

# Secondary Trait

Authored by  
**mohammad looti**

October 6, 2025

## RECOMMENDED CITATION

mohammad looti (2025). *Secondary Trait*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=34918>

## Secondary Trait

**Primary Disciplinary Field(s):** Human Physiology, Endocrinology, Developmental Biology

### 1. Core Definition: Secondary Sexual Characteristics

The term "Secondary Trait," in the context of human development and physiology, is synonymous with **Secondary Sexual Characteristics (SSCs)**. These are the physical and behavioral attributes that distinguish the sexes but are not directly involved in the reproductive process itself. Unlike primary sexual characteristics--the gonads and internal and external genitalia--which are present from birth and determine biological sex, SSCs develop later in life, primarily during **adolescence** as a result of the hormonal shifts associated with **puberty**. They serve crucial roles in mate attraction, social signaling, and competition within the species.

The emergence of these traits is a critical hallmark of transitioning from childhood to reproductive maturity. These traits are typically dimorphic, meaning they manifest distinctly between males and females, though the degree of expression can vary significantly among individuals due to genetic, nutritional, and environmental factors. The physiological mechanisms governing their appearance are intricate, involving the pulsatile release of **gonadotropin-releasing hormone (GnRH)** from the hypothalamus, which subsequently stimulates the pituitary gland to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). This cascade ultimately drives the gonads (testes or ovaries) to produce the sex steroids responsible for characteristic development.

Examples of SSCs are numerous and encompass a broad range of biological changes. In general, male traits often emphasize strength, size, and potential for competition, such as the development of heavy facial and body hair and increased musculature. Conversely, female traits typically focus on signaling fertility and reproductive capacity, exemplified by the growth of breasts, the widening of hips (to facilitate childbirth), and specific patterns of subcutaneous fat deposition. These visible changes often lead to profound psychological and social adjustments, marking the individual's entry into the adult social structure.

### 2. Biological Basis and Endocrine Control

The induction of secondary traits is governed by a tightly regulated **endocrine system**, primarily centered around the Hypothalamic-Pituitary-Gonadal (HPG) axis. Before puberty, this axis is relatively quiescent. The onset of puberty is physiologically characterized by the activation of this axis, often referred to as gonadarche, which releases a powerful surge of sex hormones. In males, the testes increase the production of **testosterone**, an androgen, which is the primary driver of masculinizing secondary traits. In females, the ovaries increase the production of **estrogens**, particularly estradiol, which drives feminizing secondary traits.

This hormonal surge affects various receptor sites throughout the body. For instance, androgens target hair follicles, leading to terminal hair growth in specific areas (beard, chest, pubic region). They also stimulate the growth plates, increase the density of bone, and dramatically enhance protein synthesis in muscle tissue, resulting in the characteristic male physique. Estrogens, conversely, influence mammary gland development, modify skeletal architecture--specifically promoting an increased pelvic inlet and outlet size--and dictate the typical female pattern of fat storage around the hips, thighs, and buttocks, known as gynoid fat distribution.

The timing and pace of these changes are dictated by genetic factors but can be modulated by external influences, such as nutrition and overall health. The sequence of development generally follows standardized stages, such as the Tanner scale, which provides a clinical measure for tracking the progression of puberty based on the development of pubic hair, breast tissue (in females), and external genitalia (in males). The predictable sequence ensures the coordinated development of all necessary secondary traits, preparing the body gradually for reproductive function and adult social roles.

In addition to the sex steroids, other hormones play supportive, though less defining, roles. **Growth hormone (GH)** and insulin-like growth factor 1 (IGF-1) contribute significantly to the adolescent growth spurt, which is intensified and differentially patterned by the presence of sex hormones. Furthermore, hormones produced by the adrenal glands during adrenarche (early pubertal maturation) contribute to the development of pubic and axillary hair in both sexes, independent of gonadal maturation. The interplay of these endocrine messengers ensures the complex, multi-system changes characteristic of the transition into sexual maturity.

### 3. Key Male Secondary Sexual Characteristics

The development of male secondary traits is primarily mediated by increasing levels of circulating **testosterone** and its potent derivative, dihydrotestosterone (DHT). One of the most noticeable traits is the development of **terminal hair**, transforming fine vellus hair into thick, coarse hair, particularly on the face (beard growth), chest, abdomen, and limbs. This hirsutism is a powerful visual marker of male maturity and is highly sensitive to androgen levels, often continuing to increase in density and coverage well into the twenties and thirties.

