Is Pubertal Timing Associated With Psychopathology in Young Adulthood?

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ABSTRACT

Objective: This investigation tested whether the timing of puberty continued to be associated with experiences of psychopathology (symptoms and disorders) from mid-adolescence into young adulthood. **Method:** At age 24, 931 participants from a large community sample, who had been interviewed twice during adolescence, completed a telephone interview (assessing Axis I disorders and elevated antisocial and borderline personality traits) and a mailed questionnaire battery. **Results:** Analyses tested whether pubertal timing was associated with lifetime and current history of mental disorders and psychosocial functioning in young adulthood. As expected, young women who had been early maturers had higher rates of lifetime history of disorder along with current elevation of psychosocial symptoms compared with women who were on-time maturers. Young men who had been late maturers, compared with other men, had elevated onset of disruptive behavior and substance use disorders during the transition to adulthood. **Conclusions:** Early maturing females are at unique risk of persistent difficulty during adolescence and should be targeted for preventive efforts. Late maturation among males may be associated with a late-onset pathway for deviant behavior or substance abuse. *J. Am. Acad. Child Adolesc. Psychiatry,* 2004;43(6):718–726. **Key Words:** pubertal timing, depression, antisocial personality, social supports.

Several recent studies have investigated links between pubertal timing, i.e., going through puberty earlier, at about the same time, or later than one's peers, and both clinical and subclinical psychopathology among adolescents. Specifically, early maturation in girls has been associated with higher rates of psychopathology during adolescence. However, a persistent question about the significance of these associations is the extent to which timing is predictive of longer term psychopathology

into adulthood (e.g., Brooks-Gunn et al., 1985). Early timing may be associated with higher rates of psychopathology during adolescence or may instead be associated with earlier onset of problems; in the latter case, on-time and late maturers would eventually have the same rates for problems with later onsets (i.e., catch up). In this study, we tested whether timing is associated with current and previous episodes of disorders using a longitudinal study of young adults seen most recently at age 24.

As indicated, early maturation in girls has been linked to diagnosable disorders and subclinical symptoms including depression; alcohol, tobacco, and substance use; disruptive behaviors/conduct disorder; and eating disorders and symptoms during adolescence (see Graber, 2003 for a review). Even though these studies have used different approaches to assessing puberty, most demonstrated consistent effects during young to mid-adolescence. However, Stattin and Magnusson (1990) found that effects of early maturation on adjustment indicators dissipated over time, but young women who were early maturers seemed to have low-

ered educational and occupational outcomes in young adulthood. As such, potential influences on outcomes in adulthood may or may not include psychopathology but rather markers for less advantageous adult transitions. Thus, we also examine associations between pubertal timing and adult role attainment (e.g., educational outcomes, employment, marriage) as well as current psychosocial functioning at age 24.

Notably, whereas findings for girls have identified early maturation as a risk for psychopathology, studies of boys have been more consistent with the hypothesis that off-time development, either early or late, is a risk for subclinical psychopathology (Berg, 1955). Early maturation has been linked with elevated depressive symptoms, alcohol use, delinquent and externalizing behaviors (see Graber, 2003 for a review). Late maturation has also been linked to elevated psychological distress during mid-adolescence (Graber et al., 1997) and increased alcohol abuse in young adulthood (Andersson and Magnusson, 1990). No studies have found links of timing and disorder in boys during adolescence.

The current investigation makes use of data from the Oregon Adolescent Depression Project (OADP), a longitudinal, epidemiological study of psychopathology begun with high school students (ages 14–18) who have been assessed in three waves, most recently at age 24. Previous publications have reported on the prevalence and incidence of mental disorders, the psychosocial correlates of depression, association of pubertal timing and psychopathology during adolescence, and, most recently, continuity of psychopathology into young adulthood (Lewinsohn et al., 1993, 1999, 2000). Young adult outcomes of pubertal timing have not been examined in these data. The current investigation examined links between pubertal timing and lifetime history of disorder, current disorder, current adult role attainment, and current psychosocial functioning in both young men and women to determine whether timing effects on psychopathology are limited to adolescence or whether new associations emerge in young adulthood (e.g., timing is linked to adult role attainment).

