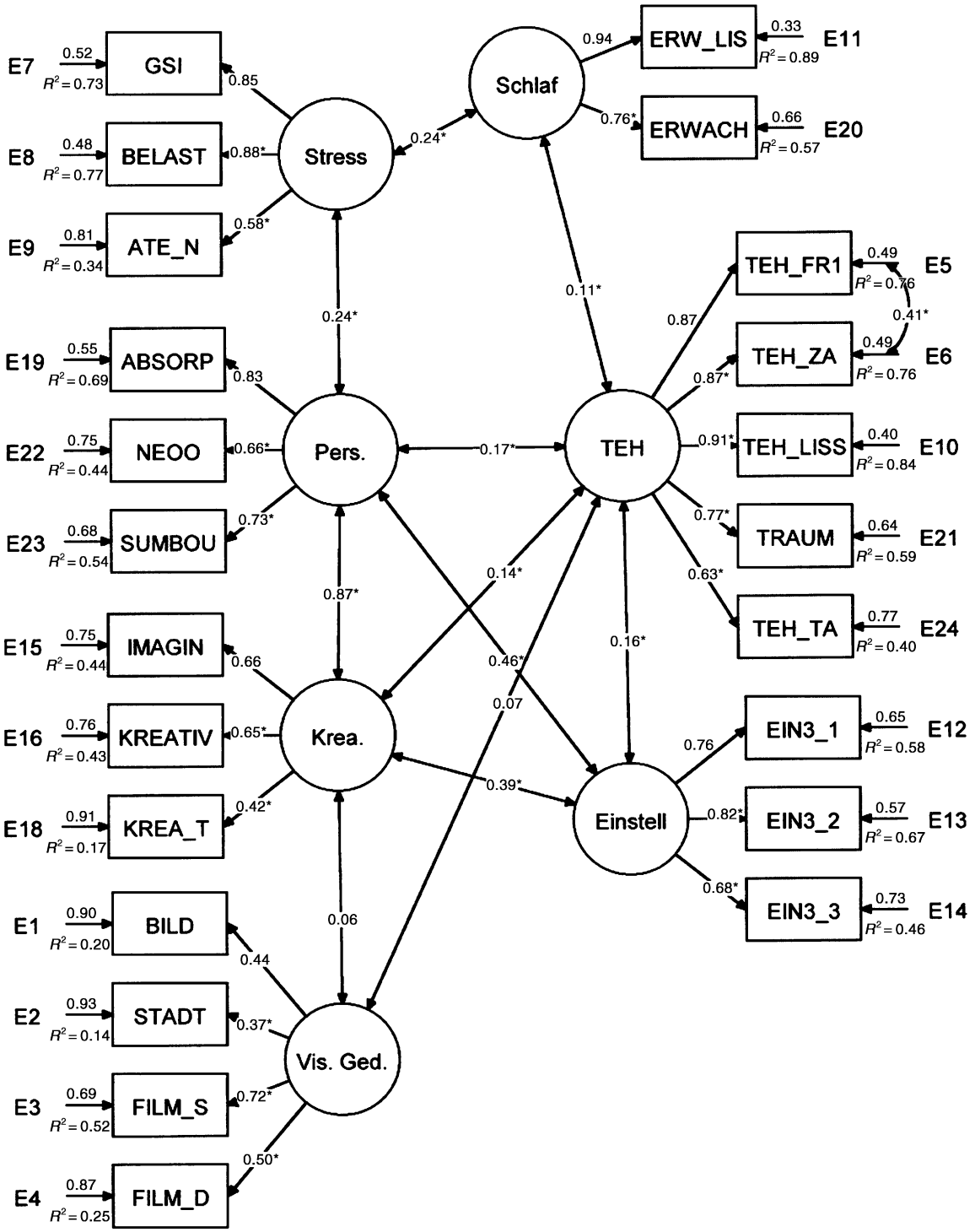

Figure 2. Structural equation model of home dream recall frequency (DRF). DRF, TEH_FR1 = Dream scale (Dream questionnaire); TEH_ZA = Mornings with dream recall; TEH_LIS = DRF scale (Sleep questionnaire); TRAUM = Five-point DRF scale (SF-B); TEH_TA = Dream diary. Attitude towards dreams: EIN3_1 to EIN3_3 = three subscales. Sleep: ERW_LIS = Nocturnal awakenings (LISST), ERWACH = Nocturnal awakenings (SF-B). Stress: GSI = General severity index (SCL-90-R), BELAST = Global stress score (EBF-72/3), ATE_N = Negative events (ATE 36). Personality (Pers.): ABSORP = Absorption, NEOO = Openness to experience, SUMBOU = Thin boundaries. Creativity (Crea.): IMAGIN = Imagination, KREATIV = Attitude towards creativity, KREA_T = Creative activities. Visual memory (Vis. mem.): BILD = Visual memory (objects), STADT = Visual memory (city map), FILM_S = Film test (scenes), FILM_D = Film test (details).

