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ORIGINAL ARTICLE

Movement compression, sports and eSports

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ABSTRACT

In this paper I argue for the usefulness of the concept of 'movement compression' for understanding sport and games, and particularly the differences between traditional sport and eSport (as currently practised). I suggest that movement compression allows us to distinguish between different activities in terms of how movement quality (in the sense of the *qualities* the movement possesses, rather than that the movement is of 'high quality') affects outcome. While it applies widely, this concept can in particular help us to understand the persistent idea that eSports are in some key way distinct from traditional sports.

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Introduction

In this paper I argue for the usefulness of the concept of 'movement compression' to understanding sport and games. Movement compression – understood here as any kind of mediation that causes different movements to produce the same outcome – reduces the dimensions along which the quality of the movement (in a descriptive, not evaluative, sense) is integral to the activity. This concept can help us to understand in particular the curious status of eSports in the sports family, offering a competing and, I argue, more accurate, explanation of the similarities and differences between current and future eSports and traditional sports than competing accounts.

First, I discuss some of the issues around movement in sport and eSports, including arguments purporting to explain why we ought to consider eSports as distinct from traditional sports. I then offer movement compression as a competing theory to those currently in the literature. I focus in particular on the gross vs. fine movement, virtual vs. actual, and domain of execution vs. domain of application distinctions. On the basis of the concept of movement compression, the core difference between traditional sports and eSports is that player movement has effects on the outcome in eSports along fewer dimensions than in traditional sports. However, it is important to note that this is a contingent feature of eSports rather than a necessary one. That is, not only are there large differences within the eSports/video game family in terms of the degree of movement compression they contain, but there is also no reason in principle why we could not have eSports with the same (lack of) movement

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compression as traditional sports. Finally, I explain some of the advantages of considering sport and games in terms of movement compression.

It is important to note that my interest here is in *describing* the features of various activities, not *evaluating* them. So, when I say that an activity contains more or less movement compression, this should not be taken to be suggesting that it is more or less legitimate or worthwhile. To say that eSports contain more movement compression than soccer, for instance, is not to say anything whatsoever about their relative worth (Hemmingsen, 2023). Similarly, in describing some activities as involving more or less movement compression, I am making no statement whatsoever about the relative *skill levels* involved in these activities.[1] I have no doubt that there are sports containing no movement compression that require less skill than eSports with high levels of movement compression. My concern is rather *what dimensions* of movement are relevant to an activity, rather than *how much* skill that movement requires.

Sports and movement

Sport is often understood as a sub-category of games: all sports are games of one kind or another. But, of course, 'sports' and 'games' are not coextensive. There are plenty of games that are not sports: monopoly, for instance, is certainly a game, but no one is claiming it is a sport. Sports, then, are often understood to be games with 'the additional characteristic of requiring physical skill and prowess to be demonstrated by the participants in the pursuit of its goal' (Meier, 1981, p. 94).

The 'physical skill' requirement is often used to distinguish activities such as 'mind sports' (chess and bridge, for example) from sports *simpliciter*. While mind sports like chess share a competitive strategy element with sports such as soccer, baseball, tennis, etc., in terms of the outcome of a chess match it typically does not matter *how* you move your pieces. As Dennis Hemphill puts it, 'although the movement of chess pieces is circumscribed by the rules, the physical dexterity of that movement is neither relevant to understanding the nature of the game nor valued as a game-relevant skill' (Hemphill, 2005, p. 198). Similarly, Klaus V. Meier points out that,

> chess, bridge, and numerous other games can be played without any specified or necessary physical movements demanded of the participants – machines or slaves can move the pieces or cards, verbal commands or instructions may suffice adequately, and chess may be played through the mail or over the radio (1981, p. 83).

So-called 'mind sports' are fairly clear-cut cases where physical movement is irrelevant. But how about activities such as eSports? After all, many eSports are games requiring physical skill. The physicality of eSports has of course been a matter of debate. As Emma Witkowski puts it, 'articulating how a computer game engages the physical self is complicated' (2012, p. 356) and Daniel Kane and Brandon D. Spradley remind us that 'Sitting in front of a computer and playing video games is not the image that comes to mind when a person thinks of an athlete' (2017, p. 1). As an occasional gamer myself, I would hardly describe my gaming activities in general as highly physical. But *competitive* gaming is quite another matter. David Ekdahl & Susanne Ravn point out that:

> playing games such as *Counter Strike: Global Offensive* [Valve, 2012] and *League of Legends* [Riot Games, 2009] successfully … presupposes a unique physical skillset on the side of the eSports practitioner: manipulating the relevant hardware in order to cope in their virtual world is absolutely central to the successful performance. This physical skillset of an eSports master amounts to a fast-paced and dexterous prowess with the physical hardware unmatched by most people (2019, p. 133).

Felix Lebed agrees, noting that,

> the majority of contemporary digital games are too hard to play successfully without fast psycho-motor reactions and action-focused decision making. Fine motor skills play a decisive role in success and/or victory over opponents. Additionally, performance of very fast movements over extended periods of time demands a high level of psycho-physical endurance (2021, p. 117).

