

Development of Disturbing Dreams During Adolescence and Their Relation to Anxiety Symptoms

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Study Objectives: This work assesses the prevalence and development of disturbing dreams among adolescents and the association of these dreams with anxiety.

Design: Sex differences in prevalence were analyzed with chi-square analyses. Changes over time were assessed with Wilcoxon tests and cross-tabulation tables. Associations with anxiety and DSM-III-R symptoms were assessed with ANOVA designs.

Setting: N/A

Participants: A total of 610 boys and girls rated their recall of disturbing and normal dreams at both 13 and 16 years of age. Subgroups of subjects were evaluated for anxiety symptoms at age 13 and for DSM-III-R symptoms of separation anxiety (SA), overanxious disorder (OD) and generalized anxiety disorder (GAD) at age 16.

Interventions: N/A

Measurements and Results: The recall of disturbing dreams was more prevalent for girls than for boys at both ages, and increased over time for girls while it decreased for boys. The recall of normal dreams was also more prevalent for girls at both ages, but this difference could not fully account for the difference in recall of disturbing dreams. Normal dream recall increased from age 13 to 16 for both sexes. The frequent occurrence of disturbing dreams was associated with anxiety at age 13 and with GAD, SA and OD symptoms at age 16 for both sexes. Evidence of more numerous OD symptoms for girls with frequent disturbing dreams suggests that this form of anxiety may partially account for the observed sex difference in disturbing dream prevalence.

Conclusions: The findings highlight a prevalence of disturbing dreams that is especially marked for adolescent girls. Unlike previous cross-sectional studies, which have found the same sex difference, this longitudinal design also calls attention to within-subjects changes in disturbing dream recall. The results also confirm that the frequent recall of disturbing dreams is associated with pathological symptoms of trait anxiety—apparently even as young as 13 years of age. Further study of disturbing dreams may contribute to understanding of associated pathophysiological factors which, too, vary by sex (e.g., PTSD, insomnia, depression).

Key words: Disturbing dreams; nightmares; sleep disorders; parasomnias; dream recall; epidemiology; anxiety; sex differences; separation anxiety; overanxious disorder; generalized anxiety disorder; DSM-III-R

INTRODUCTION

NIGHTMARES ARE A COMMON CLINICAL COMPLAINT, PARTICULARLY AMONG CHILDREN AND ADOLESCENTS. Whereas among adults nightmare problems have a prevalence of about 5%,¹⁻⁸ estimates for children and adolescents are consistently higher. From 10%—50% of very young children, aged three to five, have disturbing nightmares according to the DSM-IV.⁹ Prevalence has been found to increase through the first decade of life and diminish from adolescence to early adulthood.¹⁰⁻¹³ On the other hand, nightmare prevalence may be particularly

high for girls.^{12,14-16} One recent cross-sectional study found an association between nightmares and the female gender that first appeared at age 14.¹⁷

A particularly controversial question is whether disturbing dreams are associated with anxiety. Several studies have demonstrated relationships between nightmare frequency and anxiety among healthy adult subjects,¹⁸⁻²⁴ psychiatric patients,²⁵⁻²⁸ and patients in counseling.²⁹ Others have failed to find clear relationships.^{24,30,31} Even though it is claimed that nightmares in children likely reflect benign factors associated with development (whereas those of adolescents reflect psychopathological or stress-related processes),³² there is a virtual absence of information about nightmare-anxiety relationships among children and adolescents and about how this relationship may develop over time.

Identifying links between nightmares and anxiety

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among young subjects may therefore be an important step in diagnosing, treating, or even preventing future psychopathologies. Most studies (but not all^{24,33,34}) have found that nightmares are associated with pathological conditions such as personality disorders,³⁵⁻³⁷ schizotypy,³⁸ alexithymia,³⁶ depression,²⁷ drug and alcohol dependence,³⁹ depression,²⁷—even an elevated risk for suicide.⁴⁰ Other studies have even suggested that nightmares may reflect a vulnerability toward future psychopathology (e.g., schizophrenia, character disorder, and substance abuse in children⁴¹ and adults).^{38,42} One key study⁴² found frequent past nightmares to predict PTSD and depression following traumatization by Hurricane Andrew. Another large-scale epidemiological study²⁸ found positive relationships between past nightmares and present psychiatric disorders.

In the present study, we defined disturbing dreams as the occurrence of either bad dreams *or* nightmares in order to gain a more representative index of the phenomenon. It is almost certain that measures of nightmare prevalence alone underestimate the real occurrence of disturbing dreams. *Bad dreams* are, in fact, three to four times more prevalent than are nightmares⁴³⁻⁴⁵ even though they differ from nightmares only by virtue of not triggering awakenings from sleep. But they do depict threatening and aggressive scenarios with intense, disturbing emotions—just as nightmares do.^{45,46} Assessing both bad dreams and nightmares should enhance the precision of prevalence estimates of disturbing dreams.