METHOD

Participants

The OADP was composed of 1,709 participants drawn from nine senior high schools in urban and rural western Oregon

(total population of 10,200 students) at the initial assessment (T_1). A second assessment (T_2) was conducted 1 year later with 1,507 of the participants. Previous publications from the OADP have described the representativeness of the sample and the comparison of adolescents who did and did not participate in the study during adolescence (see Lewinsohn et al., 1993 for details).

Most recently, at age 24 (T_3), all participants with a history of major depressive disorder (MDD) and other disorders at T_2, and an equal number of randomly selected participants with no history of mental disorder at T_2 were contacted to complete a questionnaire via mail and a telephone interview (Rohde et al., 1997). Participants provided written informed consent at T_3; study protocols were approved by the institutional review board at Oregon Research Institute. Of the 1,101 individuals selected for interview at T_3, 941 (85.5%) young adults participated. Of these, 931 had information on pubertal timing available for analysis. Individuals who did or did not participate at T_3 did not differ on any demographic or T_2 diagnostic variables, although women were more likely to participate than men at T_3. Participation at T_3 also did not vary by pubertal timing category (at T_1).

The demographic characteristics of the sample were as follows: mean age was 24.2 years (SD = 0.6); 57.3% were women ($N = 539$); 89.0% were white, with 1.1% black, 3.0% Hispanic, 2.6% Native American, 2.6% Asian, and 1.8% other. Most participants were single (61.4%) with 34.1% married, 1.6% separated, and 2.8% divorced. Nearly all (96.8%) had obtained a high school diploma or GED, and 31.4% had completed a bachelor's degree or higher.

Diagnostic Interview

Adolescents at T_1 were interviewed with the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS) adapted from K-SADS–Epidemiologic version (Orvaschel et al., 1982) and K-SADS–Present Episode version and additional items to assess past and current psychiatric disorders as outlined in *DSM-III-R* (American Psychiatric Association, 1987). At T_2 and T_3, the Longitudinal Interval Follow-up Evaluation was administered (Keller et al., 1987) to obtain information on the course of psychiatric symptoms and disorders since the previous interview. T_3 diagnoses were made using *DSM-IV* criteria (American Psychiatric Association, 1994). Diagnoses were collapsed into five primary categories of disorder at each time: (1) MDD; (2) anxiety, which comprised panic disorder, agoraphobia, social phobia, simple phobia, obsessive-compulsive disorder, separation anxiety, and overanxious disorder; (3) disruptive behavior, which comprised attention-deficit/hyperactivity disorder (ADHD) and conduct and oppositional disorders; (4) substance use, which comprised substance abuse and dependence disorders; and (5) eating disorder, which included anorexia and bulimia nervosa. In addition, at T_3, the Personality Disorder Examination (Loranger et al., 1988) was used to assess antisocial and borderline personality disorders. The Personality Disorder Examination provides dimensional scores (i.e., summation of partial and full symptom criteria), which were dichotomized at the 90th percentile to define the elevated dimensional score for each personality disorder (Lewinsohn et al., 1999) because rates of diagnosable disorder were quite low. Interviewer reliability as indicated by the κ statistic was moderate to excellent, with most equal to or greater than 0.80, with the exception of a few diagnoses (Lewinsohn et al., 1993, 1999).

Young Adult Role Attainment and Concurrent Psychosocial Functioning

Indicators of adult role outcomes were assessed via questionnaire and interview items. These measures were dichotomous and included the following: attainment of a bachelor's degree; unemployment of 1 week or more during the past year; annual household income less than $10,000; annual personal income less than $10,000; marital status (currently married: yes/no); divorce or separation (assessed only among participants who had been married); cohabitation or "living together" in a romantic relationship (assessed only among the never-married participants); and parenting (whether participant had ever been a parent: yes/no).

