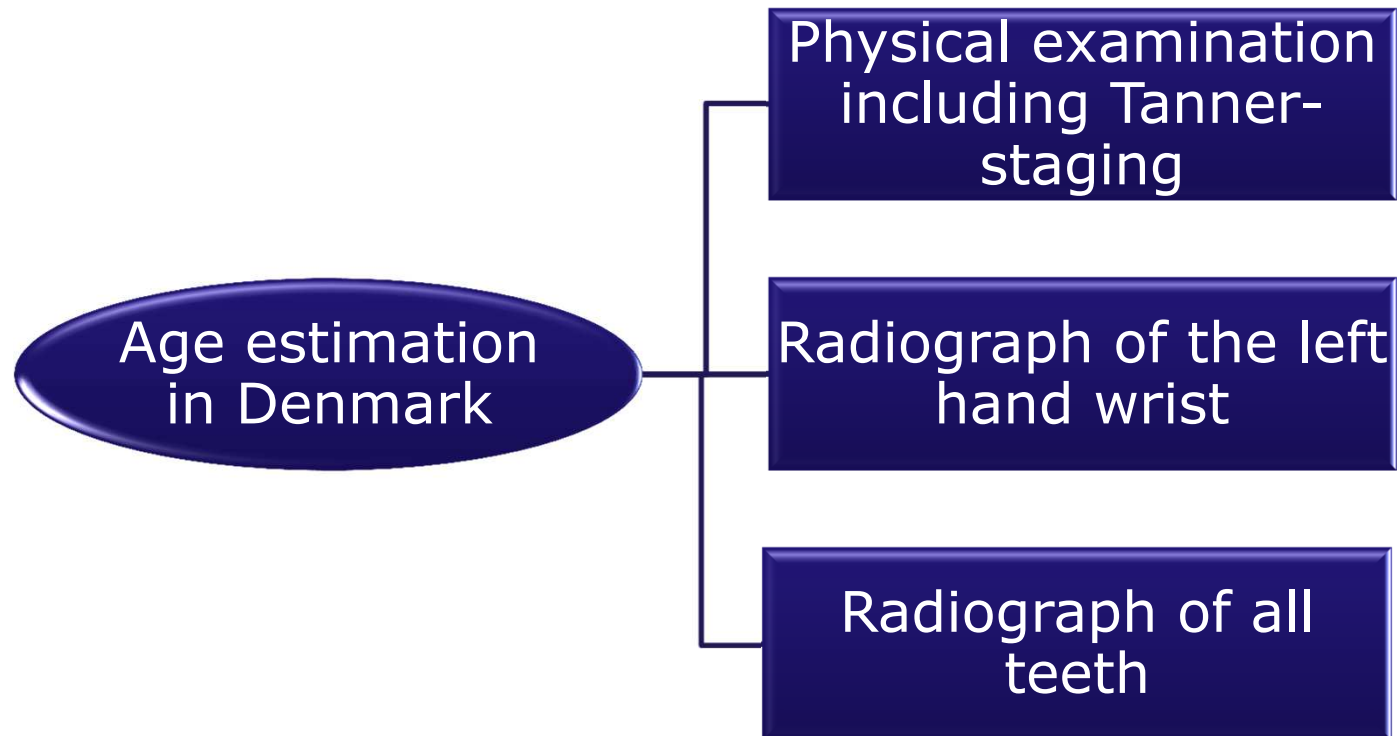




# Use of Tanner stages in forensic age estimation

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# Background



## Background

- Annually approximately 1 % of unaccompanied asylum-seeking minors refuse to go through with the physical examination in which Tanner-staging is included.
- Potentially intrusive?
- This has led to reconsideration about the value and purpose of the full physical examination.
- In turn it has raised doubts about the usefulness of the Tanner-staging.



## Historical aspects

- Named after the British pediatric endocrinologist James M. Tanner.
- Five-point scale for the rating of sexual development.
- Photographs and descriptions of the secondary sexual characteristics for girls and boys – pubic hair and size of genitalia
- Based on Harpenden Growth Study – a study on the growth of children set up in a children's home in Harpenden in England
- The children were measured and photographed every 6 and 3 months during puberty.
- A combination of data from the Harpenden Growth Study and earlier studies.
- They are recognized as 'gold standard' after the publication of 2 articles, one for girls and one for boys (1969 and 1970)



Marshall, W. A., & Tanner, J. M. (1969). Variations in pattern of pubertal changes in girls. *Arch Dis Child*, 44(235), 291-303. Retrieved from

<http://www.ncbi.nlm.nih.gov/pubmed/5785179>

Marshall, W. A., & Tanner, J. M. (1970). Variations in the pattern of pubertal changes in boys. *Arch Dis Child*, 45(239), 13-23. Retrieved from

<http://www.ncbi.nlm.nih.gov/pubmed/5440182>



## Historical aspects

- The content of the articles:
  - Analysis of data on 192 girls and 228 boys with the purpose of giving information about the variability in the development of the secondary sexual characteristics
    - Age at which the different stages are reached
    - The rate at which they pass the different stages
    - Range of normal variation
  - Diagram of the sequence of events at puberty
  
- Ever since the publication of the two articles the stages have subsisted.
  
