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Timing of Menarche, Preparation, and Initial Menstrual Experience: Replication and Further Analyses in a Prospective Study

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The goals of this study were to assess the significance of two timing variables (objective timing of menarche and subjective timing, i.e., the belief—not necessarily true—about one's status as early, average, or late maturing) and two cognitive variables (preparation for menstruation and ego functioning) as predictors of the experience of menarche. Subjects were 92 girls who changed from pre- to postmenarcheal between two test occasions, six months apart. Findings were that subjective timing of menarche and preparation were significant predictors of menarcheal experience, while objective timing and ego functioning were not. The results replicated earlier findings based on cross-sectional analyses. Interpretation of the results suggested some directions for further exploration of determinants of initial menstrual experience.

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INTRODUCTION

In the context of the plethora of changes associated with pubertal development in girls, menarche is unique. It usually occurs suddenly and without precise predictability, and it involves a tangible product, associations to which are emotionally charged. Given its late appearance in the pubertal process—occurring as much as two years after breast bud development (Tanner, 1978)—menarche takes place when girls are most highly sensitive to body change, with its personal, interpersonal, and cultural meanings (Notman, 1983). Although girls, their parents, and their peers may be aware of earlier, and more gradual pubertal changes, such as breast development—which may be obsessively monitored (Rierdan and Koff, 1980) and reliably rated by girls themselves (Brooks-Gunn and Warren, 1988)—it is menarche that is taken by girls to constitute "proof" of their normality (Koff *et al.*, 1981; Whisnant *et al.*, 1975) and of their status as women (Logan, 1980).

While early clinical writings advanced the views that menarche was predominantly a disruptive (Deutsch, 1944) *or* integrative (Kestenberg, 1967) event, subsequent empirical investigations have consistently reported that both positive and negative emotional reactions characterize immediate (e.g., Petersen, 1983; Ruble and Brooks-Gunn, 1982; Whisnant and Zegans, 1975) and retrospective (Golub and Catalano, 1983; Koff *et al.*, 1982; Pillemer *et al.*, 1987; Woods *et al.*, 1982) descriptions of initial menstrual experiences. Recognizing both the positive and negative meanings of menarche for girls and women, and acknowledging that the normative experience of menarche is one of ambivalence (i.e., of both positive *and* negative feelings), researchers and clinicians also note that the emotional valence of the initial menstrual period may differ greatly among individuals, ranging from largely positive to largely negative. Investigations such as this one seek to understand determinants of such differences in menarcheal experience.

Among the classes of variables hypothesized to affect initial menstrual experience are those concerned with *timing* (both objective timing, which pertains to a girl's actual age and grade at menarche, and subjective timing, which pertains to a girl's sense of being on or off time) and those concerned with *cognitive* status (in relation to a girl's adequacy of preparation for menarche and, more broadly, to her level of ego development[4]). One timing variable—objective timing—and one cognitive variable—preparation—have received some systematic study.

[4]A review of the different definitions and descriptions of the ego is beyond the scope of this report. Ego functioning is categorized as a cognitive variable here, given the adoption of Loevinger and Wessler's (1970) model of the ego as a sense-making framework.

Objective timing suggests itself as a likely variable to affect menarcheal experience since the age range for onset of menarche is very broad (on average, from 10 to 16 years; Tanner, 1978), and since age and grade at menarche have implications for a girl's objective social status as on or off time (Faust, 1960), for the adequacy of her preparation for menarche (e.g., Koff *et al.*, 1982), and for her level of ego development (Livson and Peskin, 1980). It has been speculated that a curvilinear relationship might exist between objective timing and menarcheal experience, with earlier and later maturers both having less positive menarcheal experiences than average maturers, but a linear relationship has more generally been found, with earlier maturers having less positive emotional responses to menarche than average as well as later maturers. This relationship has been reported to be significant in studies of early adolescents (Ruble and Brooks-Gunn, 1982), and in retrospective studies of late adolescents (Pillemer *et al.*, 1987) and adult women (Woods *et al.*, 1982), but the degree of relationship has been modest and not significant in other retrospective studies (e.g., Rierdan and Koff, 1985; Ruble and Brooks-Gunn, 1982).