Together, evidence for a high prevalence of bad dreams and for their association with psychiatric problems, particularly anxiety, warrant their closer scrutiny in young populations. The present study investigated changes in the frequency of disturbing dreams over time among a large sample of adolescents attending school in the province of Québec, and examined relationships between self-reported disturbing dream frequency and parent-rated levels of anxiety. It is a preliminary report on a limited subset of variables selected to (1) assess the prevalence of disturbing dreams in adolescence as a function of sex and changes in age; and (2) determine whether disturbing dreams are in fact associated with anxiety. We hypothesized that overall recall of disturbing dreams would be more prevalent for girls than for boys and that disturbing dream frequency would be associated with anxiety symptoms at both 13 and 16 years of age. We examined age and gender effects because these have been observed to mediate relationships with personality factors in the case of nightmares.^{47,48} We also examined normal dream recall as a factor because there is a large sex difference favoring females on this variable^{49,50} and because dream recall and nightmare recall are correlated.⁷

METHOD

Subjects and Instruments

During 1986—1987, mothers and teachers completed questionnaires for a community sample of 4488 French-speaking kindergarten children in the province of Quebec, Canada. From this sample, 2000 children were randomly selected, in order to be representative of all 11 administrative regions of Québec and of both urban and rural settings, for annual assessments throughout childhood and into adolescence. The annual assessments included hundreds of measures pertaining to health status, developmental landmarks, behavior problems, etc. For the representative sample, mother's mean age at the birth of her first child was 24.54 years ($SD = 3.83$), and father's mean age was 26.87 years ($SD = 4.02$). The average amount of formal education was 11.97 years for mothers ($SD = 2.56$) and 12.17 years for fathers ($SD = 3.42$). The mean occupational socioeconomic index, based on a report that the mean for Canadian occupations is 42.74,⁵¹ was 44.01 for both mothers and fathers ($SD_{\text{mothers}} = 13.03$, $SD_{\text{fathers}} = 14.88$). The majority of children (82.9%) lived with both biological parents, while 9.8% lived with their biological mother only and 3.9% lived with their biological mother and her partner. The remaining 3.4% of children lived in other types of arrangements. See Zoccolillo and colleagues⁵² for more detailed information on sample selection and description. The ethics and review board for human subjects of the Université de Montréal approved the study.

At ages 13 and 16, children were asked to complete self-administered questionnaires that included questions on the frequency of recall of normal dreams and nightmares/bad dreams during the previous year (*never, rarely, sometimes, often*). At age 13, the self-administered questionnaire was sent only to participants attending schools in which seven or more participants were present (i.e., to 1244 of the initial 2000 participants; the response rate was 67.8% [$n = 843$]). At age 16, 1903 of the initial 2000 participants were presented with the same dream and nightmare items, with a response rate of 65.1% ($n = 1239$); the 97 participants who were not reassessed at age 16 had clearly withdrawn from the study or had moved to an unknown location. A total of 610 subjects (280 boys, 330 girls) therefore completed questions concerning their habitual recall of normal and disturbing dreams at both 13 and 16 years of age and were included in the study. An additional 98 subjects were not evaluated with the anxiety scale at age 13, leaving 512 subjects who were included for analyses concerning this anxiety measure. Using *t*-tests, no significant differences between the selected sample of 610 subjects and the remaining 1390 subjects were observed for geographical location of the school attended by the child, and fathers' socio-economic status, profession and age at the birth of the child. A significant sex difference was observed: the

Table 1— Descriptive statistics for DSM-III-R anxiety scales at age 16

DSM-III-R anxiety measure	Mean ± SD	Range	Alpha	N
Subject-rated:				
Separation anxiety (SA)	0.823 ± 1.04	0-6	.439	577
Overanxious disorder (OA)	1.603 ± 2.17	0-12	.758	552
Generalized anxiety (GAD)	1.355 ± 3.46	0-18	.952	577
Mother-rated:				
Separation anxiety (M-SA)	0.474 ± 0.87	0-6	.510	574
Overanxious disorder (M-OA)	1.436 ± 1.95	0-10	.718	573
Generalized anxiety (M-GAD)	1.101 ± 2.80	0-18	.923	574

proportion of boys in the selected sample was 45.9% while it was 51.9% in the remainder of the sample (Pearson $\chi^2 = 6.04$, $df = 1$, $p < .05$). Also, for subjects at age 16, no significant differences were found on any anxiety measure between subjects included in and excluded from the current analyses.

