SONIC PALETTE

AN EXPERIMENTAL EXPLORATION FOR INCLUSIVE FASHION PRACTICES

VIDMINA STASIULYTĖ
University of Borås, The Swedish School of Textiles
vidmina.stasiulyte@hb.se
Orcid 0000-0002-3016-0879

Copyright: © Author(s). This is an open access, peer-reviewed article published by Firenze University Press and distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Data Availability Statement: All relevant data are within the paper and its Supporting Information files.
Competing Interests: The Author(s) declare(s) no conflict of interest
DOI: https://doi.org/10.36253/fh-3108

Abstract

We have a palette of colors, but what if we take sounds as a starting point for designing practice? What could be a sonic palette for sonic wear? This paper introduces new ways of thinking with the body in time and space as a sonic composition. It presents experimental research on fabricating sonic material using 3D printing on textiles technique for developing different sonic expressions as musical notes. This experimental *Sonic Palette* is seen as a way of bringing awareness about otherness, and commonness with those with visual impairment while exploring alternative possibilities and unusual approaches to materials. *Sonic Palette* introduces a new experience of wearing, nonetheless, it suggests an experimental language, extended vocabulary, and expressions in the field of fashion and textile design. Aesthetics of interaction and experience rather than aesthetics of appearance propose considering garments as musical composition and musical instruments. The expansion of sensory plentitude and expressiveness of materials with non-visual, experience-based, and time-based expressions is an example of inclusive ways of thinking, designing, and presenting fashion for example for those with diverse visual abilities.

Keywords: *Experimental aesthetics, Sonic fashion, Sonic palette, Inclusive fashion practices, Alternative materials and design methods*

BACKGROUND

"*Sometimes I want to avoid using my white cane as it has a negative association with regard to my blindness. Then I am wearing a polyester sport jacket and walking in the city; it makes a lot of sounds so I can echolocate. Or I am following a person with high heels and this person becomes my guide even without knowing it!*"
From the interview with research participant, June 2017, Vilnius, Lithuania

FASHION ACOUSTICS

In the majority of fashion research, fashion is considered and approached from visual perspectives. Such aspects are generally over-represented in mainstream perspectives on fashion. However, which other layers constitute identity? Although identity in fashion is visually dominated, sound adds another layer and can be considered to be another part of the construct of the self. If you close your eyes you can hear people talking, breathing, walking, etc. Fashion also comes into play: the bouncing of metal bracelets is audible as an arm moves, as are the zipping or unzipping of a synthetic sports jacket, electrostatic rasp of someone taking off a knitted sweater during winter, clacking of high heels and squeaking of sneakers (reference left blank for anonymous submission). The steps of individual people are identifiable aurally due to their gait. We seldom think about the 'voice' of materials and garments, and yet the diversity of their sonic expressions is unique and inspiring. The sonic expressions created by brushing, rubbing, pulling, pressing, stretching, etc. fabrics provide a rich sound world that is capable of focusing our ear on a deep level of attention to detail (Beilharz & Vande Moere, 2008). "The squeaking of silk, the crackling of faille, the rubbing of wool, the purring of velvet, without mentioning the tinkling of embroideries are all different sounds made by fabrics, in movement" (Ibid., p. 112). The investigation into sonic expressions began with this potentially interesting area of material exploration moving towards the field of sonic fashion in order to find new research methods, suggest alternative approaches to fashion, and propose fundamental knowledge.