And Jason Holt suggests that 'just as the essential physicality of sport is *the* crucial feature that distinguishes it from other games, so too are such videogames … games of physical skill whose outcome is determined largely by physical prowess' (2016, p. 2).

The traditional response to this is to acknowledge that 'there might be plenty of physical action and effort in computer gaming,' but then to question 'whether the physical exertion involved is adequately physical in the required sense' (Parry, 2019, p. 12). That is, to question whether the physical movement in eSports is the *same kind* of movement as in sports. The 'required sense' of physicality here usually refers to a distinction between gross physical activity and fine physical activity (Loy, 1968). The argument, then, is that activities such as basketball rely on gross physical movements whereas activities such as *League of Legends* utilise only fine-motor movements, and that the two kinds of activity are therefore distinct.

The distinction between gross and fine movement, however, is not uncontested. Meier, for instance, argues that this distinction is 'arbitrary and counterproductive,' and that the attempt to draw it 'does not at all justify the effort expended in its attainment' (1981, pp. 84–85). Others find this distinction unproblematic: Holt argues that 'drawing the distinction between fine and gross motor skill is neither as arbitrary nor as difficult as [critics] suggest,' and that there are 'sufficiently precise ways to distinguish gross motor skills' (2016, p. 3). These can include defining gross motor skills as involving major muscle groups, or, as Jim Parry suggests, the issue can be recast in terms of 'whole-body skills' (2018, p. 11).

For myself, I think that Meier is absolutely right to think the attention given to this distinction is overblown, at least when trying to distinguish between sports and eSports on this basis. Even if we understand 'gross movement' in terms of 'whole-body control,' there's very little difference between a competitive shooter and a professional *Counter Strike* player in this respect. If a shooter's breath control, etc., qualifies it as a 'whole-body' activity, then surely professional eSports players should be considered athletes as well. As Mariona Rosell Llorens puts it,

> eSport gaming requires an important degree of physical engagement; gamers need to develop their motor and body control skills, eye-hand coordination and position endurance in order to be precise in their shots. In fact, the physical activity involved is *very similar to the one of shooting* (an Olympic sport) (2017, p. 5, italics mine).

In addition, while no current professional eSports (to my knowledge) utilise the technology, game systems increasingly incorporate motion controls (Holt, 2016, p. 4). This may be in the form of movements that are still arguably in the realm of fine motor movements, such as simple flicks of the wrist to roll or jump in *Super Mario Odyssey* (Nintendo, 2017). Or, it can involve full body movement, such as the Nintendo Switch's *Ring Fit Adventure* (Nintendo, 2019), a top-selling game where players engage in a full range of exercise movements utilising the whole body; the recent *Creed: Rise to Glory* (Survios, 2018) for the Playstation 4, which simulates boxing, including the use of a VR headset; or the classic *Wii Sports* (Nintendo, 2006) on the Nintendo Wii, in which players use gross physical movements to play golf and tennis.

I don't there's any question that *Ring Fit Adventure*, for example, involves more gross physical movement that shooting. Yet while there are no current professional leagues of such games, games such as Wii Sports are nonetheless played competitively (in the form of speedrunning, for instance). Hence, it's unclear whether we can sharply distinguish sport from eSport on this basis, and certainly we do not seem to be dealing with an in principle distinction here.

Virtuality

Since at least some eSports involve *more* gross physical movement than some traditional sports,[2] if there's a difference between those activities, it can't be down to the gross vs. fine motor distinction. One alternative suggestion for distinguishing the two is to emphasise the virtuality of eSports. Unlike traditional sports, eSports occur in 'uniquely structured, virtual worlds within which the eSports practitioners must comport themselves perceptually and practically' (Ekdahl & Ravn, 2019, p. 132). In other words, the worlds in which the 'action' is occurring are virtual rather than real. Graham McFee, for instance, distinguishes sharply between physical and electronic activities in this sense, arguing that sport is physical, whereas eSports are merely non-physical or virtual (2004, p. 19).

However, we can question whether virtuality/non-virtuality a meaningful distinction, as well as whether it allows us to draw a sharp line between sports and eSports. It's certainly true that eSports players – unlike soccer players, or cricket players – have to learn to move and act in a world that is different from the everyday. But at the same time, phenomenologically it seems that eSports players become perceptually embedded in these virtual worlds. As Ekdahl & Ravn describe it,

> The eSports practitioner must lose some indeterminate part of his or her sense of being in front of a monitor, peering into a digital world, instead allowing his or her body subject to become enveloped by a new and unique world of virtual comportment with its own sensory structures. In other words, the eSports practitioner must learn to attune and integrate his or her body schema to the spaces of the virtual worlds in order to cope within them (2019, p. 137).

