‘TOUCHLESS’ BODY LENGTH MEASURING INSTRUMENT FOR GROWTH MONITORING OF PREMATURE INFANTS

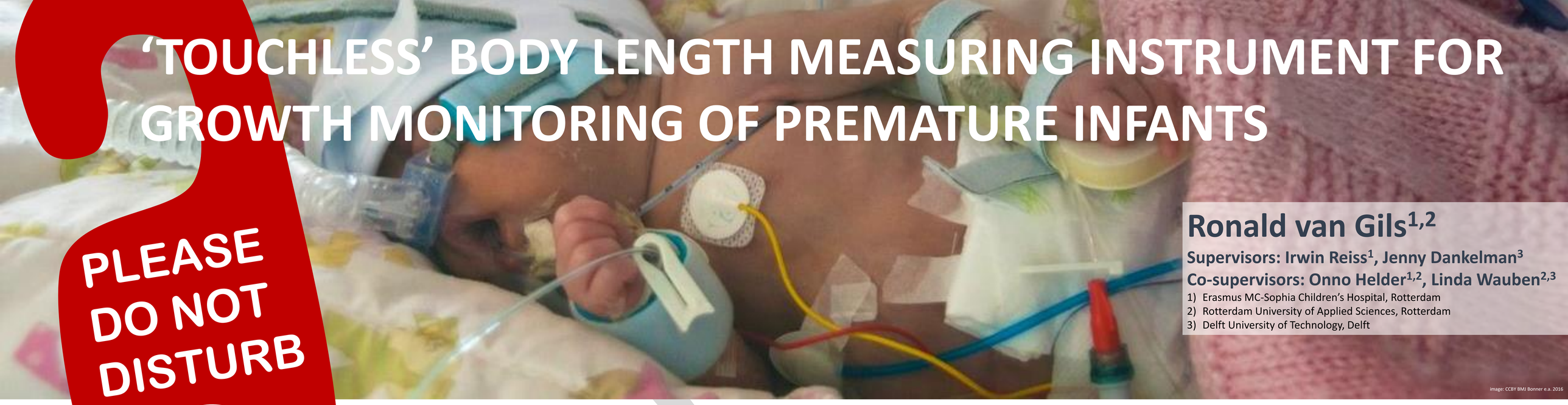

image: CCBY BMJ Bonner e.a. 2016

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Problem

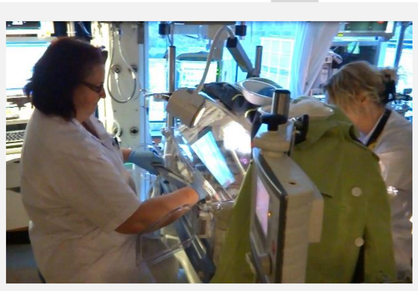
The current body length measuring instrument for premature infants in a neonatal intensive care unit (NICU) causes so much stress to the infant, that length measurements of extreme vulnerable premature infants are simply skipped. But length measurement of premature infants is essential for growth monitoring.

Premature infants in incubators are attached to **“a spaghetti of wires, lines and tubes”** (image: CCBY BMJ Bonner e.a. 2016).

Current instrument (slide calliper) for length-measurement of a premature infant inside an incubator: **big, clumsy, unhygienic and very stressful for the infant.**

Objective

To develop a ‘touchless’ body length measuring instrument that is more hygienic and less stressful for the infant.

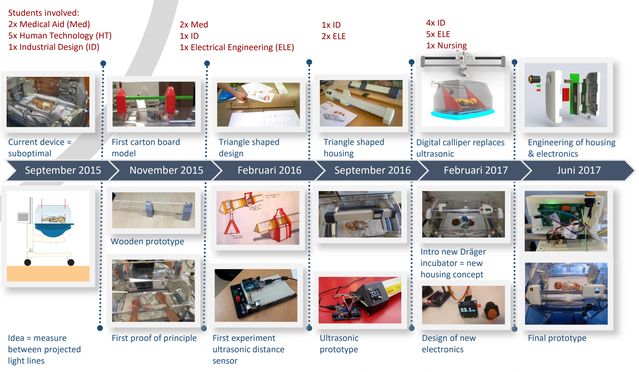


Skill and concentration is needed to perform a length-measurement (Video screenshot November 2015).

