Chapter 20
Electrorganic Technology for Inclusive Well-being in Music Therapy

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Abstract This chapter presents a contemporary and original musical instrument proposed for use in music therapy—the instrument is namely ATV Corporation’s electrorganic aFrame. This chapter reports on initial aFrame intervention testing by music therapists as a part of the second phase of research. This follows over six-months of proof-of-concept trials questioning reactions across a range of contemporary musical instruments and their potential use in music therapy, wherein the aFrame was the preferred device by testers. As the name suggests, the aFrame is modeled on a traditional frame drum, and appears to be aimed at skilled hand percussionists, with the appeal of applying natural playing techniques to an electronic instrument. What makes the aFrame unique is the sensor array and electronic sound module combination that generates a richly expressive palette of sounds beyond the scope of other electronic percussion instruments. The posited hypotheses are concerned with the applied potentials of the aFrame in the field of music therapy. This chapter technically elaborates on the aFrame alongside an explanation of the electrorganic concept behind the realisation of the instrument. Initial critique and reflections from secondary tests are informed by two Danish music therapists.

Keywords Electrorganic · Music · Therapy · Creativity · Differently-abled

20.1 Introduction and Background

The authors are both musicians of many years’ experience who are, or have been, university educators and researchers with periodic vocations within the digital media and creative industries. They are both aware of advances across the music industries over recent years.
Within these profiles, a common goal is to realize societal impact through music toward benefitting the differently-abled.

In pursuit of such a goal, a central aim of the work presented herein is to explore opportunities for supporting music therapists, principally to find ways to facilitate optimisations of their practice interventions. One way to approach this is by engaging with therapists directly and encouraging them to consider supplementing their arsenals of traditional instrumentation with contemporary instruments. Such instruments—most of which are electronic to some degree—were hypothesised at the start of this research, and linked to particular affordance criteria; Specifically, instruments that hold the potential of increased accessibility, inclusion, and opportunities for offering wider creative self-expression, alongside raising the user’s sense of self-agency, self-efficacy, self-achievement, and success.

Following preliminary testing by music therapists (and others) over several hands-on playing trials, a preference was found in favour of an electrorganic instrument when compared to a selection of purely digital devices e.g. MIDI instruments. The electrorganic instrument in question is the ‘aFrame’ and this chapter elaborates on the instrument and initial therapeutic responses following testing adoption.

20.2 Music and Music Therapy

MacDonald et al. [22] posited how music has been implicated as a therapeutic agent in vast swathes of contemporary research studies, thereby reflecting that it is only recently that researchers have begun to explore and understand the positive effects that music can have on our well-being—across a range of cultures and musical genres. Contributions in the cited edited publication (ibid.) make clear a relationship between music, health, and well-being, whilst questioning scientific evidence and the lack of robust theoretical frameworks alongside empirical observations and methodological issues concerning the effects of musical interventions on health-related processes. Bonde’s [1] earlier review of the health and music literature relatedly informs a similar narrative.

Small [24] referred to ‘music’ as a verb rather than as a noun. He considered music an action relating to the activity, and not as a self-standing entity or object. In defining the term ‘Musicking’, Small referred ‘to music’ as a performative action, of playing; relating to an act of dancing; or otherwise passively listening, as such, affording a means for participants to explore, assert, and acclaim their identities in whatever preferred way (ibid.). Small further posited on how the challenge for music educators was not to churn out more professional musicians, but was instead to “provide that kind of social context for informal as well as formal musical interaction that leads to real development and to the musicalizing of the society as a whole” (ibid., p. 208): See also Cohen [5].

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1MIDI (Musical Instrument Digital Interface) is a musical instrument signal protocol—see https://www.midi.org.
Stige [25] informs that health musicking was originally developed in a discussion of music therapy theory (p. 183), and accordingly it expounded on how the discipline of music therapy could be defined as the study and learning of relationships between music and health [25, p. 198]. From an anthropological perspective, music therapy has been defined as a field of study where integrative perspectives on health-related music practices could be developed [19].

In context, the research herein considers an elaboration on how accessible and inclusive development of music therapy can lead to music therapists enabling clients increased therapeutic potentials and possibilities resulting from their own creative expression and rewarding experiences. This via therapists, and the discipline in general, being more open to exploring new interfaces for musical expression aligned to development and musicalizing of society as a whole.