Significant relationships have repeatedly been found between preparation for menarche and initial experience. In cross-sectional and prospective studies of early adolescents (Ruble and Brooks-Gunn, 1982), as well as in retrospective studies of late adolescents (Golub and Catalano, 1983; Koff *et al.*, 1982; Pillemer *et al.*, 1987), although not of older adults with more extensive and varied menstrual experiences (Golub and Catalano, 1983), better prepared individuals have reported more positive menarcheal experiences than less well-prepared individuals.

Reports have not appeared of the impact of ego development on menarchael experience. It has been theorized (Livson and Peskin, 1980) that level of ego development, which is correlated with age (Martin and Redmore, 1978), might account for the effects of maturational timing on psychosocial functioning, when such relationships occur. This is explained in terms of later maturers having more developmentally advanced psychological means that earlier maturers for coping with and assimilating the biological, psychological, and social changes that define and/or accompany puberty. A goal of this report is to address the hypothesis that level of ego development affects the experience of menarche.

It has been rare for investigators to assess the relative importance of different timing and cognitive variables for menarcheal experience. In two relevant studies, Rierdan and Koff (1985) found that subjective timing (a girl's personal, not necessarily accurate, sense of being early, on time, or late) was a better predictor of menarcheal experience than objective timing,[5]

[5]Wilen (1980) and Tobin-Richards *et al.* (1983) also have studied the dimension of subjective timing in studies of pubertal development, but have not focused on menarche *per se*.

and Koff *et al.* (1985) found that preparation more adequately accounted for variations in initial experience of menarche than objective timing. The relationship between subjective timing and preparation as determinants of menarcheal experience has not as yet been assessed, nor has the possible role of ego functioning as a mediator of the effects of subjective timing and preparation been investigated.

All studies reviewed above, save that of Ruble and Brooks-Gunn (1982), are limited methodologically in that they are retrospective. While memories of age at menarche *per se* have been demonstrated to be quite accurate (Bean *et al.*, 1979; Damon and Bajema, 1974), memories for subjective states such as sense of preparation and emotional response to menarche may be distorted by subsequent menstrual experiences, as well as other intervening life events (Pillemer *et al.*, 1987). It would be preferable, then, in seeking to clarify how timing and cognitive status affect menarcheal experience, to conduct a prospective study, where objective and subjective timing, preparation, and ego development of early adolescent girls are assessed shortly before menarche, and where girls' emotional response to their first menstruation is recorded shortly thereafter.

Accordingly, data are reported from a set of girls in Grades 6–9, who were studied at two points in time, in the fall of a school year, when they were premenarcheal, and in the spring of the same year, when they were postmenarcheal. The goals of this report are (1) to assess the significance of objective timing, subjective timing, menstrual preparation, and ego development as predictors of emotional response to first menstruation; (2) to replicate earlier findings of the greater importance of subjective timing over objective timing (Rierdan and Koff, 1985) and preparation over objective timing (Koff *et al.*, 1982) for initial menstrual experience; and (3) to evaluate hypotheses (Rierdan and Koff, 1985; Brooks-Gunn *et al.*, 1985) that cognitive variables may mediate the impact of timing on menarcheal experience.

METHOD

Subjects

Subjects were 92 girls, in Grades 6–9, who reached menarche during a 6-month period between two test occasions in the fall and spring of a school year. These girls included all who reached menarche during the course of a short-term longitudinal study; they comprised a subset of a larger sample of nearly 600 white, middle-class girls in Grades 6–9 who have been described more fully in Rierdan *et al.* (1987, 1988). In this larger sample, the percentage

of girls reaching menarche by the spring of their respective grade in school was 19% (Grade 6), 48% (Grade 7), 77% (Grade 8), and 95% (Grade 9).

Measures and Procedure

Girls filled out extensive questionnaires that included measures pertinent to biological, personality, and social development. Questionnaires were group-administered over a total of four days, two in the fall and spring. If girls were absent from test periods on any one of the four days, they were lost to analyses, since the data reported here derived from measures administered on all four days.

