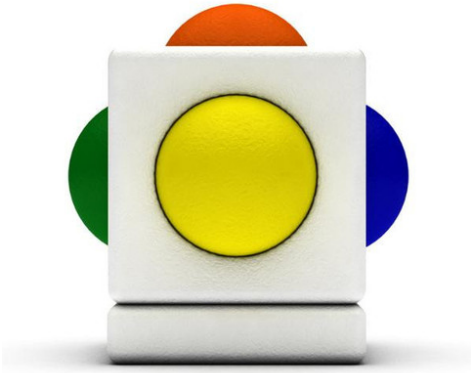
Institution: The University of Edinburgh

Unit of Assessment: 35 Music

Title of case study: The Skoog: a new kind of musical instrument



1. Summary of the impact

Research (2003-12) by Osborne at the Reid School of Music (RSM) revealed a need for a new musical instrument for disabled users. Under the direction of Osborne, between 2006-8 an interdisciplinary team across Music, Psychology and Physics, including RSM-based Schögler, developed a new musical 'object', the Skoog, which allowed people with a wide range of disabilities accessible expressive control of sound. A spin-off company, Skoog Music, was formed in 2010, which now employs six staff, and has sold more than 1,000 units in 16 countries, generating an income of around £600k. The Skoog is widely used by schools and education services and in clinical music therapy by institutions such as Drake Music. It featured in the Best of the Best 2010 in *Able Magazine*. It was one of three instruments to inspire the composition *Technophonia* by Oliver Searle, performed at the South Bank as part of the 2012 Cultural Olympiad and short-listed for a 2013 British Composer Award.

2. Underpinning research

The idea for the Skoog emerged from music in the community work being carried out by Professor Nigel Osborne (Reid Professor until 2012), together with researchers/performers from the RSM, with four Scottish local authorities – Fife, North Lanarkshire, and North and East Ayrshire. On the basis of this work (and the problems posed by some of the children involved), a wider research programme was proposed, focused on the educational and health benefits of the creative arts. The initial stage of this research, carried out in collaboration with the Tapestry Partnership between 2003 and 2005, involved extensive consultation at a school level, and identified music as a tool for improving learning engagement in children with profound physical and learning difficulties. Some of these insights were later published in Osborne 2010 and 2012 (see 3.1 and 3.2 below). In order to develop research on these issues the School formed the Institute for Music in Human and Social Development (IMHSD) and a funding bid was made to the National Endowment for Science, Technology and the Arts (Nesta), which in 2006 awarded Osborne a grant of £195k for the development of a musical 'object' that would be commercially viable and useful to as wide a range of ages and abilities as possible.

Under Osborne's leadership a team was established to design and create such a new musical instrument. The team set itself three research objectives: to develop a universal interface to sense fine or limited movements of the body; to develop an appropriate way of understanding and interpreting the musical meaning and expressivity of such movements; and to develop a way of communicating this meaning and expressivity to a new, flexible and attractive source of musical sound, so that the new instrument would offer its users the opportunity for learning, progression

and creativity.

Professor Osborne was joined on the research management team by Professors Campbell (Physics) and Lee (Psychology); and by two NESTA-funded Post-doctoral Research Fellows (2006 – 2008): Ben Schögler (Music/Psychology) and David Skulina (Music/Physics). The underlying music psychology research concerned the relationship between brain activity and expressive gestures and temporal patterns of movement and sound, as understood through Tau theory (an approach to the relationship between perceptual and intrinsic motion guidance in human action through measurement of the 'time to closure' of a motion gap). The resulting account of the relationship between physical movement (however minimal) and musical expression informed subsequent work on the sensory guidance of purposive movements and on the acoustical properties of computer-based sound simulation. The computer software translating the hand movements on the sensor into expressive sound is based on a 'neuron mathematics of movement', on the theory that there is a clear relationship between brain activity, physical movement and musical expression. The main difference between the Skoog and the technology used in most other forms of computer music-based musical therapy is therefore that the Skoog does not use MIDI (Musical Instrument Digital Interface); it allows a direct relationship between the movement of the Skoog user and the sound made. Continuing practice-led music community research projects enabled the researchers to test the effectiveness of this approach in practice.

3. References to the research

3.1 Osborne N. (2010) 'Music for children in zones of conflict and post-conflict: a bio-psycho-social paradigm' and 'Towards a chronobiology of music', in S. Malloch and C. Trevarthen ed. *Communicative Musicality. Exploring the Basis of Human Companionship*, Oxford: Oxford University Press, 331-356, 545-564. Peer reviewed book chapters, ISBN: 978-0-19-856628-1

3.2 Osborne N. (2012) 'Neuroscience and "normal world" practice: music as a therapeutic resource for children in zones of conflict', *Annals of New York Academy of Sciences* 1252, 69-76. Peer reviewed journal article, DOI: 10.1111/j.1749-6632.2012.06473.x

3.3. Schögler B. and Trevarthen C. (2007) 'To Sing and Dance Together' in Braten S. ed. *On Being Moved. From Mirror Neurons to Empathy*, Amsterdam: John Benjamins Publishing. Peer reviewed book chapter, ISBN-10: 9027252041 | ISBN-13: 978-9027252043

3.4. Schögler, B., Pepping, G-J. & Lee, D. N. (2008) 'TauG-guidance of transients in expressive musical performance' *Experimental Brain Research* 189, 361-372. Peer reviewed journal article, http://dx.doi.org/10.1007/s00221-008-1431-8

3.5 Lee, D. N., and Schögler, B. (2008). 'Tau in musical expression' in S. Malloch & C. Trevarthen eds. *Communicative Musicality. Exploring the Basis of Human Companionship*. Oxford: OUP. Peer reviewed book chapter , ISBN: 978-0-19-856628-1

