The Speed of Time

We travel through the temporal landscape on a one-way street, with an inexorable push towards the future (compare Clark 1973, p. 50). Just like when driving on a highway, we may speak of ourselves traveling through the landscape, or the landscape moving around us by means of the ego-moving and time-moving metaphors respectively (described in chapter one, section 1.1). But, while we are forced to drive in one direction, we are not restricted to a constant speed. These variations in the speed of temporal travel are, to be clear, unrelated to the *actual* passage of physical time, or to the change of pace characteristic of some videogame worlds (see section 1.2). It is our *experience* of the speed of time that is constantly changing.

One of the most familiar situations in which time seems to slow down its pace is in waiting rooms. While waiting for a doctor's appointment, for instance, we tend to focus our attention on the passage of time itself. As a result, our experience of time dilates, making the distance between now and the expected appointment seem excruciatingly long (Wittmann 2015, p. 13)—which elicits a feeling of boredom or impatience.

William James (1866, p. 392) stated that we feel bored when "we grow attentive to the passage of time itself." But what does that exactly mean? As stated in the beginning of this study, there is no organ that senses time in the way eyes sense light or ears sense sound. A prevalent theory states that the mind has a pacemaker that starts counting pulses whenever we direct our attention to the passage of time (see Wittmann 2009). These pulses accumulate, producing an estimation of how much time has elapsed. According to this model, focusing solely on the passage of time would generate a higher number of pulses than, for instance, performing timing tasks that involve external information. The accumulation of more pulses creates the illusion that a moment is longer than it actually is. As the idiom goes: a watched pot never boils. However, there is no evidence for a part of the brain that performs this function. Marc Wittmann has hypothesized

that these pulses are our bodily signals. Then, the expression of "growing attentive to the passage of time" would refer to our bodily experience: "During waiting times I become self-aware and experience myself and my body more intensely"[1] (ibid., p. 1961). Becoming attentive of our own body, known in psychological jargon as *interoception*, slows down our experience of the passage of time.

On the other end, when focused on external or *exteroceptive* information, we lose self-awareness and the passage of time accelerates (Pöppel 1988, p. 83; Wittmann 2015, p. 13). Our bodily pacemaker is not engaged and we lose track of time. This phenomenon is commonly associated with a feeling of pleasantness (Craig 2009, pp. 1938-1939). Therefore, the speed at which we travel through the temporal landscape is contingent on what we are doing and where we direct our attention—inward or outward.

A further factor that can intensify the role of attention is the level of arousal elicited by the perceived stimulus (Craig 2009, Wittmann 2015). When an intense emotion overcomes us, we become more attentive to our bodily processes. The experience of fear, awe, anger, bliss, or sexual attraction, directs our attention to strong internal sensations and slows down the passage of time. For a brief moment, it might even seem to stop.

A final differentiation is in place here. We can judge the duration of an event both *prospectively* and *retrospectively*. This difference between prospective and retrospective judgments of duration can elicit contradictory impressions of the same moment. While in the waiting room, the temporal landscape between now and a future event (the doctor's examination) becomes rather empty and we come to be expectant of the next salient event. In this case, we are judging duration *prospectively*. We can only estimate time prospectively for short periods. For durations that exceed mental presence (the limits of working memory), the judgment of duration is either a mix of prospective and retrospective estimations, or purely retrospective.

When judging duration *retrospectively* (remembering the time in the waiting room), we might recall the feeling of boredom and the apparent dilation of time, but we will likely underestimate the time we actually spent waiting. And the inverse is true with enjoyment and the compression of time. Right after a vacation in a foreign country, for example, we may have the impression that two weeks went by in a heartbeat because we were not paying attention to the passage of time during those days. That is, we made no prospective judgments of duration. Retrospectively, however, it can seem like we spent two months instead of two weeks on vacation given that those two weeks provided us with unusual quantities of novel information.

1 My translation from the original German.

Retrospective judgments of duration rely on the available quantities of information from the remembered moment. That is, if our memory of an event is more detailed than usual, we will retrospectively overestimate its duration. Events with new information seem longer than events with known information. Moreover, emotionally saturated events will also seem longer retrospectively. Strong emotions make us process more interoceptive and exteroceptive information. Therefore, the higher the level of arousal, the longer we will tend to judge any period of time (Wittmann 2015, p. 22).