- Changes have been proposed with regards to measurement of the testis for boys and breasts for girls.



## Use of the stages

- Where?
  - They are accepted and used worldwide
  
- When?
  - Both in clinical work and research
  - First and foremost in clinical work for the assessment of pubertal development and diagnosis of growth disorders
  - Treatment of HIV
  - Sports-related situations
  - Potentially play a role in interpretation of hematocrit, hemoglobin and alkaline phosphatase?



## Use of the stages

- How?
  - No clear guidelines about the execution
  - In scientific articles it is typically stated that the stages are assessed according to the criteria by Tanner
  - In other situations the stages are described without explanation as to how they should be carried out
  - According to Tanner:
    - Assign ratings for each characteristic separately
    - Compare with standards for a group of healthy children with the same sex and age
    - More precision is achieved if the child is followed and measured longitudinally.





# Problems

## Marshall and Tanner point towards some problems:

- Low SES -> Maybe not representative for the whole population?
- Pubic hair was not seen on the photographs before sometime after they had appeared on the body -> photographs instead of visual inspection may lead to imprecise results

## Other:

- Palpation vs. visual inspection (vs. photographs)
- Inter-rater reliability
- Ethical problem – potentially intrusive?



## Alternative methods

- Few alternative methods in general
- The ones that exist are thought of as a means to overcome problems with the execution of the staging mainly the ethical issue.

The following has shown to be somewhat valid alternatives:

- Self-assessment
- Parental-assessment
- PDS



## Worldwide variations

- Consistency has generally existed in the development of puberty since it was described by Tanner and even prior to that.
- Generally rural populations have been found to be delayed in puberty compared to their urban peers.
- Studies on pubertal development consistent with data from the work by Tanner is mainly from industrialized countries..
- Few studies have been conducted on children from developing countries and even fewer on the children from the countries of the asylum seekers.



# Influencing factors

- Genetic
  - Ethnicity (race)
  
- Environmental factors
  - Light
  - Geographic location
  - Nutrition
  - Acute and chronic infection
  - Socioeconomic status
  - Physical stress
  - Endocrine disrupting chemicals (EDC)



## The Tanner stages in forensics

- Used in forensic age estimation in several contexts such as:
  - Adoption cases
  - Criminal proceedings
  - Child pornography
  - Sex workers
  - Human trafficking
  
- In Denmark
  - Unaccompanied asylum-seeking minors
  - Criminal proceedings – few
  
- The use in child pornography cases has been widely criticized
  - According to Tanner - misuse if the stages are spent for determination of chronological age



## Discussion

The results give rise to the following issues:

- The Tanner stages are based on British children → children from developing countries may pass those stages differently
- Most studies pointing towards consistency with data from the British children of Harpenden are conducted on children from industrialized countries. Very few studies have been conducted on children from the countries of the asylum seekers.
- Studies with use of completely different methods are compared giving rise to concern about the validity of the stages and their use in the context of age estimation.



## Discussion

- Environmental factors and the genetic component are confounders and contribute to the complexity of linking the secondary sexual characteristics and chronological age -> makes use of the Tanner stages in age estimation doubtful.
- The lack of uniformity with regards to the execution of the staging and doubt in how it is and how it should be performed -> general inaccuracy in the procedure and in age estimation.
- The original black-and-white photos, which are still the most widely used, were taken decades ago and are of British children -> do not take into account differences in pubertal development based on race.



## Discussion

- These different issues with regards to the use of Tanner stages in general and in the context of age estimation including in cases asylum seekers could indicate that:
  - 1 They are not the most suitable method for age estimation
  - 2 They are probably neither the most appropriate method for asylum seekers.
  
- On the other hand it is expressed by several that the physical examination including Tanner-staging is essential in age estimation since it:
  - 1 Plays a role in the overall assessment and precision
  - 2 Contributes in the detection of potential growth disorders.





## Conclusion

- Assessment of the Tanner stages are not meant for chronological age estimation.
- The literature points towards problems with the applicability of the method for asylum seekers.
- However some find the physical examination essential and indispensable.
- No study has so far examined the importance of the physical examination in forensic age estimation.
- Neither has the usefulness of the Tanner stages been studied.



**There is no clear answer**