SOUND IN FASHION AND TEXTILE DESIGN

Research into sonic form and expression in the field of design demonstrates that sound is generally used in the context of industrial and product design; product sounds are often tackled within the fields of engineering and acoustics (Lemaitre et al., 2010; Özcan & Van Egmond, 2006; Zetterblom, 2008) or in the context of interaction design (Franinović & Serafin, 2013; Frauenberger & Stockman, 2009; Hermann et al., 2011). For a long time, sounds emitted by products have been regarded as noise, and therefore as undesirable product features that should be reduced or eliminated. The implications for sound design relate to the natural tendency of product designers to analyze the 'sound problem' in isolation from other product properties, leading to sound being considered mainly as a secondary quality in design processes (reference left blank for anonymous submission). Due to the fact that the visual aspects of a product are considered to dominate the communication of the desired product concept, sound is generally expected to fit the visual character of a product. In *Basic Semantics of Product Sounds* (Özcan & van Egmond, 2012), Özcan and van Egmond claim that designers lack tools with which to model sound. When sound is applied in the field of fashion design, it is usually in the context of smart textiles or soft wearables (Berglin, 2013; Dumitrescu, 2013; Tomico & Wilde, 2015) and used to provide an additional property in the form of digital/artificial sound. The embedding of sound-emitting elements in textiles/garments (Ma, 2017; Murray-Leslie, 2014; Paiva et al., 2015; Pesonen et al., 2015) is used in many research projects. Natural sounds (the sounds that are inherent in the materials) are relatively rarely discussed in relation to fashion. In fashion theory sound is generally presented as an additional part of dress, as in the book *Geisha* (Dalby, 2008). In *Dress Sense: Emotional and Sensory Experiences of the Body and Clothes sound* (Foster & Johnson, 2007), Welters (Welters, 1995) dedicates a chapter to Greek dress, focusing not only on the visual but also on the sonic. In a chapter entitled *The Classification System of Dress* (Eicher et al., 2008), authors consider sound to be a component of dress. The text focuses on the sonic properties of dress and several examples are provided, relating largely to the sounds of steps in different footwear and the sounds of the body itself. The discourse on Sonic Fashion does not exist, it is a new discipline to consider for the education in the field of fashion. It is an interdisciplinary project that merges fashion design, sound phenomenology, and performance art into an experimental and unique discipline—Sonic Fashion.

SONIC FASHION

The artistic research project Sonic Fashion investigates and develops the foundations for the Sonic Fashion that is unique to the fashion field. The primary foundational theory on Sonic Fashion was introduced for the first time in the fashion field within the PhD research (reference left blank for anonymous submission). While developing this first primary theory for Sonic Fashion, the main focus was on developing alternative methods for introducing, designing and presenting sonic expressions for building the foundations for further research. To develop the mentioned methods, there were a series examples made of sonic garments and accessories that were assembled from different found materials. As the materials used for fashion are based on visuality, it was difficult to find textiles that would make sound, thus, alternative ones were used, such as materials for building and advertisement. It identified a gap in the field that could be filled with the new foundations on Sonic Textiles and Sonic Wear. Therefore, this research project puts the main focus on developing the original sonic textiles that would be later applied for designing sonic wear. By composing the sonic textiles into garments, the sonic silhouettes will be created as a music composition that is a novel approach to the dressed body.

The main contribution of this research project, such as the palette of sonic textiles, vocabulary for sonic expressions, design methods and tools, will expand the knowledge in the fashion design field and even beyond it. This paper presents primary experiments and introduces them as sound-based thinking and designing practices and it works as a suggestion and alternative proposition for inclusive fashion and textile design practices. During the previous research, the project leader developed the foundational theory (reference left blank for anonymous submission), methods for designing with non-visual materials, a toolkit of sensorial objects—Sound to Wear, and the digital platform—Sonic Fashion Library, which all serve as a basis for the research project Sonic Fashion. The toolkit Sound to Wear was revised and several possible directions for this research were found, such as layering objects on each other, composing objects on the surface, using abrasive surfaces, and adding long bouncing details [Fig. 1]. Few tests were done with 3D printing, thus, showed a big potential for embedding the mentioned ideas for designing novel sonic textiles as the technology is flexible and suitable for developing various abrasive surfaces, designing shapes, choosing different filaments, and filling percentage of shapes—that all could influence the sounding expression. The 3D printing technology in the field of fashion is mainly used for the development of visual designs (Chan et al., 2020; Fanglan & Kaifa, 2021); 3D printing has not been used yet to create natural sounds with textiles in relation to sonic fashion, thus, it opens the potential for new application within technology. Therefore, the 3D printing on textiles technology was chosen as the main one for fabricating and developing sonic material that will suggest the Sonic Palette for creating sonic wear (Fig.01).

