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Review article

Transitions in Body and Behavior: A Meta-Analytic Study on the Relationship Between Pubertal Development and Adolescent Sexual Behavior

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A B S T R A C T

The present meta-analysis studies the relations of pubertal timing and status with sexual behavior and sexual risk behavior among youth aged 10.5–22.4 years. We included biological sex, age, and ethnicity as potential moderators. Four databases were searched for studies (published between 1980 and 2012) on the relation between pubertal timing or status and sexual behavior. The outcomes were (1) sexual intercourse; (2) combined sexual behavior; and (3) risky sexual behavior. Earlier pubertal timing or more advanced pubertal status was related to earlier and more sexual behavior, and earlier pubertal timing was related to more risky sexual behavior. Further, the links between (1) pubertal status and combined sexual behavior and (2) pubertal timing and sexual intercourse status, combined sexual behavior, and risky sexual behavior were stronger for girls than boys. Most links between pubertal status, timing, and sexual behavior and sexual risk behavior were stronger for younger adolescents. Moderation by ethnicity did not yield consistent results. There was significant variation in results among studies that was not fully explained by differences in biological sex, age, and ethnicity. Future research is needed to identify moderators that explain the variation in effects and to design sexual health interventions for young adolescents.

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IMPLICATIONS AND CONTRIBUTION

Research comparing the effects of pubertal status and timing across different sexual outcomes is lacking. This meta-analysis gives a systematic overview of research examining these links. Early developing adolescents engage in earlier and more (risky) sexual behavior—these effects were stronger for girls.

Recent perspectives on adolescent development view sexual development as a normative task of this life phase [1]. However, the early initiation of sexual behavior has also been linked with increased risk for unwanted pregnancies, sexually transmitted infections (STIs), and depression [2,3]. Given the obvious link between pubertal development and sexual reproduction capacity, the onset of puberty has been associated with the initiation of sexual desires and behavior. It is less clear to what degree pubertal development is related to sexual activity and whether early pubertal development is particularly problematic for the development of risky sexual behavior.

Although qualitative reviews and a large body of quantitative work have shown support for the relationship between pubertal timing and sexual development, no meta-analytic review exists that quantifies the magnitude of this relationship or that explains variation in results across studies. Moreover, although most studies

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focus on whether (vaginal) sexual intercourse has occurred, sexual development consists of a broad range of physical behaviors besides intercourse including activities such as kissing, petting, and oral sex. The primary objective of the present meta-analysis is to examine and quantify the association between pubertal status and timing with nonrisky and risky coital and noncoital sexual behaviors.

Not only do studies vary in terms of the sexual behaviors examined, but there is also substantial variation in how pubertal status and timing are assessed. Pubertal status is most often measured using (1) Tanner scale ratings made by a trained professional of adolescent pubic hair development (males and females), and breast development (females), or penis and testicular development (males); (2) adolescent self-report of these characteristics using photographs or line drawings; or (3) questionnaire measures of pubertal characteristics (growth spurt, acne, pubic hair, menarche, and voice change). Pubertal timing is often assessed using (1) adolescent self-report of age at growth spurt, age at the first ejaculation, or voice change (males), or age at menarche (females); (2) age-adjusted measures of pubertal status (stage-normative); or (3) adolescent self-perceptions of whether their pubertal development is early, on time, or late (peer-normative). There is a moderate consistency across these different methods, however, the degree to which the adolescents rate themselves as more or less developed than their peers might not just reflect their physical development but might also reflect the degree to which they feel psychologically or behaviorally more mature [4–6]. Therefore, the second objective is to compare whether the magnitude of the association between pubertal development and sexual behavior and risky sexual behaviors depends on how pubertal development was assessed.

