Making Sense of 'Game Feel' through Affective Science

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ABSTRACT

This paper examines the concept of 'game feel' in videogames, exploring its connection with affective science. Game feel describes the player's sensory and emotional response to a game's mechanics, aesthetics, and environment, contributing significantly to the overall play experience. By integrating theories of constructed emotion (Barrett 2017) and core affect (Barrett and Bliss-Moreau 2009), this study provides a nuanced understanding of how players perceive and interact with game worlds and systems. It examines the dynamic interplay between the game's designed elements and the player's anticipatory brain functions, which are responsible for shape each game's unique 'feel' at a given moment. The paper further discusses the significance of the 'affective niche,' highlighting the role of internal affective states and external stimuli in creating engaging gaming experiences. This approach offers a holistic perspective of game design, emphasizing the need for an inclusive approach that has the potential to resonate with a diverse player base.

Keywords

Game feel, affect, emotion, game design, player experience

INTRODUCTION

Videogames entangle players in multi-modal sensory experiences shaped by what the game development community has long referred to as 'game feel.' Steve Swink was the first to formally define the term game feel in his 2009 book as "real-time control of virtual objects in a simulated space, with interactions emphasized by polish" (Swink 2009, 6). "Game feel is often described as being at the heart of game design [...] highlighting how central it is to the experience of playing a game" (Pichlmair 2022) while also being largely invisible yet immediately recognizable for the player when adequately and/or inadequately implemented (Brown 2015).

Game feel is a complex and nuanced concept that has served as a relatively popular umbrella term for certain difficult-to-pin-down yet crucial qualities and experiential aspects vital to the player's sensory and emotional responses to and enjoyment of the game's controls, mechanics, and representational aesthetics. The player's experience

of the game's physicality is the foundation on which Swink's (2009) entire concept of game feel rests (Pichlmair and Johansen 2020). Swink describes the first layer of this functional physicality of game feel as "the aesthetic sensation of control" (Swink 2009, 12), the player's pure pleasure at manipulating a virtual object and sensing its response to their game controller's input.

To draw an analogous parallel to Swink's aesthetic sensation of control, we may consider veteran game audio director Andrew Lackey's description of the aesthetic sensation of eating a potato chip. The crucial part of enjoying the experience of eating the chip is not the taste of "the salt and fat, but the satisfying crunch and dissolve in the mouth" (Lackey, personal communication, December 19, 2018). In line with Lackey's analogy, Swink notes that the aesthetic sensation of control is the feeling of the game's physicality that players are trying to describe when they use words like "[...] floaty, smooth or loose [...]" (Swink 2009, 12) to make sense of the perceptual sensations of the feedback they are experiencing from their controller during gameplay.

Swink's definition of 'game feel' as a concept sheds light on crucial aspects of the intersection of player experience and game design and, as such, deserves praise and recognition for its contributions to the discourse on the topic. However, as with all definitions, the scope must be delineated, and boundaries must necessarily be drawn to determine what is inside its borders and what is not. As such, any definition warrants closer scrutiny and attention to its theoretical underpinnings, systematic application, and collectively shared understanding of its applicability. However, even though Swink acknowledges "[...] that definition is not value judgment" (Swink 2009, 9), a sentiment Pichlmair and Johansen echo by asserting that "Game feel is a value-neutral expression" (2020, 16), game designers and games scholars are mainly preoccupied with designing and defining what "good," and by exclusion what "bad" game feel is. As Pichlmair and Johansen note, "the subjective nature of game feel and the need for "good negative moments" calls for a more holistic terminology" (2020, 16). This underscores the importance of game feel in the game design and development process, emphasizing its centrality and the need for a holistic approach that considers visual elements, sound design, controls, and code.

We aim to demonstrate how understanding the theories from affective science has the potential for establishing a framework for analyzing and understanding the complex interplay between game design elements, player percepts, and gameplay conventions to aid in the design of more engaging and affectively resonant gameplay experiences. To accomplish this, the paper is structured as follows: First, we introduce the concept of game feel and contextualize it in relation to theories that examine the ontological relationship between a player and a game. We then outline the concepts of 'core affect' (Barrett and Bliss-Moreau 2009), 'constructed emotions' (Barrett 2017), and how the player's 'affective niche' (Barrett 2017) functions as a lens through which the design and experience of videogame play can be evaluated. Moreover, we propose the concept of the affective niche as a pivotal mechanism for understanding how to design for game feel. By doing so, we aim to contribute a holistic perspective to the discourse on game feel, its entanglement with the game design process, and the need for inclusivity and resonance with a diverse player base. We conclude by discussing the implications of our findings for game design and future research.