Measures analyzed for this report were as follows:

Objective Timing

Grade at menarche was adopted as a measure of objective timing. Initial plans had been to include age, as well as grade, as an index of timing, as suggested by Brooks-Gunn *et al.* (1985), but since the correlation between the two measures was +.92, age was seen to provide little additional information beyond that provided by grade alone.

Subjective Timing

Premenarcheal girls were asked to estimate the number of their grademates who had already reached menarche, a question similar to that posed by Rierdan and Koff (1985). They were provided a 5-point scale with end points of *almost all* and *almost none*. It was assumed that girls who reported that almost none of the girls in their grade had reached menarche before them subjectively experienced themselves as very early maturers, that girls who reported that almost all of their grade-mates had reached menarche before them subjectively experienced themselves as very late maturers, and that girls who reported that 25%, 50%, or 75% of their grade mates had reached menarche before them experienced themselves as somewhat early, average, or late maturers, respectively.

Preparation

Girls were asked to indicate, on a 7-point scale, ranging from 1 (*completely unprepared*) to 7 (*completely prepared*), how adequately prepared they believed they were for menarche, in terms of what they knew about menstruation.

Ego Development

Girls completed the Washington University Sentence Completion Test (SCT; Loevinger and Wessler, 1970), a projective measure that instructs the subject to complete 36 sentence stems. For every subject, each sentence completion was scored for level of ego development (Loevinger *et al.*, 1970), then a total protocol rating (tpr) was derived (Loevinger and Wessler, 1970, p. 129). Protocols were scored separately by two coders, both blind to the hypotheses under investigation. One scored all protocols; the other scored a random subset of 40. For this subset, the Spearman correlation coefficient for the tpr scores of the two coders was +.82.

The model of ego development underlying the SCT is of the ego as a sense-making framework that provides the individual with an orientation to the self and the world. There is considerable evidence for the construct and discriminant validity of the SCT (Hauser, 1976; Loevinger, 1979), as well as evidence that the measure is sensitive to individual differences and developmental changes (e.g., Rierdan *et al.*, 1987a). The model posits a hierarchical sequence of stages, with the I-2 (Impulsive) to I-4 (Conscientious) range characterizing this group of subjects.

Experience

On the second test occasion, which was no more than 6 months after menarche, postmenarcheal girls were asked to describe their emotional response to menarche. They indicated on a 7-point scale, the poles of which were *completely positive, happy, and pleased* and *completely negative, unhappy, and upset,* how they felt when they got their first period.

Data Analysis Plan

Since the first goal of this report was to assess the significance of objective timing, subjective timing, preparation for menstruation, and ego development as independent predictors of experience of menarche, a series of regression analyses was planned in which the predictor was one of the variables enumerated above and the outcome was experience of menarche. For the timing variables, linear and quadratic components are distinguished, given hypotheses that timing may be related in a linear and/or curvilinear way to menarcheal experience (Tobin-Richards *et al.*, 1983). For the ego development variable, both level and timing of ego development (i.e., interaction of level of ego development and grade) are included in the regression equation, since there is some evidence that it is not simply level of ego devel-

opment, but also status as relatively advanced, on time, or delayed, that is related to emotional dimensions of adolescents' lives (Hauser, 1976; Rierdan *et al.*, 1987b).

Since the second goal was to replicate earlier findings (Koff *et al.*, 1980; Rierdan and Koff, 1985), two stepwise regression equations were planned, in one of which the relative importance of objective vs. subjective timing was determined, and in the other of which objective timing vs. preparation were compared as predictors of menarcheal experience. Finally, a hierarchical regression equation was planned in order to determine whether cognitive variables mediate the impact of timing on menarcheal experience.

RESULTS

Descriptive Statistics

The numbers of girls in Grades 6–9, and their mean ages, were as follows: Grade 6 (n = 18, 12.20 years), Grade 7 (n = 26, 12.94 years), Grade 8 (n = 27, 13.82 years), Grade 9 (n = 21, 14.90 years). There was a significant correlation between objective timing and subjective timing (r = .61); however, as found previously (Rierdan and Koff, 1985), there was a considerable proportion of girls (20%) who erred in their subjective timing, including 40% of the 6th graders who thought almost no peers had reached menarche (actually, 19% had) and 14% of the 8th and 9th graders who thought only 25% of their peers had reached menarche (when 77% of 8th graders and 95% of 9th graders had).