Drawing from a developmental systems approach which acknowledges that development in one domain (such as sexual development) does not occur independent from other domains (such as the social domain), we also examine whether the relation between pubertal and sexual development is also associated with individual differences in age, sex, or ethnic background. Previous research has shown that boys and girls show different patterns of pubertal development [7] and these differences are also suggested to relate to differences in social status and well-being [2,3,8–10]. Therefore, in the present meta-analysis, we examine whether the effects of pubertal status and timing on sexual behavior and sexual risk behavior are different for boys and girls. Further, as adolescents move from a parent- to a peer-focused context during adolescence [11], they are faced with more opportunities to engage in intimate and sexual behavior. Therefore, we also examine whether the effects of puberty on adolescents' sexual development vary depending on the adolescents' age. The link between pubertal development and sexual behavior might be stronger at younger ages, particularly in risky sexual behavior, because younger adolescents may not have the social and cognitive skills to engage in safer sexual behavior. However, stronger effects might also be found in older adolescents because they are less restricted by parents. Finally, research has shown several inconsistent racial and ethnic differences in pubertal [7,12] and sexual development [13,14]. Therefore, we examine whether these links are moderated by the ethnic background of adolescents.

The present study

The primary objective of the present meta-analysis is to examine and quantify the association between pubertal status and timing with sexual behavior and risky sexual behavior. With this meta-analysis, we answer the following questions: Within the research literature published between 1980 and 2012, are pubertal timing and status related to sexual behavior and sexual risk behavior? If related, is this relation moderated by the way pubertal development is assessed (pubertal status or pubertal timing and stage-normative or peer-normative), or the age when pubertal development was assessed, sex, and ethnicity?

Although, initially our intention was to study differential effects of pubertal development on a range of sexual behaviors, most studies have examined either only sexual intercourse or have lumped together several sexual behaviors. Therefore, we have made the distinction between three sexual behavior categories as follows: (1) sexual intercourse status (had sexual intercourse or not) and age at the first sexual intercourse; (2) combined sexual behavior (studies that include sexual intercourse *and* noncoital sexual behaviors, in their combined measure of sexual behavior); and (3) sexual risk behaviors such as a combined measure of sexual risk behavior, unwanted pregnancy, contracting STIs or human immunodeficiency virus (HIV), noncondom/contraception use, and drug/alcohol use during sex.

Methods

Sample of studies

We searched four electronic databases (Scopus, MEDLINE, Web of Science, and PsycINFO) using variations and Boolean connectors of the key terms such as pubertal development, menarche, spermarche, spermatogenesis, breast development, adrenarche, gonadarche, oogenesis, adolescents, and sexual behavior. To supplement these searches, we searched reference lists of reviewed studies and contacted key authors in the field. To be included in the meta-analysis, studies had to be: (1) published in a peer-reviewed, English language journal; (2) empirically examined and reported the relation between pubertal development and adolescents' (risky) sexual behaviors; (3) published between January 1980 and December 2012; and (4) must include adolescents with a mean age ≤24 years.

Information extracted from each study included: (1) age, sex, and/or ethnicity of sample; (2) pubertal development measure(s); (3) sexual behavior measure(s); and (4) effect size(s). Thirty percent of the studies were independently coded by two coders (including the first author, L.B.). Intrarater reliability was good (correlations, .68–.99). Any inconsistencies in the coding were checked by another independent coder and reconciled. Data were entered into SPSS 20.0 (SPSS Inc., Chicago, IL) and analyzed with the SPSS macro [15].

First, effect sizes were calculated or recoded using the Pearson product-moment correlation (r) such that higher r values indicated a stronger relation between pubertal status, or timing, and (risky) sexual behavior. If a study reported results on group differences (t, F, or odds/risk ratio), their results were converted to r [15]. Second, all r values were converted to the Fisher z (zr). Third, for each effect size, we calculated a relative weight for zr, taking into account the sample size. To yield an interpretable overall effect size, the weighted mean effect size was then converted back to r (ESr).

Pubertal development

Pubertal status. Several studies included self-report occurrences of physical pubertal events (e.g., the first spontaneous nocturnal emission, menarche, Tanner drawings [16,17], Pubertal Development Scale (PDS) [18], Index of Adolescent Development, or