GAME FEEL AND THE PLAYER

As multimodal media, videogames shape the player's perception of game feel through audio-visual-haptic stimuli. What is heard, seen, and felt (kinesthetically) comprises the embodied expression provided to the player (Keogh 2019). Game feel can, therefore, be understood as a compound term—of 'game' and 'feel,' where the 'game' is the audio-visual-haptic materialities of the game and the 'feel' is the sensations and resulting situated conceptualizations the player forms as a result of the game's audio-visual-haptic stimuli during play. Rather than 'game' and 'feel' as two separate words, perhaps it is more accurate to understand 'game feel' as a hyphenated compound term by hyphenating the phrase as 'game-feel' to convey the interrelated and indivisible nature of the concept we generally understand as game feel.[i]

This separate yet togetherness of the term can best be understood, as Keogh (2015) argues, because videogames are fundamentally experienced as embodied textuality and a play of bodies. "In the cybernetic circuit of videogame play, the player's sense experience is distributed across the posthuman embodiment of technological hardware, virtual bodies and cameras, and audiovisual representation." (Ibid., 157) As such, "What a videogame feels like to play is inseparable from what that videogame is about" (Keogh 2015, 264). It is, therefore, essential that we stress that 'computation,' often associated with the presymbolic, sensation, and the unconscious, and 'representation' linked to the symbolic, cognitive, and interpretive, are not to be understood as a "[...] dualism that pits computation against representation" (Anable 2018, 8). But, as two sides of the same coin — Indivisible and interrelated. This means that videogames are not mere "[...] containers of and for affects that float around between bodies and things but rather" (Anable 2009, 7) playable media that have particular sensory properties, perceptible in their audio-visual-haptic modalities, that can be interpreted and analyzed.

Spread across several pages (144-147) of his 1983 book *Pilgrim in the Microworld*, David Sudnow describes his multisensory experience while playing the game *Breakout* (Atari 1976). During a gameplay session, Sudnow manipulated *Breakout*'s audio-visual modality to enhance his connection to the game. He decides to sit close to a darkened television, with the game's sounds turned off, yet still unable to stop substituting the silence with his own internal sounds, thinking "bump" in the back of his mind every time the ball collides with a brick, side wall, or the paddle. Sudnow describes the irresistible urge to think "bump" as being unable to transcend the feeling of being connected to the game, if for no other reason than to assure himself he is actually present "[…] and not merely a nonbeing the TV set uses to complete an electronic circuit so its programmed balls stay in motion" (Sudnow 1983, 145).

This self-generated sound compensates for more than just the lack of actual sound during gameplay. It illustrates his need to feel embodied beyond the visual and tactile connection to the game, reassuring him that he is still anchored in reality rather than just being a passenger. Sudnow later reintroduces the game's sounds, feeling the game synchronize with his movements to create a rhythm that becomes almost a physical extension of himself, turning his experience of playing the game into something similar to playing an instrument. Simply removing one expressive modality from his activity of play emphasizes the embodied entanglement a player and a game's material-discursivity share. Sudnow's detailed self-report account neatly showcases the intimate and intricate entanglement between the player's and the

game's audio-visual-haptic input-response-loop that, even for such seemingly mundane and minimally aesthetic gameplay like *Breakout*'s, still accomplishes to gives rise to the experience of game feel.

THE 'GAME' IN GAME FEEL

Game feel should not be understood simply as an inherent attribute belonging to the player or the videogame but rather as an emergent and entangled material-discursive performativity consisting of sensations generated by the game's representational, computational, and material aspects, felt as sensory stimuli by the player's body, and dynamically constructed as gameplay concepts by the player's brain.

The notion of game feel must, therefore, necessarily assume an entanglement of a player, a game, and an activity of play to give rise to the intertwining aspects of the game as 'object' with the engagement of a player for the purposes of play. Consequently, the 'game' to be 'felt' in our understanding and investigation cannot be studied without simultaneous attention to the aesthetic, material, mechanical (code), and cultural aspects of a game and its socioculturally situated (human) player. Instead, their entanglement and 'control aesthetic' is brought to the fore (cf. (Giddings 2008; Giddings and Kennedy 2008; Klevjer 2001; Gadamer 1975; Murray 1997) – a widespread and popular approach to studying games and players as entangled or at least interrelated entities.

Following the concept of a descriptive model for cybermedia – the cybermedia object, Aarseth and Calleja's (2015) ontological 'game' perspective is beneficial for understanding the aspects of games that open possibilities for a player to engage with an object. Aarseth and Calleja (Ibid.) list three interrelated elements of the cybermedia object: 1) a sign space (audio-visual expression), 2) a mechanical system (code and rules), and 3) the object's materiality, i.e., player controller, screen, etc. (See Figure 1).

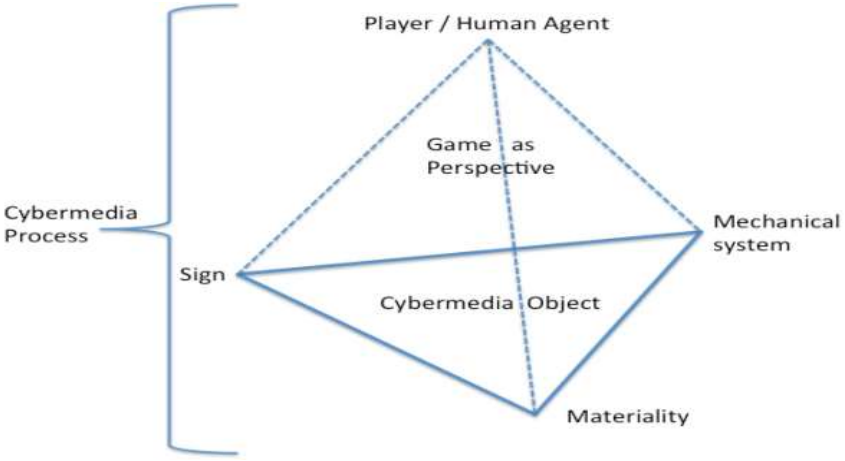

Figure 1: The entanglement of the player and cybermedia object through the cybermedia process. (Aarseth and Calleja 2015)