4. Details of the impact

By early 2008 the researchers had developed a prototype instrument (the Skoog) that gave its users accessible expressive control over real sounding instruments. Drs. Schögler and Skulina then determined to form a commercial company to bring the Skoog to market. They raised £400k investment funds from the University of Edinburgh, Nesta, Scottish Enterprise, Banwell plc and the Daedalus Investment Fund; Skoog music was launched in early 2010. Skoog website hits reached 85,000 and sales had passed 1,000 (in 16 countries) by February 2013 (the end of the last accounting period), by which point the company had taken on two further full-time employees, a software engineer and an applications development officer, and two part-timers. Turnover in the 12 months preceding was £177,671. In its commercially developed form, the Skoog is a musical instrument based on a sensor covered with a coating which makes it

sensitive to touch but tough enough to resist strong handling. The sensor is linked to a computer, which takes in information about how slow or fast, soft or hard, and from which direction the player is touching the sensor. In essence, there is a virtual instrument inside the computer. The Skoog has been programmed to produce the sound of a flute, trumpet, bowed or plucked strings and clarinet, among other instruments. It can be set for different levels of ability or range of movement.

The great majority of sales have been to schools or education services. Skoog use figures are therefore much higher than the sales figures. The instrument's general value for music education, in enhancing innovation and creativity, was quickly picked up by both reviewers in the specialist press and early customers, as is indicated in these comments:

'*A fantastic product that shows real innovation and fun alongside its more serious educational benefits. One of the easiest five stars we've given*.' (*Able Magazine*'s 'Best of Best' 2010) (5.1)

'*The Skoog is an inspired and inspiring creation*.' (ICT Development Officer, Fife Council) (5.2)

The Skoog's impact has been particularly significant for people working with children with specific physical disabilities. In the words of one customer:

'I am an HCPC registered Senior Music Therapist from Northern Ireland. In my clinical work I address the development of children and adolescents living with visual impairments, physical impairments and complex needs. Recently, I acquired a Skoog and it has quickly become an asset in my music therapy instrument "tool-kit", providing an effective means for shared communication. The Skoog's touch-sensitive responsiveness means that it can bypass some of the more stringent physical playing demands made by conventional musical instruments.' (5.3)

One of the Skoog's most important attributes is its versatility: it can be used in all sorts of music education settings, and therefore makes a major contribution to policies of inclusivity. A review in the magazine, *Special Children*, noted that:

'*The Skoog makes music accessible to everyone. It has transformed the life of one young girl at our school in particular. She is on the autism spectrum, with limited speech. However when she plays the Skoog, she becomes graceful, confident and at ease with herself. It's wonderful to watch*.' (5.4)

In 2011, Skoogmusic donated two Skoogs for use at Athens Special Olympics events, and set up a Skoog Zone in the delegates' area for trying out the instruments. Videos from the Skoogmusic website show many of the athletes enjoying making music with the Skoogs (5.5). Mary Mavis, Managing Director of Special Olympics Europe/Eurasia, commented that 'The Skoog is a wonderful invention which is accessible to everyone and gives people with disabilities of all ages an opportunity to express themselves and develop new skills' (5.6).

The Skoog also featured prominently in a composition commissioned for the 2012 Cultural Olympiad. The Skoog was one of three instruments developed for use by disabled performers, which were the inspiration for and centrepiece of *Technophonia*, a piece commissioned from Oliver Searle by the Drake Music School Project. The piece premiered in Queen's Hall Edinburgh, and was performed in the South Bank Centre as part of the London Olympics celebrations (5.7). In an interview given while working on the piece, Searle explained how experimenting with the Skoog and the other two instruments shaped the process of composition. In particular, he enjoyed 'being able to work hands on with the instruments, with the sounds, that might give me ideas that I might use later in the piece' (5.8). The Southbank Centre website commented that the piece would 'stir their audience and stimulate them to think again about what is possible, as well as how we define musical instruments and performing musicians.' The piece has been short-listed for the 2013 British Composer Awards (Community or Educational Project category).

5. Sources to corroborate the impact

Copies of these web page sources are available at
https://www.wiki.ed.ac.uk/display/REF2014REF3B/UoA+35

5.1 Rating award, Able Magazine (disability lifestyle magazine)
http://content.yudu.com/Library/A1p3it/AbleMagazinesBestoft/resources/index.htm?referrerUrl=http%3A%2F%2Fablemagazine.co.uk%2Fable-ratings-awards%2F

5.2 Testimonial from ICT Development Officer, Fife Council
http://www.skoogmusic.com/case-study/189

5.3 Testimonial from a Senior Music Therapist
http://www.skoogmusic.com/case-study/MusicTherapy

5.4 Testimonial from a teacher at Prospect Bank School, special state school for pupils aged from 4 to 11
http://www.skoogmusic.com/sites/default/files/Skoog%20Music%20SC%20205%20p50-51.jpg

5.5 Video clips of the Skoog Zone at the 2011 Athens Special Olympics
http://www.skoogmusic.com/videos/special%20olympics

5.6 Special Olympics website
http://www.specialolympics.org/Regions/europe-eurasia/News-and-Stories/Stories/Special-Olympics-and-SKOOG-make-music-together.aspx

5.7 BBC Scotland news clip on Technophonia and the Skoog
http://www.skoogmusic.com/videos/pressmedia/BBCScotland_20120627

5.8 Interview with Oliver Searle http://www.prsformusicfoundation.com/Partnerships/Flagship-Programmes/New-Music-20x12/Meet-the-New-Music-20x12-Composers/Oliver-Searle