In summing up this brief introduction, suffice to state that this chapter does not attempt to establish formal scientific evidence, a theoretical framework, or even empirical observations and method to question the effects of musical interventions on health-related processes associated to use of the aFrame instrument. It instead focuses upon simply introducing the background and technical aspects of the aFrame as well as sharing early-tester music therapists’ initial field responses associated to a ‘Musicking’ related framework [1, 5, 22, 24, 25].

20.3 Technology Empowered Musical Expression in Therapeutic Settings

It has been observed in therapeutic settings how novel forms of creative and musical expression empowered by accessible technologies can offer a more fun, playful, sociable, and enjoyable—and thus entertaining—experience when supplementing traditional intervention strategies in (re)habilitation across a wide range of end-user profiles. Such interactions have also been found to be beneficial to clients’ physical and mental outcomes as targeted by therapists (e.g. [2, 6–12, 14, 15, 22]).

Such motivated usage of technology has been reported to result in increased engagement with the facilitator/therapist in training activities, thereby leading to improved treatment program compliance. These benefits are aligned with what has been termed ‘Aesthetic Resonance’ (e.g. see [2, 4, 6–11, 14, 15, 17, 18]). Aesthetic resonance is the subject of elaboration and definition later in this chapter (see also [3]) as it is directly associated with the aFrame musical instrument, which is the main focus of this contribution to the field of music therapy.

Such technology-enhanced interactions can be tailored, adaptive and selectable to a client’s profile of preference, need, and therapeutic requirement, leading toward optimized patient experiences across the sessions of a treatment program [2].

Brooks (e.g. [2]) details in the holistic research associated to this study (Sound-Scapes) how sensor-based technical devices that control auditory stimulus have been invented and self-created (e.g. in line with [14, 15]), whilst other devices in the field
have been adapted for implementation from commercial apparatus (e.g. in line with [6, 9]). Notably, Gehlhaar, Ellis, and this chapter’s authors are all musicians.

Both approaches to apparatus exploration in this field have resulted in positive outcomes as evaluated by professional therapists to offer benefit for clients with dysfunction across diagnosis, age, and targeted therapeutic outcome—(see also third-party reports directly associated to the research herein e.g. [13, 16, 21]). Posited is how a contributing factor is therefore related to knowledge of technologies aligned with comprehension of human activity associated with music-making. Additionally, an emotional and empathetic understanding that is associated with music-making is considered attributing to results questioning human performance where end-users are differently-abled/handicapped.

20.4 Alternative Musical Instruments and the aFrame in Music Therapy

Contemporary literature on electroacoustic music and alternative ‘instruments’ are abundant, with the topic being central to such events as the International Conference of New Interfaces for Musical Expression (NIME) that offers annual conference proceedings freely available online.2 Within such archives reside numerous inventions on alternative means for a human to perform music-making.

The first author’s concept on the use of the aFrame as an alternative musical instrument in therapeutic situations was first presented at the International Conference of Arts and Technology, Interactivity and Game Creation (ArtsIT)3 hosted in Braga, Portugal 2018. However, the presentation missed out on being able to showcase a live demonstration of the actual physical instrument, which would have been ideal to optimally enable audience members’ opportunities to have hands-on experiences of the device.

However, throughout 2019 numerous trials were undertaken in Denmark with physical units to test the idea of the aFrame in this field. Testing was designed for music therapists to be able to compare selected contemporary MIDI-based digital musical instruments and the aFrame. Notable were the positive evaluations received from many of the over six-hundred international music therapy delegates from across an array of countries who had hands-on experiences of the aFrame at exhibition demonstrations given at the European Music Therapy Conference (EMTC 2019).4 The event was hosted at the prestigious Musikkens Hus5 (The House of Music), in the centre of Aalborg, Denmark’s fourth-largest city. At this event delegates were invited to attend a large exhibition stand set up outside the main auditoriums, giving

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2 https://www.nime.org [23].
3 Arts and Technology, Interactivity, and Game Creation—see https://artsit.org.
4 https://www.musictherapy.aau.dk/emtc19/.
5 https://en.musikkenshus.dk/musikkens-hus/profil/om-musikkens-hus/.
them access to test various contemporary musical instruments—mostly digital/MIDI (see [3]).