At age 13, child behaviors were rated by the mother using the Social Behavior Questionnaire.^{53,54} The mother indicated on a three-unit scale if each brief description *never applied* (0), *occasionally applied* (1), or *frequently applied* (2), to the behavior of the child. Anxiety was measured with six items ($\alpha = 0.648$ for girls; $\alpha = 0.676$ for boys; and $\alpha = 0.661$ for both): 1) *worried, worried about many things*; 2) *tends to do things on his own, solitary*; 3) *unhappy, or distressed*; 4) *tends to be fearful or afraid of new things or new situations*; 5) *easily cries*; 6) *stares into space*. The anxiety score derived from these six items can vary from 0 to 12. Factor analyses on a previous sample of 768 first- and second-grade students responding to this questionnaire⁵⁵ produced a solution with two principal components (anxiety, aggressivity) that were stable across gender, age, socioeconomic level and culture. The scale was originally created by Rutter⁵⁶ and adapted by Behar,⁵⁷ and Tremblay and collaborators.⁵⁴ It has been shown to correlate with cardiovascular reactivity⁵⁸ and to be quite stable from school entry to early adolescence.⁵⁹ In the present cohort, 98 subjects were not evaluated with this anxiety scale, leaving 512 subjects who were included in the analyses concerning anxiety at age 13.

At age 16, adolescents and their mothers were interviewed separately using the Diagnostic Interview Schedule for Children (DISC) version 2.3⁶⁰ which draws upon the DSM-III-R criteria for assessment of separation anxiety (SA), overanxious disorder (OD) and generalized anxiety disorder (GAD) among other disorders. Specific items used for the present analyses were, for SA, nine symptoms mentioned under criterion A; for OA, 10 symptoms mentioned under criterion A, and for GAD, 19 symptoms mentioned under criterion C. Each item was coded as either *no* (0) or *yes* (1) over the past six months and each scale score calculated to be the sum of positively coded items. Three anal-

ogous anxiety measures were thus computed for self-reports and mother ratings of these symptoms: SA, OD and GAD for the adolescent and M-SA, M-OD, and M-GAD for the mother. Some subjects were not evaluated on all items (i.e., there were $N = 33, 58, 33, 36, 37$, and 36 missing scores for the SA, OA, GAD, M-SA, M-OD, and M-GAD scales respectively). Therefore, statistical analyses for these measures are based on between 552 and 577 subjects. Descriptive statistics for these variables appear in Table 1.

Statistical Analyses

Prevalences of disturbing dream recall at 13 and 16 were assessed with 2 X 4 chi-square tests with four levels of disturbing dream recall (*Never, Rarely, Sometimes, Often*) and two levels of sex (*Boys, Girls*) for each age. Sex differences at each frequency level were further assessed with Cohen's h -statistic for proportions.⁶¹ Prevalences of normal dream recall were similarly assessed. Prevalences for the recall of disturbing dreams independent of the recall of normal dreams (at 13 and 16) were calculated by splitting the normal dream recall samples into *Frequent (Sometimes + Often)* and *Infrequent (Never + Rarely)* groups and then calculating the same 2 X 4 chi-square tests on disturbing dream recall separately for each of these two groups. Non-numerical frequency categories were used because of small sample sizes in some of the frequency levels, especially *Never* and *Often*.

Changes in normal and disturbing dream recall with age were assessed using Wilcoxon Matched Pairs Tests that compared these measures at ages 13 and 16 years; scores for boys and girls were examined separately. A 4 X 4 cross tabulation table contrasting the four levels of disturbing dream recall at ages 13 and 16 was used to isolate changes in specific levels of this measure over time. Changes in the normal dream recall measure were similarly determined.

Relationships between anxiety and the recall of disturbing and normal dreams at age 13 were examined by entering anxiety scores as the dependent measure into an ANOVA with recall (*Infrequent, Frequent*) and gender (*Boys, Girls*) as independent variables. Relationships between anxiety symptoms of SA, OD, GAD, M-SA, M-

OD, and M-GAD and the recall of disturbing and normal dreams at age 16 were similarly assessed by entering the anxiety measures into separate ANOVAs with recall (*Infrequent, Frequent*) and gender (*Boys, Girls*) as independent variables. Additionally, Pearson correlations were calculated among anxiety measures at age 13 and anxiety symptoms at age 16.

RESULTS

Prevalence

At 13 years, the frequency distributions of Disturbing Dream Recall (DDR) differed significantly by sex ($\chi^2_{(3)}=19.6$, $p<.0002$) indicating that more girls than boys recalled disturbing dreams (see Figure 1). This sex difference was detected for the frequency categories *Never* (girls < boys; Cohen's $h=-.31$; $p=.0001$) and *Sometimes* (girls > boys; $h=+.26$; $p=.001$) (see Table 2). Girls endorsed the *Sometimes* category more often than boys by a factor of 1.52:1 (i.e., 34.2% vs. 22.5%), while they endorsed the *Never* category by a factor of 0.47:1 (i.e., 10.0% vs.