Indicators of current psychosocial functioning and health-related behaviors were quality of relationship with family members and relationship with friends (α = .88 and α = .88, respectively; 10 items each [Procidano and Heller, 1983]); social network (α = .69; size and frequency of social contact; three items [Berkman and Syme, 1979]); daily hassles (α = .88; during the past 4 weeks; 20-items from the Unpleasant Events Schedule [Lewinsohn et al., 1985]); major life events [33 events occurring to the participant in past 12 months (Holmes and Rahe, 1967; Dohrenwend et al., 1986); depressive symptoms (α = .89; 20-item Center for Epidemiologic Studies–Depression Scale (CES-D) [Radloff, 1977]); self-esteem (α = .81; 10 items [Rosenberg, 1965]); life satisfaction (α = .89; 15 items [Andrews and Withey, 1976; Campbell et al., 1976]); and physical health (α = .50; four items assessing self-rated health, number of times received treatment in past year, treatment for illness or injury in past year, chronic medical problems distress). Scores on the continuous variables were converted to standard scores (i.e., Z scores) and were scored such that high values reflect more problematic functioning. Participants also reported their current daily smoking (K-SADS item, dichotomous).

Pubertal Timing. At T_1, adolescents indicated whether their physical growth and development was early, on-time, or late compared with most teens their age (N = 1,669). As described previously (Graber et al., 1997), comparisons were made for self-reported weight and height at T_1 with the perceived timing categories. There was a significant timing effect for both girls and boys for weight and a significant timing effect for boys for height. For girls, weights in pounds were mean = 136.7 for early maturers, mean = 129.3 for on-time maturers, and mean = 119.9 for late maturers. For boys, weights in pounds were mean = 158.9 for early maturers, mean = 153.3 for on-time maturers, and mean = 141.9 for late maturers. These patterns along with consistency among other items that assessed age of other physical maturation events suggest that the perceived timing measure is consistent with other indicators of physical development. The same variable for pubertal timing, based on the item asked at T_1, was used in the current investigation (N = 931) because our goal was to follow the same groups (early, on-time, and late maturers) from adolescence into adulthood.

Analysis Plan

We examined the association of timing with (1) lifetime history of psychiatric disorder as assessed in young adulthood, (2) current psychiatric disorder in young adulthood, and (3) first incidence of disorder or recurrence of disorder during the period from mid-adolescence to young adulthood using two-way frequency tables, logistic regression, and survival analysis using the actuarial life-tables method. To examine associations between young adult indicators of adjustment and adult role attainment (e.g., education,

marriage) and timing, t tests were conducted for continuous variables and adjusted odd ratios using logistic regression analyses were conducted for the dichotomous measures. Analyses were adjusted for the age of the participant at T_1 and were conducted separately for women and men. For each analysis, two planned contrasts were tested: (1) the early group versus the on-time group and (2) the late group versus the on-time group. Prevalence rates and the planned contrasts for the analysis of disorders are weighted to account for the stratified sampling procedure that was used for the collection of data at T_3.

RESULTS

Pubertal Timing and Psychiatric Disorders in Young Adulthood

The associations by gender between the three perceived pubertal timing groups and the lifetime and current prevalence rates of Axis I disorders as well as elevated Axis II antisocial and borderline personality traits are shown in Table 1. For women, early maturers, compared with on-time maturers, had significantly elevated lifetime prevalence rates of MDD (66.5% versus 49.4%), anxiety (30.3% versus 20.0%), disruptive behavior disorders (11.3% versus 3.2%), and any Axis I psychiatric disorder (86.0% versus 70.6%). (The sampling strategy at T_3 oversampled individuals with disorders and as such is not meant to provide prevalence rates for young adults; Lewinsohn et al. (1999) report an incidence rate of 3.7% for MDD among young adults with no history of disorder during adolescence. See Lewinsohn et al. (1999) for additional details.) Because disruptive behavior disorders included ADHD, additional analyses examined whether this disorder accounted for the group differences. Lifetime prevalence of ADHD did not differ by timing group. Rather the effect reported for disruptive behaviors disorders was accounted for by the higher rates of conduct disorder and oppositional defiant disorder among early maturers. In addition, early maturers had significantly higher rates of elevated antisocial personality traits compared with on-time maturers (6.5% versus 2.7%). Young women who were late maturers did not differ from on-time maturers for lifetime prevalence of disorder. Prevalence rates for current disorder among women did not differ by timing group (lower section of Table 1).