As anticipated, the aFrame (a non-MIDI device) was the preferred device from delegate testing.

Interviews with those music therapy delegates who participated revealed that their preferences for the aFrame centred on its playability, which was both familiar and similar to a traditional frame drum. However, a key appeal of the instrument was that it offered a large spectrum of interesting musical sounds that could be easily selected, explored and modified by the players, and if desired, saved as a user preset sound for later recall.

Other trials involving music therapist testing (also professional musicians and teachers) yielded similarly positive responses.

At the end of 2019, two professional music therapists were contacted to initiate a loan of instruments for their testing in their practices to inform feasibility from field use. Critique and reflections from these therapists are elaborated on near the end of this chapter.

### 20.5 Musicality and Nuances of Expression

Typically, musicality in playing an acoustic instrument has dependencies on an underlying accomplished technique; a core set of rigorously practiced and mastered abilities that enable a virtuosic musician to control nuances of expression that connect to intended communications and meanings during the performance of a musical work. Music Therapists are typically accomplished musicians who apply their skills within therapeutic situations to benefit others’ well-being.

A background context to this chapter’s research asserts that Music Therapy education in Denmark is primarily focused upon acoustic/electric instruments, and/or vocals. Interviews with Danish music therapists strongly suggest that digital MIDI-based instruments are rarely used in practice, although some therapists do use them on occasion. This suggestion could align with their trained musician sensibilities and preferences for fine, low-tolerance nuance of ‘real-time’ musical expression, that being in contrast to the relatively uncertain expressive quality and artificiality of MIDI-based instruments, noting that response latency and jitter between the interface and a sound generating module are negatively evident when compared to an acoustic instrument (see [3]).

It was hypothesized early in the research that by demoing the aFrame instrument at The European Music Therapy Congress, thus exhibiting its ‘acoustic/electric’ (direct and immediate) related playability properties alongside its ‘sonic capability differences’, in comparison to other instruments that were MIDI-based, and also by allowing hands-on experience for attending therapists, potential future disruption and adoption of the aFrame could be indicated within the discipline.

Thus, given the relative similarity to the attributes of an acoustic percussion frame-drum instrument, as typically used in the field, the electroorganic aFrame was further
hypothesized as a bridging mechanism that would appease those sceptical therapists who have a delimited traditional perspective and approach.

Further, acoustic instruments typically appease players with a specific natural timbral feedback—a resonance (e.g. distinct characteristic, reverberation, colouring, quality... ‘play feel’) that is difficult to specifically articulate with written words.

The aFrame engineers have utilised such timbral qualities and mixed them with equalisation properties associated with performance attributes, subsequently processing the expressive acoustic sound source input to achieve a simply wonderful (electro-) organic playing experience, one which offers what has been referred to as ‘Aesthetic Resonance’ (see elsewhere in this chapter).

Aesthetic Resonance relates to human qualities posited in the therapeutic field where a sense of self-agency and self-efficacy, as afforded by a human performance (playing) experience is achieved.

In line with research focused upon Aesthetic Resonance, this contribution is considered a work in progress toward a long-term research investigation by professional music therapists in Denmark and ultimately internationally.

As far as the authors are aware, this is the first time this particular electrorganic instrument, as illustrated in the following sections, has been proposed and tested in a music therapy or therapeutic context. Technical details of the instrument and its playability attributes are further expanded on in the following sections.

20.6 ATV Electrorganic aFrame

Manufactured by ATV Corporation, the ‘electrorganic aFrame’ was the last electronic musical instrument developed under the guidance of the late Ikutaro Kakehashi—a music industry pioneer synonymous with the introduction of the MIDI standard.

The design ethos that drove the aFrame’s development aimed at the creation of an electronic percussion instrument that would be uniquely expressive in response to a full range of gestures used by the performer—including palm muting, pressure articulated pitch bends, and frictional (rubbing) techniques.

The technical realization of this bold idea immediately confronted the limitations of PCM sample triggering technologies used in most commercially available electronic percussion instruments.