Table 2—Prevalence of recall of disturbing (DDR) and normal (NDR) dreams for girls and boys by frequency category

	Girls	Boys	h	p
DDR (age 13)				
Never	10.0%	21.1%	-.31	.0001
Rarely	53.0%	53.9%	-.02	.824
Sometimes	34.2%	22.5%	+.26	.001
Often	02.7%	02.5%	+.01	.877
DDR (age 16)				
Never	09.7%	26.8%	-.45	.00000002
Rarely	50.3%	52.9%	-.05	.522
Sometimes	35.2%	20.0%	+.34	.00002
Often	04.9%	00.4%	+.32	.0001
NDR (age 13)				
Never	01.8%	07.9%	-.30	.0002
Rarely	16.7%	30.0%	-.32	.0001
Sometimes	43.9%	40.0%	+.08	.331
Often	37.6%	22.1%	+.34	.00003
NDR (age 16)				
Never	01.5%	06.1%	-.25	.0018
Rarely	09.4%	22.1%	-.36	.00001
Sometimes	39.4%	44.6%	-.11	.1945
Often	49.7%	27.1%	+.47	.00000001

21.1%). Note that at this age the *Often* category was endorsed by approximately the same number of girls (2.7%) as boys (2.5%) (ns).

At 16 years, the sex difference was much more accentuated ($\chi^2_{(3)}=48.7$, $p<.000005$) (see Figure 1). This is largely because the disparity in responses to the *Often* category increased from a ratio of about 1:1 at age 13 to over 12:1 at age 16 (i.e., 4.9% vs. 0.4%; $h=+.32$; $p=.0001$) (see Table 2).

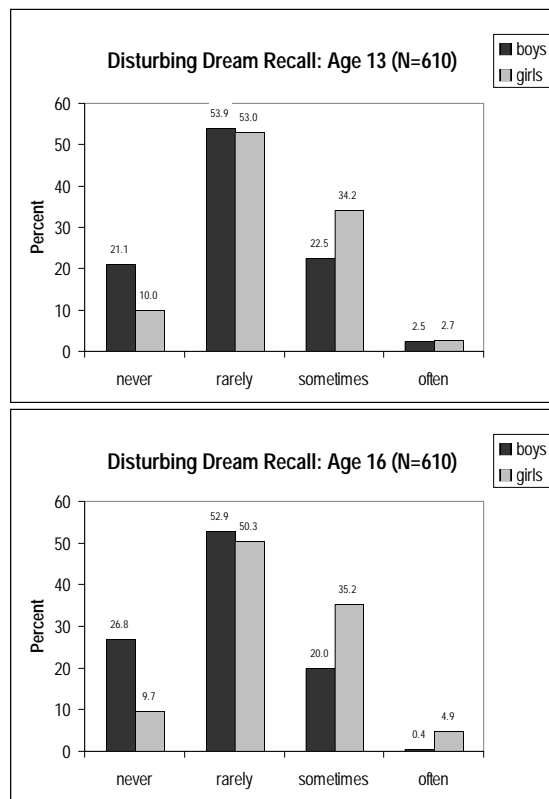


Figure 1—Prevalence of boys and girls recalling disturbing dreams in each of four recall frequency categories at ages 13 and 16

It is also because the disparity in the *Sometimes* category increased somewhat to 1.76:1 (i.e., 35.2% vs. 20.0%; $h=+.34$; $p=.00002$) as did the disparity in the *Never* category to 0.36:1 (i.e., 9.7% vs. 26.8%; $h=-.45$; $p=.00000002$).

Sex differences were also observed for the normal dream recall (NDR) variable at the two ages (see Figure 2 and Table 2). At age 13, girls had higher NDR than did boys ($\chi^2_{(3)}=36.2$, $p<.000005$). Unlike DDR at this age—when the odds were about equal for recalling bad dreams *Often*—the odds of girls recalling normal dreams *Often* were 1.70:1 (i.e., 37.6% vs. 22.1%; $h=+.34$; $p=.00003$). At 16 years, a similar overall sex difference was found ($\chi^2_{(3)}=45.5$, $p<.000005$) with an even larger girl:boy ratio (1.83:1) for the *Often* category ($h=+.47$; $p=.00000001$).