RELATIONS AND INTERACTIONS: ACTING BODY AND REACTING MATERIAL

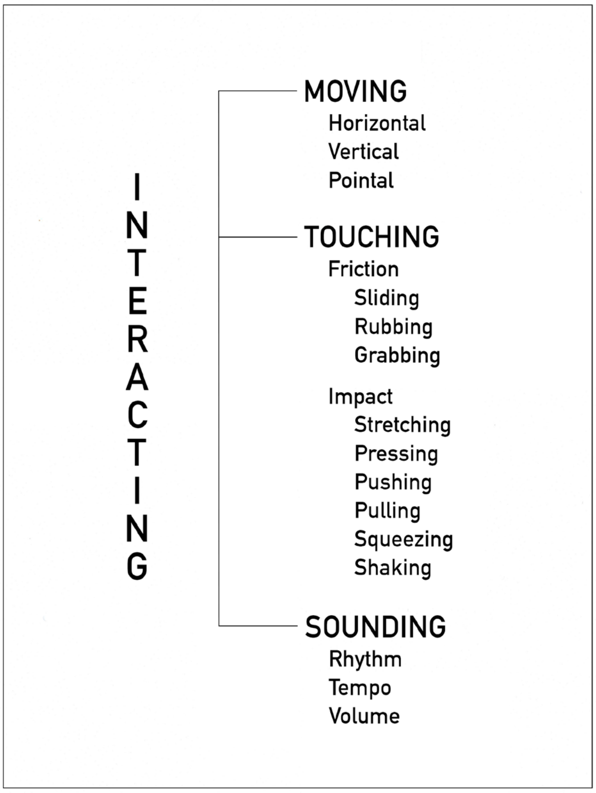
In Sonic Fashion, the dressed body is considered to be a sonic form that consists of temporal properties and temporal composition. Looking at and listening to a body wearing high heels are fundamentally different experiences (reference left blank for anonymous submission). Thus, from an auditory perspective, the dressed body is understood as a dynamic, temporal form, rather than a static one, as it is in visual representation (e.g. photograph). The shift of focus—from visual to audial—thus constitutes a reorientation in terms of design thinking and design modes to ones based primarily on sound. Temporality and changeability over time and linear sequences in which an artwork/object enfolds over time are the main features with regard to composition and expression (Levinson & Alperson, 1991). In a worn sonic composition, just like with an instrument, different body acts result in different material sonic expressions. Hence, the movement of the body is a potential source for sonic expressions to happen. This 'meeting point' between an acting body and reacting material becomes the main focus for how the methodology on the sonic wear is developed. The relation of body-dress that is in focus for the investigation could be unfolded into a threefold interaction of moving-touching that results in sounding. These three different interactions – moving-touching-sounding – are the basis of ideating and fabricating the primary palette of sonic textiles (Fig. 2).

MOVING: HORIZONTAL, VERTICAL AND POINTAL

The relational interactions of body-dress could be described as re-action: the body movement activates: through this kinetic-tactile action — and the dress responds as a sound. There are various ways we interact with dress. The main wearing act in the context of the everyday performativity of a dressed body is walking, which means that sonic expressions are defined by vertical movements of the arms and legs. These movements occur in conjunction with a part on the opposite side of the body, in the words of Von Laban (1966, p. 21) — "contralateral". As well, vertical movement includes lifting or bending the arm/leg which could result in sliding, or rubbing the materials of the dress. Horizontal movement involves the body parts moving along the horizontal axis, such as rotating head, moving arm(s) or/and legs horizontally, and rotating feet/foot. Pointal movement refers to the movement of joints that are rotation and bending-based and result in the tactile interaction of shaking, pressing, and squeezing material of the dress.