These are the constituent parts needed for player-game entanglement to exist. The collective whole of a cybermedia object's audio-visual-haptic expression is effectively a videogame's semiotic and kinesthetic representation of its mechanical system as a game world. I.e., the interrelated material-discursive multiplicity of signs, code, and

controls that operate as the game's kinesthetic and representational aesthetics. In other words, the "[...] the interpretable, "surface" representational elements that players read/observe in order to be able to use/play the game" (Aarseth and Calleja 2015, 7) combined with the underlying code and the haptics of its materiality. Understanding the cybermedia object as materially-discursive, thus, "[...] emphasizes the entangled inseparability of discourse and materiality" (Barad 2007, 699) that exists between a videogame's interpretable audio-visual-haptic aesthetics and the entanglement with its underlying mechanical system, material form, and the interpreter-player's sociocultural context. As such, "Videogames, [...] provide materially-specific audiovisual-haptic experiences [...]" (Keogh 2019, 981).

Conceptualizing the multimodality of videogames as entangled in a materially-discursive performativity with the player means that our understanding of the interpretable surface and the game's physical materiality are interrelated and shape each other. Following Barad (2007), we may say that discourse and materiality intersect in videogames, where feel and concepts influence gameplay, and the game's physical materiality shapes our understanding of its aesthetics and mechanics. In other words, our understanding of what games are is not just an idea or concept but deeply rooted in the audio-visual-haptic physicality of how we interact with them and who we are. Further, the videogame as material is not merely a passive object but is likewise shaped by the player's sociocultural concepts and their interactions with it. The materially-discursive entangled performativity of the activity of play is irreducible as such "[...] because the internal, coded level can only be fully experienced by way of the external, expressive level [and] what goes on at the external level can be fully understood only in light of the internal. Both are equally intrinsic [...]" (Aaseth 1997, 40).

Miguel Sicart (2022) echoes this view of entities as mutually constituted through their interactions when he contends that Karen Barad's New Materialist perspective emphasizes the significance of comprehending the ontology of materiality and agency as an entangled phenomenon. Barad (2014) proposes an onto-epistemology that challenges the Cartesian subject-object duality as she rejects the fundamental notion of splitting objects into single acts of absolute differentiation, dividing here and there, this from that, and now from then. According to Barad,

> "The key is understanding that identity is not essence, fixity or givenness, but a contingent iterative performativity, thereby reworking this alleged conflict into an understanding of difference not as an absolute boundary between object and subject, [...] but rather as the effects of enacted cuts in a radical reworking of cause/effect" (Barad 2014, 173-174).

Barad's term for this radical reworking of causality is Intra-Action (Barad 2007). This means that a player does not merely interact with the videogame through the activity of play. Because the intra-action of an entangled human and the game as an artificial agent is indivisible in the sense that one cannot 'Be,' as it were, without the other. They possess "co-dependent origination [that is] there is nothing independent or self-existing whatsoever apart from other things. Everything is mutually dependent and co-arising and co-ceasing" (Abe 1997, 94). Thus, the human only becomes a 'player' because they are entangled through play with the artificial, and the artificial likewise only becomes a 'game' through the playful entanglement with a player.

In terms of the 'feel' of a game, using the same semiotic and mechanical system on one material platform will, therefore, influence its game feel and experience if used

on another (Aarseth, 2014). To complicate this further, different hardware types "[...] also allow for different social contexts in which cybermedia are used" (Aarseth and Calleja 2015, 7). For example, even though they share much the same visual aesthetics, playing *Chess* on a computer with a mouse, keyboard, and monitor has a drastically different material feel than playing it as a board game with wooden pieces. Even if chess is exclusively played non-digitally, the context of where and by whom the game is played profoundly impacts how those playing perceive the activity of play. After all, playing *Chess* at the World Chess Championship or a public table in NYC's Central Park has vastly different material and sociocultural contexts associated with how and why these particular players play the game.

Wirman and Leino (2019) argue for these fundamental differences by discussing the ancient Chinese board game *Mahjong*. In their analysis, the use of different technological setups, from mobile platforms to game arcade machines and automatic shuffling machines, all emphasize the unique pleasures of gameplay and have an impact on player interaction, among them competitiveness. Ultimately, the "[...] videogame experience is fundamentally constituted from the embodied perception of digital sights and sounds, and tactile hardware" (Keogh 2019, 979), playing in concert with the player's sociocultural situatedness. As Keogh (2019) argues, through Sudnow (1983), the experience of playing a videogame is purposefully designed to incite the player to engage on an experimental and playful level. In a way, analog games and sports are not. After all, "If every time you bounced a basketball it made different sounds, you'd dribble more than necessary" (Sudnow 1983, 196).

THE 'FEEL' IN GAME FEEL

Previous definitions of game feel have been linked to a more expansive notion of 'affect' (Swink 2009; Cremin 2015; Anable 2018; Pichlmair and Johansen 2020; Pichlmair 2022). When not using the term in its broadest psychological sense as emotion, game studies have approached affect, as defined by affect studies — constituting our core, shaping our experiences, perceptions, and relations. However, the definition and delineation of the 'affect' have not yet been thoroughly defined. The most concrete definition of affect in terms of game feel has been put forward by Pichlmair and Johansen, who defines affect as "[…] the reaction to the concretization of the expectations towards the feedback of the system. It is subjective and highly dependent on context inside and outside the game" (Pichlmair and Johansen 2020, 16).