When the contribution of the NDR variable to the observed gender effect for DDR was minimized by examining DDR frequency distributions separately for *Infrequent* and *Frequent* NDR groups, the sex differences were still observed for both ages. At age 13, girls recalled more disturbing dreams than boys whether they were *Infrequent* ($\chi^2_{(3)}=10.6$, $p<0.02$) or *Frequent* ($\chi^2_{(3)}=13.8$, $p<0.005$) recallers of normal dreams. At age 16, girls again recalled more disturbing dreams than boys whether in the *Infrequent* ($\chi^2_{(3)}=7.2$, $p<0.03$) or *Frequent* ($\chi^2_{(3)}=29.2$, $p<0.000005$) groups. Despite these similarities of pattern, it is noteworthy that at both ages the sex difference for DDR was larger for the *Frequent* than for the *Infrequent* NDR

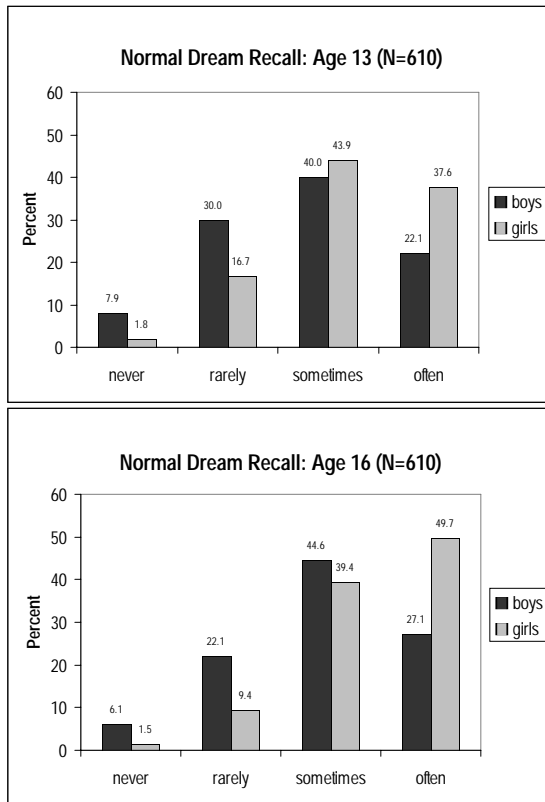


Figure 2—Percent of boys and girls recalling normal dreams in each of four recall frequency categories at ages 13 and 16

group.

Wilcoxon tests for age effects revealed that, over the entire DDR distribution, boys' scores decreased from age 13 to 16 ($z(280)=2.3$, $p=0.02$), whereas they remained stable for girls ($z(330)=1.0$, $p=0.30$). The 4 X 4 cross tabulation table clarified that more girls (51.8%) than boys (46.8%) did not change their DDR scores from age 13 to 16, especially their combined *Sometimes* and *Often* DDR scores, which for the girls remained unchanged by a large margin (16.7% vs. 9.0%). In addition, more girls (26.1%) than boys (21.8%) increased their DDR scores while fewer girls (22.0%) than boys (31.4%) decreased them.

Wilcoxon tests for age also revealed that NDR increased with age for both girls ($z(330)=3.9$, $p=0.00009$) and boys ($z(280)=2.8$, $p=0.005$). Again, more girls (53.6%) than boys (44.5%) did not change their NDR scores, especially their combined *Sometimes* and *Often* NDR scores (50.0% of girls vs. 31.7% of boys). However, fewer girls (31.5%) than boys (33.6%) increased their NDR scores and fewer girls (14.9%) than boys (21.8%) decreased them.

Table 3—Pearson correlations (and p-values) among DSM-III-R anxiety scale scores at age 16 (subject ratings and mother ratings) and anxiety scores at age 13

Subject ratings	Mother ratings			Anxiety-13
	M-SA	M-OD	M-GAD	
Separation anxiety (SA)	.318 (.00000)	.185 (.00001)	.161 (.00013)	.071 (.11941)
Overanxious disorder (OD)	.217 (.00000)	.386 (.00000)	.321 (.00000)	.151 (.00110)
Generalized anxiety (GA)	.180 (.00002)	.259 (.00000)	.360 (.00000)	.077 (.09036)
Anxiety-13 (mother rating)	.146 (.00130)	.255 (.00000)	.321 (.00000)	

Anxiety Symptoms

Anxiety intercorrelations. All six anxiety measures at age 16 correlated positively with the anxiety measure at age 13; four were significant; two were trends (see Table 3). On average, correlations with anxiety at 13 (which was rated by the mother) were higher for the three mother-rated measures (Mean $r=.24080$, $p<.00001$) than for the three subject-rated measures (Mean $r=.09957$, $p<.07029$). Overanxious Disorder was the only clinical scale that was significantly associated with anxiety at age 13 for both subject-rated (OD: $r=.1510$, $p<.00110$) and mother-rated (M-OD: $r=.2554$, $p<.0000005$) measures. Correlations between subject-rated and mother-rated anxiety measures were all moderate (Mean $r=.35461$) and highly significant (Mean $p<.0000005$) (see Table 3).