Figure 03 introduces an experiment with designed sound-tools worn on the body. Each sound-tool 1-5 has a different sonic expression and is designed for a specific body act. The experiment is based on analyzing the complexity of a sonic silhouette. This sonic complexity is exemplified by the designed sounding body-objects for specific actions: lifting and lowering the arm, walking, shaking, and rotating/swinging the head [Fig. 3a]. The image identifies the spatial

Fig. 01



INTERACTING
MOVING
Horizontal
Vertical
Pointal
TOUCHING
Friction
Sliding
Rubbing
Grabbing
Impact
Stretching
Pressing
Pushing
Pulling
Squeezing
Shaking
SOUNDING
Rhythm
Tempo
Volume

Fig. 02

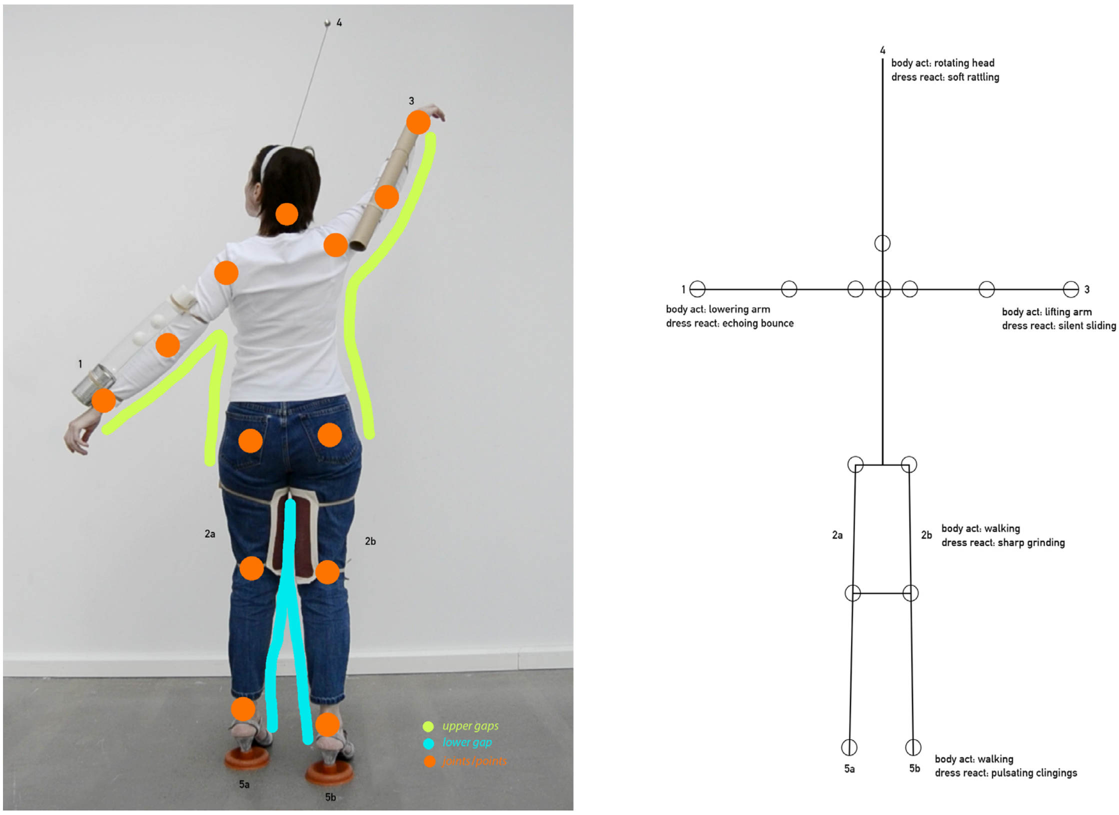


Fig. 03

relation of the location of the sound-tools that are activated through movement. The main 'sound clusters' are situated around the feet, "upper gaps" (space between the arms and waist), "lower gap" (space between the legs), and above the head. The exemplified sketch of sound embodiment suggests possible sonic expressions that could be designed in relation to movement and touch (body-to-material and material-to-material): rotating head will sound like a soft rattling, lifting or lowering the arm could result in silent sliding or echoing bounce, walking could elicit a sound of sharp grinding and pulsating clingings (Fig. 3). The sonic expression of the moving body involves different tactile interactions, such as friction and impact and could be expressed differently over time, in different rhythms, tempos and volume. The tactile and sonic aspects are introduced in more detail in the following subchapter.

