Resting Zones in Puzzle Games

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Foreword

This paper is written during a period of 6 months in which I did an embedded specialization at *Digital Dreams*, organized from the *Utrecht School of the Arts*. For this research I could use a prototype of the game *Complex*. Complex is a game by Digital Dreams. This is also the company I did my internship at. The development of this game continues as soon as the game *Metrico+* is released. Complex is a first person puzzle game in which the player is able to directly influence the world around him with the input he gives.

Through my work in puzzle games I noticed I found it hard not to cramp every last inch of the game with puzzles. I doubted if that benefited the experience of the player. That's why I did this research on how important moments of rest are in puzzle games.

The first part of the research consists of a deep look into how other puzzle games handle resting zones such as: *The Witness, Portal, Alan Hazelden's games and Metrico+*. The latter part of the research is about the playtests I did with the prototype of Comlex. I playtested two identical sequences of levels with the only difference being the resting zones in between the levels in one of the two sequences of level. Then I compared the results and made a conclusion of the collected data.

Paragraph 1
Introduction

1.1 Abstract

It seems that resting zones in puzzle games can be the answer to several problems in the design of puzzle games. This paper is about other puzzle games that do or do not use resting zones and why they use it. It's also about how you can achieve the same effect as a resting zone in other ways. There's also a part in which resting zones are analyzed with playtests. There's a lot of potential in resting zones for puzzle games because it can be used to tackle multiple problems.

1.2 Keywords
Puzzles, games, resting zone, resting moment, flow channel, difficulty curve.

1.3 Puzzle games
I think the biggest difference between humans and animals is the extraordinary human ability to solve problems. Humans are exceptionally good at observing patterns and use those observations to solve the problems. Therefore it's in our nature to be able to enjoy puzzle solving. But what is a puzzle?

A puzzle represents a problem that is designed to be solved. So the solver knows from the start that he is able to solve the problem. But a game is also a problem that is designed to be solved. So what's the difference between a puzzle and a game? An interesting way of looking at this is by looking at a Rubik's Cube or a jigsaw puzzle. These types of puzzles are more a toy than a game. The main difference is that usually a puzzle has one solution to the problem, and in games you ideally have multiple strategies of how to approach it. Or "A puzzle is a game with a dominant strategy" as Jesse Schell, auteur of *The Art of Game Design,* puts it. Puzzle expert *Tim Scott* says: "A puzzle is a problem that is fun to solve and has a right answer". [1] [2]

Along with the fact that there's only one solution comes some other properties puzzles do have, and other games have not. These can be either positive or not:

1. A puzzle forces you to stop and think about a problem, where in most games the

player is continuously progressing while playing.

2. In puzzle games you often need to make a perceptual shift in your head to get to the solution; the so-called 'ah-ha' moment. This is one of the most important aspects of puzzle design, and at the same time the hardest aspect. More of this later on.

3. Because of the tight design of a puzzle, there's no room left for the player to tackle the problem on his/her own way. Normally this is absolutely not a good thing in a game. That means risk reward systems or a sense of personal identity is hard to achieve.

4. There's no replayability. Once you solved a puzzle and know its solution, it's absolutely no fun at all doing it again. [3]

1.4 Problems with puzzle design

There are some aspects of puzzle design that are extremely hard to do right. As previously mentioned, the 'ah-ha' moment is really important. In a puzzle game you want your players to feel smart. This is achievable in different ways. For example the player can be rewarded for the puzzle he/she solved. But rewards are not really an elegant way to provoke this feeling. Rewards has nothing to do with the puzzle itself. The click in your head to solve a puzzle makes the player feel smart and is a way to achieve a rewarding feeling within the core of your puzzle design itself.

The hard part is designing in such a way that a player has enough guidance through the puzzle to get that click. If it takes too long for that moment to happen, it can build up a lot of frustration. Besides that, every player is different. One person might need 2 minutes to get the click, which might be what you're going for, and the other needs 15 minutes and it becomes a frustrating ordeal. Then the guidance part becomes important. But guidance is a slippery slope, because it can result in spoiling the solution of a puzzle by giving too obvious hints. The player is the one who should come up with the solution. The only way a designer can really know what the best representation of a puzzle is, and whether or not there is enough guiding or too much, is to playtest a lot. [4]

Another problem in puzzle design are distractions or red herrings. These are the misleading clues that distract the player of solving the puzzle. Players can get stuck very easily by trying to solve the puzzle with methods or objects that has nothing to do with the solution. Sometimes it can be very hard to get rid of these because things that are red herrings in one puzzle can lead to the solution of another.

A way to solve this problem is to make sure the player encounters the puzzles in the right order. Figure out by playtesting what players are most likely to try first and then let them learn the ins and outs of the game in the right order.