Anxiety and disturbing dream recall. The distribution of mother-rated anxiety scores at age 13 was unimodal with a slight positive skew (i.e., relatively normal in form). An ANOVA main effect at age 13 ($F_{(508)}=5.57$, $p=.019$) revealed that subjects with *Frequent* DDR had higher anxiety scores ($M=3.70\pm 2.34$) than did subjects with *Infrequent* DDR ($M=3.25\pm 2.07$) (Figure 3). A main effect for gender revealed that boys and girls were similarly anxious ($M=3.37\pm 2.19$ vs. 3.40 ± 2.12) ($F_{(508)}=0.36$, $p=ns$). There was no significant sex by DDR interaction ($F_{(508)}=1.50$, $p=.222$), indicating that both boys and girls with *Frequent* recall of disturbing dreams were more anxious than were their counterparts with *Infrequent*. Anxiety scores at 13 also differentiated DDR groups at the later age of 16; a main effect for DDR ($F_{(508)}=4.56$, $p=.033$) revealed that subjects with *Frequent* recall of disturbing dreams had higher anxiety scores ($M=3.68\pm 2.30$) than did subjects with *Infrequent* recall ($M=3.26\pm 2.09$), and this effect did not interact with sex (Figure 3).

The three subject-rated anxiety measures at age 16 differentiated *Frequent* and *Infrequent* recallers of disturbing dreams in a manner consistent with the anxiety measure at age 13, (i.e., there were DDR main effects for SA [$F_{573}=12.56$, $p=.00043$], OD [$F_{548}=15.49$, $p=.00009$] and GAD [$F_{573}=12.16$, $p=.00053$] [see Table 4]). However, only one of the three mother-rated anxiety measures at age 16—M-GAD—differentiated *Frequent* and *Infrequent* recallers in this way ($F_{570}=6.70$, $p=.00990$) (see Table 4).

All three subject-rated anxiety measures also revealed significant sex main effects (all $p<.00003$) with girls con-

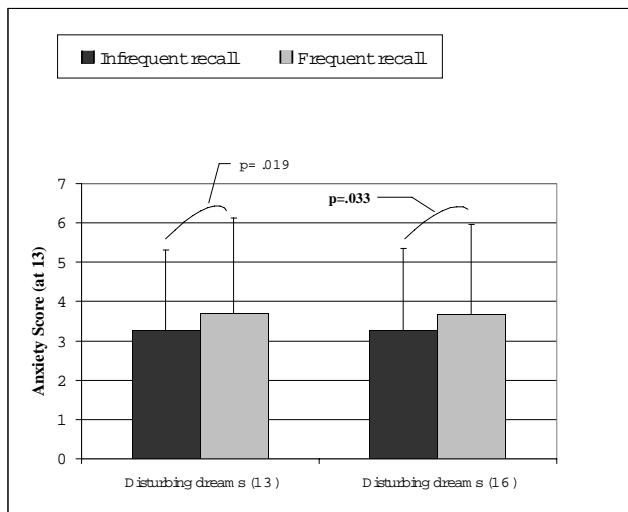


Figure 3—Anxiety scores for 13-year-old boys and girls with Frequent and Infrequent recall of disturbing dreams

sistently scoring higher than boys on anxiety. For mother-rated measures, M-SA ($p=.013$) and M-OD ($p=.032$) also showed this effect, whereas M-GAD ($p=.918$) did not. The three subject-rated measures also conformed to a sex by DDR interaction in which anxiety scores were selectively elevated for girls with *Frequent* DDR; this interaction was significant for OD ($F_{548}=8.14$, $p=.00449$) but not for SA ($F_{573}=2.15$, $p=.14313$) or GAD ($F_{573}=1.74$, $p=.18818$). In the case of OD, contrasts revealed that girls with *Frequent* DDR were much more anxious (2.82 ± 2.85) than were boys with *Frequent* DDR (1.30 ± 1.81) ($F_{548}=19.19$, $p=.000014$); girls and boys with *Infrequent* DDR were only marginally different (1.44 ± 1.90 vs. 1.08 ± 1.67 ; $F_{548}=2.83$, $p=.093$). No mother-rated anxiety measures showed this interactive pattern. All of the preceding effects for subject-rated variables remain highly significant even when a conservative Bonferroni correction for Type I errors is applied (i.e., critical $p = .05/6 = .0083$); the main effect for DDR on the M-

GAD measure does not however ($p=.0099$).

ANOVAs for the NDR variable revealed no significant main effects or interactions with anxiety for NDR scores at age 13. For subjects aged 16, ANOVAs revealed the same significant sex main effects as did the DDR variable but no other main effects or interactions.

