Playful Somaesthetic Technology Practices
Characteristics, Conditions, and Frameworks across Arts, Games, and Augmentation

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Abstract: *This paper explores playful instances of somaesthetic technology practices. Based on a multiple case study strategy, a preliminary framework will be provided for playfulness in technology practices which are focused on somaesthetic experience, appreciation, and transformation. To illustrate the understanding of playful somaesthetic technology practices, three selected cases are introduced (Alternative Game Controllers, Medical Performance Art, Human Tail Augmentations), their playful features defined, and their conditions of practice analysed.*

Keywords: *Technology Practice; Design; Somaesthetics; Playfulness; Alternative Game Controllers;Tail Prosthetics; Medical Performance Art.*

1. Introduction

Playfulness is a reappearing term within the discourse on technology practices, typically relating to playfulness as a tool for heightening motivation, productivity, and acceptance of novelty (Abend, Fuchs, & Wenz, 2021; Moon & Kim, 2001). Meanwhile, playful technology practices related to intrinsic user motivation and not primarily concerned with extrinsic outcomes are lesser explored phenomena.

Within this paper, such practices will be centered, with a special focus on aesthetic-oriented practices which connect the appearance of playfulness across games, art, design, and the progressing enhancement of human bodies: *playful somaesthetic technology practices* (PSTP).

This research is aimed at defining the underlying frameworks of those playful technology practices and analyzing the specific conditions of practice evident. Primarily drawing from the field of arts, experimental game design, and artistic design for technological playful activity, cases are selected from fields characterized by their enabling of playful practices involving both real and simulated technologies and explorative behavior.

This specific focus is based on the assumption that experimental technology practices focused primarily on somatic experience provide a framework highly different from the dominant perspective of enhancement as repair or optimization and the connected view on relevance and productivity (Beloff, 2014, p. 59).

All analyzed areas of practice primarily center the somatic experience of the developer/user, unfamiliar interactions, aesthetic qualities of technology, questions of human enhancement, and use of technologies/technological concepts outside their typical field of application.

Three selected case areas of PSTP are introduced in the following, with a focus on development and user interaction, different types of somatic enhancement and activation, as well as the transformation and recontextualization of practices and frameworks.

a) Alternative Game Controllers (AGC): instances of design within a field characterized by playful interaction, disrupting familiar embodied interaction modes of users and modifying somatic experiences of play.
b) Medical Simulation Art (MSA): a field of playful negotiation of medical technologies, adopting practice fragments typically considered as "serious" and recontextualizing those for explorative and reflective purposes, typically focusing on strong somatic activation through sensory elements.
c) Tail prosthetics: instances of playful prosthetics and the appearance of playful practices in larger frameworks typically considered as serious (e.g., institutional prototyping), typically focused on the extension and modification of the somatic state of users.

Within this paper, the objective is to map out the specific aspects and conditions of playful technology practice, based on those selected case areas. Based on a general framework of somatic and playful technology practices, the specific conditions, frameworks, and characteristics of PSTP will be located.

2. Framework

First, the concepts of technology practice, somaesthetic practices, playfulness and their combination in the specific understanding here applied need to be introduced.

Technology Practice: The general definition of technology practice is based on considering the influence of social, cultural, non-institutional, and material aspects on production, application, and reflection of technology (Ghoshal, Mendhekar, & Bruckman, 2020, p. 5). This understanding is further considering technology as being primarily shaped by individualized and subjective practices, rather than being a "neutral entity" (Ghoshal et al., 2020, p. 5).

Ghoshal et al. (2020, p. 6) propose a triangular relation between socio-cultural, organizational, and technological elements, which in combination constitute technology practice. For these practices, involved technologies are not understood primarily as tools, but rather as relational elements, whose development and applications shape the involved socio-cultural and technological elements (Morley, 2017; Shove, Watson, Hand, & Ingram, 2007, p. 13). At the same time, the experience of technologies is both momentary and subjective, changing across users, times, and application areas (Orlikowski, 2000, p. 408). This subjective experience of technologies within a practice framework leads to an individualized and fragmented perception and use of technologies, in which not all features of a technological device are equally relevant to a repeated user (Orlikowski, 2000, p. 408).

Through the interplay of these elements, technology practices are not only defined as mere activities involving technological actors, but rather as "performances, shaped by and constitutive of the complex relations" (Shove et al., 2007, p. 13) of the involved elements and actors.

Playfulness: Due to the diverse uses of the term "playfulness" across different fields, the objective here is to define the specific aspects of playfulness relevant to the selected cases.

A multidisciplinary shared meaning, the focus of playfulness on "engagement over

external consequence, realness, or convention" (Masek & Stenros, 2021, p. 23), provides here a fundamental starting point.

As neuroscientist Kelly Clancy (2024, p. 10) writes, "[p]lay is to intelligence as mutation is to evolution." While adopting playful strategies, we enhance our creative potential and behavioral adaptivity, or – for the case of somatic practices, as it will be shown – consciously activate and improve the body as a site of experience.

A primary and foundational characteristic of playfulness is here a self-determined, intrinsically motivated, autotelic engagement (Fishbach & Woolley, 2022; Ryan & Deci, 2002). Interaction is not functional, utilitarian, or aimed at producing an extrinsic outcome like increased pay or optimized performance, but rather at creating and exploring a subjectively meaningful somatic or emotional experience (Korhonen, Montola, & Arrasvuori, 2009, p. 283).