As Nicolas Besombes and Pauline Maillot put it,

> In direct or indirect contact with the material objects of the video game devices that surround him (e.g., screen, controllers, chairs), the player reaches an altered state of instrumented experience. Connected with the various sensory-emotional-motor elements

> of his environment, he ends up identifying himself with the character he embodies on the screen. He then no longer has the impression of controlling his fingers but rather his graphic representation (the avatar) and becomes able to feel the physical characteristics of the game: The air control of a character (i.e., the possibility of controlling the avatar when he jumps) will be different from one game to another, or the grip and therefore the manageability of a virtual car will change according to the race surface (e.g., asphalt, sand, or grass). (2020, pp. 570–571)

Rune Klevjer notes that, when immersed in a game, 'if the computer then takes camera control away from you, if only for a brief second, this will not break the strong prosthetic link, but instead produce a sensation of being moved, of being taken for a ride' (2012, p. 31). In highly immersive games – and I imagine this is especially true at the upper reaches of competitive play – the player 'incorporates the machine as one would the body in a "lived body" experience' (Hemphill, 2005, p. 200). Given this phenomenology, it's not clear that the distinction between virtual and real – on its own, at least – tells us anything interesting about the differences between sport and eSport, except to those specifically interested in the question of embodiment.

Perhaps, however, we might note that while eSports involve detailed visual and auditory sensations, they typically lack the comprehensive tactile sensations of traditional sports.[3] This may be enough to distinguish the two activities from each other sharply and meaningfully. However, while this distinction may hold in practice as things stand now – the level of interactivity and immersion has clear limits in current popular eSports – this is certainly not an in-principle distinction, and likely a distinction that will be overcome at some point in the not-too-distant future. For instance, Hemphill discusses some of the more exotic gaming technologies, including 'hydraulically controlled motion platforms and bicycle ergometers;' 'motion-sensor flooring, infra-red sensors, and cameras to track whole-body movements and register them through an electronic game character or object (2005, p. 201);' and the experimental Lumetila project, in which,

> a player stands on a stage facing a three-dimensional image of a rectangular room and a moving ball image. EMFi (Electro Mechanical Film) sensors underneath the 4- by 4-m floor area track bodily movements, and a computer translates them into the movement of a virtual racquet that propels the ball toward and off a virtual back wall (Hemphill, 2005, p. 202).

Given that these technologies require that players utilise full movements in real space, often using physical objects such as racquets or ergometers, we can expect that much of the pain and fatigue that accompanies play in real world sports will be found in these virtual sports as well.

Domains of execution/application

One further way of distinguishing sports and eSports is Holt's idea of the domain of execution and the domain of application. As he puts it, 'The domain of execution is subject specific, a matter of *where* the agent's skilled movement occurs; by contrast, the domain of application is object specific, *where* the action's outcome is meant to obtain' (2016, p. 4). The difference between the eSports and sports then lies in the fact that in traditional sports, the domain of execution and the domain of application are identical, whereas in eSports they're not. For example, in ice hockey, the 'realm' in which I perform a movement with the stick to hit the puck is also – and unremarkably – the very same realm in which the outcome – the movement of the puck – takes place. The same is not the case when it comes to eSports: the actions performed in the actual world – such as mouse clicks or, in the case of whole-body games, the simulated movement of the racquet, club, etc. – is then 'transposed' into a virtual world (Holt, 2016, p. 5).

There is certainly something to be said for Hemphill's distinction, and it's one I have used fruitfully in other contexts (Hemmingsen, 2021, p. 455). However, first, it's unclear why this difference should matter all that much in comparing the two activities: the case for precisely why it is a productive and illuminating distinction rather than a merely contingent difference has yet to be clearly made.

Second, there are activities in which the domain of application and execution are the same, but which seem intuitively to be more like eSports than sports. For instance, Parry discusses the BBC TV show *Robot Wars*. In this show, contestants build a robot, and using these robots 'fight a remote-controlled battle to the "death" – the aim being to disable (and, preferably, destroy) the opposition' (Parry, 2019, p. 8). Intuitively, *Robot Wars* has more in common with eSports like *Counter Strike* or *Fortnite* (Epic Games, 2017) than it does with traditional sports such as soccer, tennis or swimming. However, in *Robot Wars* the domain of execution and the domain of application are the same. If a split between domains of execution and domains of application are what is supposed to distinguish sports from eSports, then *Robot Wars* presents a challenge of categorisation.

According to Parry, the key difference between eSports and *Robot Wars* on the one hand, and traditional sports on the other, is that in the former the players are not 'huddled as they are behind their controls … , direct competitors' (Parry, 2019, p. 8). In the case of eSports, they are not direct competitors because the effects of the players' actions occur in a virtual world; for *Robot Wars* because the real competitors are the robots, which the players merely control. Here, it's not the application/execution distinction that matters, but whether or not the contest is directly between humans or is mediated.

I think this is the wrong explanation. Imagine the following future sport, which we can call 'Robo-Football.' In Robo-Football, players put on a full sensor suit, including detailed haptic feedback. This suit controls a humanoid robot, with 1-1 movement control, i.e., the players must perform the very same actions that they want the robot to execute. These robots are then used to replicate exactly a professional football game, on a real field. Given the haptic feedback of the suits, the players feel (within limits) what the robots are experiencing, such as the force of tackles, or physical resistance when trying to drive forward against another player. As a result, they experience the same physical fatigue as they would if they were playing an ordinary game of football. And due to the highly immersive nature of the suit, phenomenologically they feel as if they are embodied in the robot.