These phenomena also explain why time goes by faster as we get older. At a very young age, even the most trivial things are new pieces of information that will catch our attention. Additionally, childhood is more emotionally saturated than adulthood. These factors make a year for a child seem to last longer than for an adult. In adulthood there is less new information in the environment, lives tend to get structured in routines, and subjective experience loses some of the intense emotional coloring of childhood. All of this contributes to the acceleration of our journey through time as we age.

MEDIATED SPEED OF TIME

A study conducted by psychologist Olga Pollatos and coworkers (2014) exposed two groups of participants to three different movie clips, each of them 40 seconds long. The clips were scenes from THE BLAIR WITCH PROJECT (Myrick and Sánchez 1999), ICE AGE 3: DAWN OF THE DINOSAURS (Saldanha 2009), and a documentary describing a German city. The first film was chosen to elicit the negative emotion of fear, the second to amuse the participants, and the third for its emotionally neutral content. Additionally, one group of participants was asked to focus on interoceptive states and the other on exteroceptive stimuli while watching the clips. After viewing, the participants had to estimate the duration of each video retrospectively. The study showed that arousal had a significant impact in the estimation of duration. The fear condition produced the longest duration estimates, the neutral condition only slight underestimations, and the amusement condition the shortest duration estimates.

Moreover, the emotional effects were on average more pronounced in those participants who focused on their interoceptive states. They overestimated the duration of the fear condition clip (over 44.4 seconds) in relation to the other two estimates, and they starkly underestimated the duration of the clip in the amusement condition (27.4 seconds). In the neutral condition, both groups underestimated the duration of the clip with only slight differences (the interoceptive

group: 35.2 seconds, the exteroceptive group: 33.2 seconds). This study provides evidence that film can influence our time perception. There is no equivalent study for video games at the moment, but it would be reasonable to hypothesize similar results if such an experiment were carried out.

The experience of time moving fast is well-known by video game players (Wood et al. 2007).[2] When immersed in a game—especially games of skill—, players often lose track of time. Even within a gaming session the speed of time fluctuates. Salient moments like the jolt of encountering a menacing enemy, or the frustration of losing a tense fight, can slow down the passage of time. Even positively-laden events might make time slow down if they are intense.

THE LAST OF US (Naughty Dog 2013) is a third-person video game with shooting and stealth mechanics. The game puts the player in the shoes of Joel, a man living in a world destroyed by a fungal infection that turns people into voracious zombie-like monsters. Joel, who lost his daughter twenty years earlier during the fungus outbreak, must now bring a teenage girl, Ellie, to an underground group called the Fireflies. This task signals the start of a long and perilous journey that brings Joel and Ellie into conflict with both human and non-human adversaries. During their time together, the characters develop a caring father-daughter relationship. Towards the end of the game, with a long series of death-defying events already behind them, Ellie and Joel find themselves in a quiet, abandoned bus station in Salt Lake City. All of a sudden, Ellie runs off as if surprised by something. The player—controlling Joel—needs to follow her and find out what caught her attention. Given the constant threat in THE LAST OF US' merciless world, the player is probably alarmed by Ellie's behavior. After a short pursuit, however, it is revealed that Ellie is chasing after a group of giraffes (which apparently escaped from the Zoo after the infection). The revealing moment is oddly awe-inspiring.

Standing on the second floor of the overgrown building, in a room with no outer wall, Ellie and Joel encounter one of the giraffes feeding on the vines that cover up what remains of the structure. It is a peaceful and touching moment. Ellie, a child forced into adulthood by a tragedy-ridden world, is suddenly bursting with childlike enthusiasm. It is a moment that lingers in the memories of those who play the game.[3]

2 As an anecdotal note: Whenever I commented to someone that I am writing my PhD thesis on the topic of time in video games, the most common remark that followed was something along the lines of "so you mean like when you are playing video games and hours seem to pass by in minutes?"

3 IGN's Lucy O'Brien asked if the giraffe scene was "the most important moment in The Last of Us" (O'Brien 2013). Kirk Hamilton of Kotaku called it "the emotional

Figure 3.1: THE LAST OF US REMASTERED (Naughty Dog 2014).

Source: https://www.gamer83.de/the-last-of-us/screenshots/ (accessed January 31, 2018).