Consequently, the design team’s innovative solution focused on developing a sophisticated new DSP approach to processing signals from two contact microphones positioned at the centre of the playing surface and also in contact with the bamboo wooden frame (see Fig. 20.1).

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6The first author was a professional contra-bassist, thus versed in acoustic instrument playing experiences.

7Also the founder of the Roland Corporation and ATV Corporation.
This signal processing approach, later termed Adaptive Timbre Technology (ATT), is further supplemented with expressive control input from a pressure sensor positioned behind the textured polycarbonate playing surface.

### 20.7 Adaptive Timbre Technology

The aFrame’s sound design framework is built on the structural concept of a Tone—a signal-processing patch with separate instrument and effect components. Within an aFrame’s project, instruments and effects can be freely mixed to create new tones.

An instrument is made up of four independently programmable timbre layers and generative processes termed Main, Sub, Extra and Dry. Of these, the Main and Sub timbre layers are the principal applications of Adaptive Timbre EQ Technology.

The Adaptive Timbre EQ works by processing the mixed contact microphone signals through a series of parallel band pass filters. The end user may select up to 32 filters (overtones) for input signal processing. The centre frequency of each filter is determined by a selected overtone model—a function that expresses the mathematical relationships of harmonic and inharmonic partials in a sound spectrum. The generative product of this parallel filtering is a new spectrum of band-limited signals that preserve certain frequency content of the input (contact microphone) signals. These combined filtered signals that form the processed spectrum is then pitched-shifted and tuned to a fundamental frequency in order to create usable musical notes. It is also possible to generate note sequences in certain musical keys and scales by varying pressure applied to the playing surface while tapping on it. This form of pressure-controlled musical note generation within a key and scale is used in many of the aFrame’s multi-layered tones.
The remaining two timbre layers that make up a tone’s instrument component combine a simple two DCO percussion synthesizer patch based on X-FM synthesis (Extra layer) with the ‘dry’ signals picked up by the contact microphones (Dry layer).

All four of the timbre layers that comprise an instrument tone can be flexibly mixed, panned and processed through a selected effect.

Many of the preset aFrame tones use some type of spatial effect (Delay + Reverb) that can also be expressively controlled by varying pressure on the playing surface. The aFrame also implements a binaural 3D spatialisation effect (Space Z, Space R) to create more immersive soundscapes.

The aFrame’s electronic sound module is fixed on the rear of the instrument between two bamboo supports (see Fig. 20.1-right image).

Connections on the unit include outputs for headphones (stereo mini-jack); 2 × line out 1/4” mono jacks; DC 5-V power input/AC adapter (supplied); USB micro type B connector (battery and computer connectivity) and a MicroSD card slot for storing aFrame project and tone data.

The aFrame also has two onboard memory slots for storing project data.

An aFrame project organizes the structure of tones (instrument + effect combinations) in groups (A, B, C, D, A’, B’, C’, D’). A project can utilize up to 80 unique instruments and effects that can be freely combined. Each group can store up to a maximum of 40 tones, although 10 is typical for most projects.

The weight of the unit is 1.6 kg (3 lb 8.5 oz) and the dimensions are 380 (high) × 380 (wide) × 44 (deep) millimetres i.e. 15 × 15 × 1.75 in.

To support mobility, an UNC camera adapter (female) mount is positioned in the centre of the unit’s back panel Fig. 20.1-right image and as clearly marked in Fig. 20.2 that allows a strap to be attached that can be worn around the player’s neck.

Bundles are also retailed with the aFrame, including a padded carry case, and a velcro-attachable battery pack that eliminates the need for a power cable in performance.

The aFrame back panel has a number of readily accessible sound controls including sensitivity knobs for the ‘edge’ and ‘centre’ contact microphone sensors i.e. piezo microphones. The back panel is shown in more detail in Fig. 20.2.

An optional footswitch connected to the aFrame via USB can be used to switch sequentially between groups and tones within groups. This useful extension to the aFrame avoids the need to pause during a performance in order to switch tones using the group navigation buttons positioned on the back panel (see Fig. 20.2). This is considered an essential addition in the context of use with the differently abled (as in music therapy), especially those end-users with limited ability to be able to physically turn the aFrame in order access controls that change tones.

