

Don't blame adolescent social behavior on hormones

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Reproductive hormones that develop during puberty are not responsible for changes in social behavior that occur during adolescence, according to the results of a newly published study by a University at Buffalo

researcher.

"Changes in [social behavior](#) during adolescence appear to be independent of pubertal hormones. They are not triggered by [puberty](#), so we can't blame the hormones," says Matthew Paul, an assistant professor in UB's Department of Psychology and lead author of the groundbreaking paper recently published in the journal *Current Biology*.

Disentangling the adolescent changes that are triggered by puberty from those unrelated to puberty is difficult because puberty and adolescence occur simultaneously, but Paul and his collaborators have found a way to tease out the two using a seasonal-breeding animal model.

"Puberty and adolescence are happening at the same time. So if you want to know if one causes the other, one of the elements must be moved. We have no way of doing that in a human, but we have found a way to do it using Siberian [hamsters](#)," says Paul.

His new model, explained in the study with co-authors Clemens Probst, a scientist at Massachusetts General Hospital, Geert de Vries, a professor at Georgia State University, and Lauren Brown, a UB graduate student, provides a basic understanding that did not previously exist for what drives adolescent social development.

Adolescence is a critical period of development for individuals, notes Paul.

Complex thinking develops; many [mental health disorders](#) arise; and it is associated with the beginning of high-risk behaviors, like drug use. For social behavior, it is a time when the focus of children's social relationships shifts from the family to peers. In other words, they stop wanting to hang out with mom and dad. It has been widely assumed that these changes can be attributed to increases in gonadal hormones at

puberty.

"What we've done here is find a new way to ask the question of how puberty plays a role in adolescent development - a new way to determine which developmental changes pubertal hormones trigger and which changes they do not."

In conversation, we might hear puberty and adolescence used interchangeably, yet biologically, they are two distinct processes.

Puberty is the process by which individuals develop the ability to reproduce. It is triggered by the activation of the reproductive axis, which is responsible for the development of reproductive capability, the appearance of secondary sexual characteristics, and the increase in gonadal hormones.

Adolescence is broader. It encompasses puberty, but also includes cognitive, social, and emotional changes that occur during the teenage years.

Because puberty and adolescence occur concurrently, answering the fundamental question of whether puberty causes non-reproductive adolescent behavioral changes or merely coincides with them has confounded researchers - until now.

Using a seasonal breeding species, like Siberian hamsters, Paul is able to control the timing of puberty.

Siberian hamsters born at the beginning of the breeding season (when days are long) go through puberty quickly in order to breed that year. Those born late in the breeding season (when days are shorter) experience a delay in puberty so as not to give birth in the middle of winter.

Controlling the amount of light a hamster receives in the lab delays arrival of puberty, which comes around 30 days of age for "long-day" hamsters and around 100 days of age or later for "short-day" hamsters.

With two groups going through puberty at different times, Paul can now observe behavioral changes in each group to determine whether these changes are always locked to puberty. In this study, they looked at the transition from play-fighting to social dominance, which is an important step for these young animals to be able to leave home and find their own territory (also called dispersal).

"Play is an important behavior in many species, especially mammals," says Paul. "It's evolutionarily conserved, meaning it hasn't been lost from a common ancestor as species broke off from each other in the evolutionary tree. Because play is expressed in so many species, it's likely to be serving an important function, including in humans. It also suggests that what we learn from our hamsters will likely be true for many other species."

If pubertal hormones were responsible for the shift from play to dominance, this transition would occur early for long-day hamsters and late for short-day hamsters; always co-occurring with puberty. But Paul found that the transition occurred at the same time for both groups, regardless of when they went through puberty. For the short-day hamsters, the transition was completed before puberty had even begun.

"This is a surprising finding, because we tend to think that pubertal hormones are responsible for the changes we see during adolescence. But our research suggests otherwise." says Paul. "These findings are also important for adolescent mental health - understanding the underlying mechanisms responsible for adolescent development will provide insight into why so many mental health disorders arise during this time in life."

More information: Matthew J. Paul et al, Dissociation of Puberty and Adolescent Social Development in a Seasonally Breeding Species, *Current Biology* (2018). [DOI: 10.1016/j.cub.2018.02.030](https://doi.org/10.1016/j.cub.2018.02.030)

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