It's important to have the right flow in your levels. In *fig. 1.1* you can see how Jesse Schell looks at the difficulty curve in his book *The Art of Game Design*.
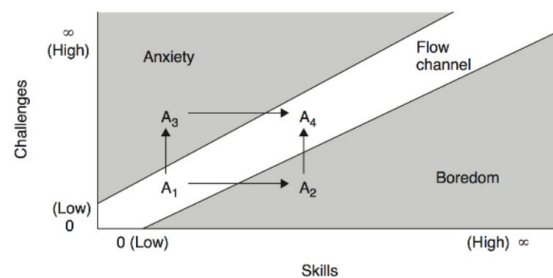

Fig 1.1: Flow channel

The flow channel is where you want your difficulty to be. It starts in A1 where the players skill is low and the game has low difficulty. From A1 the difficulty goes to A4 where the players skill is higher and the difficulty is also higher. You don't want the difficulty to be in the gray areas. In A3 the players skill is too low and the challenge is too high, this causes frustration by the player. In A2 the skill is too high and the challenge is too low, this causes boredom by the player. In *fig. 1.2* you can see the ideal difficulty curve.
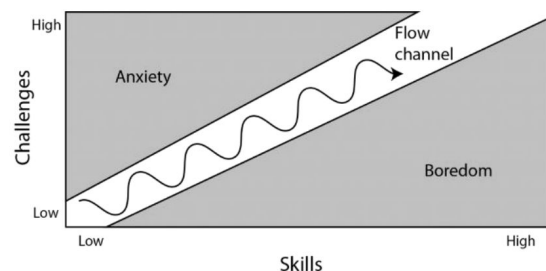

Fig 1.2 The ideal difficulty curve

You can see the line is not just a straight line in the flow channel. It's better to have the difficulty

increasing and fluctuating to engage the player more. Again, the best way to know how challenging your levels are and to know the red herrings in your levels is by playtesting.

Another problem with puzzle design is complexity. One of the definitions of a puzzle is that the player is confused at first. But confusion can be achieved in different ways. It is an easy mistake to make puzzle too complex to achieve confusion. If a level has a lot of objects and the player needs to make a lot of steps in order to complete the level, it takes a long time for the player to understand what is actually going on in a level. People are confused because they do not know where to start to solve the puzzle and they don't know the goal of the puzzle. In a good puzzle the player does not get confused by the amount of pieces he needs to use to solve the puzzle but by the way how to fit the pieces together. That's what the puzzle is all about.

A way to achieve this is to make minimalistic and elegant levels which are clear to the player, so the player can focus on solving the puzzle instead of figuring out what the puzzle actually is.

But sometimes it's hard to make puzzles like this. It's possible to start with the solution and then design a puzzle around that solution by adding more and more, but you will often end up with a puzzle that is too complex and you cannot really explore the mechanic to discover what the mechanic is capable of. This way of designing is often called backwards design.

Matthew VanDevander has an interesting talk about this. To make your puzzles using forward design your game does need to have (a) mechanic(s) with lots of possibility space. Now try to make interesting situations which are possible with that mechanic. So don't focus on making puzzles too much, he says, just experiment with the mechanics of the game and if you've found an interesting situation, make a puzzle in which the player has to evoke that situation in order to solve the puzzle. This way it's relatively easy to create interesting puzzles which are clear to the player, and let the player focus on solving the puzzle instead of finding out what the goal is of the puzzle. Don't try to make these puzzles harder than they are supposed to be. And again, playtesting is the best way to know how complex your level is and to know if the goal of the puzzle is clear. [5][6]

1.5 Solutions in puzzle design

For all these problems playtesting is key to solve the problems. But playtesting only shows the problem, and because you know the problem you can solve it and improve your levels. But aren't there other ways to improve your levels besides the playtesting and iterating loop?

Yes, it seems that there is. It's the part in between the puzzles. The moments you are not solving a puzzle. Some puzzle games throw you right into another puzzle after solving the last one but in most puzzle games you do have parts in between the puzzles. Those parts are sometimes used for narrative exposition, or to let the player explore, or to change the gameplay with platforming for example. In puzzle games it automatically serves as a moment to rest, to get your mind off things. It's important to switch the way you use your brain once in a while in a puzzle game so the player can look at a puzzle with a fresh view. Jonathan Blow once said in an interview: "Just changing the color of some area's or something. Or just put a little more visual work into something determines how hard the puzzles are near that area". [7]

The main question I'm trying to answer is therefore: *To what extent do resting zones influence the experience of a puzzle game?*

A part of answering that question is to look at other puzzle games. So in paragraph 2 the question is: *Which other puzzle games have resting zones?* Other questions that will be taken into account in that paragraph are: With what purpose are the zones placed? In what games does it work, and in what games it doesn't? And what's the difference with puzzle games which do not have resting zones? All these questions will get an attempt at answering, but there is one important thing to keep in mind: all games are different from one another, so what works in one game doesn't necessarily work in another game. And the way a resting zones in a game are handled can differ greatly between games.