My own view (as well as a casual, highly unscientific survey of the opinions of friends and colleagues) is that there is very little daylight between an activity like Robo-Football and 'real' football.[4] However, Robo-Football is entirely mediated: the players control the robots, but they are not physically on the field itself. Robo-Football resembles Parry's description of *Robot Wars* as involving players who are 'remote-controllers, not allowed to touch their robots during the contest,' and who are not 'direct competitors' (2018, pp. 6–7). So is Robo-Football a sport, or an eSport? At the very least, it seems difficult to come down cleanly on one side or the other in this case, and as a result, Parry's distinction is questionable in its usefulness.

Movement compression

I argue that the distinctions discussed so far – gross vs. fine, virtual vs. real, and mediated vs. unmediated – are circling the core issue that explains the intuition many have that sports and eSports are importantly different, without quite touching on it.

The gross vs. fine distinction rightly emphasises movement. The intuition that the quality of a movement is relevant to the distinction between sport and eSport is significant. But the gross vs. fine distinction incorrectly identifies the issue as being the *kind* of movement. Instead, I argue that we should be concerned with the *effect* of the movement or, rather, the dimensions along which the movement is able to be effective.

The virtual vs. real and mediated vs. unmediated distinctions usefully draw attention to the fact that in eSports the actions of the players undergo a translation between what the player *does* and what *happens*. However, the former distinction mistakes the key issue as being one of *where* the outcome takes place (in a real world vs. a virtual one); and the latter places undue importance on the fact *that* the player's actions are mediated. However, the real issue is the nature of the *relationship* between the player action and the outcome, i.e., the nature of the mediation.

In my view, what truly distinguishes eSports from sports (not sharply, but as a matter of degree), is the issue of what I call 'movement compression.' By 'movement compression,' I mean the degree to which the quality of the initial action translates to a difference in outcome in the activity along various dimensions. For example, in all 'analogue' sports, every action[5] the player performs immediately and inevitably expresses itself fully in what happens in the game itself. In cricket, for instance, extremely small differences in where I strike the ball with my bat, the angle of the bat, the speed of movement, and so on, affect where that ball ends up going. When I play a stroke, there's no aspect of my movement that fails to be relevant to what subsequently happens.

Of course, we need to be careful here about what we mean by 'outcome.' In a narrower sense, there are plenty of actions in traditional analogue sports that make no difference to the outcome: I can make a successful hook shot in cricket with slightly more or slightly less force, but within a certain range the ball is still going over the fence for six. In this sense, the quality of my movement doesn't make a difference to the outcome, and the two shots are 'the same.' Similarly, there are many different foot movements that will strike the ball past the goalie in soccer; in this sense, various different movements have an identical effect on the 'outcome.'

Outcome in this sense – what we might call the outcome of the *game* – is different, however, to outcome in the broader sense of what physically happens on the field. A goal is a goal is a goal, but kicking the ball one way moves the ball differently towards that goal than kicking it another way.

Digital activities, by contrast, currently can't guarantee (or are not interested in guaranteeing) this kind of fidelity between action and outcome. Take golf in *Wii Sports*, for example: in this game, players make golf swings with the Wiimote (the motion-sensitive game-controller) in order to cause their avatar in the game to strike the golf ball. Consequently, it certainly matters to the outcome of the game *how* the player swings the Wiimote. But only up to a point. There's a reason, after all, why I'm pretty good at *Wii Sports* golf, but pretty bad at the real thing: *Wii Sports* golf is far more forgiving of small differences in movement, differences that would lead to divergences in outcome in real golf but make absolutely no difference in the digital version. In other words, in *Wii Sports* golf, so long as my movements are within a certain (small but real) range, the on-screen stroke will be the same, and the (virtual) ball will move in *exactly* the same way. By contrast, in analogue golf all the actions within that same range will lead to greater or lesser degrees of difference in how the ball travels and where it ends up. In this sense, my movements are 'compressed' in *Wii Sports* golf, in that not every detail of my action has an effect on the game. Instead, various slightly different actions all lead to the same result.

When we consider current eSports, we can see this kind of movement compression to a much higher degree than in *Wii Sports* golf. For instance, in *Counter Strike* clicking the left mouse button fires your weapon. Many details of this action matter to the outcome, such as the precise timing of the click, and where the cursor is pointing, etc. However, it doesn't matter at all *how* you click the button; it doesn't matter if you press it softly or with force, what finger you use – you could even lift the mouse up and click the button with your nose and, while inefficient, this will lead to exactly the same outcome as if you'd used your finger. Hence, the quality of your finger (or nose) movement here is *compressed* into a single outcome.

In saying this, I want to be very clear about what I am claiming. I am *not* saying that clicking the button is can never be skilled activity. I also recognise that in many eSports – as in any other game in which physical movement is central – the player does not *simply* press the button. Rather, the pressing of the button is part of a suite of movements that flow from the previous button push, lead into the next button push, take into account matters of timing, and may occur simultaneously with the pushing of other buttons or the movement of the mouse or joystick. In this sense, my idea that a skilled player could push the button with their nose is somewhat facetious: each button push is not isolated, but part of a holistic series of movement utilising (at least typically) the whole body.