For young men, only two effects of pubertal timing on disorder were found. Specifically, men who were late maturers compared with on-time maturers have

TABLE 1
Pubertal Timing Group Prevalence Rates[a] of Psychiatric Disorders at T_3 Separately for Female and Male Samples

	Female Sample					Male Sample				
		Group		Planned Contrasts			Group		Planned Contrasts	
	Early	On Time	Late	Early vs. On Time	Late vs. On Time	Early	On Time	Late	Early vs. On Time	Late vs. On Time
Disorder	(n = 113)	(n = 372)	(n = 50)	OR (95% CI)	OR (95% CI)	(n = 55)	(n = 283)	(n = 58)	OR (95% CI)	OR (95% CI)
Lifetime (%)										
Axis I										
Major depression	66.5	49.4	50.2	**2.0 (1.3–3.3)**	1.0 (0.6–1.9)	37.9	28.1	39.3	1.6 (0.8–2.9)	1.7 (0.9–3.0)
Anxiety	30.3	20.0	16.3	**1.7 (1.1–2.8)**	0.8 (0.4–1.6)	8.1	9.3	8.9	0.9 (0.3–2.3)	1.0 (0.4–2.5)
Substance use	35.3	28.2	32.4	1.4 (0.9–2.2)	1.2 (0.6–2.4)	43.3	40.9	49.4	1.1 (0.6–2.1)	1.4 (0.8–2.6)
Disruptive disorder	11.3	3.2	4.4	**3.9 (1.8–8.0)**	1.4 (0.4–5.0)	6.8	10.1	19.1	0.7 (0.2–1.8)	**2.1 (1.1–4.5)**
Eating	6.4	2.8	7.4	2.4 (0.9–5.9)	2.8 (0.8–9.6)	—	—	—	—	—
Any	86.0	70.6	70.7	**2.6 (1.3–5.2)**	1.0 (0.5–2.1)	70.4	63.1	72.2	1.4 (0.7–2.9)	1.5 (0.7–3.2)
Axis II										
Antisocial	6.5	2.7	0.0	**2.5 (1.1–6.2)**	NC	19.2	13.3	11.6	1.6 (0.7–3.5)	0.9 (0.4–2.1)
Borderline	5.8	4.1	9.4	1.4 (0.6–3.7)	2.4 (0.8–7.2)	2.8	2.8	6.4	1.0 (0.2–4.9)	2.4 (0.7–8.8)
Current (%)										
Major depression	2.8	3.6	4.4	0.8 (0.2–2.9)	1.2 (0.3–4.5)	1.4	1.0	1.3	1.4 (0.2–12.9)	1.3 (0.1–12.9)
Anxiety	7.7	5.8	7.4	1.4 (0.6–3.3)	1.3 (0.5–3.3)	2.7	1.7	2.5	1.6 (0.2–13.9)	1.5 (0.3–7.9)
Substance use	3.5	2.8	7.4	1.3 (0.4–4.4)	2.8 (0.8–9.7)	9.5	8.5	19.0	1.1 (0.4–3.3)	**2.5 (1.1–5.9)**
Any	16.9	13.4	16.2	1.3 (0.7–2.4)	1.3 (0.6–2.8)	21.7	14.4	21.5	1.7 (0.8–3.6)	1.6 (0.8–3.5)

Note: OR = odds ratio; CI = confidence interval; NC = not calculable. Significant odds ratios appear in boldface. The lifetime prevalence of eating disorder among male subjects was too low for analysis (n = 3) as was the current prevalence of eating disorders for both genders.
[a] Weighted for the stratified sampling procedure for data collection at T_3.

significantly higher lifetime prevalence rates of disruptive behavior disorder (19.1% versus 10.0%) and significantly higher rates of current substance use (19.0% versus 8.5) (lower section of Table 1). Again, additional analyses were conducted to examine whether ADHD accounted for the effect for disruptive behavior disorder; neither of the planned contrasts was significant for this analysis. No effects were found linking early maturation and lifetime or current disorder among men.

Onset and Recurrence of Psychiatric Disorders From Late Adolescence to Adulthood

Most significant associations in young adulthood are found for lifetime prevalence rather than current disorder. Effects of lifetime prevalence of disorder may be the result of experience of disorder in adolescence or during the period from mid-adolescence (T_1) to young adulthood (T_3). Thus, a second set of analyses was conducted to examine associations of pubertal timing with first incidence of disorder between the T_1 and T_3 assessments. Individuals who had already had a disorder by T_1 are excluded from these analyses.