Specific for somatic practices, which center the material modification of the body, playfulness is therefore to be understood as the subversive and explorative focus on somatic experience, bodily impermanence, and affective perception (MacKendrick, 1998, pp. 8–9; Pitts, 2003, p. 14), allowing for "experimenting with bodily sensations without a determinate goal" (Buruk, Matjeka, & Mueller, 2023, p. 3).

Playful experience is typically enabled through a "protective frame", allowing for intense emotional reactions and experimental interactions (Apter, 1991, pp. 15–16). To specify this frame, the additional term of "non-serious framing" (Masek, 2024, p. 15) is applied. It separates the predetermined application of playfulness in inherently serious frames (e.g., workplaces, formalized education) (Masek, 2024, pp. 18, 15) from engagement-centered playfulness located outside of such fields, allowing for non-consequential, fictionalized, and non-productive actions (Masek, 2024, p. 14). Behavior within the playful frame can still be perceived as partially serious by the practitioners themselves (Simon, 2017, p. 611), but as long as the perceived seriousness does not dominate the interaction, it would still be considered playful (Masek, 2024, p. 14).

This protective non-serious frame, in which external consequences do not have to be considered, is typically achieved by creating and experiencing a temporary "non-real reality" (Masek & Stenros, 2021, p. 21), for example achieved through social negotiation, stage setting, prop use, or costuming. This allows for behavior patterns, which would otherwise be considered inefficient, norm-breaking, or risky to the practitioner and their surroundings, or break with material limitations of reality. Cases for those patterns can be found for example in Shusterman's *Golden Man* (Shusterman & Svanæs, 2023), performative body modification practices, Live Action Roleplay, interactive experiences such as *Breathless* (Marshall et al., 2011), and the use of a hairbrush as a microphone or sticks as swords.

Within this context, practitioners are allowed to freely act outside the potential limitations of their real identity and reality (Masek & Stenros, 2021, pp. 21–22). Their actions are often (but not exclusively) characterized as non-optimized, counterproductive, disruptive, complicating, or are not "conventionally considered relevant" (Masek & Stenros, 2021, p. 22) outside of the playful framework.

Both the protective framework of play, as well as the potential "strangeness" of actions in playful states mirrors a characterizing element of transformative somaesthetic experiences, the "departing from the habitual" (Shusterman & Svanæs, 2023, pp. 286–287).

> *The experience needs to be framed as somehow different from the ordinary, everyday flow of experience in order to engage our attention, to "dramatize" experience, and thus evoke a change of perception and perspective. […] However, the key is not the shock of weirdness but the enticing stimulation through the difference and novelty of the unhabitual. (Shusterman & Svanæs, 2023, p. 287)*

While typically the discussion of such experiences is focused on fun and joy as characteristic key-features, also the active search for mentally and physically intense and potentially challenging, even temporarily uncomfortable experiences can be observed (Lucero, Karapanos, Arrasvuori, & Korhonen, 2014). Examples for this can be found in cases of "uncomfortable interactions" (Benford et al., 2012), such as rollercoasters, haunted houses, or specific body modifications and performance art for emotional, social, and cognitive stimulation.

Within this understanding, the individual hedonic experience is centered over social and often technological functionality, compatibility, and often comfortability (Pitts, 2003, p. 33).

To summarize, for the specific context of this work, the following described playful practices are understood as engagement-focused activities, which center the somatic experience of users/practitioners within a non-serious framework, subverting and modifying familiar modes of interaction.

Somaesthetic Practices: Within this research, playful technology practices which are focused on somatic activation and improvement of somatic consciousness (both intentional and unintentional) will be central. Therefore, for the context of this work, the focus will be on experiential (focused on the experiencing body; see previous section), rather than representational (focused on bodily appearance) practices (Shusterman, 1999). As Shusterman describes, such pragmatic experiential practices are utilized "to make the quality of our experience more satisfyingly rich, but also to make our awareness of somatic experience more acute and perceptive" (Shusterman, 1999, p. 305). Activating their soma and increasing their somatic consciousness, such practices are having the potential to increase the quality of experience for practitioners through the involvement of bodily stimuli.

Somatic consciousness is defined for the context of this paper according to Shusterman as the layered consciousness of the own "living, sensing, dynamic, perceptive body" (Shusterman, 2009, p. 133), which can be influenced and modulated by practices influencing the sensory awareness and aesthetic experience of and through the subject's soma.

Somatic activation here describes the processes and factors of aesthetic practices, which foreground the somatic stimulation of users/practitioners and result in an increased conscious and active perception of the own body. Several elements are here relevant to generate a meaningful somatic activation in relation to atmosphere, interaction, and disruption. Atmosphere, similar to the frameworks of interaction for playfulness, here means the emotional and sensory surroundings of an individual, which "cannot be narrowly identified with a particular object in that experience or with the particular subject's personal feelings" (Shusterman & Svanæs, 2023, p. 286). Activation through interaction is shaped by the affective qualities of objects and materialities, such as their visuality or haptic qualities. As a third element, the interaction should be a disruption of familiar patterns, practices, and experiences, leading to an irritation which foregrounds the experience of the body (Shusterman & Svanæs, 2023).

