

The growing dancer: Physiological challenges

By Siobhan Mitchell

This information sheet is Part 1 of a two-part series dedicated to the adolescent dancer. Part 2 addresses the psychological and social changes adolescence brings for young dancers.

This information sheet provides an overview of the physiological changes which happen at puberty, such as increases in height and weight and development of secondary sexual characteristics, and the implications of these changes for young dancers.

Puberty presents both opportunity and challenge for young dancers. On one hand, dancers benefit from improvements in strength, motor skills, and the activation of new motivational tendencies. On the other, sudden changes in size and shape can disrupt flexibility and co-ordination, adversely impacting dance performance and increasing risk of injury. With the onset of puberty, many dancers also become anxious and more self-conscious about their shape and appearance; placing them at greater risk for the development of affective (i.e., emotional) disorders, specifically those related to physical attributes and performance.

This information sheet examines the physical, morphological, and functional changes that accompany puberty, including the differences between boys and girls. It also discusses the implications that such changes may bring for performance and injury risk.

Puberty

- The process of physical changes through which the child is transformed into its adult state, capable of sexual reproduction
- A hormonally driven process resulting in marked changes physique, form, and function; including notable increases in height and weight, sexual dimorphism, and the appearance of secondary sex characteristics.
- Plays an important role in the activation, reorganization, and rewiring of brain structures; profoundly impacting emotions, motives and drives (Blakemore, Burnett, & Dahl, 2010; Rosenfield, 1991; Tanner, 1962).

Adolescence

- A transitional period of growth and development that occurs between childhood and adulthood.
- Whereas puberty describes only physical maturation, adolescence encompasses physical, cognitive, and socio-emotional maturity (Blakemore et al., 2010).
- Not a single event but a series of interrelated changes which occur over a long interval of time and span several domains of growth and development (Dorn, Dahl, Woodward, & Biro, 2006).

- ➔ **Adapting the focus of training during this time can help young dancers both physically and psychologically. For example, focussing on development of musicality and artistry as well as working through the relearning period on the more technical aspects will help young dancers to feel they are still progressing with their training and takes the focus away from the challenges of adjusting to a changing body which can easily become negative and frustrating.**
- ➔ **It may be especially helpful to emphasise how movements feel as opposed to how they look during this time, to reduce training load and adapt exercises for students experiencing their most rapid periods of growth.**
- ➔ **Flexibility is most responsive to training during childhood and as a dance teacher this is the ideal stage of development in which to promote this attribute. Due to an asynchrony between skeletal and soft tissue growth at adolescence, flexibility can be disrupted, during this period the focus can be shifted to maintaining flexibility rather than promoting it.**
- ➔ **These changes inevitably lead to young dancers struggling with movements which they are used to being able to perform, this can increase risk of physical injury and psychological effects such as loss of confidence, reduced motivation and increased self-consciousness.**
- ➔ **It is important that young dancers understand that these changes, such as reduced flexibility, are temporary.**

Implications for injury risk

In addition to these functional and physical changes, there are challenges and increased injury risk associated with adapting to these changes. During this 'relearning period' young dancers must relearn technique and re-programme this technique to adjust to new biomechanical challenges, such as decreased strength, power and flexibility and rapid change in limb length (Bowerman et al., 2015; Phillips, 1999). During this period of rapid growth, susceptibility to injury is increased. Factors such

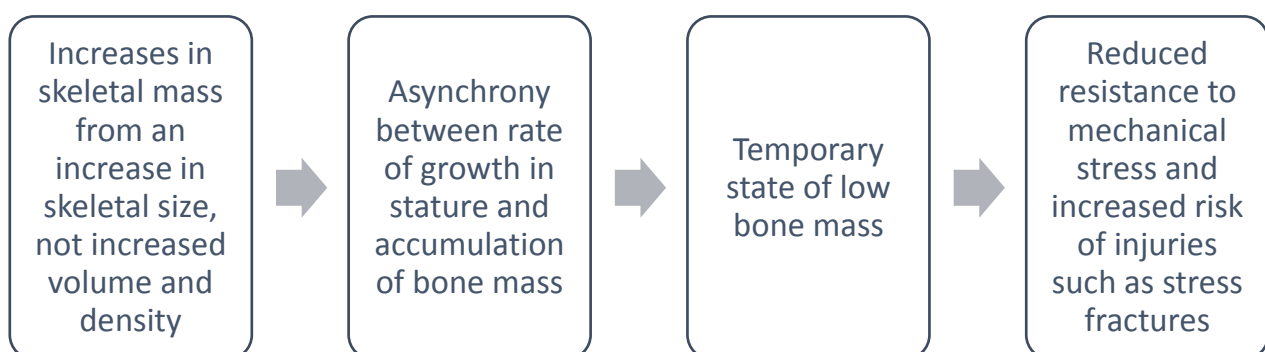


Figure 5. Skeletal growth and injury risk

as temporary low bone mass and adjustment to new biomechanical challenges can coincide with increased intensity of dance training.