In such a context, i.e. working with those with limited strength/mobility/dexterity etc., the empowered ability to self-change/control what is played is important from an efficacy perspective. Even with a footswitch, it is speculated that it may be necessary to enable another form of change control for those end-users without limb strength to press the buttons.
In use with the optional battery, the footswitch requires an additional cable so that the battery feeds the footswitch (USB to power cable) and the footswitch feeds the aFrame (USB to USB).
20.8 The Electrorganic aFrame in Use

The design of the electrorganic ATV aFrame reflects the ‘Artware’ philosophy of Ikutaro Kakehashi [20]. This design philosophy directed an exceptional group of engineers working on the project, including Ikuo Kakehashi—a professional percussionist and sound designer for the aFrame.

Artware refers to the infusion of human and artistic sensibilities. It is only when Artware is combined with hardware and software that machines become true musical instruments [20]. More background information about the development of the aFrame can be accessed at the online link https://aframe.jp/story/.

The instrument’s development benefitted greatly from the input of select musicians, and since its release it has been embraced by a number of master percussionists, as illustrated by the variety of published videos online that demonstrate different setups and methods of performing (see aFrame #001 https://youtu.be/T2iyF1UV2f4 “ATV aFrame”).

Such methods also include examples of using external additional pedals to process sounds in real-time, as well as to enable other improvisational strategies, such as performing with self-created layers of multiple loops.

Playing the unit can be via strikes to the bamboo frame or the textured playing surface (drumhead). ATV recommends that sticks are not used, but the instrument’s sensitive contact microphones ensure that the sounds of percussive gestures made by the hands, fingers, and nails are captured in fine detail for further processing.

Beyond what many would use as percussion tools, those with a more experimental bent may explore a wide selection of methods to initiate textured input sounds, including small motor driven devices, inducers, soft drum brushes and woollen mallets etc.

The aFrame is provided with access to a multitude of preset tones that the user can play and manipulate, using a variety of gestural means to articulate the sounds (dynamic playing at the edge and centre, applying pressure to the surface, muting, etc.).

Each tone is programmed to respond in a unique way to the player’s input, so that it represents an entirely new sound world to explore.

This explorative experience underpins the authors’ hypothesis of usefulness within therapeutic contexts where social performing, fun, and enjoyment are typically paramount.

Furthermore, because the aFrame is equipped with a headphone output, it was posited that use by/with patients in hospital beds has great potential in music therapy because minimal disturbance to others would be optimized.

Alternatively, the collective use of the aFrame in drum circles, to explore communal melodic, harmonic and rhythmic percussion playing, has been proposed for trials across kindergartens/pre-schools, high-schools, universities, care homes for the elderly, establishments for differently-abled, and many other contexts.

Whilst these differing contexts are speculated as being receptive of this electrorganic instrument, it is within the domain of music therapy that the authors posit the
aFrame’s potential to have the most impact. This is because this context provides a suitable adaptable means to safely and optimally position the device for accessibility and inclusion for all.

20.9 European Music Therapy Conference (EMTC), Aalborg Denmark 2019 (See Brooks [3])

In line with the hypothesis that music therapists could benefit from the use of the aFrame electrorganic instrument in their practice, two units were showcased at the European Music Therapy Conference (EMTC) 2019 when hosted at the 20,000 square meter Musikkens Hus Aalborg (The House of Music), an architectural gem overlooking the ‘LimFjord’ (the body of water that cuts through Jutland) and the musical gathering point for Northern Denmark.

The first author established an exhibition under the collaboration of two departments of Aalborg University, namely the departments of (1) Learning and Philosophy, and (2) Architecture and Design: Media Technology (CREATE), for the EMTC 2019 event. Alongside this, a separate presentation of the device was given as a session in the program on ‘Aesthetic Resonance’ (see elsewhere in this chapter), which aligned to the theme of the event ‘Fields of Resonance’. The collaboration (between university departments 1 and 2) is operating as an outreach project under the direction of Xlab under Aalborg University. Xlab is an experience, experiment, and exploration laboratory located at the university’s main campus outside the city.