Skeletal and muscular changes represent another core set of male secondary traits. Testosterone stimulates hypertrophy of muscle fibers, leading to a significant increase in **muscle mass** and overall strength relative to body size. This is often accompanied by changes in skeletal structure, including the broadening of the shoulders and chest (android skeletal pattern), resulting in the characteristic V-shaped torso. These physical attributes are interpreted anthropologically and biologically as adaptations for hunting, physical labor, and intra-sexual competition for mates.

Vocal changes are also prominent. Androgens cause the larynx (voice box) to grow and the vocal

cords to lengthen and thicken. This results in the characteristic **deepening of the voice**, a change known as the breaking of the voice. The resulting lower fundamental frequency serves as an auditory signal of sexual maturity. Other subtle, yet significant, changes include changes in skin texture, increased sebaceous gland activity (often leading to acne), and the male pattern of fat distribution, which tends to be deposited around the abdomen rather than the hips.

The source material specifically mentions increased **aggression** as a mental trait accompanying puberty. While complex and influenced heavily by environmental and social factors, hormonal changes certainly play a role in behavioral shifts. High levels of testosterone are correlated with increased competitiveness, risk-taking behavior, and elevated assertiveness, traits that may have been historically advantageous for establishing dominance hierarchies and securing reproductive opportunities. These psycho-social changes are integral, though less physically tangible, components of male secondary traits.

#### 4. Key Female Secondary Sexual Characteristics

The induction of female secondary traits is predominantly driven by rising levels of **estradiol**. The most recognizable trait is **thelarche**, the development and growth of the breasts. Breast development involves the proliferation of glandular tissue, fat deposition, and the enlargement of the nipple and areola. This process is complex, often proceeding through distinct Tanner stages, and typically precedes the onset of menstruation. Biologically, breasts signal reproductive maturity and the capacity for lactation.

Another critical skeletal change is the **widening of the hips**, specifically the pelvic structure. Estrogen influences the fusion and remodeling of the pelvic bones, creating a broader, more rounded pelvis suitable for childbirth (the obstetrical dilemma). This results in the characteristic female pattern of carrying weight and influences gait. Coupled with this, estrogen promotes the gynoid pattern of fat deposition, primarily localized in the hips, thighs, and buttocks. This stored energy is theorized to serve as a metabolic reserve for pregnancy and lactation.

The appearance of pubic hair (pubarche) and axillary (underarm) hair is also classified as a secondary sexual characteristic, although this development is primarily dependent on adrenal androgens rather than ovarian estrogens. While present in both sexes, the density, texture, and pattern of pubic hair are often distinct. Furthermore, the overall body shape changes due to a slightly lower ratio of muscle mass to fat mass compared to males, contributing to the distinct feminine silhouette.

The culmination of female secondary trait development is often marked by **menarche**, the first menstrual period. While menarche signifies the onset of potential fertility, the reproductive system typically requires several years of maturation following menarche before ovulation becomes reliably cyclical. The entirety of these changes--from breast development and fat distribution to the

onset of menstruation--serve as robust signals of reproductive readiness, informing potential mates and structuring social interactions within the group.

## 5. Distinction from Primary Traits

A fundamental concept in developmental biology is the distinction between primary and **secondary sexual characteristics**. Primary traits are defined as the reproductive organs themselves--the structures essential for copulation and gamete production. These include the testes, ovaries, uterus, fallopian tubes, penis, and vagina. These traits are typically determined at conception and differentiate during fetal development under the influence of the SRY gene (or lack thereof) and subsequent hormonal exposure. They are functional components of the reproductive system.

In contrast, secondary traits are **epiphenomena** of hormonal maturation; they are features that differentiate the sexes externally but are not strictly necessary for the act of reproduction itself. For example, a man can reproduce without facial hair, and a woman can conceive without significant breast development. Their biological importance lies not in function but in **signaling**. They signal the individual's sexual maturity, hormonal status, genetic quality, and reproductive fitness to potential mates.