Nonetheless, there *is* a difference in the quality of the movement when outcomes are considered. In a game like *Counter Strike*, the whole-body movement facilitates the push of a button (not in isolation, of course, but still a button is pushed), yet the specifics of that movement are not *carried through* the push of that button into the game itself. Certainly, the specifics of the movement matter to timing, to the movement flow of the player in terms of what she does (or is capable of doing) before and after the button is pushed, and in terms of simultaneous actions the player takes. But they *do not* translate into a difference in terms of the outcome of that button push in particular. A left mouse click at a particular moment in the game creates the very same game outcome regardless of what else the player is doing: it shoots the gun, and in exactly the same way. The impact of that holistic movement is therefore limited in particular ways due to it being mediated through the button push, in a way that is not true of analogue sports. In analogue sports, the quality of that holistic, whole body movement is *carried through* in the sense that everything about that movement *matters*, not just to subsequent movements the player makes in the game, but to the outcome of that movement in a narrow sense, i.e., when taken in isolation from subsequent/simultaneous actions in the game. By contrast, while movement is *Counter Strike* is also both holistic and highly skilled, movement quality does *not* carry through to the outcome of that movement in this narrow sense.

Additionally, it is important to note that movement compression in video games occurs not only in games that emphasise fine motor movements, but also those that involve gross movement. For instance, when my son plays *Ring Fit Adventure*, he utilises various movement techniques for achieving a perfect score that do not much resemble the movements the designers intended players to use. Yet the outcomes in terms of what happens in the virtual world are identical. Similarly, so long as the player's feet touch the correct pads at the right time in *Dance Dance Revolution* (Konami, 1998), the same level can be beaten using a range of quite different collections of gross movements. Movement compression is not, therefore, merely a recasting of the fine vs. gross movement distinction in different language.

A continuum of movement compression

To illustrate how movement compression differs both between sports and eSports/video games, as well as between eSports/video games as a group, let's take the case of golf, which has a long history, both analogue and digital. I will start with golf games that involve the most movement compression, and show how that movement compression is reduced as technology develops and as more dimensions of a movement become relevant to the outcome, i.e., how that movement becomes gradually *de*compressed in various ways.

To begin, in the video game *Pro Golf 1* (Softape, 1979), players manually select their club and the angle and force of their shot, then click the button to activate the shot. There's no timing or skill involved in any of their actions – it's a purely intellectual activity – and so it makes absolutely no difference *how* the player pushes the keys. We might therefore describe *Pro Golf 1* as involving complete movement compression (Figure 1).

3-D Golf Simulation (T&E SOFT, 1982) adds an additional dimension: as with *Pro Golf 1*, players select their club and angle, but control the strength of the stroke by the timing of their key press (there's a swing metre that moves up and down automatically, and the stroke has different strengths depending on where that metre is when the player hits the key). So, *3-D Golf Simulation* does involve some physical skill – in particular, timing skill – but it still doesn't matter *how* the player hits that key, in the sense of their physical movement when they do so. If the timing is correct, they can press the key softly or with force, in any way they like, and it simply doesn't make a difference. *3-D Golf Simulation* therefore involves slightly less movement compression

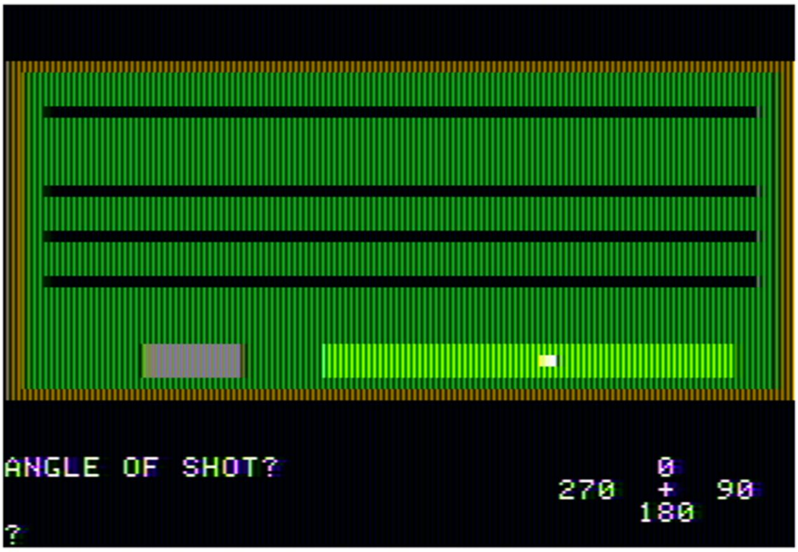

Figure 1. Pro Golf 1 (Softape, 1979).