In terms of preparation, scores ranged from completely unprepared (1) to completely prepared (7), with a mean of 4.43 (SD = 1.70). The mean level of ego functioning of girls corresponded to the delta/3 stage, which is the transition from the self-protective to the conformist stage. Menarcheal experience ranged from *completely positive*...to *completely negative*..., with a mean of 4.15 (SD = 1.67) on this 7-point scale.

Predictors of Menarcheal Experience

The hierarchical regression equation for objective timing was not significant; thus, there was no evidence for either a linear or curvilinear relationship between objective timing, considered alone, and menarcheal experience. In contrast, the equation for subjective timing was significant. The first variable entered—the linear component of subjective timing—emerged as significant, as did the second variable entered—the quadratic component of

Table I. Experience of Menarche as a Function of Subjective Timing

Beliefs about timing	Mean experience scores[a]
Very early	6.00
Early	4.17
Average	3.81
Late	3.84
Very late	4.16

[a]Scores ranged from 1 (*positive*) to 7 (*negative*).

subjective timing. Examination of the mean experience scores for girls whose sense about their menarcheal timing ranged from a belief that almost all their grade mates had reached menarche to a belief that almost no grade mates had reached menarche before them (see Table I) indicated that it was girls who experienced themselves as very early who had a particularly negative response.

Analyses of the impact of cognitive variables on the experience of menarche indicated that there was a significant relationship between preparation and experience. This linear relationship revealed that less well-prepared girls reported more negative experiences than better prepared girls. In contrast, there was no significant relationship between level or timing (interaction of objective timing and level) of ego development and menarcheal experience. A summary of these results appears in Table II.

Replication Analyses

Consideration of the above set of findings suggested that subjective timing was a more powerful predictor of menarcheal experience than objective timing and also that preparation for menstruation was a better predictor of menarcheal experience than objective timing. These conclusions based on observation of separate regression equations were confirmed in the following stepwise equations, which are summarized in Table II. When objective timing and subjective timing (linear and quadratic components of each) were entered as predictors, with menarcheal experience as the outcome variable, the equation was significant. In this equation, the only variable that was significant was the quadratic component of subjective timing. Thus, the experience of menarche was related in a curvilinear fashion to subjective timing (as described in Table I) but not to objective timing. Analogously, when objective timing and preparation were entered as predictors, the equa-

Table II. Summary of Significant Findings

		R^2	B	t
I. Predictors of menarcheal experience				
Equation 1		.07		
Objective timing	(L)[a]			
Objective timing	(Q)[b]			
Equation 2		.12[e]		
Subjective timing	(L)[a]	.05	.36	2.09[d]
Subjective timing	(Q)[b]	.07[c]	.33	2.38[d]
Equation 3		.06[d]		
Preparation		.06	−.24	−2.14[d]
Equation 4		.09		
Ego (level)				
Objective timing				
Ego (timing)				
II. Replication analyses				
Equation I		.12[e]		
Subjective timing	(Q)[b]	.08	.33	2.37[d]
Subjective timing	(L)[a]			
Objective timing	(L)[a]			
Objective timing	(Q)[b]			
Equation 2		.10[e]		
Preparation		.06	−.23	−2.05[d]
Objective timing	(L)[a]			
Objective timing	(Q)[b]			
III. Timing/cognition compared				
Equation		.17[e]		
Preparation		.05	−.23	2.01[d]
Subjective timing	(L)[a]	.06[c]	.37	2.18[d]
Subjective timing	(Q)[b]	.06[c]	.31	2.18[d]

[a](L) = linear component.
[b](Q) = quadratic component.
[c]Increment to R^2.
[d]$p < .05$.
[e]$p < .01$.

tion was significant. On the first step, preparation emerged as a significant predictor; neither the linear nor quadratic component of objective timing was significant. The results from this prospective study thus replicate earlier findings (Koff *et al.*, 1980; Rierdan and Koff, 1985) based on retrospective data that indicated the greater importance of subjective timing and preparation relative to objective timing for menarcheal experience.