These analyses revealed two effects of pubertal timing on first incidence of disorder during the late adolescence/young adulthood period. For young men, late maturation compared with on-time maturation was associated with first incidence of disruptive behavior disorder from T_1 to T_3 (13.0% versus 2.5%; odds ratio [OR] 5.8, 95% confidence interval [CI] = 1.8–19.0). Again, this effect was not accounted for by rates of ADHD.

For young women, early maturation compared with on-time maturation was associated with first incidence of MDD from T_1 to T_3 (51.5% versus 33.9%; OR 2.1, 95% CI = 1.2–3.7). A survival analysis was conducted to examine explicitly whether age at onset for MDD varied by timing; whereas the survival analysis comparing early versus on-time girls was significant due to the higher lifetime prevalence rates of MDD among early maturers, no differences were found in age at onset for first MDD episode (Fig. 1). Taken together, these findings indicate that early maturation was associated with onset of MDD throughout adolescence rather than during a single period of adolescence, as can be seen in Figure 1.

Recurrence of disorder during the T_1 to T_3 interval was also examined to see whether pubertal timing was associated with recurrent episodes of a disorder. Analy-
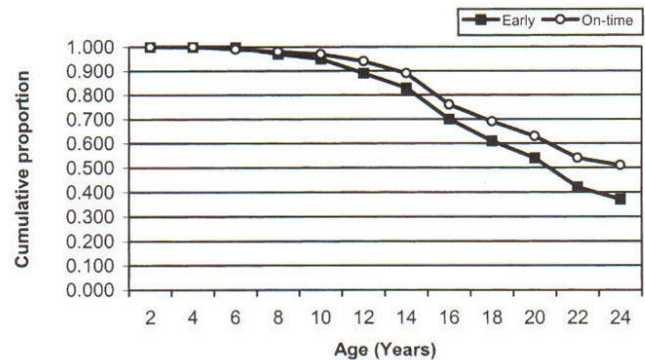

Fig. 1 Survival curves for the onset of major depressive disorder comparing early and on-time female maturers.

ses examined associations of pubertal timing with recurrence of MDD, MDD episode followed by anxiety, and recurrence of any disorder. Because these analyses are restricted to a subset of the sample, there was not sufficient power to test for recurrent pathology across other disorders by timing group. Analyses did not find any significant associations for pubertal timing and recurrence of disorder from T_1 to T_3.

Pubertal Timing Effects on Young Adult Role Attainment and Current Psychosocial Functioning

The associations between the three pubertal timing groups and indicators of adult role attainment (e.g., educational attainment, household income) and indicators of current psychosocial functioning (e.g., depressive symptoms, quality of relationships) in young adulthood are shown in Table 2. Beginning with adult role attainment, only one significant association of timing was found such that women who were late maturers were significantly more likely to have completed a bachelor's degree by age 24 than were their on-time counterparts (57.5% versus 33.2%). No other associations were seen for women or men between pubertal timing and adult role attainment.

For psychosocial functioning at T_3, several significant associations were found (Table 2). For women, again, early maturation compared with on-time maturation was associated with indicators of poorer adjustment, especially in relationships with others. Women who were earlier maturers reported poorer quality of relationships with family and friends, having a smaller social network, and lower life satisfaction than on-time maturers. Women who were late maturers reported more major life events than did on-time maturers; oth-

TABLE 2

Pubertal Timing Group Percentages, Means, and Contrasts[a] for T_3 Psychosocial Measures Separately for Female and Male Samples