Ellie (left) and Joel (right) pet a giraffe.

PREDICTIVE PROCESSING AND THE SPEED OF TIME

The way time speeds up and slows down can be understood in terms of predictive processing. As seen in chapter two, section 2.1., the mind creates top-down models of the world. These models are compared to impinging bottom-up sensory signals and, if there is no mismatch, the mind continues relying on the predictions. Since these models are based on prior knowledge about the environment that we have stored in memory, the more priors we have, the better we are at predicting the state of the environment.

Operating on the base of predictions is a pleasant experience. It is metabolically cheap, it is fast, and it allows us to move around with ease in autopilot. Bottom-up information is more expensive and slower to process, which is why we tend to prefer our predictions as long as they are good enough. Whenever there is a discrepancy between predictions and sensory information (the phenomenon called *surprisal*), we become aware of the bottom-up stimuli. Attention is, in this sense, an error signal. A highly unpredictable environment with con-

peak of the game" (Hamilton 2013). The website CONTROL500 referred to it as an "iconic scene" (CONTROL500 n.d.).

stant error signals is more demanding than one with familiar places and people, which is why we tend to prefer the latter. However, an environment that is completely predictable—like a doctor's waiting room—can prove utterly tedious. We naturally seek some level of unpredictability; a level that is not exhausting, but still challenging enough to keep our attention away from the passage of time.

In the context of the predictive processing framework, growing attentive to the passage of time can also be interpreted as an error signal. As long as we are engaged by occurrences in the environment, we remain inattentive to time. Time entering our attention is a sign that the temporal landscape has become dull, pushing us to find an activity to get busy with.[4]

Emotionally arousing events usually provide us with a surge of interoceptive and exteroceptive information, making time slow down in our experience. Prospectively, increased speeds in information processing make our experience of time decelerate. Retrospectively, the feeling persists because we store this information in memory, likely due to its adaptive value. Positive, intense emotions,

4 A possible reason for this could be in our deep past. In our evolutionary history, this experience could have led us to engage in activities with adaptive value. While this is only speculation, it seems reasonable that those individuals with a tendency not to squander their time should have had a better chance at spreading their genes. It does not follow from this that we should then be only interested by activities that are obviously productive (especially not in the modern world). Many activities, such as playing, which seem on the surface as wasteful, are always taking over our free time and even stealing time from activities that are more important for survival, such as working for a wage. There are a few arguments that support this seemingly contradictory claim. Firstly, we do not live in the environment in which we evolved. Our instincts are tuned to life in the Pleistocene African savannah, not to contemporary life. Secondly, one should distinguish between the proximate and ultimate causes of a behavior (see Scott-Phillips et al. 2011). The proximate cause might be because it is fun or pleasurable for the individual. The ultimate cause can be adaptive, meaning that said experience of fun or pleasure would have evolved because it motivated behavior that contributed to spreading the individual's ancestor's genes in the Pleistocene environment in which humans evolved. Thus, fun is a proximate cause to play, but the ultimate cause might be improving motor skills or strengthening social bonds. Another aspect that should be taken into account is that behavior can also be a byproduct of another, adaptive behavior. Playing video games is fun even though sitting for hours on a chair staring at a screen can be a health risk and it detracts from other productive activities. But we did not evolve in an environment with video games, just as we did not evolve in an environment with cheesecake, but both are (at least in some ways) enhanced versions of play and food of our ancestor's environment.

such as love, can signal significant events and people related to reproduction and kin selection. Life-threatening situations, such as a car crash, provide us with a collection of potentially life-saving priors. Exhilarating activities such as extreme sports or amusement park rides usually emulate danger—albeit in controlled, relatively safe environments. Therefore, these can also make time slow down (see Arstila 2012).