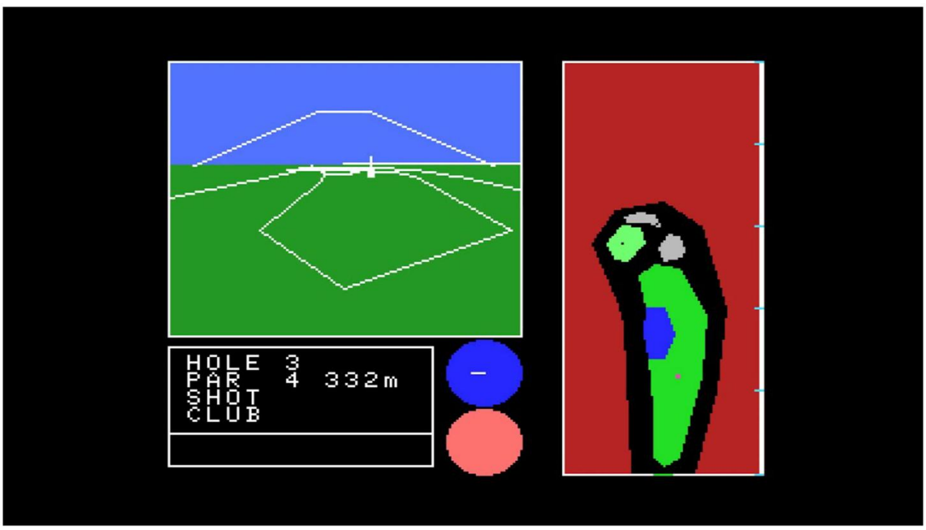

Figure 2. 3-D Golf Simulation (T&E Soft, 1982).

than *Pro Golf 1* – timing is now a factor – but the movement compression is still high (Figure 2).

In *PGA Tour 2K21* (HB Studios, 2020), players select their clubs and aim the shot. They then make the shot by moving a directional stick on the controller.[6] This is different from *3-D Golf Simulation*, in the sense that the directional stick has an analogue element to it; the speed, force, direction, etc., with which you move the stick now makes a difference to the stroke: a lighter, slower push leads to a different stroke than a faster, more forceful one, for instance. However, the degree to which the quality of your movement makes a difference to the outcome is limited. There's a point at which

Figure 3. PGA Tour 2K21 (HB Studios, 2020).

the degree of variation between stick movements is so slight that it makes no difference to how the stroke plays in the game itself. *PGA Tour 2K21* therefore involves less movement compression than *3-D Golf Simulation*, in that both timing and the quality of movement does matter to the outcome. But since the quality of the directional stick movement has obvious limits in sensitivity, the degree of movement compression is still quite high (Figure 3).

Mario Golf: Super Rush (Camelot Software Planning, 2021) involves full motion controls that have the player mimic real golf swings with the Nintendo Switch controller. For increased veracity, players can even embed the controllers in simulated (though not very authentic looking) golf clubs that can be bought separately. *Mario Golf* involves significantly less movement compression than *PGA Tour 2K21*, since it matters a great deal how you swing the club. However, there are also limits: for one thing, the ball can only go in the direction the player selects in advance. The player's swing determines only a) how hard the ball is struck, and b) the degree of spin, which affects how the ball moves through the air. By contrast, in a real-world golf game, how the player swings the club affects not just the movement of the ball in the air, but also the initial direction of the stroke (for instance, I can be intending to hit down one line, but the angle of my stroke means that – spin aside – the ball goes down a slightly different line instead). There are also limits to the sensitivity of the controller, in that the quality of the swing matters only to a point. Hence, while player movements in *Mario Golf* are much less compressed than in *PGA Tour 2K21*, they are still compressed to some extent (Figure 4).

Then there are systems such as Smart Golf. As described by Hemphill,

> players stand in an 18- by 10- by 12-ft cubicle facing a 10- by 12-ft video screen that can display three-dimensional computer-generated versions of golf courses … Players, using their own clubs, hit a ball from a tee, rough grass, or sand mat into the three-dimensional fairway or green screen image. The 'real' ball hits the screen and drops to the ground,

> but during its flight infrared sensors track ball trajectory and a computer calculates velocity and plots vector curve and spin rate. The flight characteristics … are then reproduced on the screen. With each stroke, the virtual golfing landscape adjusts to match the ball's position and the player's first-person perspective on the golf course (2005, p. 201).

In Smart Golf, nearly every aspect of the player's swing is translated into a difference in the outcome, in the sense that the sensors tracking the ball pick up on a range of features of the ball's movement that the player's swing has imparted onto it. However, there are still limitations to the sensitivity of the sensors leading to slightly different actions being 'compressed' into singular outcomes. I don't think the compression is *high* in Smart Golf, but it still exists. After all, any digital system 'quantises' input data, even if it does this so finely we can't easily notice (Figure 5).[7]

Finally, we have real-world golf. In real-world golf, absolutely everything in the player's stroke – thanks to the laws of physics – has at least *some* effect on what happens.

Figure 4. Mario Golf: Super Rush (Camelot Software Planning, 2021).

Figure 5. Smart Golf.

Even if different strokes all lead to a *similar* outcome – the ball flying through the air – there's no apparent limit to the sensitivity of the laws of physics, and hence no limit to the ways in which small differences in movement can translate to (albeit often small) differences in outcome. Hence, while Smart Golf involves *almost* no movement compression, real-world golf involves no movement compression whatsoever.

Of course, as mentioned above, the game (analogue golf) itself 'compresses' the *game significance* of different shots, but game significance and movement outcome are not the same thing: the latter is about the effect of a movement on the outcome, in the sense of what 'objectively' occurs, whereas the former is interested in how that physical occurrence affects the game itself and subsequent moves in that game. For instance, subtle differences in swing lead to the ball moving in slightly different ways (movement outcome), even though both shots end up in the hole (game significance).