In terms of game feel, affect thus becomes more than individual, exceeding personal boundaries. I.e., becoming a transpersonal force and capacities. These capacities are not confined to human responses but rather extend to all interactions between bodies, including the non-human. This situates affect not as emotion but rather as "[…] a force that varies in intensities as it combines with multiplicities of different objects and assemblages: exceeding a body defined by an identity society prescribes to it […] (Cremin 2016, 3). In other words, a dynamic flow (or exchange of energy) that transcends individual subjectivity in favor of affect as an actualizing force.

Beyond the discourse on game feel, in game studies, the most common definition of affect uses Deleuze's reinterpretation of Baruch Spinoza (Deleuze 1970; Deleuze and Guatarri 1980; Massumi 2002). In broad terms, Deleuze's use of affect (and by extension affect studies) is intimately related to his concept of *puissance, i.e,.* the capacity to affect and be affected (Deleuze and Guattari 1980). For Deleuze, *puissance* underlies all interactions and transformations, making it a core aspect of his

ontological thought. This means that beings (human and non-human) are not defined by their static properties but by their relational and interactive capacities. Every entity's being is not fixed to 'what' it 'is' but to what it can do—its potential for interaction and the transformations it can undergo.

As such, every interaction with another being potentially alters these capacities. Therefore, *puissance* can be seen as the underlying, often latent power of entities, whereas affect represents the visible or felt outcome of activating this power. Further, Deleuze with Guattari (1980) considers the relationship between *puissance* and affect to be dynamic and reciprocal. *Puissance* serves as the underlying structure or foundation for potential actions and changes, whereas affect represents the specific manner in which these possibilities materialize through interaction. Affect, therefore, both reveals and actualizes the ontological capacities represented by *puissance*.

Similarly, affective scientists understand affect as "[…] a fundamental, psychologically, irreducible property of the human mind" (Barrett and Bliss-Moreau 2009, 167), "[…] a basic, biological substrate that is available to be categorized" (Barrett 2006, 30), and as a component with the potential to "[…] become an emotion when combined with other mental elements" (Barrett and Bliss-Moreau 2009, 170). Crucially, this situates game feel as transcending simple sensory feedback and instead as a symbiotic construct shaped by both the immediate, raw sensations provoked by the activity of play and the player's anticipatory cognitive frameworks.

Feelings, affect, and emotions

Because affective science views affect as associated with the body and sensation, the feeling aspect of affect is a pre-cognitive, pre-linguistic mode of experience that is not yet fully formed or articulated at the point of encounter with the "feel" of a game (Barrett et al., 2007). However, it is crucial to stress that both Barrett (et al., 2007) and Deleuze (1980) are not solely presymbolic but also continually interact with and disrupt symbolic representation. As such, the player's "feel" aspect of game feel as affect can thus be understood as a pre-personal, pre-individual force (Deleuze 1980) that affects the player's body through sensory stimuli and drives their brain to make meaning of these stimuli through situated conceptualizations (Barrett 2006). Therefore, affect can be understood (in a holistic sense) as an entanglement of 'feeling' and 'emotion' (situated conceptualizations), two separate yet indivisible capacities tied to how the player 'feels' the affective sensation's intensity and subsequently how they evaluate its affect through a process of 'situated conceptualization,' where the current context of play and the previous encounters with similar actions and situations. Ultimately, this process terminates in the dynamic formation of a game feel concept (emotion), such as, "these controls, feel 'floaty,' 'tight,' of 'heavy.'

Game feel as affect is thus at once a steering force and a catalyst for the formation of concepts. For example, Brown explains that *Super Meat Boy* (Team Meat 2010) "feels fun at a primal, kinetic level" (2015, 5:16), while YouTuber Kari describes the experience of playing *Shoot Out* (Usborne 1982, 9-10) on the *BBC Micro* as "frantic" (Kari 2024, 12:05). The latter is an example of how "Game feel is an important property of all games" (Wilson, 2016, 33:32). This includes games like *Shoot Out* (See Figure 2) that do not have a real-time controller, as such, rather, merely hitting one key on a keyboard and anticipating the visual countdown of the numbers on screen creates game feel. Kari notices the difference in game feel in the version she coded in Python (See Figure 3) on a modern computer and suggests that her "[…] program is a

lot easier and a lot slower than the one we did on the BBC, which is very frantic […] so, I'm going to change that now and make it a bit quicker to match the Basic [programming language] one a bit better" (Kari 2024, 12:03). This describes how adjusting the underlying mechanical code layer of the game to 'feel' a certain way affects the game feel of the other two modalities.