The use of the term *somaesthetic practice* is deliberately ambiguous and not only includes practices which are actively considering the somatic perception and transformation of the individual, including temporary body modification practices (MacKendrick, 1998), physical movement exercises, or the technological enhancement of bodies (Shusterman & Svanæs, 2023, p. 280), but further also those, which are aimed at inducing somatic reactions through perception, including the consumption of music, films, or interactions with games (Gallese & Guerra, 2020; Ryynänen, 2022, pp. 12–13). While these practices are taking diverse forms and follow multiple and sometimes incompatible norms (Shusterman & Svanæs, 2023, p. 280), the here applied definition consciously only includes practices, which are designed to transform the momentary somatic experience of users through interactions with technologies. A similar practice-based

definition can be found in somaesthetic appreciation design, previously recognized as inheriting playful qualities for engagement allowing for unfamiliar and enhanced experience (Höök, Jonsson, Ståhl, & Mercurio, 2016, p. 3132), with the difference of here primarily analyzing practices which do not necessarily hold a long term purpose.

PSTP: Based on the introduced frameworks, PSTP are here briefly defined as practices utilizing interactive technologies, following the requirements of playfulness, centering autotelic aesthetic experience, and characterized by their focus on elements of human-technology interaction and the conscious somatic perception of users (W. Lee, Lim, & Shusterman, 2014). While somaesthetic practices can also follow a utilitarian approach, creating somatic activation as a "side-effect" of goal-oriented engagement (e.g., in sports), playful practices are primarily concerned with the novelty and disruptive nature of an experience. The primary goal is a stimulating experience, located outside of a serious framework of interaction. The experience in itself, both emotionally and somatically, becomes the goal of the practice.

From a pragmatic somaesthetic perspective, PSTP can be understood as being aimed at extending an experience of playfulness through the body of the user and potentially leading to individual somaesthetic reflection, as somatic activation potentially intensifies the experience of playful interactions.

Within these practices, the body is centered as a site of technologically mediated action, perception, and reflection of aesthetic experience. These practices are influenced by the combination of cultural and aesthetic preconditions regarding the influence of technology on the body, individual and general ideology, technological artifacts, and organizational contexts of production and application (Brock, 2018, p. 1026; Ghoshal et al., 2020, p. 6).

3. Approach

This study is based on a multi-case analysis. Selection was based on the combined presence of activation of a somatic experience in users through unfamiliar actions and movesets, the sensory experience of somatically activating material, embodied interaction with technologies, and clear contextual frameworks of application. Solitary technology practices were excluded within this process.

The process of case selection and framework building further followed a hermeneutic circle approach (Debesay, Nåden, & Slettebø, 2008). Based on an initial understanding of playfulness and somaesthetics, and a broad review of cases, recognized elements relevant to playfulness were used to adjust the theoretical framework for playfulness and technology practice. Exemplary cases were then selected based on them representing their respective field and encompassing the key-elements of the adjusted theoretical frameworks. As none of the observed cases included all relevant aspects present in their respective field, for the analysis not only the examples, but further the broad review of each field had to be taken into consideration. The analysis of cases included review of supplementary materials as reports, developer notes, and image and video material. While interviews were considered as an additional approach, it was decided to first map out the field within this work and follow up with interviews at a later point.

While cases were primarily approached from an analytical somaesthetic perspective, potential impacts of analyzed features for pragmatic and practical approaches were considered and will be reflected in Section 6.

4. Cases for Playful Technology Practices

Within this segment, three areas of application for PSTP are presented, with illustrating examples provided through selected cases.

Alternative Game Controllers: When playing digital games, players typically utilize a set of established interfaces to navigate the virtual game space, allowing for familiar modes of interaction along different games and platforms. This includes legacy interfaces as well as commercial XR or motion tracking interfaces which are here defined as non-alternative game controllers, aligned with traditional modes of game control.

When utilizing interfaces which break those familiar patterns of interaction through unusual modes of interaction, control sets, or materiality, the term *alternative game controllers* is applied. The use of alternative controllers is typically an expression of interactions with tangible or embodied user interfaces (Fishkin, Moran, & Harrison, 1998; E. Lee, Kafai, Vasudevan, & Davis, 2014). Their application is primarily found in public showcases at conferences, festivals, or game jams and workshops (Granzotto Llagostera, 2019, p. 1), and for the creation of online video content.

According to Pokorný et al., alternative controller design can be separated into three categories, the combination of existing controllers (e.g., game pads, keyboards, dance mats) to create new modes of interaction, the transformation of existing controllers by modifying the embodied interaction and somatic experience (Grace, 2013), and the utilization of everyday objects through combinations with programmable microcontrollers (Pokorný, Kejstova, Rusnak, & Kriglstein, 2023, p. 3). All three categories find application both as part of novel game-specific development and as the modification of interaction with already existing games. Additionally, the first and the third category find their popular application in online video entertainment, typically presenting the construction of AGC and their use, framed as an additional gameplay challenge.

Additional to this framework, a fourth category is the use of modified existing games and utilization of online chat tools for engaging online entertainment.

Especially AGC development embedded in game design typically presents practices which affect both developer and user, activating unusual physical or mental involvement, augmenting the player's experience, and/or reducing "the cognitive distance between a task goal and the human actions needed to accomplish the task" (Fishkin et al., 1998, p. 2). A typical example for this mode of interaction is the arcade game *Sky Ladder Repair* (Qiu et al., 2024), presented at Alt.Ctrl.GDC 2024 (Fig. 1). In the coop-game, players climb and repair virtual buildings. Instead of utilizing an abstracting interface, the game consists of two embodied interfaces, with required input actions approximating the output of virtual actions on two separate screens for each player.