In the context of movement compression, it's also important to distinguish two different impacts of the game on a player's actions: *accuracy* and *sensitivity*. Continuing with the golf example, accuracy can be thought of as the degree to which the ball's movement corresponds to the movement that the ball would have undertaken in a game of real-world golf. So, for instance, the sensors of Smart Golf might consistently underestimate the distance of the shot, placing a 170-metre shot at 160 metres, causing the ball to end up somewhere other than it would have in a real-world game. In such cases, the game is *less accurate* than one that placed the ball 'correctly.'

By contrast, sensitivity is a matter of *how much* of a difference your stroke makes to the outcome. An insensitive system will translate similar movements into identical – rather than merely similar – outcomes. A sensitive system will translate even small differences in movement into at least *some* difference in outcome.

Accuracy is what the concept of movement compression tracks. After all, a video game set in a fantasy world – such as *League of Legends* – has nothing in the real world for it to be accurate *to*. The same could be said about games that adopt a non-realistic set of physics. But this has nothing to do with whether the player's movement are being *compressed*. Even if the player avatar is shooting fireballs from their hands, what is of primary concern is the degree to which the system is sensitive to the movements of the player. Is the *way* the fireball shoots sensitive to how the player moves their arm? If so, then such a game contains less movement compression than one in which it is not (or where it is in some way *less* sensitive to the player's arm movement).

Arguments for movement compression

In certain respects, movement compression is not a new idea. When Bernard Suits argued that 'how chess pieces are moved has nothing whatever to do with manual dexterity or any other bodily skill' (Suits, 2007, p. 16) arguably he was implicitly referring to movement compression. The basic idea that the connection between the quality of the movement and the outcome of the game is important to how we understand or categorise a game has been expressed by a range of philosophers of sport. Kevin Schieman, for instance, has claimed that sports 'require physical performances that bear directly on one's ability to affect outcomes within the game' (2016, p.

48); and Parry asserts that in *sport*, 'movements [must] bear a direct relation to the outcome of the event. The actual movements made must directly produce the result' (2018, p. 10). Similarly, Robert J. Paddick argues that we ought to consider darts as a sport, but not chess, since in darts, 'how accurately you throw the dart is what matters,' whereas in chess, 'how you move the chess pieces (what movements as opposed to what moves you make) does not affect the outcome' (1975, p. 14). I could go on. But the basic idea is that the idea of movement compression is, in a fundamental sense, more or less continuous with an established way of thinking about sport and games.

It might be asked, then, what *new* insight is uncovered by the concept of 'movement compression.' I argue that there are at least five things to be said in favour of putting the issue in this way.

First, the idea of movement compression specifies *how* movement can contribute outcome in a clear way. If someone wants to insist that sports require 'physical performances that bear directly on one's ability to affect outcomes within the game,' (Schieman, 2016, p. 48) then what does it actually mean to say that the physical performance 'bears directly' on the outcome? The concept of movement compression provides precisely this kind of specification.

Second, movement compression – partly through the act of specifying the necessity of movement more clearly and explicitly – allows us to see the relationship between movement and outcome as a matter of degree, rather than as an either/or proposition. Previous discussions of movement in sport have often suffered, in my view, by trying to draw a sharp dividing line between activities that involve movement (of the right kind) and those that don't, leading to confusion.

For example, in his otherwise compelling article, Filip Kobiela discusses the relationship between movement and outcome in 'fast chess.' He notes that 'In view of the strict time limit, to some extent [fast] chess is a dexterity game since inaccurate hand movements (leading to touching the wrong chess piece) could result in an immediate [loss]' (2018, p. 282). He takes this to trouble definitions of sport that rely on the necessity of movement, since fast chess seems to have an ambiguous status (2018, p. 284). But by specifying 'necessity of movement' in terms of movement compression, we can identify differences in the *degree* to which an activity requires movement, or the *dimensions along which* the player's movement is relevant to the outcome. This is turn means that examples like Kobiela cease to be troubling: we no longer need to try to categorise fast chess as *either* a mind sport *or* a sport *simpliciter*: instead, using movement compression, we can note the degree to which fast chess relies on mind skills and the degree to which it relies on physical ones – the extent to which physical movement is trivial or non-trivial within the game (Karhulahti, 2013), and precisely how physical movements are outcome-relevant – and leave things there.

The third point is that movement compression gives us a tool to think about virtual activities such as eSports, and also captures common-sense intuitions on the matter. For instance, it explains why proponents of eSports want them to be considered sports (they are activities that in many cases genuinely do involve highly skilled movement as a necessary feature); but also explains why many people push back against this idea (because they are compressed, the movements in eSports truly do play a different role in the game than in traditional sports).

At the same time, movement compression also gives us the tools to make sense of highly sensitive, cutting-edge virtual activities – such as movement controls or Smart Golf – as well as hypothetical future activities – such as my aforementioned Robo-Football, or full movement, near-perfect sensitivity controllers, and identify precisely how they are similar to or different from current eSports.