The timing of development is the clearest differentiator. Primary traits are largely established and defined before birth, determining whether the individual is anatomically male or female. Secondary traits are, by definition, developed post-natally, specifically during the window of physiological change known as puberty. The development of SSCs is thus an explicit biological advertisement of the transition from a non-reproductive state to a reproductively competent state, a process that takes place externally and visibly across several years of adolescence.

## 6. Evolutionary Significance and Sexual Selection

The pronounced dimorphism created by secondary traits is central to the theory of **sexual selection**, a concept pioneered by Charles Darwin. Sexual selection explains traits that may not directly enhance survival (e.g., a large, energy-demanding beard or broad hips that complicate locomotion) but provide a critical advantage in securing a mate. This evolutionary pressure operates through two primary mechanisms: inter-sexual choice and intra-sexual competition.

In the context of **inter-sexual choice** (mate attraction), secondary traits serve as reliable indicators of underlying genetic health and maturity. For example, in males, traits such as heavy musculature, deep voices, and facial symmetry, which are highly sensitive to testosterone levels, signal robust health and competence. For females, traits like clear skin, specific waist-to-hip ratios, and breast symmetry signal high estrogen levels, fertility, and the capacity to bear and nourish offspring. These signals allow individuals to quickly and efficiently assess the fitness of potential partners.

In **intra-sexual competition** (competition within the same sex for access to mates), male secondary traits are particularly important. Increased size, strength, and aggressive behavioral tendencies are traits that enhance a male's ability to dominate rivals and monopolize resources or territory. The broadening of shoulders and the deepening of the voice, for example, function as visual and auditory displays of physical formidability, often minimizing the need for actual physical confrontation. The presence of these highly visible traits helps establish social hierarchies related to breeding success.

Furthermore, secondary traits are often thought to resolve the problem of honest signaling. Because the development of robust SSCs is metabolically costly and requires significant hormonal output, only individuals with good overall health and genetic quality can afford to display them prominently. A sparse beard or delayed muscle growth might signal suboptimal health or genetic issues. Thus, these traits act as reliable, hard-to-fake advertisements of fitness, driving their continuous exaggeration through evolutionary time.

## 7. Clinical and Psychological Significance

The typical progression of secondary trait development is often used as a clinical benchmark for assessing the health and function of the endocrine system. Deviations from the expected timeline can signal underlying health issues. For instance, **precocious puberty**--the onset of secondary traits significantly earlier than the societal norm (e.g., before age eight in girls or nine in boys)--may indicate issues such as CNS tumors or excessive adrenal activity, requiring medical intervention to prevent premature closure of growth plates and ensure psychological well-being.

Conversely, **delayed puberty**, where secondary traits fail to emerge by the expected age, can be caused by conditions ranging from chronic illness and malnutrition to specific endocrine disorders like hypogonadism. In such cases, the lack of SSCs can be socially isolating and psychologically damaging. Clinical endocrinologists often administer hormone replacement therapy to induce puberty and allow the individual to develop these characteristics, thereby mitigating associated physical and psychological distress.

The psychological impact of secondary trait development cannot be overstated. Adolescence is a period characterized by intense self-awareness and social comparison. The sudden, visible transformation of the body directly influences **body image**, self-esteem, and the formation of social identity. Individuals whose trait development is atypical (either too early, too late, or exhibiting cross-sex characteristics due to congenital adrenal hyperplasia or other conditions) may experience significant anxiety, dysphoria, or social maladjustment, highlighting the profound social weight placed upon these physical markers of maturity.

The study of secondary traits is also crucial in understanding sexual differentiation disorders (DSDs). Conditions like Androgen Insensitivity Syndrome (AIS), where an individual is genetically

male (XY) but cannot respond effectively to testosterone, result in the failure to develop typical male secondary traits, often leading to a female physical appearance. The careful assessment of SSCs is therefore vital for accurate diagnosis and compassionate management of complex intersex variations.

## 8. Further Reading

[Wikipedia: Secondary Sexual Characteristic](#)

[Wikipedia: Human Physiology](#)

[Wikipedia: Endocrinology](#)

[Wikipedia: Developmental Biology](#)

[Wikipedia: Hypothalamic-pituitary-gonadal axis](#)

[Wikipedia: Charles Darwin \(Sexual Selection\)](#)

ARABPSYCHOLOGY.COM