Player 1 uses a stationary life-sized ladder with sliding handles to replicate the act of climbing. To conduct a repair, Player 1 is first required to choose one of three screw attachments and use a drill-shaped controller, pressing it against a metal plate attached to the ladder.

Figure 1 *Sky Ladder Repair (c) 2024 Andrew Qiu, Ben Courtemanche, Hangjiatai Du, Kitty Chen, Sadira Kooblal-Caesar, Suowei Sun, XuanMing Wang*

In parallel, Player 2 utilizes a sliding miniature ladder as a controller to move the virtual ladder from left to right and balance its angle. Players attempt to complete a preset number of repairs as fast and with as less disruptions as possible.

While reducing the cognitive dissonance between input mode and visual output, utilizing simplified simulations of actions, this example will here further illustrate the intensified somatic engagement through unusual interaction, characteristic for AGC.

Medical Simulation Art: As a second case area, the example of *medical simulation art* will be introduced. For the context of this work, MSA should be defined as a form of speculative design practice, which engages primarily artistic methods and objectives, medical practice/theory and technology, and is presented to the public within artistic performances and exhibitions (Jeśman, 2020, p. 55). Similar to speculative design, the narrative practice of MSA is focused on imagining alternative realities or futures of medical technology practices, often extrapolating current practices and theories of medicine, bio-engineering and medical technology (Auger, 2013, p. 12; Jeśman, 2020, p. 55).

The typical objective of these artistic technologically enabled representations is to create multisensory, visceral, and immersive experiences for an audience, in which a curious engagement or relation with (medical) technology can be observed.

Within MSA, such somatic experiences are achieved by utilizing either applied or simulated medical procedures taken from their formal context, combined with elaborate prop making and robotics, contrasting carnal materiality and clinical sterility, and familiar visual elements of science fiction. Artists utilize technology-enabled digital and analogue modes of production

and simulation for immersive experiences of medical technologies and augmentations.

As an example case, *The Anatomy Lesson: Dissecting Medical Futures* by Agi Haines (2016) was selected. The analyzed iteration was exhibited in a former anatomical theater, a historical site for anatomy lessons. In this installation, Haines addresses speculative bio-technological modifications of the human body through simulated medical procedures.

Providing a setting closely related to roleplay practices, the artist invites the audience to take part as students in a futuristic anatomy lesson to reflect on those required practices and technologies through active engagement.

The material part of the work consists of surgical dissection equipment and four artificial body parts. Typical for Haines' works, those parts are developed in cooperation with medical experts, and are almost indistinguishable from real body parts, with realistically reproduced textures and properties. The artifacts are placed on steel tables, positioned in the demonstration space of the anatomical theater.

The four artifacts depict a transparent cranium underneath layers of skin and flesh; a technologically augmented eye; a removeable teratoma functioning as a tooth implant; a nanoparticle filter in a trachea with attached lungs. The audience interacts with those objects within the constructed framework of an anatomical lesson led by the artist, using medical equipment and technologies for examining and operating on the artificial body parts. Members of the audience peel back layers of skin and flesh to visually examine a brain through the transparent cranium; cut open a bleeding cyst caused by an implant on an eyeball; extract a tooth-shaped teratoma from a bone and insert it into a jaw; examine the nanoparticle filter in a trachea with an endoscope.

The required actions are deliberately simplified, not requiring or depicting the multitude of preparatory steps and hygiene procedures theoretically necessary for the simulated surgeries. Audience members actively decide their level of involvement and their acceptance and immersion within the non-real reality of the anatomical theater.

Human Tail Development: The third area consists of the extension of the body through novel artificial limbs, exemplified through tail wearables for human users. While the development of additional artificial limbs found both across the field of arts and engineering are predominantly focused on enabling new hand- and arm-based motoric capabilities and forms of multitasking, the development and use of tail wearables is often not centered on an immediate augmentation of functional capabilities. Rather, tail wearables are typically focused on the exploration and transformation of somatic experience of body, movement, and space (Buruk, Dagan, Isbister, Márquez Segura, & Tanenbaum, 2024, p. 146), as well as on speculations about the "lost tail" of humans and augmentation through tails (Xie, Mitsuhashi, & Torii, 2019).

They primarily find application in explorative prototyping, dance and performance, soma-based research, and visual modification of the body in costuming.

Typically, two different modes of control can be observed, either using direct user input, or utilizing external input as the following introduced *Appendix*.

Figure 2 *Appendix (c) 2011 Laura Beloff*

Beloff's *Appendix* (Fig. 2), the illustrating example categorized as "wearable technology art practice" (Bering Christiansen, Beloff, Jørgensen & Belling, 2020), is a wearable tail, composed of a robotic compartment and attached horse hair, which give the wearable a horse tail-like appearance. Other than some of the earlier referenced cases, the movement of the wearable is not controlled by the user, but by live data received by the networked tail. As described by Beloff, source data was selected based on having no "self-evident meaning for the user" (Beloff, 2014, p. 56). Real-time data of wave heights in the Baltic sea (movement on the vertical axis) and directions in the public transport system of Helsinki (movement on the horizontal axis) are utilized as input (Beloff, 2014, p. 5).