Timing and Cognitive Variables Compared

A final analysis, also summarized in Table II, sought to evaluate the general hypothesis that cognitive variables mediate the impact of timing on

menarcheal experience. Since one of the timing variables—objective timing—and one of the cognitive variables—level of ego development—did not prove to be significant predictors of menarcheal experience when evaluated separately, these variables were not included in this analysis. Instead, in a hierarchical regression equation, preparation, and then subjective timing (linear, then quadratic components), were entered as predictors of menarcheal experience. The equation was significant. Not only was preparation a significant predictor of menarcheal experience at the first step, but the linear and quadratic components of subjective timing were significant at the second and third steps, respectively. Thus, the timing variable—subjective timing—was a predictor of menarcheal experience even when the cognitive variable of preparation was controlled.

DISCUSSION

These findings extend our understanding of the determinants of menarcheal experience in two ways. First, the important of subjective timing of menarche and preparation for menstruation is validated. Second, since these two factors together explain only a portion of the variance in emotional response to menarche, it becomes clear that other variables must combine additively or interactively with subjective timing and preparation to determine girls' experience of the complex biopsychosocial event of menarche.

A major goal of this study was to replicate earlier findings (Koff *et al.*, 1982; Rierdan and Koff, 1985) based on retrospective data. In keeping with this aim, it was found again that subjective timing of menarche was a better predictor of initial menstrual experience than objective timing.

The measure of subjective timing in this study entailed girls reporting their sense of social norms regarding the onset of menstruation (cf. Neugarten, 1970) by indicating how many of their grade-mates had reached menarche at the time that they themselves were about to start to menstruate. As found in previous research, girls' judgments about social norms are not necessarily accurate (Rierdan and Koff, 1985). It is interesting to consider how girls reach inaccurate conclusions regarding how many of their peers have reached menarche. For young girls, since many early maturers initially deny their menarche (Petersen, 1983), their peers may infer that fewer girls in the 6th grade have reached menarche than is the case. For all girls, the secrecy that typically follows menarche even among "ontime" girls (Whisnant *et al.*, 1975) may lead to some confusion about the numbers of girls who have begun to menstruate. Finally, it seems possible that an inaccurate sense of subjective timing may reflect misinformation about norms regarding the timing of menarche, i.e., may be an expression of inadequate preparation for menstruation.

In this study, objective timing was not simply a less powerful predictor of emotional response to menarche than subjective timing; the results were that neither the linear nor quadratic component of objective timing predicted menarcheal experience to a significant degree. It seem that the relationship between objective timing and menarcheal experience, while consistently characterized by early matures reporting less positive menarches than later maturers (Golub and Catalano, 1983; Koff *et al.*, 1982; Pillemer *et al.*, 1987; Ruble and Brooks-Gunn, 1982) is nevertheless modest in strength, such that its detection is affected by the age range of subjects, sample size, and analytic test. Objective timing may not have reached a conventional level of significance in this sample because onset of menarche ranged only from 6th–9th grades, thus excluding very early maturers who would be expected to have the most negative menarcheal experience (Ritvo, 1977).

In addition to replicating findings about subjective timing, this study also confirmed the finding (Koff *et al.*, 1982) that perceived adequacy for menstruation is a better predictor of menarcheal experience than objective timing. As expected, girls who perceived themselves to be well prepared reported a more positive menarche than girls who perceived themselves to be less well prepared. It should be noted that subjective judgments of preparedness are not isomorphic with objective assessment of adequacy of preparation for menstruation (Whisnant *et al.*, 1975); this may be one of the reasons why even those girls who declare themselves to be "completely prepared" before menarche sometimes report less than positive menarcheal experiences.