BULLET TIME AND THE EXPERIENCE OF DANGEROUS SITUATIONS

The first detailed reports of the experience of life-threatening situations date back to the nineteenth century. Albert Heim, a geology professor in Zurich, driven by curiosity about the final experience of climbers who fall to their deaths, interviewed the lucky survivors of potentially fatal falls in the Alps. Heim later published these accounts in the 1892 Yearbook of the Swiss Alpine Club under the title "Notizen über den Tod durch Absturz." The text was translated in 1972 by University of Iowa psychiatrists Russell Noyes and Roy Kletti with the title "Remarks on Fatal Falls" (see also Arstila 2012). Heim writes: "In nearly 95 percent of the victims there occurred, independent of the degree of their education, thoroughly similar phenomena, experienced with only slight differences" (Noyes and Kletti 1972, p. 46). And he continues with this captivating description of the experience (my emphasis):

"[N]o grief was felt, nor was there paralyzing fright of the sort that can happen in instances of lesser danger (e.g. outbreak of fire). There was no anxiety, no trace of despair, no pain; but rather calm seriousness, profound acceptance, and a dominant mental quickness and sense of surety. *Mental activity became enormous, rising to a hundred-fold velocity or intensity. The relationships of events and their probable outcomes were overviewed with objective clarity.* No confusion entered at all. *Time became greatly expanded.* The individual acted with lightning-quickness in accord with accurate judgment of his situation. In many cases there followed a sudden review of the individual's entire past; and finally the person falling often heard beautiful music and fell in a superbly blue heaven containing roseate cloudlets. Then consciousness was painlessly extinguished, usually at the moment of impact, and the impact was, at the most, heard but never painfully felt. Apparently hearing is the last of the senses to be extinguished" (Noyes and Kletti 1972, p. 47).

Further studies by Noyes and Kletti (1976, 1977) essentially support Heim's account. In their 1976 and 1977 surveys, the most commonly reported aspects of

the experience of life-threatening situations were "increased speed of thoughts" accompanied by purposeful and quick reaction and "increased attention and alertness," and "an apparent slow down of external time," which for some was so intense that they reported that "time stood still."

The philosopher Valtteri Arstila (2012, p. 2) summarizes the experience of time in dangerous situations in six key features:

1. The feeling of external time expanding and slowing down to a great extent.
2. Dominant mental quickness as demonstrated by the increased speed of thoughts.
3. There is often an altered sense of the duration of the event lasting longer than it actually does.
4. If possible, in the event in question, people often act fast and purposefully.
5. In the latter case, their attention is also altered and narrowly focused on the issues relevant for survival.
6. Unusually sharp vision or hearing.

Points one ("the feeling of external time expanding") and three ("an altered sense of duration") might require further clarification, given that they appear so similar. The first feature refers to the subjective experience of time passing slowly. The third feature is concerned with the estimation of the duration of the moment. Regardless of the connection between the experience of time going slowly or fast and the estimation of its duration, these are separate phenomena (ibid., p. 3).

According to Arstila, the two main factors that trigger this experience are "the belief in imminent death" and "that the event is surprising" (ibid., p. 2). Individuals who experienced a dangerous event but did not believe that it was life-threatening do not report experiencing time in slow motion as often as those who believed their lives were in real danger (65 percent versus 80 percent respectively). Surprise is perhaps an even more important factor, since "hospital patients facing a threatening situation due to their illness do not report an increased speed of thoughts and altered attention" (ibid.).

Video games cannot elicit this experience, given that they are safe activities. Even if the player character's life is threatened in the game, players are sitting securely in front of a screen. Nevertheless, slow motion in video games is often used to *represent* this psychological state of emergency. This effect is commonly

known as *bullet time*, and it was popularized in the video game medium by MAX PAYNE (Remedy Entertainment 2001).[5]

MAX PAYNE is a third-person shooter inspired by hard-boiled fiction.[6] It gets its name from its protagonist, a DEA agent who is undercover in the Punchinello Mafia family, responsible for the trafficking of a designer drug named Valkyr in New York City. Three years before the events of the game, a group of junkies high on the drug broke into Max Payne's home and murdered his wife and baby daughter (compare Max Payne Wiki 2019). The tale of MAX PAYNE is one of bloody revenge. The player leads Payne armed to the teeth through three acts of carnage, leaving a trail of mobster corpses behind.

Figure 3.2: Max Payne soars through the air in bullet time.

5 The bullet time effect is also well-known in film, perhaps most prominently used in THE MATRIX (Lana and Lilly Wachowsky, 1999).

6 According to the Encyclopædia Brittanica, hard-boiled fiction is "a tough, unsentimental style of American crime writing that brought a new tone of earthy realism or naturalism to the field of detective fiction" that emerged in 1929, which "used graphic sex and violence, vivid but often sordid urban backgrounds, and fast-paced, slangy dialogue" (Encyclopædia Brittanica 2018).