DISCUSSION

The present results reveal a high prevalence of disturbing dreams during adolescence that is particularly striking for girls. The sex difference is less marked at age 13, when girls differed from boys only on the *Never* (difference = -11.1%) and *Sometimes* (difference = +11.7%) frequencies. However, at age 16 the difference becomes both more accentuated (differences = -17.1% and +15.2%, respectively) and dramatically visible also for the more clinically pertinent *Often* frequency (difference = +4.5%). In fact, at age 16 there is a twelve-fold difference between girls and boys for the *Often* frequency, a difference that is due both to a decrease among boys (-2.1%) and to an increase among girls (+2.2%) relative to responses at age 13.

This increasing divergence between girls and boys through adolescence is similar to what has been observed in other cross-sectional studies of nightmares. One study of 4812 adolescents⁶² found the prevalence of nightmares to be elevated for girls between 14 and 19; girl:boy ratios increased from 1:1 at age 14 to 3:1 at age 16 to 4:1 at age 19. Also similar to our findings, Schredl & Pallmer¹⁷ found substantially higher bad dream prevalences in German girls aged 14 (18.8%) and 15 (27.3%) compared to boys of the same age (10.0% and 0.0%) but no such differences at ages 12 and 13. On the other hand, some cross-sectional studies have found sex differences in preadolescents but not in older subjects.^{11,12} Our longitudinal design demonstrates that these sex differences are due largely to within-subject changes over time: actual decreases in bad dream recall for boys, and increases for girls.

Table 4—ANOVA main effects for disturbed dream recall on three DSM-III-R anxiety measures at age 16 (subject and mother ratings)

DSM-III-R anxiety measure	Subject ratings ^a		Mother ratings ^a	
	Mean ± SD	F (p)	Mean ± SD	F (p)
Separation anxiety (SA)	I: 0.681 ± 0.94 F: 1.140 ± 1.16	12.56 (.00003)	I: 0.433 ± 0.79 F: 0.564 ± 1.03	0.85 (.35797)
Overanxious disorder (OA)	I: 1.248 ± 1.79 F: 2.382 ± 2.68	*15.49 (.00010)	I: 1.310 ± 1.86 F: 1.715 ± 2.12	2.46 (.11725)
Generalized anxiety (GAD)	I: 0.897 ± 2.77 F: 2.374 ± 4.48	12.16 (.00053)	I: 0.881 ± 2.43 F: 1.587 ± 3.45	6.70 (.00990)

^aFrequent (F) DDR > Infrequent (I) DDR groups in all tests

*Also Sex X DDR interaction: Frequent DDR > Infrequent DDR groups for girls ($p=.000014$), not boys ($p=.093$)

It bears mentioning that per-year retrospective estimates of disturbed dreaming such as the one used in the present study have been found to significantly underestimate real frequencies as measured by daily home sleep diaries;^{24,63} home diaries maintained over a two-week period find from 2.5 to 10 times more nightmares per year (pro-rated) than do per-year retrospective estimates, depending upon the age of subjects.

The present results link the prevalence of disturbed dreaming to indicators of psychopathology. That anxiety scores were elevated for 13- and 16-year-old subjects who frequently recall disturbing dreams parallels, in a large stratified sample of young adolescents, what many research groups have observed for smaller groups of nightmare sufferers of various ages.^{18-25,30,31,38,64} Moreover, our findings for age 16 indicate that the recall of disturbing dreams is associated with clinically symptomatic anxiety indicators taken from the DSM-III-R. For subjects' own ratings on these measures, a significant association with disturbing dream recall was found on all three types of anxiety symptoms assessed, and for both sexes. However, the strongest effect was for overanxious disorder, a particularly extreme form of anxiety reflecting excessive or unrealistic fears about future or past behavior or performance in areas such as sports, school, or socializing.⁶⁶ The overanxious scale was also the only measure that clearly indicated that girls with frequent disturbing dreams were more anxious than were boys. This finding, and the fact that overanxious disorders affect females twice as often as males,⁹ is consistent with the possibility that our observed sex difference in disturbing dream prevalence is associated specifically with anxiety symptoms of the overanxious type. Another of our recent studies of adult (primarily female) nightmare sufferers⁶⁵ found a highly specific correlation between nightmare frequency and obsessive-compulsive symptoms as measured by the SCL-90-R. Since a frequently associated characteristic of overanxious disorder is obsessive compulsive behavior (e.g., 'perfectionist tendencies, obsessive self-doubts'⁶⁶), it is possible that our overanxious subscale is detecting a subclinical form of OC-related anxiety in our adolescent subjects.