Touching: Friction and Impact

Many of the sounds we hear in the everyday world involve the friction of one material moving against or impacting another. Similarly, body movement results in contact sounds resulting from friction and impact. Sound is transformed in the same way as material changes as it moves, depending on the kind of surfaces' tactile-kinetic interactions that take place. The sonic expression of a surface varies if it is e.g. rubbed or squeezed. Therefore, the surface of a material is crucial to its sonic expression. Tapping an object, placing it against another, letting one fall—all of these actions involve impact sounds. Impacts are basic events in the sense that they are produced by a simple interaction of objects; combinations of impacts may produce more complex events such as footsteps or the bouncing noises of details. The interactions and materials that make up sonic events are relatively independent of one another: "The interaction type could be very different in sonic expression: hitting, tapping, scraping the same object could be different in relation to sound. […] the series of impacts may be modeled as a continuous waveform describing the forces on the object". (Gaver, 1993a)

The body-dress tactile interaction can be frictional and involve sliding, rubbing, or grabbing; meanwhile, the impacts on materials can contain stretching, pressing, pushing, pulling, squeezing, and shaking (reference left blank for anonymous submission). The previous study on everyday actions of wearing and (un)dressing demonstrated the main tactile interactions, such as sliding, rubbing, stretching, pressing, pushing, pulling, squeezing and shaking, which could be grouped into (i) friction and (ii) impact sounds and can be summarized as follows. (Reference left blank for anonymous submission).

The summarized tactile-kinetic interaction types during wearing:

Friction: sliding, rubbing, grabbing

- material-material interaction: sliding, rubbing;
- body-material interaction: sliding, grabbing.

Impact: pressing, squeezing

- material-material interaction: squeezing;
- body-material interaction: pressing, squeezing.

The summarized tactile-kinetic interaction types during (un)dressing:

Friction: sliding, rubbing, grabbing

- material-material: sliding, rubbing;
- body-material: sliding, grabbing.

Impact: pressing, squeezing, pushing, pulling, stretching

- material-material: pressing, squeezing;
- body-material: pressing, squeezing, stretching, pushing, pulling, shaking.

Sounding: Rhythm, Tempo and Volume

Sounding can be influenced by rhythm, tempo, and volume. In simple terms, tempo is how fast or slow a piece of music (in this case, the sound of material) is performed, while rhythm is the placement of sounds in time, in a regular and repeated pattern. Tempo generally is measured as the number of beats per minute, where the beat is the basic measure of time in music. Meanwhile, rhythm can be thought of as the pattern of sonic composition in time. Volume is the perception of loudness based on the intensity of a sound wave. The higher the intensity of a sound, the louder it is perceived and the higher the volume it has. Volume could be described by the loudest emitted sound—the true peak. These three main characteristics of sound are significant to mind when ideating and designing sonic textiles as it can differ and bring intriguing sonic expressions. When designing a sonic palette, designers could think about the pattern of 3D print as it would result in a different rhythm and, thus, the location on the body would inform the tempo of how the sound is 'played'. Also, the volume could be designed while fabricating the 3D print, e.g. varying the size, thickness or/and length of the 3D printed structures.

SONIC PALETTE

3D printing on textiles for fabricating sound expressions is a new material experience that was not researched before. Designing with a new application of already existing technology allows the designer/researcher to define the applications through "unique user experiences, identities for materials and new meanings may be introduced" (Karana et al., 2015, p. 39). The investigation starts by developing textiles with a single sonic expression as small-scale samples. The 3D prints were designed by research project Sonic Fashion participant, textile engineer Dr. Razieh Hashemi Sanatgar by using the Rhino 3D design program and 3D printed with Prusa 3D printer. The tests were printed on the net-like textile with the intention that they would later be used as a textile for upscaled sonic garments. The examples were 3D printed with Polylactic Acid (PLA) filament and PLA composites. Polylactic Acid filament is a recyclable, natural thermoplastic polyester that is derived from renewable resources such as corn starch or sugar cane. The main geometric form – tube – was selected for the first examples for to make comparison and analysis easier.

The very first primary exploration for possible sonic textiles by 3D printing on textiles started with 5 different filaments: 1) PLA (Polylactic acid), 2) PLA with copper, 3) PLA with wood, 4) PLA with carbon, and 5) PLA with steel. Within the mentioned filaments the different density level of the tubes (the percentage of 3D print infill) was investigated while using 2 filaments: 1) PLA with copper and 2) PLA with carbon filaments.