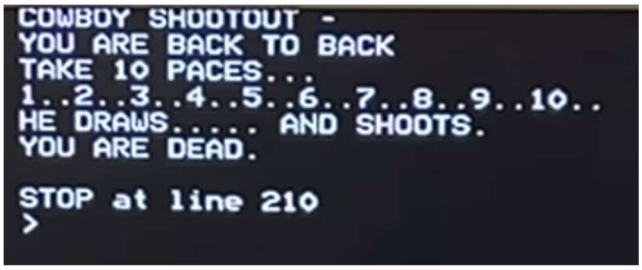

Figure 2: Screenshot (Kari 2024) of BBC Micro 'Basic' version of *Shoot Out* (Usborne 1982)

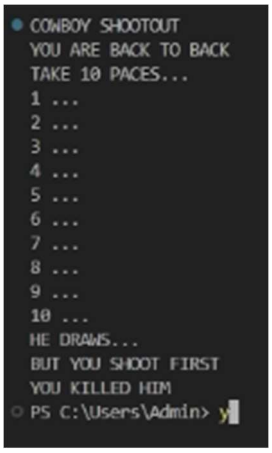

Figure 3: Screenshot (Kari 2024) of Python implementation of *Shoot Out* (Usborne 1982)

A further clarification of the terms feelings and emotions is in place. Feelings are interrelated percepts that interact in complex and difficult-to-measure ways, often leading to unpredictable results through mutual intensification and interference in action. Feelings understood as such are thus what is referred to as affect. Feelings are the unconscious, pre-personal, and non-linguistic experiences of bodily sensations and changes (Massumi 2021). Our present discussion will see this understanding of affect as synonymous with the game feel.

On the other hand, emotions refer to a subjective, conscious experience that is socio-culturally and linguistically constructed. That is, an emotion is a subjective experience that is given a specific meaning through social and linguistic conventions and is, thus, considered personal to the subject from that point on. An emotion represents the feeling aspect of affect that has been (culturally and socially) claimed and conventionalized. "Emotions are constructions of the world, not reactions to it." (Barrett 2017b, 16).

Thus, emotions are not universally inherent but dynamically crafted by the brain based on sensory inputs, past experiences, and cultural influences. The theory of constructed emotion (Barrett 2017) suggests that the brain predicts and interprets our bodily responses to create our emotional experiences. Accordingly, emotions are

constructed at the moment through ever-present sensations of valence (pleasantness or unpleasantness) and arousal (activation or deactivation) (Barrett and Bliss-Moreau 2009). Crucially, emotions are not universal fixed categories but constructed through an interplay of these components. Integrating these theories in the design of game feel provides a nuanced understanding of how videogames can influence the player's emotional states, thereby leading to the formation of game feel concepts and gameplay conventions.

Because "[...] context is intrinsically involved in even the most basic aspects of object perception" (Barrett et al. 2011), understanding how players perceive and categorize what game controls feel like, e.g., "loose," "tight," or "floaty," can be explained through the lens of predictive processing. This concept explains how the brain uses past experiences and abstract concepts to interpret what sensory inputs are most likely to occur in the current context (Hoemann et al. 2020; Barrett 2017b; Clark 2013; Friston 2010). This process mirrors how the brain uses predictive processing mechanisms and how emotions are categorized (Hoemann et al. 2020), suggesting that the brain's predictive models shape the player's experience of game feel and how these are modified based on past gameplay interactions, the genre-specific conventions, and the context in which the activity of play takes place, leading to a diverse and personalized interpretation of how the game's controls and mechanics feel.

For videogames, this means that what players feel – suspense, joy, or frustration – is a product of their brain's interpretation of the game's stimuli (its 'feel'). For instance, a player's fear in a horror game is not a direct result of the scary visuals alone but also how the player's brain constructs this emotion based on past experiences, the game's socio-cultural context, and the player's current entanglement in the activity of play. This interpretation challenges the traditional view of emotions as discrete, pre-determined states expressed through specific physiological and behavioral responses. Instead, it proposes that emotions are dynamic, flexible, and context-dependent processes that emerge from the player and game's entanglement through multiple neural and cognitive mechanisms (Barrett 2017).

Instead of simply referring to affective states as a cognitive container, it may be more appropriate to describe this interplay as 'affective exchanges' between the pre-individual causality of the Real and the individualized aspects of the subject's contextualized and unique perceptions. (Massumi 2021) In other words, emotion presupposes affect. In this sense, emotion represents the moment-to-moment stabilization of a multiplicity of affects into a single unit of signification, with emotion itself becoming the meaning attributed to an affect. Hence, the player's conventionalization of the game's affects (game feel) from moment to moment. Crucially, this positions feelings and emotions as referring to two distinct phenomena.

CORE AFFECT AND GAME FEEL

Core affect is pivotal in shaping a player's immediate and raw emotional response during the activity of play. As a fundamental aspect of core affect, these 'raw' elemental feelings are described as valence (pleasant-unpleasant) and arousal (activated-deactivated). They are the initial, direct physical responses to stimuli (Barrett and Bliss-Moreau 2009). In the context of digital games and the activity of play, valence and arousal serve as fundamental dimensions of core affect that considerably influence a player's experience of the game's feel (Pichlmair and Johansen 2020). For instance, a high arousal level combined with negative valence

could contribute to feelings of tension and anxiety in high-stakes game scenarios. Conversely, positive valence and low arousal might be associated with a relaxing, enjoyable gaming experience. This understanding is crucial for game designers as it underscores the importance of designing game mechanics, visuals, and sounds that intend to evoke specific emotional responses.