Increases in the mass of the skeleton during puberty are mainly attributed to an increase in skeletal size, not to increased skeletal volume and density. The asynchrony between the rate of growth in stature and accumulation of bone mass reduces the bones' resistance to mechanical stress and therefore increases the risk of injuries such as stress fractures in high impact activities such as dance (Bonjour, Theintz, Buchs, Slosman, & Rizzoli, 1991; Bowerman et al., 2015; Fournier, Rizzoli, Slosman, Theintz, & Bonjour, 1997; Theintz et al., 1992). This is most severe at the point of most rapid growth, around age 11 - 12 for females, 13 - 14 for males, and can continue for 3 to 4 years. This coincides with increases in the intensity of dance training, leaving young dancers at high risk of overuse injuries (Bowerman et al., 2015; Fournier et al., 1997).

Young dancers' growth rates are also associated with injury risk (Bowerman, Whatman, Harris, Bradshaw, & Karin, 2014). Differences in foot length growth have been found to be associated with small to moderate increases in risk of lower extremity overuse injuries in elite adolescent ballet dancers. While the sample size in this study was small (N=46) and thus, further research is warranted to substantiate this risk, the study highlights rate of growth as a potential factor which contributes to increased injury risk in young dancers (Bowerman et al., 2014).

The timing of maturation can also have implications for injury risk, in particular for young female dancers who are delayed in maturation where the incidence of fractures has been reported to rise with increasing age at menarche (Warren, Gunn, Hamilton, Warren, & Hamilton, 1986). This increased risk of injury is associated with prolonged hypoestrogenism, referring to a lower than normal level of oestrogen, and is a well-recognised complication of weight loss, dieting and physical training in girls and young women (Tanchev, Dzherov, Parushev, Dikov, & Todorov, 2000; Warren et al., 1986). Delayed growth and maturation lead to a prolongation of the vulnerable growing years, exposing the growth plates to the influence of adverse mechanical factors such as pressure, impact and microtrauma for a longer period (Tanchev et al., 2000). Further injury risk factors identified in adolescent gymnasts, which may be applicable to young dancers, include skeletal immaturity, insufficient rest periods and repetitive movements (DePalma, 2006; Wyatt, 2015).

Summary

Puberty clearly represents a challenging time for young dancers and many of these challenges can be overcome with the guidance of the dance teacher. Awareness of the physical changes that dancers go through during puberty and gender differences, and how these changes impact upon performance and injury risk can equip dance educators to make this transition through puberty as adaptive as possible. There are several ways in which schools and teachers can work towards reducing risk of injury during adolescence. Monitoring and measuring growth and maturation can help to predict most rapid periods of growth, identify maturity timing and inform any adjustments to training schedule and load. Remaining mindful of additional risk factors such as insufficient rest, reduced flexibility and strength and individual differences in maturity timing can enable more personalised approaches to the training of young dancers.

While the physical changes of puberty present challenges to young dancers in terms of technique, performance and injury risk, further conflicts can arise between pubertal changes and physical appearance, which can become increasingly important for young dancers auditioning or being assessed. Desirability of pubertal changes may also depend on the gender of the individual. For example, in dance, pubertal changes may have more apparent advantages for boys, bringing the

benefits of strength and power (Buckroyd, 2000; Pickard, 2012). In particular, for young female dancers, the more overt changes such as breast development and increases in fat mass, alongside the temporary changes to their physical capabilities, can have a significant effect upon feelings of self-consciousness, self-confidence, body image and identity. Healthy adaptation to these physical changes is critical; adaptation at this point can heavily influence the trajectory of future psychological wellbeing.

Healthy adaptation to these physical changes is often effected by social context. Involvement in elite sport or dance at adolescence may place considerably higher pressure on successful and rapid adaptation to physical changes. These challenges will be discussed further in part 2 of this series dedicated to the adolescent dancer: *Psychological implications of puberty in dance*.

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