| | Female Sample | | | | | Male Sample | | | | |
| | Group | | | Planned Contrasts | | Group | | | Planned Contrasts | |
Variable	Early (n = 113)	On Time (n = 372)	Late (n = 50)	Early vs. On Time	Late vs. On Time	Early (n = 55)	On Time (n = 283)	Late (n = 58)	Early vs. On Time	Late vs. On Time
Adult role attainment, %										
Bachelor's degree	31.1	33.2	57.5	1.1 (0.7–1.8)	**0.4 (0.2–0.7)**	19.2	33.6	40.5	2.1 (1.0–4.7)	0.7 (0.4–1.4)
Unemployed	39.9	42.3	47.8	0.9 (0.6–1.4)	1.3 (0.7–2.4)	45.2	45.5	40.5	1.0 (0.5–1.9)	0.8 (0.4–1.5)
Household income										
<10K	21.8	20.1	24.3	1.1 (0.7–1.9)	1.3 (0.6–2.6)	17.8	22.8	27.9	0.7 (0.3–1.6)	1.3 (0.7–2.6)
Personal income										
<10K	47.2	47.9	47.1	1.0 (0.6–1.5)	1.0 (0.5–1.8)	32.5	36.2	35.4	0.9 (0.4–1.7)	1.0 (0.5–1.9)
Married	33.9	44.1	32.4	0.7 (0.4–1.0)	0.6 (0.3–1.2)	23.0	30.9	31.6	0.7 (0.3–1.4)	1.0 (0.5–2.0)
Cohabitation	37.3	31.4	17.4	1.3 (0.7–2.4)	0.5 (0.2–1.2)	18.2	23.1	20.4	0.7 (0.3–1.9)	0.9 (0.3–2.2)
Parenting	28.6	26.5	23.6	1.1 (0.7–1.8)	0.9 (0.4–1.7)	21.4	15.0	12.7	1.6 (0.7–3.6)	0.8 (0.3–2.1)
Current psychosocial functioning, mean (SD)										
Quality of relationship										
Family members	0.05 (1.00)	−0.24 (0.83)	−0.13 (0.93)	−2.70**	−0.82	0.26 (1.35)	0.07 (1.01)	0.29 (0.99)	−0.89	−1.45
Friends	−0.01 (1.01)	−0.23 (0.67)	−0.18 (0.77)	−2.04*	−0.36	0.28 (1.36)	0.14 (1.15)	0.36 (1.23)	−0.63	−1.20
Small social network	0.16 (0.97)	−0.10 (0.97)	0.08 (0.93)	−2.39*	−1.18	−0.12 (1.19)	−0.08 (0.97)	0.07 (0.97)	0.22	−0.96
Daily hassles	−0.01 (1.04)	−0.15 (0.98)	−0.30 (0.89)	−1.19	1.06	−0.05 (1.08)	0.02 (1.00)	0.27 (0.93)	0.40	−1.70
Major events	−0.11 (0.88)	−0.12 (0.96)	0.17 (0.95)	−0.10	−1.96*	0.02 (0.94)	−0.04 (0.98)	−0.11 (1.05)	−0.38	0.45
CESD	0.05 (1.05)	−0.01 (1.03)	−0.04 (1.10)	−0.52	0.23	0.01 (1.13)	−0.27 (0.79)	0.10 (0.85)	−1.72	−2.76**
Low self-esteem	0.20 (1.04)	0.00 (0.93)	−0.06 (1.05)	−1.77	0.31	0.18 (1.26)	−0.37 (0.88)	0.09 (1.00)	−2.79**	−3.02**
Low life satisfaction	0.26 (1.02)	−0.24 (0.96)	−0.25 (0.79)	−4.18***	0.04	0.12 (1.09)	0.03 (0.98)	0.06 (0.95)	−0.54	−0.21
Poor physical health	0.33 (1.06)	0.13 (0.97)	−0.05 (0.90)	−1.61	1.33	−0.24 (1.01)	−0.44 (0.83)	−0.19 (0.90)	−1.26	−1.79

Note: Odds ratios with 95% confidence intervals are presented for planned contrasts on dichotomous variables; *t* tests are presented for planned contrasts on continuous-type variables. Significant odds ratios and *t* values appear in boldface.

[a] Weighted for the stratified sampling procedure for data collection at T_3.

* $p < .05$; ** $p < .01$; *** $p < .001$.

erwise, no effects were found for late maturation among young women.

For young men, both early and late maturation were linked to a few indicators of adjustment in young adulthood. Early maturers, compared with on-time maturers, had significantly lower self-esteem and were more likely to report daily smoking than their on-time counterparts (40.5% versus 20.7%; OR 2.6, CI = 1.3–5.1; not shown in Table 2); as such, psychosocial impairment was not pervasive for early-maturing men.