In game feel design, valence is pivotal in shaping the player's emotional reactions and experiences. It is a continuous spectrum representing the positive or negative quality of a feeling rather than a binary distinction (Pichlmair and Johansen 2020). This challenges the simplistic categorization of emotions as merely "positive" or "negative," and game feel as either "good" or "bad" and suggests the need for a more nuanced understanding of the player's conventionalization of concepts and their comprehension of play. Likewise, arousal is a crucial dimension of core affect and varies in intensity from high (e.g., excitement, agitation) to low (e.g., calmness, lethargy). Arousal, in concert with valence, significantly contributes to gameplay dynamics, affecting a player's level of engagement and emotional response to game scenarios. This perspective is crucial for game feel design, as it underscores the multifaceted nature of the player experience of game feel during the activity of play.

Thus, valence and arousal create a complex affective space within which the player navigates. For example, the strategic use of dynamic music and sound effects can modulate the arousal and valence of the player's core affect, aiming to craft the game designer's intended emotional response. As game feel design involves minute design work that evokes affect (Pichlmair and Johansen 2020), this is central to the design of game spaces and game feel. This situates game feel design as an act of fine-tuning the relationship between the player's expected and actual outcomes of their interactive entanglement, a process central to designing for game feel.

A possible challenge for game designers in applying these theories to game feel design lies in the variability of emotional experiences among players. Because the conventionalization of game feel is not universally experienced but varies across individual players, game genres, and cultures, game designers must consider a broad spectrum of potential emotional responses when designing for how the player is supposed to experience the game feel. This variability, however, also presents an opportunity for designers to create diverse and inclusive experiences that resonate with a wide range of players.

DESIGNING 'FOR' GAME FEEL

Pichlmair and Johansen posit that "Game feel design is the intentional design of the affective impact of moment-to-moment interaction with games" (2020, 1). They argue that game feel design is the fine-tuning of the relationship between expected and actual outcomes of interactive game processes (Pichlmair and Johansen 2020, 16). Because game feel emerges as a product of the entangled activity of play, this intentionality is difficult to pin down. As a result, game feel necessarily emerges as a unique personal experience individual to each player, game, and their entangled activity. Further, "how a game feels to each individual player is accordingly hard to predict with high accuracy" (Pichlmair 2022).

Game feel, as experienced by the player, can be understood as a complex product of the interplay between the brain's predictive efforts and the actualization of the stimuli of various objects within the game. As such, designing for the player's game feel experience is a complex moment-to-moment process of balancing the player's

expectations and the contextual actuality of the outcomes they experience because of their actions. As a result, the perception of the game's feel does not preexist their interactions but emerges through them. Therefore, a game's unique 'feel' emerges not only from its design elements but from how these elements interact with and sometimes contradict the player's anticipatory expectation based on prior experiences and collateral knowledge of games of a similar type, style, and genres. The "perceived heaviness of the ball in *Rocket League*" (Wilson 2016) requires certain previous knowledge and the interaction of the player to conclude that very heaviness. All while being couched in the existing game design conventions they have previously been exposed to and their socio-cultural background. In other words, to design for game feel we must assume the widely accepted view of the player as a cultural being and an individual whose relationship with the game can be conceptually framed as, for example, an 'entanglement' (Sicart 2021; Barad 2007) or 'cybernetic circuit' (Giddings and Kennedy 2008).

As such, game feel emerges as a unique experience individual to each player-game and their entangled activity. This is why "how a game feels to each individual player is accordingly hard to predict with high accuracy" (Pichlmair 2022), and ultimately also why the perception of game feel does not preexist the player and game's interactions but emerges through them. This hints at just one of the many reasons game developers find the feel of a game hard to pin down.

Game Feel and Context

Game feel "is subjective and highly dependent on context inside and outside the game" (Pichlmair and Johansen 2020, 5). Although the aesthetic aspect of audio-visual design, such as evoking a particular atmosphere, location, and emotional tone, through its audio-visual design is widely acknowledged, the functional elements of videogame design are not always given the same attention. The sensations experienced through interaction with this functional videogame component are generally recognized as the game's feel or game feel. Hicks et al. suggest that while developers are intuitively able to recognize "juicy" design[ii] they have difficulties in articulating them (Hicks et al. 2018, 15).

To a large degree, the player's experience of the game's aesthetics depends on the consistency of the environment the game designer and developers crafted for them. This means that a successful game's mechanics, gameworld, aesthetics, and conventions are perceived to be consistent with the player's expectations of the experience. It follows that game feel design is the intentional, nuanced, and often intuitive process that focuses on crafting the affective impact of real-time interactions within a game. It involves a complex interplay of fine-tuned auditory, visual, and mechanical elements designed to evoke specific reactions and feelings in the player. To design for game feel is essentially about designing "coherent, contextualized experience[s]" (Hicks et al. 2018) because it governs all the other emerging sub-categories of the game's integration. Moreover, while game designers typically strive to create games with "good" game feel, the subjective nature of the term and the importance of players experiencing "good negative moments" suggest that a more holistic terminology is required (Pichlmair and Johansen 2020). In other words, the term game feel should be considered value-neutral, and more inclusive language is needed to fully capture players' complex and nuanced experiences while playing videogames.