The mechanics of the game are typical for a third-person shooter: move the character, point the gun, and shoot at your enemies. In addition, MAX PAYNE has a signature move. By the press of a button, the player can trigger the bullet time mode, which decreases the pace of the game. The mobster's screams deepen and stretch like bubblegum and bullets visibly whoosh through the air. Max's aiming, however, remains comparatively faster than the rest of the gameworld, allowing the player to dispose of a group of enemies with relative ease and panache. Nonetheless, this slow-motion mode cannot be used indefinitely. An hourglass icon on the bottom left of the screen (see figure 3.2) depletes as time passes. The meter progressively refills as the player kills enemies.

Since MAX PAYNE'S implementation of slow-motion mechanics in 2001, numerous games have replicated the effect in one way or another. A few examples are F.E.A.R. (2005), CALL OF JUAREZ (2006), VANQUISH (2010), and GRAND THEFT AUTO V (2013). In the sci-fi third-person shooter VANQUISH, the protagonist Sam Gideon dons a sophisticated battle armor called the Augmented Reaction Suit (ARS), which, among other things, can enhance his perception. PlatinumGame's blog describes this *AR Mode* in a way reminiscent of the phenomena related to time perception in dangerous situations:

"Activate AR mode [*sic!*] to speed up Sam's perception, making enemies around him seem slower. AR Mode can be used during any of your regular maneuvers – dodging, vaulting and boosting – to allow you to aim with precision" (PlatinumGames 2017).

This ability is a bullet time mode just like MAX PAYNE'S, but with one addition: The AR Mode also activates automatically whenever the player character's health drops to dangerously low levels, giving the player a final chance to find cover or dispose of threats before the gauge reaches zero. It is in this last scenario that the AR mode resembles somewhat more closely the real experience of slow motion as an automatic phenomenon triggered by near-death experiences. Still, video games are far from implementing a realistic version of the experience of time in dangerous situations. In most cases, it is framed as an ability of the player character (enemies seem to lack it), and it is activated either manually by the player or automatically in very specific scenarios, instead of in every life-threatening event.

On the other end of the experience of the passage of time is the feeling of time speeding up, which is most noticeable when in a state of *flow*. Unlike the extreme slowing down of time in dangerous situations, the speeding up of time is an experience that video games can certainly elicit in players (Wood et al. 2007).

FLOW

Flow is the opposite of that are-we-there-yet feeling we experience when the passage of time enters our awareness. First systematically studied by psychologist Mihaly Csikszentmihalyi, who also coined its name, flow is what we experience when we get so focused on an activity that we lose awareness of time, our self-consciousness, and our surroundings. As Wittmann (2012, p. 78) notes, "after work or play in flow comes to a conclusion one is surprised that it is already nighttime (or daytime again)."[7] One might only then notice a feeling of hunger or the need to go to the restroom that was lurking in the background during the work or play session. Flow is a state that we deeply enjoy.

Csikszentmihalyi's studies showed that this experience is a common denominator of many activities that, on the surface, might seem worlds apart: "Apparently the way a long-distance swimmer felt when crossing the English Channel was almost identical to the way a chess player felt during a tournament or a climber progressing up a difficult rock face" (Csikszentmihalyi 1990, p. 48). Furthermore, the experience of enjoyment of an activity is described in the same way regardless of age, gender, culture, or socioeconomic status. Flow is characterized by eight components:

> "First, the experience usually occurs when we confront tasks we have a chance of completing. Second, we must be able to concentrate on what we are doing. Third and fourth, the concentration is usually possible because the task undertaken has clear goals and provides immediate feedback. Fifth, one acts with a deep but effortless involvement that removes from awareness the worries and frustrations from everyday life. Sixth, enjoyable experiences allow people to exercise a sense of control over their actions. Seventh, concern for the self disappears, yet paradoxically the sense of self emerges stronger after the flow experience is over. Finally, the sense of the duration of time is altered; hours pass by in minutes, and minutes can stretch out to seem like hours" (Csikszentmihalyi 1990, p. 49).