The observed association between disturbing dream recall and anxiety is open to different types of interpretation. Disturbing dreams may be the result of an individual's underlying anxiety state. If one function of dreaming is to depict or process emotions,⁶⁷⁻⁶⁹ then chronic anxiety feelings might well be expressed in dream content. Fear is the emotion most closely linked to anxiety^{70,71} and is, in fact, the most commonly reported emotion in both normal⁷² and disturbing⁷³ dreams. Thus, elevated daytime anxiety may regularly be expressed as fear and other dysphoric emotions in disturbing dreams.

A second possibility is that the chronic remembering of disturbing dreams itself engenders anxiety. This idea is

inherent in Belicki's¹ "nightmare distress" concept, i.e., that waking anxiety caused by nightmares is distinct from nightmare frequency yet highly associated with psychopathology. Our results may reflect such a nightmare distress influence on waking anxiety, even though it seems unlikely that nightmare distress alone could account for elevated symptomatology on three DSM-III-R scales of clinical psychopathology.

Finally, it is possible that both anxiety and disturbing dreams are expressions of a third, unidentified, psychopathological process. Correlations between nightmare frequency in childhood and adult psychiatric disorders have been observed.^{28,74} Many such factors are feasible explanations of our observed sex difference in disturbing dreams, especially psychopathological factors that are known to preferentially affect females. Posttraumatic stress disorder (PTSD), which is usually accompanied by disturbing dreams, is more prevalent in females, whether as children,⁷⁵ adolescents,⁷⁶⁻⁷⁹ or adults.^{77,80-83} Some stressors, such as sexual abuse, increase preferentially for girls between ages 10 and 14—and persist thereafter.⁸⁶ Other sex differences paralleling those in our study have been observed for depressive symptoms,⁸⁷⁻⁸⁹ which also start around age 15,⁹⁰ and for some sleep disturbances.^{13,27,62,91-94} There is also a sex difference favoring women in the recall of dreams in general,^{49,50} however, our results indicate that the difference in disturbing dreams persists regardless of whether normal dream recall is frequent or not. Given evidence of the comorbidity of depression, anxiety, insomnia, and PTSD in various studies,^{81,95-97} all of the above-mentioned factors may contribute to the sex difference we observed. Future analyses of our subject cohort are targeted precisely at isolating the individual and combined influences of these fundamental pathophysiological variables on the prevalence of disturbing dream recall over the lifespan. Some results concerning prevalence of sleep disturbances have been published previously.^{98,99}

We are inclined to interpret the consistency over time in our findings for anxiety in relation to disturbing dream recall as evidence that there is a relationship between trait anxiety and disturbing dreams that persists from age 13 to 16 for both adolescent boys and girls. The mother-rated anxiety measures taken at age 16 in the present study were relatively well-correlated with (mother-rated) anxiety at age 13; subject and mother-rated measures, however, were only weakly associated. The latter low degree of consistency is nevertheless typical for cross-informant comparisons—especially in the case of adolescents.¹⁰⁰ Moreover, anxiety levels at age 13 distinguish frequent from infrequent recallers of disturbed dreams at age 16, an effect anticipating the parallel differences found for the three subject-rated anxiety measures taken at age 16. In a separate study, we examined bad dream and nightmare variables separately in a small sample of adults and found a signifi-

cant correlation between Spielberger trait anxiety (STAI) and the frequency of bad dreams ($r=.31$, $p<.05$) but not between STAI and frequency of nightmares.⁴⁶ Similar findings were reported by Zadra.¹⁰¹ Because we included the recall of both bad dreams and nightmares in our measure of disturbed dream recall, we cannot assess this possibility directly. Nevertheless, such findings, together with the fact that bad dreams are from three to four times more prevalent than are nightmares, suggest that bad dreams account for a large portion of the shared variance with trait anxiety in our design. If this is the case, then findings such as ours would counsel against using overly strict operational definitions of disturbing dreams—definition such as the DSM-IV *Nightmare Disorder*, which specifies that both fear and an awakening from sleep be present. Such definitions may actually obscure relationships between disturbed dreaming, anxiety and other pathological signs. In fact, several previous studies have failed to observe associations between nightmares and various psychopathological indicators.^{102,24,30,31,34}

In sum, the present findings are consistent with previous findings demonstrating a sex difference in disturbing dream recall for girls, and they go further to suggest a persistence and strengthening of this effect into later adolescence. Our results provide strong grounds for concluding that disturbing dreams are both widespread and enduring for adolescent girls in the population sampled. There are also grounds for concluding that disturbing dreams are associated with anxiety symptoms for both sexes and that this association, too, endures through adolescence. Although the two may well be causally connected (e.g., overanxious disorder leading to bad dreams primarily for girls), future longitudinal assessments are needed to evaluate whether other factors, such as traumatic stress, depression, and sleep disturbances also contribute to sex differences in disturbing dream recall prevalence.

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