For example, negative moments, such as failures and challenges, are a crucial part of the activity of play, and these moments can contribute significantly to player engagement and enjoyment. Some games, like the challenging gameplay of *Super Meat Boy*, directly speak to the type of player that enjoys a more "punishing" experience to arrive at a satisfying feeling of accomplishment when finally "beating" a challenging boss fight or level in the game. Therefore, game designers should consider the full range of player experiences, including negative moments, when designing and evaluating videogames.

Where "good" and "bad" game feel are value judgments, more inclusive language is needed to fully capture the complex and nuanced experiences of the player while playing videogames. (Pichlmair and Johansen 2020) Instead, 'valence' is an essential aspect of the emotional design of games, influencing the player's feelings and reactions. Further, game designers cannot simply implement game feel because game feel is perceiver dependent. Instead, they have to design for the possibility of different types of 'affective' valence. Drawing on affective science, we can define that "affect is generally characterized by arousal, the quality of the experience, and valence, which can be either positive or negative." (Pichlmair and Johansen 2020, 4) In the field of affective science and psychology specifically, affect refers to a particular type of influence that describes a phenomenon's ability to impact a person's mental state in a way that correlates with their physical state (Barrett 2020). As such, affect is a fundamental, psychologically irreducible characteristic of the human mind, a mental element that can become an emotion when combined with other mental elements (Barrett and Bliss-Moreau 2009). For Barrett and Bliss-Moreau, 'core affect' refers to a primary, universal, and non-reducible aspect of the mind that has wide-ranging effects on psychological processes, extending beyond emotions to impact learning and consciousness. Affective changes are "core" because they are essential to the player's conscious awareness of their surroundings.

Simply put, a core affective state encompasses two fundamental and interrelated sensations. Stimuli are related to the body's internal state (interoception), and stimuli are caused by external stimuli (exteroception) (Barrett 2020). As such, the basis of a player's core affect is rooted in changes that take place in the interplay between their body's internal and external (somatovisceral) systems, as well as their perception of movement and position (kinesthetic), their awareness of their bodily position in space (proprioception), and the function of their neurochemical systems (Ibid.).

Changes in core affect lead to integrating incoming sensory stimuli from the external world with the body's ability to maintain a stable internal environment (homeostasis) and manage its perception of internal bodily sensations (interoception). As a result, a player's core affects act as a standard metric for evaluating and comparing events that serve as the foundation for value judgments, such as 'good' or 'bad' game feel. Understood as such, "[c]ore affect is a state of pleasure or displeasure with some degree of arousal" (Barrett and Bliss-Moreau 2009, 171).

The capacity for humans to experience core affective states is cognitively universal and physically fundamental. However, people learn through experience, in which sensory patterns indicate threat and reward (Barrett and Bliss-Moreau 2009). Accordingly, the player's core affects may be understood as a neurophysiologic barometer for the individual player's felt perturbations by the gameworld's environment during the activity of play, where specific points in time and self-reported feelings are used to measure the barometer's readings.

The circuitry for core affect in the player's brain is crucial in creating a network that links sensory stimulation from internal and external sources. The interconnectivity of this network is a critical component that links sensory stimulation from within the body to sensory stimulation from outside the body, with each providing information to the other. When the predictive value of an incoming stimulus encountered during the activity of play is unknown or uncertain, the player's brain directs multiple sources of attention toward the object of the perturbation. As a result, the brain organizes physiological and physical actions to learn more about the perturbing object and adequately predict its future value. (Barrett and Bliss-Moreau 2009)

Drawing from the fact that the player brings along their expectations from previous play and life experience, it is also essential how these elements match the game's type, genre, and context in which they are used. According to Hicks et al. (Ibid.), "positive game feel" is associated with seven aspects, one of them being how there exist "predictable results that allow a sense of mastery and control by correctly and consistently interpreting player input." (Ibid., 3)

Affective Niche and Game Design

Understanding how the player perceives the affective stimuli they encounter during the activity of play is crucial to understanding how to design the game feel for diverse gameplay scenarios. The concept of the 'affective niche' (Barrett 2017) is a valuable framework for understanding how to design for the player's game feel. It highlights the interrelation of affect, bodily states, and environmental stimuli in shaping gameplay experiences. Recognizing the affective niche's role can aid game designers in creating more engaging, emotionally resonant game worlds.

The affective niche refers to the dynamic interplay between a player's internal affective state and the external stimuli provided by the game world during play (Ibid.). Our brains use past experiences to predict and interpret the impact of various stimuli on our affective state, essentially forming an affective niche (Ibid., 91-92). This concept is critical to understanding how players engage with and are influenced by the affects of the game environments they inhabit.

The 'affective niche' denotes the symbiotic relationship between the player's internal emotional states and the external stimuli presented by the game, highlighting how personal experiences, cognitive biases, and the socio-cultural context influence the perception and interpretation of a game's feel. In digital games, the affective niche encompasses everything that influences the player at any given moment during the activity of play. The player's niche includes everything crucial to their immediate activity and actions, including the game's visual aesthetics, sound design, narrative, mechanics, and the social interactions it facilitates.

As a type of affective realism, this suggests that the player's senses do not objectively represent reality but are influenced by their affective state. Therefore, the game environment, as perceived by the player, is a subjective reconstruction influenced by their affective niche. The core affective properties – valence and arousal – significantly shape a player's experience within their affective niche (Barrett 2017). These dimensions are continually influenced by the game's stimuli, impacting the player's emotional reactions and engagement levels. Interoception, the brain's perception of the body's internal state, also contributes significantly to the affective niche (Ibid.). How players interpret their internal sensations during gameplay, such as increased

heart rate or tension, can influence their perception of the game environment and their decisions.