The wearable does not follow an immediately recognizable function, but is rather described as a "playful and aesthetic experiment in which it is not known beforehand […] if it brings benefits for its users" (Beloff, 2016, p. 160) and while "based on technology, it purposely lacks an instrumental technological use" (Beloff, 2014, p. 56). The focus of the wearable is defined as the exploration of the hybrid user affected by networked environments (Beloff, 2014, p. 7; Bering Christiansen et al., 2020, p. 9), by adding external environment-controlled movements which affect the somatic perception of movement. Where user-controlled tails focus on reciprocal interaction and resulting impact on the somatic state, the externally controlled *Appendix* is primarily creating a one-directional relation of the user's soma to technology and networks.

5. Analysis: Playfulness in Somatic Technology Practices

The specific conditions of those elements and their specific approach to somatic engagement are analyzed as follows.

Objectives of Development: The primary objective for getting involved with presented PSTP as a consumer, while highly subjective, can be broadly considered as the desire for temporarily engaging in an intense, pleasurable experience, detached from the individual's regular reality. For design/development, while all cases encompass individual goals, enabling unfamiliar (somatic) experiences and novel modes of interaction can be defined as shared objectives, formative for developed practices and conditions of production.

With general optimization being irrelevant to the selected cases, the individual goals still follow a specific purpose within the playful framework, not resulting in direct extrinsic gain, but rather momentary meaningful experience or long-term reflections caused by explorative behavior.

For AGC, clear objectives for development are rarely publicly formulated. Still, two goals can be observed, both combined and separately: the replication of in-game actions and/or increasing the experience of challenge. For *Sky Ladder Repair*, a game which can only be played by players within the context of public showcases, evoking curious reaction and intrinsically motivated interaction in players can be considered as formative objectives exemplary for AGC development. Novel interfaces here are primarily relying on subverting established expectation structures (Dimbath & Sebald, 2022). Developing unfamiliar but captivating controls results in heightened awareness, attention, and/or challenge, contributing to creating an entertaining experience (Lucero et al., 2014, p. 39).

For both MSA and playful prosthetics, objectives are typically clearly stated by developers in accompanying texts or reports in artistic and academic venues.

MSA allows both artist and audience to "grasp not only the technology or biotechnology itself, but also their epistemological and ethical dimensions" (Jeśman, 2020, p. 67). The objective is therefore to create and enable spaces of potential speculative reflection both for audience and developer.

In comparison, for tail prosthetics, objectives are diverse depending on the specific context of development and recognition of functional purpose, making a generalized definition of objectives difficult. It can be noted that the objectives partially differ greatly from the serious counterpart of prosthetic engineering, not aimed on functional repair, while still sharing the goal of creating augmentations perceived as seamlessly connecting to the user's body.

Additionally, an often-shared element is the emphasis on somatic exploration of use-in-development contexts through actively engaging in temporary "roleplay" as a form of distancing the user-developer from the familiar reality and allowing to be enhanced without a necessary pre-negotiation of consequences or consideration of purpose.

The objective can therefore be considered as enabling and supporting temporary playful transformation or change of identities through technological enhancement and a supporting playful framework (Buruk et al., 2023, p. 15). Extension of the body here becomes a "willing suspension of disbelief […] that allows for a more playful attitude" (Shusterman & Svanæs, 2023, pp. 295–296), similar to costuming and roleplay, as further exemplary formulated by Beloff with the concept of the "Hybronaut", a role taken by the technologically enhanced artist to allow a playful inquiry on networked existence (Beloff, 2014).

Based on the analysis of the case areas, besides the initial selection criteria of somatic activation as an objective, three different underlying objectives can be identified. For AGC, the specific objective is the disruption of familiar interaction patterns for a potentially increased short-term increase of entertainment. Reflective behavior is not recognized as a necessary general objective

of user interaction with AGC. MSA and playful tail prosthetics aim on activating explorative behavior and (immediate and non-immediate) reflection on the somatic experience of users and developers. As a shared objective, the analyzed practices are aimed at creating a significant experience in relation to both interaction and soma of users.

Frameworks, Contexts, Venues: The location of the analyzed cases within artistic and experimental practices provides a framework which sets them apart from targeted prototyping, development, and interaction within related, but differently framed areas of technology practice. While elements of those "serious" practice elements (e.g., performance optimization; vocational training; medical prosthetic design) are adopted, they are detached from their original context, applied in modified or simulated ways, located in new practices. Specific to the introduced areas, the context of presentation and interaction additionally contributes to the unserious framework, enabling playful practices. We can here separate between underlying cultural concepts and venues of presentation.

For the specific examples, interactions take place at specific cultural events such as game conferences, festivals, or art spaces and exhibitions. Additionally, for the broader field of AGC, public game livestreams are a typical area of application. For tail prosthetics, additionally theaters and interactive showcases are venues of application, while MSA are almost exclusively found in artistic venues. All these venues can be considered spaces for voluntary leisure activities from an audience's perspective, fostering explorative and engagement-focused behavior. While from a designer/developer perspective these venues are not necessarily spaces of own leisure, the connected expectation structure (audience-perspective) enables a framework in which playful practices can be established temporarily.

Exemplary, in the case of *Sky Ladder Repair*, while partially similar to vocational training simulations, the use within an arcade game creates a non-serious framework, in which the motivation of players for interaction is intrinsic and dominated by curious engagement.

However, especially in comparison to the two other case areas, this non-serious framework seems to be less experimental, as games and devices such as *Dance Dance Revolution Universe* (Hudson Soft, 2007), *Guitar Hero* (Harmonix, 2005) or recent controller accessories for VR games have already established alternative modes of control for domestic play. And similar to *Sky Ladder Repair* those typically rely on the simplification of the simulated activity. Still, the case can be distanced from commercially available and established alternative controllers through the lens of venue and context of play. The typically event-based appearance of AGC establishes a context of use, in which interactions are relatively short, embracing curious interactions over the optimization of gaming practice.