Table 2 Measurement model of the structural equation model (Fig. 2)

	Correlation coefficients		
Scale	*r*	*z*	*P-value*
DRF scale, dream questionnaire	0.872	–	
Mornings with recall	0.869	31.0	0.0000
DRF scale, sleep questionnaire	0.915	24.0	0.0000
Five-point DRF scale (SF-B)	0.771	18.8	0.0000
Dream diary	0.632	14.2	0.0000
Attitude toward dreams subscale 1	0.764	–	
Attitude toward dreams subscale 2	0.821	13.4	0.0000
Attitude toward dreams subscale 3	0.680	12.4	0.0000
Nocturnal awakenings (LISST)	0.944	–	
Nocturnal awakenings (SF-B)	0.755	5.6	0.0000
General severity index (SCL 90-R)	0.853	–	
Global stress score (EBF-72/3)	0.875	15.6	0.0000
Negative events (ATE 36)	0.580	11.7	0.0000
Absorption	0.833	–	
Openness to experience	0.664	13.4	0.0000
Thin boundaries	0.731	14.8	0.0000
Imagination	0.663	–	
Attitude toward creativity	0.653	10.3	0.0000
Creative activities	0.418	7.1	0.0000
Visual memory (objects)	0.445	–	
Visual memory (city map)	0.373	4.9	0.0000
Film test (scenes)	0.720	5.5	0.0000
Film test (details)	0.496	5.7	0.0000

(Statistical test for $\rho = 0$).
DRF, dream recall frequency.

Table 3 Correlations between the latent variables (cf. Fig. 2)

	Correlation coefficients		
Scale	*r*	*z*	*P-value*
DRF – Attitude toward dreams	0.158	2.7	0.0035
DRF – Sleep	0.105	2.0	0.0228
DRF – Personality	0.165	2.9	0.0019
DRF – Creativity	0.144	2.2	0.0139
DRF – Visual memory	0.073	1.2	0.1151
Attitude toward dreams – personality	0.464	6.8	0.0000
Attitude toward dreams – creativity	0.387	5.1	0.0000
Sleep – stress	0.243	4.4	0.0000
Stress – personality	0.243	5.3	0.0000
Personality – creativity	0.871	9.4	0.0000
Creativity – visual memory	0.060	1.0	0.1587
Error (DRF scale (DQ), mornings with recall)	0.409	4.4	0.0000

Statistical test for $\rho = 0$.

was expected by using latent variables with several empirical indicators.

In the following, interpretations which might account for the small percentage of explained variance will be discussed. First, measurement errors will reduce sample correlation coefficients in comparison with population parameters. This explanation, however, seems not to play an important role in the present study as both the DRF scale and the dream diary are reliable instruments (high retest reliability and high internal consistency, respectively). In addition, the intercorrelations between these measure are high, as it has previously been reported (Schredl 2002a). Thus it can be assumed that interindividual differences in DRF has been measured reliably. Another issue to be considered are the sample characteristics. For the present study, a homogenous sample was selected in order to be able to interpret the correlation coefficients unequivocally as a finding obtained in a heterogeneous sample, e.g. with a large age range, may be explained by confounding variables such as attitude toward psychologic studies or questionnaires. Due to the specific announcement text, the sample might be biased toward persons interested in sleep and dreams; however, mean DRF is comparable with previous findings in student samples (cf. Schredl 1999b). Next, the distinction between state and trait factors (cf. Schredl and Montasser 1996–97a, b) and the time course of the pathways between the variables are of importance. Within the present study, stress and sleep behavior was measured retrospectively and at least one DRF measure (dream diary) was measured prospectively, so that these factors can affect dream recall. However, effects which might operate on a day-to-day basis were not accommodated in the study's design. Therefore, longitudinal studies are recommended, but one should keep in mind that the measurement method, e.g. diary, strongly affects DRF (e.g. Cory *et al.* 1975; Schredl 2002a); an effect which might mask (or augment) relationships between influencing factors and dream recall.