Xlab has a focus on researching professional development aligned to children’s creative engagement with technologies. The Xlab complex runs in-house workshops for teachers and instructors across education levels with academic research staff in attendance.

Children (and teachers) typically attend Xlab to engage in workshops aimed at facilitating testing, creativity, and play with the latest in interactive technologies. Activities, led by team-members, cover diverse areas such as robotics programming, claymation, music performance and composition, Virtual Reality, and more.

The Xlab exhibition at EMTC 2019 had a goal to present to attendees several contemporary alternative instruments (many MIDI based) for informal testing, first exposure, and evaluation. However, a special focus was placed on showcasing the aFrame units, given the Xlab team’s belief in the instrument’s potential applications in music therapy contexts, and also with them being non-MIDI devices (seemingly a preference among Danish music therapists). The most successful design would allow

8https://www.musictherapy.aau.dk/emtc19/.
9https://en.musikkenshus.dk/musikkens-hus/profil/om-musikkens-hus/.
10See more on the exhibition and outcomes in Brooks [3].
11MIDI (Musical Instrument Digital Interface) is a musical instrument signal protocol—see https://www.midi.org.
hands-on experiences, comparisons, and promote debate and discussions followed by interviews.

A further purpose of the exhibition was to challenge the preconceptions of organizers and attendees who typically delimit their practice to a preference of working with traditional instruments (according to interviews). This uncertainty and resistance towards technology found among certain therapists is speculated to arise from issues of access to new technology in their professional domains, coupled with a lack of suitable training and technical support. The exhibition targeted to offer such access and help sceptical attendees get over their technophobic reticence towards alternative instruments.

The exhibition exchanges resulted in a keen interest among attending music therapists in acquiring further information, and this was followed-up by mailing out further details on the aFrame and invitations for further contact.

Further public exhibitions of the aFrame were undertaken at the Danish Science Festival in October where, for its three days duration, the Xlab team operated a large stand in the foyer of the Aalborg University city campus, with academic staff once again promoting hands-on testing and collecting non-formal public feedback and interviews—attendees were notably across a wider age range and were occupationally more diverse—beyond solely music therapists:

The ambition of the Science Festival was to kindle a spark and breathe the curiosity of the young people who want to know more. (translated from Danish)

In addition to the public exhibition at the Danish Science Festival, the first author hosted a workshop at one of the main Musikkens Hus\textsuperscript{12} performance stage/auditoriums that was well attended by the public (including therapists, musicians, and their families). National television and radio stations covered the events and numerous external partners were involved in promoting the festival.

The aFrame was subsequently showcased at a regional educators day attended by approximately 450 teaching staff and school children.

Another exhibition was held at the 8th International Conference ArtsIT (Arts and Technology, Interactivity and Game Creation) collocated with the 3rd International Conference DLI (Design, Learning and Innovation), hosted over three days in November 2019. These two international conferences are affiliated to the European Alliance for Innovation (EAI) and steered and organised by the first author alongside the director of Xlab—professor Eva Brooks. Thus, the large foyer at Aalborg university city campus was again the venue, off which were three adjoining rooms for conference presentations. The foyer was also where all breaks and lunches were provided, thus proving an optimal area for offering hands-on demonstrations. Again, national television and radio covered the events.

On all occasions to date, evaluations on the potentials of the electrorganic aFrame across therapeutic and educational contexts were positive.

What seems clear from interviews is that in terms of the ‘tools of the trade’, music therapy in Denmark (and other countries) is struggling to stay in sync with

\textsuperscript{12}https://en.musikkenshus.dk/musikkens-hus/profil/om-musikkens-hus/.
a technologically-enabled society. This is unfortunate given the obvious practice benefits that even a limited adoption of new music technology might offer the therapist; Such as alternative play potentials supported by technical apparatus using different interfaces that open up new possibilities for accessibility and inclusion e.g. through instruments being played by breath, head, etc., as offered by non-traditional instruments/devices (e.g. see NIME literature as cited elsewhere in this chapter [23]).

Following such positive evaluations, and towards informing and giving access for music therapists to potential new ‘tools of the trade’, an approach was made to invite professional music therapists to undertake trials with their clients. Two female music therapists accepted inclusion in the explorative study, one in private practice and one in an Aalborg municipality environment.