In seeking to understand the mechanism(s) by which subjective timing and preparation affect the experience of menarche, two models were considered. A first approach was to consider whether subjective timing was itself an expression of preparation. As suggested above, it seemed that inaccuracies in subject timing judgments might reflect misinformation and/or ignorance about norms regarding age at menarche. If this were so, a regression equation including both subjective timing and preparation as predictors of emotional response to menarche would be expected to be significant, with preparation emerging as the first and only significant predictor. The finding that subjective timing remained a significant predictor of menarcheal experience after controlling for the effect of preparation is counter to this hypothesis. Further assessment of this hypothesis with additional, more objective measures of preparation (Koff *et al.*, 1982), though, is indicated before this model can be regarded as fully tested.

A second model explored in this research was the hypothesis that the impact of both subjective timing and preparation is mediated by the broad developmental variable of ego functioning. Livson and Peskin (1980) and others (e.g., Brooks-Gunn *et al.*, 1985) have proposed that level of ego functioning mediates adolescents' responses to puberty, with more develop-

mentally advanced adolescents experiencing pubertal change as more benign and less disruptive. Extending this hypothesis to the present study, it seemed reasonable to expect that by dint of having reached a higher level of ego development before puberty, more developmentally advanced girls would be more accurate in their sense of subjective timing and feel better prepared, and thus evidence a more positive response to menarche than their less advanced peers. Expressed in the language of regression analyses, it would be expected that level of ego development would be a significant predictor of emotional response to menarche, and when considered with subjective timing and preparation in a hierarchical regression equation, would be expected to emerge as the first and strongest predictor. Surprisingly, neither level nor timing of ego functioning was significantly related to menarcheal experience; ego development, therefore, did not suffice to explain the impact of the more particular variables of subjective timing or preparation.

In seeking to understand why measures of ego functioning administered shortly before menarche failed to predict initial menstrual experience, theoretical and empirical studies of ego functioning in girls' development were considered. Kestenberg (1967), in particular, has predicted a regression in ego functioning prior to menarche, followed by reintegration and then further progress. Rierdan *et al.* (1987a) tested this hypothesis in a cross-sectional design, and found that girls who were within 6 months of their menarche had lower levels of ego functioning than their age-mates who were either more or *less* advanced in their pubertal development. Kestenberg's theory, together with the findings of Rierdan *et al.* (1987a), thus suggested that assessment of level of ego development just prior to menarche may yield an inappropriate base for testing hypotheses about the relationship between ego functioning and other psychological events, particularly given the theoretical assumption that regression implies a lower level as well as instability of ego functioning. It may be that level of ego development a year before menarche would be more predictive of the experience of menarche than ego stage just prior to menarche—an hypothesis that needs to be assessed before one can reject the model of ego development as a mediator of the impact of subjective timing and preparation on menarcheal experience.[6]

[6]To assess the possibility that relationships between ego functioning and other psychological variables are unstable if assessed just prior to menarche, reanalyses were undertaken of the relationship between ego functioning and depression in a large group of adolescent girls, previously reported by Rierdan *et al.* (1987b). Three groups of girls were discriminated on the basis of their level of pubertal development, which was ascertained at two points in time (T1 and T2): more than six months before menarche at T1, less than six months before menarche at T1 (the group of girls whose data were reported in this paper), and postmenarcheal. While significant correlations between ego functioning and depression were found at T1 for the three groups combined, as previously reported, and for the first and third groups, considered separately, the correlation for the second group was not significant. Thus, associations between ego functioning and psychological variables that are significant earlier and later in pubertal development may not be evident just prior to menarche.

This research has focused on the impact of timing and cognitive variables on the experience of menarche. The results have validated and elaborated earlier findings in the empirical literature on menarcheal experience, as subjective timing and preparation were both found to predict the experience of menarche. The results have clarified, too, that more research employing a prospective design in needed, in order to understand fully the range of responses girls have to menarche, and the mechanisms by which biological, psychological, and social variables affect menarcheal experience. Other categories of variables to consider in further research are attitudinal and familial-cultural factors that together with subjective timing and preparation, may more completely explain girls' emotional response to menarche, and thus inform the work of health educators and practitioners as well as developmental psychologists and psychobiologists.

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