Fourth, movement compression captures the underlying concerns of distinctions such as between a) virtual and actual (McFee, 2004); b) domain of application and domain of execution (Holt, 2016, p. 4); and c) gross and fine movements (Loy, 1968), but does so in a way that avoids some of the less plausible implications of these views.

Finally, movement compression can help us to make sense of differing attitudes towards various analogue sports. For instance, despite the similarities between the shooting and archery in a range of respects, intuitively there is a distinction between the two. Whereas both activities seem to involve Parry's 'whole-body control' (2019), in archery, the flight of the arrow depends *not only* on how the bow is held and where it's pointed, but also crucially on how the bow is drawn. In shooting, while it clearly matters in certain ways how one pulls the trigger – shooters need to pull the trigger in such a way as to ensure that the gun doesn't move inappropriately, for instance – nonetheless the trigger-pull is a point of movement compression. That is, so long as the trigger-pull doesn't affect the conceptually separate (though, as discussed earlier, practically connected) issue of directional aim, the trigger pull always leads to the same outcome: the bullet flies from the barrel in a predetermined way. The flight of the bullet occurs identically regardless of whether the trigger is pulled gently or with force, in just the same way as a mouse click in *League of Legends* or *Counter Strike* has the exact same effect regardless of the quality of the movement that goes into it (Witkowski, 2012, p. 368). In archery, by contrast, how the bow is drawn back and released cannot help but affect the flight of the arrow. Hence, shooting has a higher degree of movement compression than archery, and the intuitive difference between the two activities is explained.

A similar argument can be made about the intuition that the most realistic driving games – such as *Forza Motorsport* (Xbox Game Studies, 2023), *Assetto Corsa* (Kunos Simulazioni, 2014) and *Gran Turismo Sport* (Polyphony Digital, 2017) – are able to provide an experience closer to real-world motor sport than the most realistic sports games – such as *FIFA 23* (EA Sports, 2022), *MLB The Show 23* (San Diego Studio, 2023) or *PGA Tour 2K23* (HB Studios, 2022) – can provide to their real-world equivalents. Of course, the reasons for this are not wholly a matter of movement compression. For instance, there is a clear difference between motor sport and sports such as soccer, baseball and golf in terms of the degree of gross physical movement, and this makes motor sport easier to simulate than these other sports. However, we can also note that since motor sport (arguably) already involves some movement compression – due to the driver's movements being mediated through the vehicle – then the movement compression in driving simulations becomes less significant in terms of reproducing the experience with veracity.

Conclusion

eSports can undoubtedly be highly skilled activities, especially at the higher levels of competitive play. However, eSports – as currently practiced – are different from traditional 'analogue' sports in certain respects. As they involve movement compression, movements in eSports do not bear on outcomes along all dimensions, as in the case of traditional sports.

While drawing on a long tradition of thought that considers movement efficacy to be central to sport, movement compression has a number of advantages over traditional approaches to understanding the differences between sport and eSport. It also allows a more fine-grained approach to movement in sport than previous approaches and better tracks intuitions about various activities, such as shooting vs. archery. In short, it is a tool that can advance our understanding of both sports and eSports as movement-based activities.

Notes

1. To a large extent I resist the idea that *competitive* games of any kind have a required level of skill 'built in' to them. Instead, the skill level required by any kind of game is dependent on the relative skill levels of the opponent (Hemmingsen, 2023).
2. I recognise, of course, that shooting isn't a wholly uncontroversial case. However, it *is* an Olympic sport, mostly uncontentiously. By contrast, I am absolutely certain that still now the idea of including eSports in the Olympics *would* be highly contentious.
3. Of course, haptic technology in controllers goes back a long way. *Fonz* (Sega, 1976) was the first game to incorporate haptic feedback, with a vibrating steering wheel; and haptic feedback became a standard feature in console controllers from 1997 on, with Nintendo's RumblePack for N64 leading the way (Khurs, 2017). More recently, the Playstation 5's DualSense controller advertises itself as providing highly precise haptic feedback, and arguably leads the pack currently. However, I think it's fair to say that this kind of tactile feedback doesn't come close to approaching the veracity of the audio or visual feedback in most games. For instance, Ekdahl and Ravn point out that 'When a player reloads a weapon, no tactile feedback is provided; if a player runs into a wall, no physical resistance is felt (although one is seen); if a player is damaged, no physical pain is felt; et cetera' (2018, p. 7).
4. Importantly, I am *not* saying here that I think Robo-Football is *the same as* football: they are clearly different games. The issue is instead about categorisation: is Robo-Football a sport, or an eSport?
5. By 'action' I mean 'game action;' that is, actions that are intended to produce some kind of effect on the game. So, a soccer defender scratching their nose as they move up the field as their forwards take the ball towards the opposing goal may be an action, but not the kind I'm interested in here.
6. *PGA Tour 2K21* also has the option of using motion sensor controls, but here I'm focusing on play with an ordinary controller for purposes of illustration.
7. The most interesting cases, to my mind, will arise from future games in which the movement compression is so low that is exceeds human beings' ability to control their movements, i.e., even top players find their movements represented with as much sensitivity and their skill allows. In such cases, the movement compression has become so negligible that sports and eSports have ceased to be meaningfully distinct.

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