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1995-2000 the clap skate and human movement sciences

The clap skate is one of the most widely known inventions to be developed by a VU researcher. In fact, it came to revolutionise the sport of skating after years of research, testing and initial hesitation. The research was carried out within the field of human movement sciences, a unique scientific field that has come to define VU's profile. So how do these research processes actually unfold in practice, and which subjects are currently important within the field of human movement sciences? Researchers Peter Beek, Jaap van Dieën and Jeroen Smeets explain how the clap skate continues to be researched and improved to this day.



Clap skate with measuring equipment, 1995-1996, VU Heritage & Collections. Photo: René den Engelsman, 2009

The clap skate

By Ab Flipse and Liselotte Neervoort

VU has been conducting research on human movement [biomechanics](#) since the establishment of the Interfaculty of Physical Education in 1971. The principal architect of this research was [G.J. van Ingen Schenau](#) (1944–1998), who was ultimately appointed Professor of Biomechanics at the faculty of Human Movement Sciences (currently part of the [Faculty of Behavioural and Human Movement Sciences](#)). While his initial research involved the biomechanics of walking, one of his students introduced him to the study of skating. Van Ingen Schenau and his team measured human movements and the corresponding forces in an attempt to gain insight into human energy production and the use of this energy in cyclic movements.

On the back of his physiological research into muscle function and control, particularly of the calf muscle, Van Ingen Schenau's enthusiasm for speed skating resulted in the development of the 'clap skate' in the mid-1980s. The definitive design was preceded by several prototypes. This process involved the development of measuring skates, which were used to study the mechanics of skating. One of the first measurement models, used to measure the force exerted by skaters when pushing off the ice, dates back to 1978. This skate still has fixed blades similar to those on the measuring skates developed from 1985 to 1988 as part of [Jos de Koning's](#) doctoral research.

Researchers developed the idea for the clap skate in collaboration with instrument makers at the Academic Medical Center (then UvA, currently part of Amsterdam UMC). The skates were tested on a larger scale as part of a trial with the South Holland youth team during the 1994/1995 season.

[Tonny de Jong](#), [Carla Zijlstra](#) and [Barbara de Loor](#) were the first to use the new skates in 1996, in the face of widespread initial scepticism. However, skaters using the new clap skates at the 1998 [Nagano Olympics](#) broke world records in almost every distance.

The skate shown here is a 1996-1997 model. The wires connected to a small computer on the skater's back, which stored data from measuring devices that could then be read at a later time.

Current developments

By Peter Beek, Jaap van Dieën and Jeroen Smeets

Human movement scientists have continued to research skating since Van Ingen Schenau's pioneering work. Jeroen van der Eb resumed development of the measuring skate at the department 2.5 years ago. The existing measuring skates still needed some further improvements in order to be suitable for professional skating. The 'old' generation of measuring skates was too heavy for professional skaters due to their built-in sensors and electronics. Also these older models did not include the actual clap-mechanism.

Jeroen resolved this problem with the help of technicians, producing a lighter version of the measuring skate with the clap-mechanism. All participants in trials with the new skate were enthusiastic about its handling and were able to achieve high speeds without any problems. The new skate model integrates all built-in electronics into the bridge between blade and shoe. This will allow for reliable measurement of the forces affecting the foot, skate and ice surface, enabling researchers gain an even better understanding of the biomechanics of skating, especially at high speed.. The measurement skate will also enable researchers to analyse the effects of any changes to the skating technique and configuration of the skate (curvature, type of blade). Skate manufacturer [Viking](#) can also use the measurement data to develop even better skates for the market.

A follow-up project involving the measuring skate won last year's [National Sports Innovation Award](#), an award for the most innovative products in the field of sports, professional athletics and physical activity. As a part of the project, the Netherlands' top skaters will start using the measuring skate so that the resulting data can be used to further improve their skating technique. While this could take the form of an offline analysis, it would be even better if the data generated by the measurement skates could be used to provide online feedback during the actual skating session. This is the long-term goal behind the project, which is being conducted by partners VU Amsterdam, Leiden University, the [KNSB](#) skating federation, [NOC*NSF](#), [Innovatielab Thialf](#) and Viking skate manufacturers.

In addition to technical knowledge, the use of online feedback also requires an understanding of the way in which feedback affects behaviour. The department is developing this knowledge in order to optimise athletic performance, for example in skating, prevent overexertion in athletics and at the workplace, and improve the well-being of patients and elderly people with mobility problems. This effort involves collaboration with future users in the fields of sports and healthcare, as well as private sector parties and developers of the measurement technologies enabling this type of feedback.

Watch this [video](#) by researcher Katinka van der Kooij to find out how you can improve the effectiveness of your movements by learning from feedback on your successes and mistakes.

Peter Beek, Jaap van Dieën and Jeroen Smeets are professors at the department of Human Movement Science. Peter is professor coordination dynamics, Jaap van is professor of biomechanics and head of the Human Movement Sciences department, Jeroen is professor of human movement related psychology .