Co-design session with NICU healthcare professionals and student at the Erasmus MC-Sophia (November 2016).

Methods

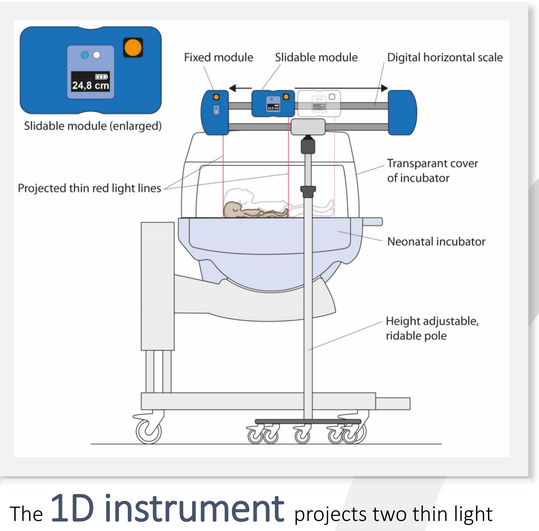
Through co-design with NICU healthcare professionals of the Erasmus MC - Sophia Children’s Hospital, students developed functional prototypes of ‘touchless’ length measuring instruments.



Increments in the co-research and co-design phases of the 1D-instrument in the period of 2015-2017.

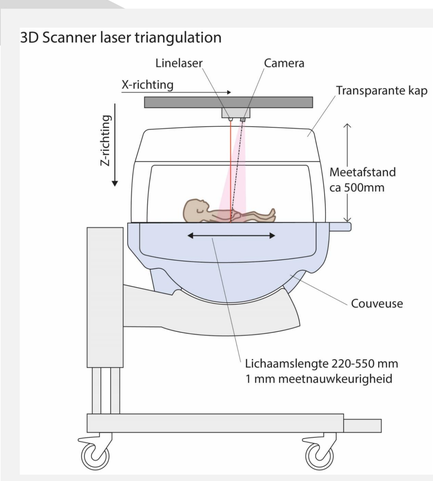
Conclusions

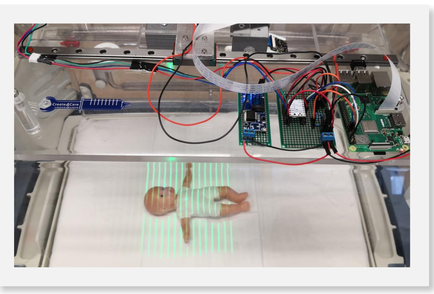
1D could be used in the near future. Further research is necessary to design instruments based on 3D and stereoscopic vision for clinical application.

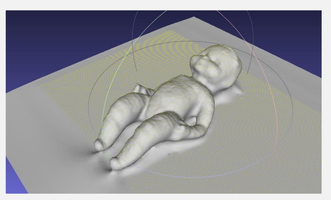


The **1D instrument** projects two thin light lines into the incubator. A numeral display shows the distance between the light lines, representing the body length. (2015-2018)

The 1D instrument was tested in the NICU of Erasmus MC-Sophia. Users found the instrument **less stressful for the infant, more hygienic and easy to use than the current instrument**. However, stretching the infant’s legs is still necessary. (September 2018)