To summarize, these methodologic issues do not explain the small percentage of explained variance in comparison with the earlier DRF studies (see Introduction) as these studies applied similar measurement instruments in similar samples. It may be hypothesized that expectation effects played a role if DRF was investigated in relation to a single influencing factor. Herman (1971, 1972) has demonstrated that experimental manipulation of the participants' as well as the experimenters' expectations using a placebo and different instruction about the effect of the placebo on dream recall had a significant effect on DRF in the laboratory. Similarly, the significant difference in DRF between the same scales, one presented within a general sleep questionnaire and the other within a specific dream questionnaire, indicate that expectancy factors may affect the results of a DRF study. More detailed studies addressing this problem, however, have not yet been carried out.

Another interpretation of the small percentage of explained variance by the global model might be that some important influencing factors have not been included. The following variables might be promising for complementing the model. Although the empirical findings regarding sleep duration as a trait factor affecting DRF are heterogeneous (cf. Schredl 1999b), diary studies (e.g. Baekeland 1969) or experimental manipulation studies (Taub 1970), on the other hand, have demonstrated a substantial relationship between sleep duration as a state factor and DRF. Introspection is a factor which was found to be associated with DRF in several studies (e.g. Griffith 1958; Glicksohn 1991; Bartnicki 1997). For this construct, however, measurement instruments with sufficient reliability and construct validity have not yet been developed.

Regarding cognitive variables, the finding of Conduit *et al*. (2001) suggests that not the cognitive functioning of the normal waking state but the performance during or shortly after awakening is of importance for the process of dream recall. Within these states cognitive functioning is often severely impaired, an effect which is termed 'sleep inertia' (e.g. Dinges 1990; Ferrera *et al*. 2000). It will be promising to correlate interindividual differences regarding the sleep inertia effect with DRF.

In the present study, visual memory did not correlate with DRF. Although the majority of the studies on this topic (e.g. Butler *et al*. 1982; Butler and Watson 1985; Cory *et al*. 1975; Kramer 1978; Lloyd 1976; Schredl *et al*. 1995) support the hypothesis of a relationship between these two measures, two previous studies (Belicki *et al*. 1978; Cohen 1971) were also not able to detect a substantial relationship between visual memory and DRF. On the other hand, consistent findings were reported for elderly persons (Schredl *et al*. 1996b; Waterman 1991) and patients with dementia (Brunner *et al*. 1972; Kramer *et al*. 1975). This comparison of the inconsistent findings in young adults with the consistent findings in persons with possible deficits in cognitive functioning might indicate that a threshold model might be appropriate, i.e. within a normal range of cognitive functioning, a correlation between visual memory and DRF does not exist; however, below a certain threshold, the impaired cognitive performance is accompanied by reduced dream recall. Although nocturnal awakenings, stress and DRF were significantly related, as expected, there might be other mediators such as dream vividness within the relationship between stress and dreaming.

As expected, the correlation coefficient between DRF and attitude toward dreams was relatively small in comparison with previous findings (e.g. $r = 0.41$; Hill *et al*. 1997). As pointed out in the introduction section, this might be explained by the fact that items with direct relationship to the person's DRF have not been included in the present scale measuring interest in dreams. On the other hand, the attitude toward dreams scale correlated highly with the personality measures (openness to experience, thin boundaries, and absorption) as well as the creativity measures. This replicates the finding of Hill *et al*. (1997) who reported a larger correlation coefficient ($r = 0.41$) for the relationship between openness to experience and the attitude scale than for the DRF scale itself ($r = 0.23$). First, this might be explained by the 'broadness' of the variables (cf. Wittmann 1990) as attitude toward dreams is a more general construct (comparable with personality traits) than dream recall itself. Secondly, the findings indicate that personality factors are strongly associated with attitude toward dreams but DRF might be affected by a large number of different factors, e.g. sleep behavior, stress, and cognitive variables.

With respect to the published hypotheses for explaining interindividual differences in DRF (see Introduction), the present findings support the arousal component of the arousal–retrieval model of Koulack and Goodenough (1976) and the life-style hypothesis of Schonbar (1965). The small percentage of variance explained by the relevant factors, however, indicate that a more complex theory for dream recall (see below) is needed.

To summarize, it can be concluded that the personality (openness to experience, thin boundaries, and absorption), creativity, sleep behavior (nocturnal awakenings), and attitude toward dreams factors are associated with home DRF, but these factors account for a relatively small percentage of variance. The results of the present study indicate therefore that future studies should focus on longitudinal aspects in order to differentiate between state and trait factors (although methodologic issues, e.g. the effect of the measurement method itself on DRF, have to be investigated in detail) and additional variables such as sleep duration, introspection, and cognitive functioning immediately upon awakening; variables which might complement the presented general model of dream recall.

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