**Title**: Pubertal maturation in neurodevelopmental disability populations: A systematic review and theoretical integration

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**Introduction**: Puberty is a critical period of neurobiological reorganization that drives physical and behavioral maturation, with profound implications for psychosocial outcomes such as internalizing and externalizing behaviors [1,2]. While significant research has documented pubertal processes in neurotypical (NT) youth, little is known about how the process of puberty unfolds may be different for youth with neurodevelopmental disabilities (NDs). This systematic review addresses this gap by exploring how pubertal theories and processes apply to ND populations, with a particular focus on understanding similarities and divergences in pubertal experiences compared to NT youth. The aim is to inform interventions that promote positive psychosocial outcomes across adolescence.

**Method**: This systematic review followed PRISMA guidelines and included studies on puberty in pediatric ND populations. The search was conducted across five databases—Web of Science, Scopus, PubMed, PsycInfo, and Childhood Development and Adolescent Studies—yielding 2,767 results. After the removal of duplicates and ineligible studies, 1,291 titles and abstracts were screened. Studies included at least one measure of puberty (e.g., Tanner Stages, Pubertal Development Scale, age at menarche) and focused on one or more of 32 identified NDs (e.g., Autism Spectrum Disorder, ADHD, Down Syndrome). Ultimately, 172 studies met the inclusion criteria and were included in the review.

**Results**: Findings reveal that pubertal research in ND populations is sparse and often limited to cross-sectional or retrospective studies. For autism, research indicates mixed findings on pubertal timing, with some studies suggesting earlier onset, particularly in youth with higher BMI, while others found typical pubertal timing. ADHD studies reported no significant differences in pubertal status compared to NT youth, though some studies noted variation in growth patterns. Schizophrenia research suggested potential interactions between pubertal timing and condition onset, with a proposed neuroprotective role of estrogen in delaying symptom onset in females. Few studies addressed pubertal development in intellectual disabilities or Down Syndrome, though these populations showed variations in the process of timing and growth, with gonadal dysfunction and growth delays common in Down Syndrome.

**Discussion:** This review highlights critical gaps in understanding the intersection of puberty and NDs.  The reliance on subjective measures, lack of longitudinal studies, and inconsistent findings across ND populations point to a need for more robust and comprehensive research. Specifically, we call for greater inclusion of ND youth in pubertal research and the application of objective, developmental, and biological measures to capture the complexities of pubertal processes. Future research should prioritize longitudinal designs to map the trajectory of pubertal development and its psychosocial consequences in ND populations. Even for ND youth where the pubertal process might be similar to NT youth, the implications of maturation can be unique and thus supporting all youth through this transition must be considered in transition supports. Understanding these processes is vital for tailoring interventions and structuring environments that promote resilience and positive outcomes during this pivotal stage of life.

**References:**

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