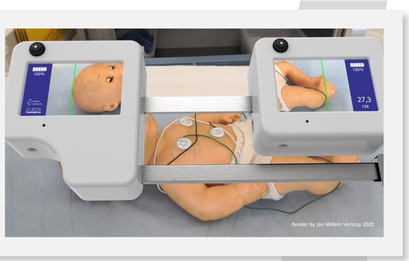


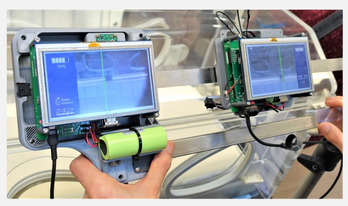


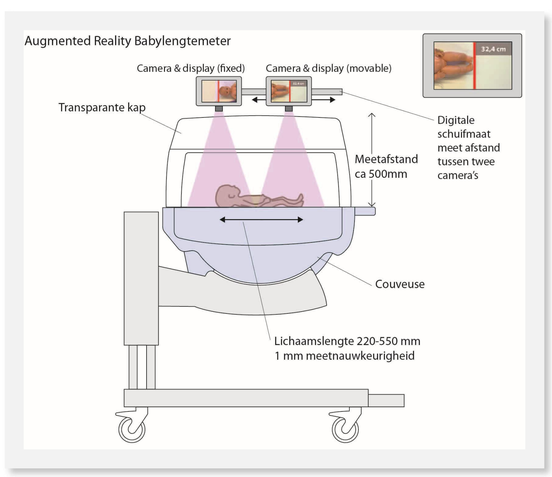
The **3D instrument** uses laser triangulation, which generates the **infant’s 3D height profile** and automatically derives the body length. Evaluation showed an accuracy of 5 mm. Limitation of the 3D scanner is that it only ‘sees’ from one viewing angle. The next step is to develop a 3D scanner with multiple viewing angles. (Timothy Singowykromo e.a. 2018-2019)

Results

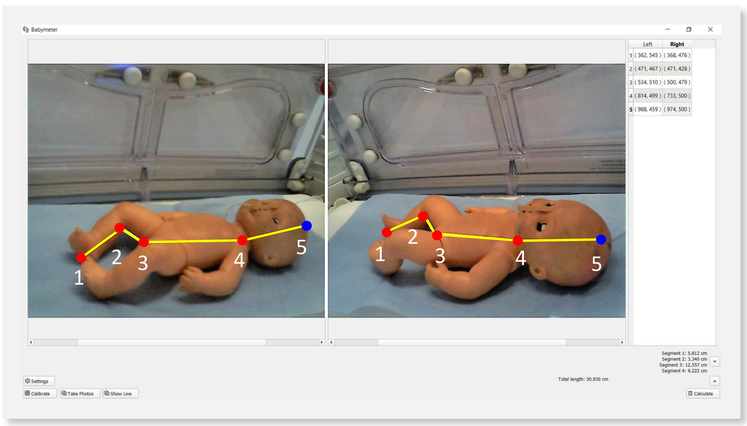
Three ‘touchless’ body length measuring instruments



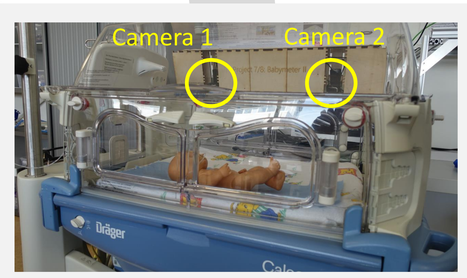


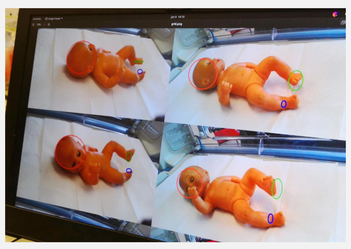


Next step in the 1D instrument is to replace the light lines by camera’s and displays with augmented reality (2018-2020)



The **Stereoscopic Vision instrument**, based on Sokolover e.a. (2014), captures two images of the infant from different viewing angles. On both images body points are marked manually. The stereoscopic algorithm calculates the distance between body points in 3D-space. **Body length can be measured without stretching the infant’s legs.** Evaluation showed an accuracy of 1 mm. (2019)





Next step in the Stereoscopic Vision instrument is adding 2D image recognition to automatically preselect body points. (2020)

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Poster design CCBY Ronald van Gils 2020