Primary examples of sonic textiles:

Example 1: PLA with carbon, hollow tubes (0% infill);
Example 2: PLA, solid tubes (100% infill);
Example 3: PLA with carbon, solid tubes (100% infill);
Example 4: PLA with steel, solid tubes (100% infill);
Example 5: PLA with wood, solid tubes (100% infill);
Example 6: PLA with copper, hollow tubes (0% infill).

Three examples were sounding similarly and the other three tests were making different pitch sounds. The two chromatic tuners were used to test the sound frequency: Chromatic Tuner A (Fig. 1a, Chromatic Tuner A) and Chromatic Tuner

B (Fig. 1b, Chromatic Tuner B). The examples 1, 2 and 3 have different pitch: F#, G# and D#; the examples 4-6 have the same pitch: D#. As presented in Figure 4, example 1 and example 6 have the same geometry - tubes - and both 3D prints are hollow (0% of filling), however, the pitch is different (respectively F# and D#) due to the different components of the filament: example 1 was printed with the composite of PLA and carbon and example 2 was printed with the composite of PLA and copper. The density of the 3D print (percentage of infill) can affect the pitch of the sound as well examples 1 and 3 demonstrate it: both examples are printed with the same filament composite (PLA with carbon), the same geometry, but the musical note of the examples are different: example 1 is F# and example 3 is G#. Hence, the idea of creating sonic textiles that have various notes/pitches shows an exciting potential for the development of the Sonic Palette. The collection of various sonic textiles that sound differently could be potentially interesting for making a sonic garment as a sonic composition. The next step could be to try various shapes and density levels that could influence the sound of textiles. As well, these examples of a *monophonic expression* when the textile has one sound could be further developed into a *polyphonic expression* when several different sounds are composed onto one textile. The examples presented here are the primary examples of testing the idea of the Sonic Palette that will be further developed within the research project Sonic Fashion into Sonic Wear (Fig. 04).

CONCLUSIONS

The paper introduced the experimental approach to textile and fashion field while focusing on auditory qualities and aesthetics of design expressions. This kind of sonic-thinking is introduced by bringing in 'material thinking' (Karana et al., 2008), experience-oriented perspective, experiential interaction design (Su & Liang, 2013) and soma design methodology (Tsaknaki et al., 2019). It extends the expressiveness of materials in regards the multisensory expression: "soma design requires training your ability to aesthetically appreciate through all your senses, but also to imagine — through your senses, movements and material encounters — what could be." (Tsaknaki et al., 2019, p. 1237). This radical creative experiment challenges the field of fashion and textile design towards more inclusive design practices at the expense of sensory plenitude. The cultivation of sensibility and inclusivity in fashion and textile design education suggests alternative approaches, design methods and original time-based expressions, such as sonic ones. There is a limitation regarding the fashion vocabulary as it is very based on the visual appearance. This experimental fashion aesthetics, which is based on interaction and experience rather than aesthetics of appearance, broadens the vocabulary by expanding it with sonic expressions and proposing the 'titles' of new 'colours' for fashion, for instance, soft rattling, silent sliding, echoing bouncing, sharp grinding, pulsating clingings, etc. It opens up for a unique sonic vocabulary for fashion and textiles that is a significant contribution to the field.

Thinking and designing with sound proposes different design variables, such as symmetry/asymmetry, volume intensities (silent-loud), location of the sound in connection to the body part that will be moved, the directionality of sound, etc. There are various properties to think about when designing the sound, for example, the configuration of an object — its shape and size. Size determines the lowest-frequency vibrations that an object can make: large objects tend to make lower sounds than small ones. The shape of an object determines the frequency and spectral patterns produced (Gaver, 1993b). The internal structure of a material, e.g. density level has complex effects on its vibration, particularly in the temporal domain (Ibid.). When designing the pattern for the 3D sonic print it is important to consider the pattern of it as it influences the rhythm and tempo of the sonic expression. As well, the material of 3D print is significant for fabricating the designs: different composites of filaments will result in different sonic expression. All of these mentioned sonic properties introduce the potential ideas for design methods to evolve that would serve as a foundational practice for inclusive fashion design practices.