The clear negotiation of context, venues and concepts allows a temporary distance from reality and familiarity, establishing the necessary protective frame and creating a condition for users/audiences in which playful, experimental, and transgressive interaction and discourse become possible.

While enabling playful aspects of practice for audiences and users, the conceptual layer further provides a space for playfulness to developers and practitioners of related areas (e.g., medicine, industrial engineering, commercial game design). The detachment from related serious practices enables practitioners/developers to reassess elements of otherwise familiar practices. For AGC, the typical lack of a driving commercial motive and the temporality of application provides a framework which enables developers to reassess the technologies centered in their practice. While within general commercial digital game design user expectation typically

requires reliance on established interfaces and interaction modes, the AGC application context (e.g., interactive showcases, livestreaming) establishes different structures for unconventional and potentially impractical interactions. With those managed expectation structures, playful utilization of technologies, the material interfaces, is supported.

Similar observations can be made for MSA. Staging medical technology practices and close-to-reality immersive environments, the specific presentation context (e.g., gallery spaces) supports the clear reflective distance between medical reality and playful simulation of the same. Within the described protective framework of play, artist and audience can engage with the potential impacts of novel medical technology and bioengineering without any consequences outside of the applied framework.

For both MSA and tail prosthetics, the artistic context functions as a tool for establishing a framework in which the discussion of ethics and usefulness is not an initial requirement for developing or involving oneself in a practice.

As Beloff notes for the context of human augmentation, the related scientifically centered practices "do not allow playfulness or radical experimentation without a justified objective, such as repair of the body" (2014, p. 59), or in extension its optimization. Related serious practices are delimited by set ethical frameworks and risk-assessments, especially when the user's body is technologically modified. Meanwhile, artistic practices create a space in which "adults can participate in play activity" (Beloff, 2016, p. 158) without considering potential consequences.

For both fields, typically involved medical and engineering practitioners are familiar with those ethical frameworks and their application in their respective field. Through relocating practice fragments into the radically different context of artistic design, simulation of non-real augmented bodies and medical procedures, and application of riskless wearables, those ethical considerations become obsolete (Beloff, 2014, p. 59). Therefore, developers gain a new space for speculation, transgression, and curious exploration without a necessary purpose, which is not typically available or "allowed" in their field of origin (Tharp & Tharp, 2018, p. 131).

To summarize, all three introduced cases contain a distinct non-serious framework, partially enabled and supported by the choice of venue and the socio-cultural context of artistic design and related expectation structures.

Somatic Engagement: Across all three case areas we can observe playful approaches to development and design and recognize practices which are aimed at temporary transformation and modification of bodily experiences. The engaged experience of playfulness is supported by a technologically enabled intensified and significant somatic experience and aesthetic appreciation.

Engagement here not only describes the active interaction of the audience with the functional side of devices and the development of interaction practices, but also the increased somatic activation of users through materiality, further supporting the awareness of a non-serious framework through immersion.

For *Sky Ladder Repair*, a significant somatic experience is tied to embodied interactions with the interface and the resulting unfamiliar bodily activation. Instead of relying on abstracted inputs of familiar interfaces, players have to actively develop movement patterns, which allow them to achieve ingame goals as fast as possible. The brief duration of each game within the earlier introduced event framework here potentially does not allow players to reach a state of routine.

As Shusterman and Svanæs recognized for transformative somaesthetic design, one of

two potential factors for establishing a temporarily changed somatic experience is an "enticing stimulation through the difference and novelty of the unhabitual" (2023, p. 287). Across the cases of AGC this is achieved in two different ways. For cases as *Sky Ladder Repair*, an entirely new gaming experience is created, while for user-based applications of AGC to existing games a novel approach to familiar gameplay is established.

By creating or modifying embodied interfaces, AGC therefore allow for enjoyable, challenging, and temporarily captivating experiences, recognized as key features of experienced playfulness (Lucero & Arrasvuori, 2010).

While AGC activate significant somatic experiences through unfamiliar embodied controls, MSA does so by activating strong somatic reactions as disgust within technologically enabled aesthetic settings.

Somatic experiences are here achieved by intentionally activating strong physical reactions through close interactions with or perception of highly visceral features, as recognized for film (Ryynänen, 2022) and immersive theater practice (Bakk, 2022). Especially disgust here not only has to be understood as an inherently somatic feature (Ryynänen, Kosonen, & Ylönen, 2023, p. 5), but further as a potential motivation for curious and pleasurable engagement (Ryynänen et al., 2023, p. 9)

Haines describes calling up disgust as a somatic key feature within her own work (The Front, n.d.), exemplary for the concept of MSA. While simulated technologies and the direct interaction with them contribute to the experience of the strange and unfamiliar, involved real technological devices as endoscopes further support such experiences. While for three of the involved body parts immediate visual perception would be enough to locate simulated strange technologies, the trachea requires an involved exploration of the object through inserting an endoscope. This active engagement, which can be observed with different intensities based on object and audience member further intensifies the curious experience of disgust.