Late maturers, compared with on-time maturers, also reported significantly lower self-esteem and had significantly elevated depressive symptoms (CES-D). As reported, late-maturing males also had higher rates of current substance use disorder than on-time maturers and had experienced elevated rates of disruptive behavior disorder between the ages of 19 and 24. A final analysis was conducted to examine whether the effects of late maturation on psychosocial symptoms accounted for the timing effect on substance use. The effect of late maturation in males on substance use was still significant after accounting for self-esteem and CES-D scores.

Taken together, symptom and disorder analyses indicate that late maturation in men is associated with serious psychopathology during young adulthood.

DISCUSSION

This study is perhaps the first to report on timing and disorder in young adulthood. Moreover, the current findings speak directly to the suggestion that as adolescents mature, other youth would "catch up" in rates of disorder; other youth do not catch up and young women who went through puberty earlier than their peers had higher lifetime prevalence rates of MDD, anxiety, disruptive behavior disorders, and elevated antisocial personality traits. For women, no timing group differences were found for current disorder, but early maturers reported current deficits in psychosocial functioning as evidenced by lowered quality of relationships with family and friends and reports of small social support networks. Given their history of struggles with mental health before age 24, it is not surprising that they report lowered satisfaction with life as young adults.

Despite expectations (Stattin and Magnusson, 1990), early timing was not directly linked to earlier or less advantageous adult role attainment, but it may be that our measures did not adequately tap the quality of the transition or effects on these indicators may not be seen until later in adulthood. However, our finding that late maturing women had higher rates of completion of college is consistent with the adolescent literature. Previous studies have suggested that late-maturing girls perform better in academic areas because they are often spending less time in heterosocial activities during early and mid-adolescence than other girls (e.g., Dubas et al., 1991).

Moreover, the current findings speak to important correlates of problems for early-maturing women. In the OADP, poor quality of relationships was consistently reported for these individuals at mid-adolescence and young adulthood. A disproportionate percentage of these individuals also had elevated antisocial personality traits in young adulthood. Antisocial personality disorder nearly always includes an inability to maintain close, warm relationships with others. Stattin and Magnusson (1990) had previously reported that early maturers who associated with older peers were those who were most likely to engage in problem behaviors during adolescence. Their findings have stimulated a great deal of discussion on the nature of peer affiliations of early-maturing girls, although few studies have investigated the topic. In addition, parent–child relationships have been found to be more conflictual for early-maturing girls than for other adolescents (Steinberg, 1987). In fact, greater parent–child conflict and lowered warmth have been found to be predictive of earlier maturation in girls (e.g., Ellis et al., 1999; Graber et al., 1995). Thus, a picture of impaired social skills, especially in the area of interpersonal interactions, is emerging for early-maturing girls. These girls likely experience more conflictual interpersonal relationships with parents as they enter puberty, enter puberty with less time to develop decision-making and interactive skills before meeting the social challenges of adolescence, experience disorders such as MDD or disruptive behavioral disorders that usually involve periods of sustained impairment in interpersonal interactions, and ultimately by adulthood have poor relationships. However, although it is possible to chart the associations of pubertal timing with relationship quality and history of disorder in the current study, it is not possible to determine the direction of the effects. As indicated, psychosocial factors, in particular, the quality of family relations, are predictive

of pubertal timing itself. Thus, the timing effects on psychopathology may, in part, be accounted for by poor family relationships, which, in turn, may predict both pubertal timing and psychopathology.

Turning to our findings for young adult men, late maturers had relatively recent onset of disorder. Late-maturing men had elevated rates of lifetime history of disruptive behavior disorder and current substance use in young adulthood. In mid-adolescence, late matura-tion was associated with lower lifetime prevalence rates of substance use among boys (3.2% versus 8.4% for late and on-time maturers, respectively) (Graber et al., 1997). Andersson and Magnusson (1990) have previ-ously reported greater alcohol abuse among late-maturing males in young adulthood. In the current investigation, we provide confirming evidence of such an association and that these problems seem to have their onset in the young adult period for late-maturing men. Furthermore, much of the existing literature on disruptive behavior disorders among males focuses on either early childhood or early adolescent onset for these problems (e.g., Moffitt, 1993); later onset during the transition to adulthood has been relatively unstud-ied.