The primary study on Sonic Palette that is presented within this publication introduces the ideating process and proposes various design variables for designing with sound. The three main characteristics of sound (tempo, rhythm, volume) are significant to mind when ideating and designing sonic textiles as it can differ and bring intriguing sonic expressions. When designing a sonic palette, designers could think about the pattern of 3D print as it would result in a different

Fig. 04

rhythm and, thus, the location on the body would inform the tempo of how the sound is 'played'. As well, the volume could be designed while fabricating the 3D print, e.g. varying the size, thickness or /and length of the 3D printed structures. Thus, the process of sound-based design thinking and ideating originates from the act of a moving body and reacting textile, as well as locating the sound on the body in relation to its activation form: e.g. horizontal sliding, vertical rubbing, pointal shaking, etc. This kind of 'sonic-thinking' introduces a unique way of exploring textiles and fashion and suggests new methods for designing garments as a sonic composition.

The research on Sonic Fashion is an example of how we as designers and design researchers/educators could train and expand our preconceptions of what dress could be, suggests new design methods, and broadens vocabulary for aesthetic expressions. While diving into this contrast dimension (from vision to sound) and expanding thinking and experiencing fashion through listening practices, e.g. through listening to sonic textiles, one becomes each time more sensitive for different sonic nuances. As Latour (2004) noted: "<...> the more contrasts you add, the more differences and mediations you become sensible to." By taking this radical approach to such a visual field as fashion, the aim is to encourage the students, peers, and design professionals to try different methods and more inclusive aesthetic expressions. An investigation into sonic expressions is seen as a disruptive fashion practice: it explores how critical fashion practices can construct more inclusive understanding and alternative creative practices. It is an experimental artistic example of the cultivation of sensibility and inclusivity in the field of fashion design and beyond it in order to develop the ideas of multi-faceted shared well-being. This paper introduces an alternative approach to fashion to think and design garments as invisible, time-and-interaction-based expressions while developing an alternative palette of sounds rather than colors. In this way, the aesthetic expressions are available to engage and experience for a broader community such as for those with visual impairment.

ACKNOWLEDGMENTS

The project is funded by the Swedish Research Council, grant agreement ID: 2021-01399.

CAPTIONS

[Fig. 01] Vidmina Stasiulytė; Revising the Ph.D. research Sound to Wear toolkit for potential ideas for sonic textiles: a. layering objects on each other, b. composing objects on the surface, c. using abrasive surfaces, d. adding long bouncing details. Image credits: a. Jan Tepe, b. Vidmina Stasiulytė, c. Faseeh Saleem, d. Jan Tepe. PhD research funded by the European Union's Horizon 2020 Research and Innovation program under the Marie Sklodowska-Curie grant agreement No. 642328.

[Fig. 02] Vidmina Stasiulytė; Sonic design variables of kinetic-haptic-sonic interaction: moving, touching and sounding. (Stasiulyte, 2020).

[Fig. 03] Vidmina Stasiulytė; a) Analysis of relations between moving body and sounding material through an ensemble of dress/sound-tools, and b) a schematic representation of the body and dress (Stasiulyte, 2020).

[Fig. 04] Vidmina Stasiulytė (author), Razieh (3D designer); Research project Sonic Fashion, funded by The Swedish Research Council, grant agreement ID: 2021-01399; Image taken and compiled by Vidmina Stasiulytė.

REFERENCES

Beilharz, K., & Vande Moere, A. (2008). Sonic drapery as a folding metaphor for a wearable visualization and sonification display. Visual Communication, 7(3), 271–290.

Berglin, L. (2013). Smart textiles and wearable technology. Högskolan i Borås.

Chan, I., Au, J., Ho, C., & Lam, J. (2020). Creation of 3D printed fashion prototype with multi-coloured texture: A practice-based approach. International Journal of Fashion Design, Technology and Education, 1–13.

Dalby, L. (2008). Geisha: Updated with a New Preface. Univ of California Press.

Dumitrescu, D. (2013). Relational textiles: Surface expressions in space design [PhD Thesis]. University of Borås.