During the activity of play, the intra-action of entangled human and artificial bodies is an infinite multiplicity at each moment of perception, where any stabilization of felt experience is not a minuscule slice but rather an indefinitely dense node in a dynamic field diffracted across spacetime (Barad 2014).

Barad uses the classical quantum mechanical double-slit experiment as an example of this bi-stable perception of intra-acting bodies. The double-slit experiment involves light particles being given two distinct paths (the double-slits) to travel through an obstructing barrier to a detection screen. The particles that pass through the slits eventually "draw" an interference pattern, also known as a diffraction pattern, which is a complex pattern of varying intensity.

Diffraction, as understood in the context of play, refers to the player's experience from within the entanglement of the ludic, human, and artificial. As an entanglement of materiality and agency, the activity of play, as such, is not experienced as a whole but rather as a continual stream sliced up into individual perceptual stabilities. The player foregrounds a dominant stability, with the other non-dominant stabilities temporarily pushed into the background. These background stabilities, in turn, serve as the experiential ground for foregrounded perception. This bi-stable perceptual mechanism illustrates how the player is affected by the different individual aspects of the game's modalities. In essence, this bi-stability constitutes the player's affective niche. Crucially, the affective niche may thus be understood as everything foregrounded and stabilized that has any relevance to the player in any present moment during the activity of play, and all else is perceived as pushed into the background as the ground to the stabilized phenomena as figure.

CONCLUSIONS

In exploring the intricacies of game feel through the lenses of affective science and cognitive neuroscience, this paper has discussed the dynamic, complex nature of players' experiences of game feel in videogames. Integrating theories from Barrett (2017) and the concept of core affect (Barrett and Bliss-Moreau 2009) with game design principles offers a rich and nuanced understanding of how players interact with and perceive their game worlds during the activity of play.

While previously undertheorized, game feel can be approached from the point of view of affective science that expands a relatively vague umbrella concept into a part of the player experience design. Theories on constructed emotion and affect explain how game feel is shaped not only by the player's prior experiences and personal background but also by the designed qualities of the game object. As discussed, the concept of game feel emerges from the reactive and predictive interplay between the game's design elements and the player's perceptive brain functions. This interaction results in a uniquely personal experience contingent upon many factors, including past experiences, socio-cultural backgrounds, and the individual expectations of the game's genre and cultural context. The reactive elements of game feel are essential in creating a dynamic, engaging gaming experience. They ensure that the game feels responsive to the player, contributing to the overall sense of immersion and enjoyment.

Thus, integrating the theories of constructed emotion and core affect into videogame design offers a nuanced and holistic understanding of how games influence players' emotional states, and their conventionalization of game feel terms. By considering these theories, game designers are afforded a framework for crafting gameplay experiences that entertain and resonate with the player's experience of the game's feel, potentially leading to more engaging gameplay. In short, the interplay of core affect and constructed emotion provides a rich framework for understanding and designing the complex affective and emotional aspects of videogame worlds.

Constructed emotion theory posits that the affective elements within a game can challenge or surprise the player's brain, continuously making predictions based on past interactions. This surprise element may elicit complex responses that are not simply positive or negative. Such complexity arises from the brain's predictive nature, wherein a mismatch between the player's expectations and the context of game events can trigger varying levels of arousal. The affect or game feel experienced is contingent on the specific context of the activity of play and the player's collateral knowledge and accumulated gaming experience. The concept of the affective niche (Barrett 2017) plays a crucial role in understanding and designing game feel. The player's niche, formed by the interaction of internal states and external game stimuli, underscores the importance of designing game environments that are not only aesthetically pleasing but also emotionally resonant. Recognizing the affective niche's influence on player experience allows designers to create games that are inclusive and sensitive to a diverse range of players, their experiences, and socio-cultural backgrounds.

Game feel, once nebulous, can now be operationalized in game design and research using affective theory. This approach expands the term beyond a simple value judgment of "good" or "bad" game feel into a range of player affect and perceptual experiences. By embracing the complex interplay of mechanics, dynamics, aesthetics, and storytelling, designers can create games that resonate deeply with players' emotional and sensory faculties.

As the field of game design continues to evolve, integrating affective science and cognitive neuroscience offers a promising path forward. This interdisciplinary approach can lead to the development of games that not only entertain but also enrich players' game feel. Future research should explore how these theories apply across different game genres, player demographics, and individual modalities, enhancing our understanding of game feel and its impact on the player experience.

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[i] While this may potentially be a fruitful perspective, we will continue using the more popular spelling of the concept, 'game fee,' throughout the rest of the article. Because, without adequate space allocated to formally defining the term and perspective, we run the risk of engaging in "merely verbal disagreement" (Næss, 1966; Aarseth and Calleja 2015), rather than any meaningful discourse concerning the topic at hand.

[ii] Juiciness is often used to refer to positively experienced feedback from the game and is thus a closely related concept to game feel. While we do not have the space to discuss the relationship between game feel and juiciness here, Juul (2010) and Keogh (2015) have presented relatable definitions of juiciness.