The reader that is experienced with video games might have noticed how these eight points can perfectly fit the description of a gameplay session. Salen and Zimmerman note that "[i]n each of the eight components of the flow activity Csikszentmihalyi mentions, there are clear parallels with games" (2004, p. 338). Let us revisit them one by one: (1) Video games are typically designed to be tasks that players have a chance to complete. Some games—for example, CUP-

7 My translation from the original German.

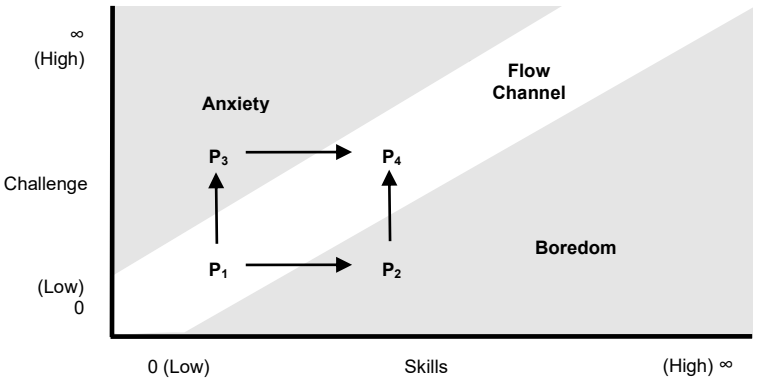
HEAD—demand more skill from their players than others—for example JOURNEY (Thatgamecompany 2012)—, but games are usually designed to be finished.[8] (2) Whether playing at an arcade or at home in our living room, games demand our full attention. To play a video game, we need to be able to concentrate. (3) Games commonly state clear goals. Those games or game passages where goals are not clear tend to be frustrating. (4) Actions performed in video games should provide immediate feedback in order for players to know how they are performing and whether they need to adjust their behavior. (5) A deep and effortless involvement is not necessarily achieved while starting a new game. However, after overcoming the learning curve, players can lose themselves easily while taking on the game's challenges. As argued in section 2.1, games are designed for us to engage in a process of uncertainty reduction, which allows us to (6) exercise control over our actions and environment. (7) The feeling of immersion is directly connected to this point. Recall section 1.1, where I stated that we feel immersed while playing video games because the spotlight of attention is directed at the gameworld and we lose self-awareness (together with the awareness of our surroundings). After an experience of flow, however, the self reemerges stronger, enhanced by new knowledge, skills, and a sense of accomplishment. (8) Finally, while playing video games, it is easy to lose track of time and hours might feel like minutes—the most common report concerning time in a state of flow. However, while retrospectively it seems like hours flew by, specific moments that require an extra dose of focus might still dilate in consciousness during the experience.

The sense of selflessness mentioned in the seventh feature of the flow experience implies that, while in a state of flow, we are not aware that we are a self, separated from the environment. The self is, after all, a mental construction that requires that the focus of attention is directed inwards. While absorbed by an activity during a state of flow, the self becomes blurry and the boundaries of this mental construction expand: "When a person invests all her psychic energy into an interaction – whether it is with another person, a boat, a mountain, or a piece of music – she in effect becomes part of a system of action greater than what the individual self had been before" (ibid. p. 65). Nothing supernatural is happening here; it is the effect of the mind focusing all of its attention on the interaction between the body and the environment, and suspending the sense of the self as a separate entity from the surroundings. This phenomenon of losing the sense of self produced by deep focus on an activity likely contributes to the feeling of immersion that is so characteristic of video games.

8 Even games without an ending, such as SPACE INVADERS, are structured as a series of tasks (that is, objectives and stages) that can be completed.

Naturally, not every gameplay session is just like the one described above. Sometimes a game is poorly designed, exasperatingly hard, or insipidly easy. But anyone who has enjoyed a video game will likely recognize the above paragraph as something familiar. The state of flow is a sweet spot at which we arrive whenever the challenge we face is high enough that it is not boring, but not too high to become frustrating. Right in the middle there is a space, the *flow channel*, where the state of flow can be achieved (see figure 3.3).

Figure 3.3: The flow channel.



Source: Csikszentmihalyi 1990, p. 74.