Additionally, Shusterman's and Svanæs' second factor is here manifest, the "qualitative atmosphere" (2023, p. 286), contributing to the experience of technology practice within this case. For *The Anatomy Lesson*, not only the spatial environment of the anatomical theater, but also the atmospheric setup through lighting and costuming contributes to a "dramatic and creepy effect" (Tharp & Tharp, 2018, p. 266), supporting and intensifying the somatic experience of the audience. Through the combination of these aspects, *The Anatomy Lesson* becomes an instance of intentionally designed "uncomfortable interactions" aimed on increasing "the deep focus or singled-minded immersion" (Benford et al., 2012, p. 2006) by having participants interact with viscerally and culturally unpleasant features.

While for both AGC and MSA the somatic activation is primarily based on interactions with technologies, for tail prosthetics it is the integration with technology. The user's soma is actively and playfully extended, as the tail affects body movement and balance. As a result, as for AGC, new patterns of movement become necessary, however here those are developed individually and undirected by users themselves.

As recognized by Buruk et al. for Svanæs' *Tail*, similar to *Appendix* an inquiry into human-technology integration (Shusterman & Svanæs, 2023, p. 294), tail prosthetics modify the experience of both movement and space (Buruk et al., 2024, p. 146), with especially movement in familiar everyday interactions not being the center of awareness. *Tail* can be considered as a somatic "defamiliarization-through-design" (Shusterman & Svanæs, 2023, p. 295). For the case of *Appendix*, this is intensified through the external control of the tail. The experience is here

not necessarily primarily one of one-directional somatic extension, but rather a hybrid relation. Where *Tail* or other examples of tail prosthetics require users to develop new movement patterns to consciously control the extension of the body, for *Appendix* users explore ways of bodily reacting to movements which have become part of their own body experience. This focus on exploring movement patterns requires an increased focus on the experiencing body, therefore also foregrounding the somatic consciousness during or after interactions.

Additionally, and rarely centered in previous studies on tail prosthetics, playful materiality seems to play a relevant role for supporting this defamiliarization. For *Appendix* and other tail prosthetics (Nabeshima, Saraiji, & Minamizawa, 2019; Svanæs & Solheim, 2016; Xie et al., 2019), hair, fur, and bonelike structures are combined with mechanical parts, further potentially playfully blurring perceived borders between user and technology.

Based on those three areas, three relevant aspects for technologically modified somatic experience and interaction can be recognized: unfamiliarity of interaction, somatically activating materiality, and technological enhancement of the soma.

Conditions of Development and Functionality: The introduced cases and their individual representation present themselves as specialized practices, located in highly specific contexts, affecting the conditions of material, functional, and technological development. Underlying condition, which shapes necessary technological developments for interaction, is the developer's awareness of "aesthetic sensibility of haptic, dynamic, proprioceptive, and other invisible qualities" (W. Lee et al., 2014, pp. 1–2) to achieve captivating somatic experiences.

Generally being focused on intensified somatic engagement and characterized as playful, they are set apart by the individual conditions of technology in practice and potentially resulting impacts.

Typically designed as unique specialized devices and part of non-commercial practices, AGC development is characterized by low-cost production methods and technologies. Exemplary, for *Sky Ladder Repair*, low-cost Arduino micro controllers, 3D printing, and woodwork are utilized to develop interface compartments. Additionally, atypical use of technical parts can be observed, in this case the use of slide potentiometers for the spatial controls for Player 2. The appearance of atypical use as an instance of playfulness, accompanied by reuse and modification of existing devices, can be also observed along all four categories of AGC development practice, resulting in varying difficulty of development and due to available modular microcontroller systems (e.g., Arduino, Makey Makey) allowing for relatively fast-paced and reproduceable approaches to production. While *Sky Ladder Repair* functions as an elaborate example, AGC development practices do not always require deep knowledge in the field of engineering and programming, due to the ability to reuse existing controllers or utilization of accessible modular systems. Different from the game-specific AGC development of *Sky Ladder Repair*, this aspect seems to allow especially for individual playful rapid development and interaction practices for user-made AGC.

MSA primarily engages existing medical technologies, typically recontextualized and simplified, and simulation technologies. Rarely new fully functional technologies are developed. Rather, technological simulation is applied to both medical devices and to establish lifelikeness, as actual functionality is not required. As in the previous section pointed out, this typically requires the involvement of experts for respective fields, while still allowing partially for theatrical *Wizard of Oz* methods and improvised techniques.

While diverse in application contexts, the conditions for technological development for

tail prosthetics are mostly coherent among different cases. The primary condition here is the seamless extension of the user's body, requiring extended or full functionality of devices, not allowing for improvisation or simulation due to complexity. For tail prosthetics, playfulness therefore does not extend to the conditions for involved technologies and required engineering.

Based on this analysis, for both AGC and MSA playfulness potentially extends towards functional technology development. For AGC, it can be assumed that playfulness through atypicality, reuse, and modification is fostered through a development practice which does not necessarily require a formal expert position of practitioners and allows for a higher grade of improvisation.

6. Discussion: PSTP as a Theoretical Framework and Practical Concept

Based on the introduced initial frameworks, the described playful technology practices are understood as engagement-focused activities, which center the somatic experience of users and practitioners within a non-serious framework, subverting and modifying established modes of interaction and practice. Typically, the soma is not consciously centered in most everyday practices, with unfamiliar experiences increasing an active awareness of the soma (Shusterman & Svanæs, 2023, p. 295). Two general motives were detected, breaking with the familiar and related expectation structures, and the creation of and interaction with entirely unfamiliar new practices, for which there are no established expectation structures, typically leading to an increased active focus on interaction and experience. While partially referring to purpose-oriented technology practices, cases create emotionally engaging, pleasurable, or fascinating conditions for interaction, by applying a playful attitude to a typically non-playful areas (Sicart, 2014, p. 27), involving cultural (objectives, motivations, expectations), technical (utilized technologies), and organizational aspects (venues and contextualization) (Ghoshal et al., 2020, p. 54:5).