Notably, in the OADP data, early maturation among males was not associated with disorder during adolescence (Graber et al., 1997) or in young adult-hood. However, poorer psychosocial functioning is seen at mid-adolescence and to a lesser extent in young adulthood for this group. Interestingly, young men who were early maturers had higher rates of tobacco use as adolescents, and by young adulthood, 40.5% of these individuals report daily tobacco use. The Centers for Disease Control and Prevention reports that 24.4% of men regularly smoked cigarettes in the United States in 2000 (26.6% of men ages 25–34) (Centers for Dis-ease Control and Prevention, 2000). Early-maturing boys may engage in more experimentation with sub-stances in general (Wichstrom, 2001); given that nico-tine is highly addictive, this experimentation may be particularly risky.

Limitations

The current investigation has some limitations. The OADP sample is representative of youth in Oregon and is not nationally representative. As such, the sample is predominantly European American (89%), and by young adulthood, most of the OADP sample

had obtained a high school diploma or GED; thus, findings may not generalize to studies of young adults from other racial or ethnic backgrounds or to youth who do not complete high school. In addition, the sampling strategy for the young adult assessment over-sampled individuals with disorders and as such is not meant to provide prevalence rates for young adults (Lewinsohn et al., 1999). In the current investigation, the sampling strategy did not affect the distribution of the pubertal timing variable, and analyses were weighted to control for the stratified sampling. As such, analyses of group differences in disorder or psychoso-cial functioning should not be influenced by the sam-pling strategy. Finally, as in our previous investigation (Graber et al., 1997), we use a self-report measure for pubertal timing. This measure was consistent with other indicators of puberty in the OADP study, and self-reported timing has been shown to be consistent with objective measures of pubertal timing.

Clinical Implications

The current findings have particular clinical rel-evance in several areas. Although effects of early matu-ration were not pervasive for young men, the particularly high rates of tobacco use in this group are clearly of importance from a public health perspective. Adults who come in contact with these adolescents may be inadvertently tolerating their smoking due to mis-perceptions of the adolescents' age. In addition, the transition to adulthood appears to be a risky period for young men who were late maturers. Once out of high school and often living away from home, it is particu-larly difficult to connect youth with supportive services (e.g., Sherrod et al., 1993). Prevention initiatives should address the needs of these youth to offset their onset of substance use and conduct problems in later adolescence.

Finally, in studies of adult women, early maturation has been linked to serious health problems such as breast cancer (Apter et al., 1989). Thus, early matura-tion in females may be a marker for vulnerability for both mental and physical health problems; investiga-tion of how and why early maturation may translate into health outcomes is needed via biological and psy-chosocial research. Moreover, better information to parents and educators regarding the risk for early-maturing girls will assist in earlier detection and inter-vention when problems occur. That problems in the

area of social relationships are likely an underlying cause or concomitant for these girls identifies an avenue for prevention efforts and future investigations.

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Secular Trends in Adolescent Never Smoking From 1990 to 1999 in California: An Age–Period–Cohort Analysis Xinguang Chen, MD, PhD, Guohua Li, MD, DrPh, Jennifer B. Unger, PhD, Xiaowei Liu, MS, C. Anderson Johnson, PhD

Objectives: We analyzed age, time period, and cohort effects on trends in adolescent cigarette smoking in California from 1990 to 1999. *Methods:* Data from subjects aged 12 to 17 years (n = 26 536; 50.4% male) from the California Tobacco Survey and the California Youth Tobacco Survey were analyzed, and never smokers were used as the outcome measure. *Results:* The proportion of never smokers increased from 60% for males and 66% for females in 1990 to around 70% for both sexes in 1999. Respondents were more likely to be never smokers if born in 1978 or later (i.e., aged 12 years or younger in 1990, when most tobacco control programs started in California). *Conclusions:* The statewide antitobacco programs prevented adolescents from starting to smoke, primarily through a cohort effect. **Am J Public Health** 2003;93:2099–2104.