In terms of predictive thinking, we are in a state of flow when an activity presents us with an adequate level of uncertainty and new information in order to remain interesting, but we have sufficient prior knowledge to act in a purposeful and controlled way. However, for an activity such as a game to *remain* interesting, it needs to meet the constantly evolving skill level of the player—recall the *progression* feature, part of the *conditions* category in the typology of temporal structures (section 1.2). The *flow channel* arises from an activity that effectively escalates the difficulty of the challenge as the skill level of the person performing it increases. If the challenge is much higher than their skill level, players become anxious. If, on the other hand, their skill level is higher than the challenge, players experience boredom. Tasks start feeling like chores, demanding time but little effort to complete. In this state, players start paying attention to the passage of time once again and might hope that the game (or the current mission) will be over soon.

But no gameplay experience is characterized by a constant state of flow. As shown in figure 3.3, a player (P_1) starts with little skill, and the game provides

almost no challenge. Since the level of challenge is adequate to the player's skill level, the player enjoys the game. In time, the player will become better at the game (P_2) and can enter a state of boredom if the game does not dial up the challenge. On the other hand, if the game becomes more challenging before the player's skill level increases (P_3), the player will become anxious. At this point, the player needs to keep practicing so as to re-enter a state of flow (P_4). The Groundhog Day Effect is often involved in this process, since players can keep repeating a sequence that is too challenging until their skills improve, enabling them to overcome the obstacle.

These fluctuations between flow, boredom, and anxiety are likely inevitable. According to Jesse Schell, this instability might even be desirable:

> "[t]his cycle of 'tense and release, tense and release' seems to be inherent to human enjoyment. Too much tension, and we wear out. Too much relaxation, and we grow bored. When we fluctuate between the two, we enjoy both excitement and relaxation, and this oscillation also provides both the pleasure of variety, and the pleasure of anticipation" (Schell 2008, p. 122).

Jesse Schell also argues that this "tense and release" cycle can occur within the flow channel and does not necessarily need to break the flow experience (ibid.). While this might be true, the interruption of the flow experience is not always an undesirable outcome. A state of flow could be the reward that players seek while playing game portions that can make them feel anxious or bored—as long as these sections do not overstay their welcome. In this sense, video games reward players not only for their success after the completion of objectives, but also for their perseverance by providing them with a pleasurable flow experience.

To be conducive to flow, an activity needs to have rules and clear goals, provide frequent feedback, require the learning of skills, and be as distinct from everyday existence as possible (Csikszentmihalyi 1990, p. 72). These are all common features of video games. In single-player video games, progression (discussed in chapter one, section 1.2) is crucial for keeping players in the flow channel. Games need to increase their difficulty as the player advances, or else they risk becoming tedious. To this end, games use different strategies: Enemies gradually move faster, do more and take less damage, and come in greater numbers; puzzles gradually become more elaborate; platforming sections demand increasing precision in greater jumping distances. Many games also offer different levels of difficulty (for instance easy, medium, and hard) to allow entry to inexperienced players and provide a challenge to the more seasoned ones (compare

Schell 2008, pp. 118-123 and pp. 177-178; Salen and Zimmerman 2004, pp. 350-352).

One other way in which designers can improve the chances of players attaining a state of flow is giving them the freedom to choose what to do—and when to do it—beyond the core mechanics of the game. To accomplish this developers can, for example, include skills or items that are not entirely necessary, but add depth to the game once the core mechanics have been learned. In this way, the designer grants some control to the player, who can decide when to increase the challenge by learning how to perform new actions. Role-playing games are good examples of this type of design in which players have a wide range of skills and items they can choose from. By acquiring experience points, a player can spend them to unlock a new skill or increase the effectiveness of one that is already in use. A new ability—for example, an offensive power that allows the player character to shoot fireballs—typically has a learning curve, and might put players at a slight disadvantage compared to older skills that they have already mastered. However, if this newly acquired skill is more powerful than previous ones, players will benefit from mastering it. Introducing interesting and useful new mechanics adds an element of risk, but it motivates players to experiment. As long as players do not feel safe enough to experiment with the new skill, they can continue to use the familiar ones, giving them some control over their flow experience.

We move through the temporal landscape at varying speeds according to where we direct our attention and how emotionally aroused we are. Video games, like any other activity, can contribute to the acceleration and deceleration of the subjective passage of time. In the next section, I will discuss *time perspective*—another feature of the temporal landscape. Time perspective is closely tied to our capacity to engage in self-control, a skill vital to player success in many video games.