The next section presents a report on the initial phase of the collaboration.

20.10 Proof of Concept and Feasibility Trials in Practice

To further the inquiry on the potentials for music therapists following the numerous rounds of public exposure, testing, and evaluation overviewed in the previous sections, two ATV aFrame units have, in February 2020, been loaned to the two professional music therapists in Aalborg, Denmark. A (non-formal) goal was discussed whereby the therapists are asked to collect notes in a diary of experiences—good and bad—as part of their ongoing routine of work with the instrument. They are also asked to explore the instrument themselves, alone and away from clients so as to have expertise to transition to their practices. A goal of this is for the therapists to reflect, critique, and discuss potentials for the aFrame to impact well-being and quality of life via inclusion in their music therapy practices.

On first handing over the two aFrames at one of the therapist’s locations, one therapist, who had attended EMTC 2019 and had tried the aFrame at the exhibition, was very excited and the other, who had not experienced the instrument previously (but had been informed by the first therapist), had a certain trepidation but was also very positive and excited about participating in the study.

Upon initial testing, the first reactions and evaluations from both therapists have been positive, with a great deal of interest and curiosity in the instrument being reported by a variety of their end-users across profile in ‘real’ sessions (many profoundly dysfunctional).

Findings point to how, for those clients who are wheelchair bound, the size of the aFrame has presented practical challenges for the therapists in mounting and positioning the unit in an appropriate manner to enable safe (without dropping) access to play.

The second author, a technical support engineer for the aFrame has advised the music therapists and researchers against tripod support due to the size and weight of the aFrame. The team are considering a solution that will fit onto a wheelchair table to support the electrorganic instrument—possibly a form of bean bag that can be
flexibly shaped to offer support alongside different positions, and therefore providing secure, safe locating and thus optimal operation as best-fit.

As a further step aimed to prevent accidental dropping of the unit, a ‘camera’ strap for each unit has been purchased and will be delivered to the music therapists to attach to each aFrame unit and to offer placement around a player’s neck.

Furthermore, to facilitate the end-user’s engagement and ability to ‘self-control’ tone selections, which each time necessitates the need to remove the unit from its support—turn it over—and change selected parameters—turn back—and reaffix to its support; the team are currently discussing and evaluating how best to use the foot switch unit that is sold as an add-on purchase for the aFrame (see Fig. 20.3-left). This targeting for (1) music therapist operation, and (2) optimising use according to an end-user’s functional abilities. In the case of (1), the music therapist can of course physically turn over and change parameters on the rear, however, this can of course disrupt ‘conduit’ contact between participants within a session and this can be a ‘play’ aspect where a change is made by the therapist to observe client reaction to a change. Thus, in the holistic body of work behind this study, a flexible and modular system approach is targeted to tailor and adapt for individual profiles toward optimised experiences. This approach also empowers therapists to be creative in their experimental interventions.

To date, two switches that are typically associated with handicapped end-users, which enable light pressure to trigger a change, have been tested to good effect (see Fig. 20.3-right). The purpose of additional switches is toward promoting a sense of self-ownership whereby the client, as much as possible, is empowered to self-change parameters. This is again toward increasing the sense of self-agency and self-efficacy for the client toward optimising experience. Another discussed topic is a play context involving multiple clients, where one performs on the aFrame whilst another can change sounds (see next section for how this may function).

Beyond these feedbacks, the impact of the Covid-19 pandemic in Denmark prevented extended trials and limited live music therapy sessions. The music therapists informed the team that they took the aFrame instruments home to spend time
exploring the tone bands, with the intention of developing their competences in being able to transfer to practices.

20.10.1 Next Steps—A Speculation

ATV Corporation has developed a companion software editor for the aFrame Fig. 20.4 that can be downloaded. This tool allows fine-tuning of parameters to modify, program, and organise aFrame tones on a computer screen as opposed to working physically with the aFrame’s rear panel controls and small LED screen (via the electronic sound module knobs and buttons). The editor software connects to the aFrame via wired USB.