The presence of playfulness and the involvement of different actors and technologies varies depending on the specific case area, modes of production, and individual objectives. Still, generally it can be observed, that both designers and active audience/users are engaged in a playful practice, with varying degrees of somatic engagement, emotional motivation, reflexive activity, and active involvement of/engagement with technologies.

The introduced framework of PSTP emphasizes the relevance of playfulness and playful elements for somaesthetic practices. While sometimes hinted towards, rarely playfulness is clearly recognized as a formative element of experiential somaesthetic practices. However, as shown, playful frames naturally establish the disruption of habitual experiences, necessary for somaesthetic transformations. Establishing and utilizing playfulness for somaesthetic practices support, what can be considered as "defamiliarization-through-design" (Shusterman & Svanæs, 2023, p. 295), bringing forward active somatic consciousness through unfamiliar stimulation.

When considering the impact of PSTP for future theoretical inquiries and applied design, it has to be noted that the emphasis on somaesthetics and playfulness in representation and discussion by designers and users varies. PSTP – for now – is not an established design concept, but rather a broad framework, which encompasses a multitude of practices sharing specific features of playfulness, interactivity, and somatic activation. Additionally, engaging with the described practices is not necessarily motivated by a desire for somatic transformation in the first place. Rather, this might appear as a side effect, only recognized as an unexpected quality of experience in or after the moment of interaction.

Additionally, the potential difference in recognition of purpose and impact within the

introduced practices between developer, developer-user, and user perspectives poses the question of how much some PSTP are considered as playful from an external observer position, and how often they are considered as such by developers and users themselves, as explicitly evident in Beloff's self-perception.

While the analysed cases point to several features relevant to consider when designing for PSTP, repeatability of interactions is not necessarily given, problematizing the understanding of practice. Similar to Shusterman's description of the experience of the *Golden Man*, the transformative somaesthetic potential of MSA lies in a unique temporal and spatial experience. Similarly, the analysed specific case for AGC, *Sky Ladder Repair*, is potentially only experienced once by most players in the context of presentations at events. Designing for/with PSTP should therefore be approached as both developing repeatable experiences, as well as the active creation of unique temporal and spatial frameworks, which allow for temporally limited practices of interaction.

Further, for all three areas both speculative and applied prototyping is a relevant element of development, which has not received attention within this study yet.

While novel practices of technological augmentation are developed, cases based in somatic inquiry and academic prototyping typically project impacts beyond their explorative application. For tails, besides the reflection on human-network relation as presented by Beloff, balance, force feedback and social expression are recognized as typical future areas of application (Buruk et al., 2023; Nabeshima et al., 2019; Xie et al., 2019). While located within prototyping practices and holding potential future qualities, the review of impact still allows for considering this area of practice as playful. Projected impacts are rarely followed up on, presenting the development and application of tails primarily as a tool for imagining futures and alternative human forms. An exception is the commercial equivalent of *Tail* by Svanæs, which finds its application in the playful practice of Cosplay (Buruk et al., 2023) as an instance of augmented performance.

While not necessarily initially reflected as somatically activating and/or play by practitioners and observers, the analyzed cases all still contribute to the same phenomenon as other practices aimed at somaesthetic experience, "to make us 'feel better' in both senses of this ambiguous phrase" (Shusterman, 1999, p. 305).

The focus on somatic activation and somaesthetic reflection in PSTP has the potential to increase the quality of playful experiences. And at same time, playful frameworks allow for increased embracing of somatic activation.

Therefore, an argument is made for the conscious design for PSTP, actively focusing on the interplay of playfulness and somaesthetics in such experiences. Bringing awareness to the specific elements contributing to both a playful frame of experience as well as somatic activation, pragmatic and practical future work can draw on this initial analysis. If the objective of development is designing for PSTP, the aspects of frame, context, and venue, somatic engagement, and the conditions of development and functionality all have to contribute to both the playful and somaesthetic quality of experience. To achieve this, referring back to relevant aspects of cases under the broader theoretical framework of PSTP allows for the development of a practical concept for developing experiences for PSTP.

7. Conclusion

This study characterized PSTP as immersion practices centered around the unfamiliar regarding interaction, materiality, and enhancement. All three introduced fields primarily provide ways of appreciating technologies and practices based on their individual aesthetics. Rather than

being primarily practical or functional applications, they allow us to experience them as art, stimulating experiences, and/or entertainment.

They present a detachment from the user's and developer's reality and familiar practice, breaking with established expectation structures of practice, temporarily creating a speculative non-real reality, or altering the somatic reality and perception of users.

Generally, is has been shown that PSTP can be considered as highly specialized and application-specific practices, customized for and through their individual framework, objective, production conditions. Users interact with unfamiliar practices in a temporarily limited frame, not necessarily allowing for deep familiarization and routinization and not achieving an extrinsic goal detached from the practice itself in the long run.

This is only an initial step for a deeper inquiry into the inherent connections of playfulness and somaesthetics through the lens of technology practices.

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