Eicher, J. B., Evenson, S. L., & Lutz, H. A. (2008). The Visible Self: Global Perspectives on Dress, Culture, and Society (3 edition). Fairchild Books.

Fanglan, Z., & Kaifa, D. (2021). Innovative application of 3D printing technology in Fashion design. Journal of Physics: Conference Series, 1790(1), 012030.

Foster, H. B., & Johnson, D. C. (Eds.). (2007). Dress Sense: The Emotional and Sensory Experience of Clothes. Bloomsbury Academic.

Franinović, K., & Serafin, S. (2013). Sonic interaction design. Mit Press.

Frauenberger, C., & Stockman, T. (2009). Auditory display design—An investigation of a design pattern approach. International Journal of Human-Computer Studies, 67(11), 907–922.

Gaver, W. W. (1993a). How do we hear in the world? Explorations in ecological acoustics. Ecological Psychology, 5(4), 285–313.

Gaver, W. W. (1993b). What in the world do we hear?: An ecological approach to auditory event perception. Ecological Psychology, 5(1), 1–29.

Hermann, T., Hunt, A., & Neuhoff, J. G. (2011). The sonification handbook. Logos Verlag Berlin.

Karana, E., Barati, B., Rognoli, V., & Zeeuw Van Der Laan, A. (2015). Material driven design (MDD): A method to design for material experiences.

Karana, E., Hekkert, P., & Kandachar, P. (2008). Materials experience: Descriptive categories in material appraisals. Seventh International Symposium on Tools and Methods of Competitive Engineering (TMCE 2008), 399–412.

Latour, B. (2004). How to talk about the body? The normative dimension of science studies. Body & Society, 10(2–3), 205–229.

Lemaitre, G., Houix, O., Misdariis, N., & Susini, P. (2010). Listener expertise and sound identification influence the categorization of environmental sounds. Journal of Experimental Psychology: Applied, 16(1), 16.

Levinson, J., & Alperson, P. (1991). What Is a Temporal Art? Midwest Studies in Philosophy, 16, 439–450.

Ma, J. J. (2017). Dress-scape: Wearing the sound of fashion [PhD Thesis]. Royal College of Art.

Murray-Leslie, A. (2014). Fashion acoustics: Synthesizing wearable electronics and digital musical instruments for performance. Critical Studies in Fashion & Beauty, 5(1).

Ozcan, E., & Van Egmond, R. (2006). Product sound design and application: An overview. Proceedings of the Fifth International Conference on Desing and Emotion, Gothenburg. https://www.researchgate.net/profile/Elif_Oezcan/publication/224927472_Product_Sound_Design_and_Application_An_Overview/links/578e034708ae81b4466eb2c1.pdf

Özcan, E., & van Egmond, R. (2012). Basic semantics of product sounds. International Journal of Design, 6(2). http://search.proquest.com/openview/0a3ee7412fe288d509a4e907690cb6b9/1?pq-origsite=gscholar

Paiva, A., Catarino, A. P., Cabral, I., & Carvalho, H. (2015). Noise: Sound reactive fashion.

Pesonen, L., Wikström, V., & Mikkonen, J. (2015). A collaborative development of an artistic responsive fashion collection. Critical Studies in Fashion & Beauty, 6(1), 95–119.

Su, C.-S., & Liang, R.-H. (2013). Designing for resonance by evocative objects: An experiential interaction design method. International Conference of Design, User Experience, and Usability, 610–619.

Tomico, O., & Wilde, D. (2015). Soft, Embodied, Situated & Connected. Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct, 1179–1186. http://dl.acm.org/citation.cfm?id=2794351

Tsaknaki, V., Balaam, M., St\aahl, A., Sanches, P., Windlin, C., Karpashevich, P., & Höök, K. (2019). Teaching Soma Design. Proceedings of the 2019 on Designing Interactive Systems Conference, 1237–1249.

Von Laban, R. (1966). Choreutics. London: Macdonald & Evans.

Welters, L. (1995). Ethnicity in Greek dress. Dress and Ethnicity, 53–78.

Zetterblom, M. (2008). Textile sound design [PhD Thesis]. Department of Computer Science and Engineering, Chalmers University