Persons (clients) diagnosed as handicapped, who are profoundly physical dysfunctional, are empowered to use personal computers via different functioning technological controllers. These controllers include ‘alternative mouse devices’ where for example, small motions, such as sensed by an eye-movement device with ‘dwell click’ function, is used by severely handicapped end-users.

In instances where a person with such profound dysfunction wishes to be included in a music-making session, it may be possible to empower that person to change and manipulate sounds whilst another person physically performs in playing the aFrame instrument. This builds upon prior multiple user-research where for example 5-V music rocker pedals and other physical controllers are used to directly manipulate audio signals or, via translators (to MIDI or to DMX 512), to manipulate digital

Fig. 20.4 aFrame software editor and patch changer (with permission ATV Corporation)
signals that effect audio signals (or other devices impacting other feedback stimuli) (e.g. see [2]).

20.11 Conclusion

This chapter details on the basic technical aspects and music-making affordances of the aFrame electrorganic musical instrument. It informs on the background of the realisation of the device and suggests the engineering complexity behind what can be played as a simple musical instrument. Highlighted is how the aFrame experience aligns to that of a traditional acoustic musical instrument—a frame drum. Through this, a hypothesis originating in this research is of how it can contribute to a discipline focused upon music therapeutic intervention. This chapter builds incrementally upon reported trials throughout 2019 that focused on hands-on testing by professionals and possible end-users across profiles of function and age (—as reported in [3]). It builds upon what was an earlier short article that briefly introduced the first author’s concept behind the explorative study having a focus upon sharing of music therapists’ first reactions from hands-on experience of both MIDI controllers and the electrorganic aFrame. This chapter details the aFrame, which was found to be preferred by music therapists, musicians, and teachers, as reported earlier (ibid.). Expert input by the second author elaborates on the history and detail of the aFrame.

Literature on use of the aFrame, or any other similarly conceived electrorganic musical instruments (if they exist), in music therapy was not discovered because, to the authors’ knowledge, electroacoustic instruments such as the aFrame have never been used in music therapy anywhere in the world. There is no literature that can be cited to argue such use and thus this work in progress is seen as avant-garde in advancing the field to explore such new opportunities for therapists.

It is predicted that there will be numerous experiments and explorations within the testing phase of the studies with the electrorganic aFrame so as to determine best-fit scenarios, while working towards developing an implementation and training protocol to support music therapists in practice. This is envisaged to begin in Denmark and from there to collaborate internationally with interested researchers and practitioners.

The team behind this work-in-progress is excited to report on the initial phases of the study and is looking positively towards producing future reports on the proof of concept and feasibility that are anticipating as potentially disrupting the field in a positive manner. Subsequent publications will thus report on use in the field and the development of use-methods as applicable.

It is worthy of mention that in instances where end-users may not be optimally stimulated via the auditory channel, the audio signals output from the aFrame can be routed and processed by a visual synthesiser to generate audio-visual correspondences that may stimulate an end-user’s visual channel. The rich soundscapes generated by the aFrame lends the instrument to an exciting potential pairing with a visual synthesizer.
Interested researchers or therapists (music- or otherwise) are welcome to contact either author should they be interested in further information or uptake leading towards a similar study.

To close it is posited that future work will include analysis built upon the first phases of therapist-based (practice-evaluation) input as reported herein. Accordingly, the authors will seek to evolve their research objectives with the aim of maximizing benefits to end-users in ways that are inclusive of their various creative endeavours, whether it be performing and/or composing music, or just finding a way to relax. As reflected in this chapter’s related research, evidence is reported in the literature of how non-formal enjoyable and fun recreational and leisure activities can have underlayers that target formal therapeutic benefit. It is clear that technological solutions can enable more tailoring and adaption to specific individual needs, requirements and preferences in order to motivate activities. Additionally, such solutions can increase accessibility and improve inclusion whilst offering ‘measurable’ outcomes if that is the targeted outcome associated to end-user benefit.

Accepting the obvious need to support the individuated goals of therapy across cases, the authors will always remain focused on a more general goal: To find ways to improve the quality-of-life of people (individual and communities) through interactive technologies, particularly for those considered as differently-abled. In this spirit, the authors consider the electrorganic aFrame to be an inclusive musical instrument that holds vast potential to elevate the well-being of those who use it.

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