In paragraph 3 I'll be looking into other ways you could influence the experience of a level without changing the level itself besides resting zones. That way it's possible to determine what problems can be solved in other ways and if there are certain problems that can only be solved by

resting zones. So that question will be: *What other ways are there to change the experience of a level without changing the level itself?*

Paragraph 4 will be about research of the playtests I've done and comparing all the data that came out of the playtests. Finally in the conclusion I can hopefully make recommendations of how to use resting zones in puzzle games.

This paper is meant for any game developer who is making a puzzle game or just for anybody who is interested in puzzle games.

Paragraph 2
Which other puzzle games have resting zones?

Before jumping to conclusions about resting zones in puzzle games we can take a look at other games and see what they do with resting zones, and whether or not they have them at all.
This chapter includes a research of four different games.

The first game I'll be taking a look at is *The Witness,* because this is a non-linear 'open world' puzzle game. This fact has a huge impact on how to handle resting zones. The second is *Portal (2),* because this is a linear puzzle game. To represent puzzle games that are much smaller in scope I'll also be taking a look at the games from the designer Alan Hazelden; most notably, *A Good Snowman is Hard to Build*. And finally *Metrico+* because this game is somewhere in the middle in sense of scope.

I also want to look at puzzle games which do not include resting zones and compare them to the ones that do. Not very much has been said on this topic by developers, so the information is mostly derived from the games themselves. If you haven't played any of these games, I'd recommend playing them before reading further as it might ruin your experience playing it.

2.1 The Witness

Fig 2.1: The witness

The Witness (2016) is a puzzle game in which the player has to explore a deserted island. The island is full with line-puzzles. An example of such a line puzzle can be seen in Fig 2.2. As the player progresses in the game, (s)he learns more and more rules about how to solve the line-puzzles. Theoretically one can solve every puzzle the first time (s)he encounters it, but in practice the player first has to learn the rules of the signs that make up the puzzles. The more puzzles you solve, the more signs you know the meaning of and the more puzzles you can solve.

Fig 2.2: Line puzzle in the Witness

There are resting zones in The Witness. One thing that sets The Witness apart from the rest, though, is that it's an 'open world' puzzle game. Right after the tutorial, the player is able to walk over the whole island. This whole game is designed not to play in a specific order but just in your own order. This means the player has access to a lot of puzzles right from the get go. That leads to the fact that if a puzzle is a bit too hard, you are allowed (almost encouraged, actually) to leave that puzzle be, and find a new one to solve. So the player spends a lot of time walking through the world from puzzle to puzzle.

The Witness can be seen as one big resting zone with a huge amount of puzzles in it. But

walking is not the only thing you can do in the resting zone. According to Jonathan Blow, the world is set up to keep your mind of the puzzles. Its overworld is packed with so called environmental puzzles. In *fig. 2.3* you can see an example of an environmental puzzle. These puzzles are hidden in the environment. The puzzles consist of a circle (the beginning), a line and a half circle at the end in one color. Sometimes they can only be seen from a certain perspective and sometimes they are even covering multiple objects.

Fig 2.3: Environmental puzzle in The Witness

These puzzles are not hard to solve, but hard to find. That's completely the opposite of the normal line puzzles which are usually quite hard to solve but very easy to see. So besides an extra feature, the environmental puzzles makes sure you need a different part of your brain so to say, when walking from puzzle to puzzle. The player is encouraged to explore and to look at every object and around every corner in all possible perspectives to find these environmental puzzles. Searching for these puzzles you often find other 'secrets' in the world if you look at something from the right perspective. An example can be seen in *fig. 2.4*.
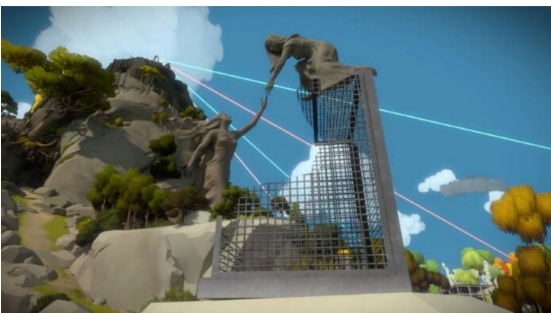

Fig 2.4: Environmental secret

Paying that amount of attention to the environment makes you forget that you are playing a puzzle game.

2.2 Portal 1 & 2

Fig 2.5: Portal

Portal (2007) and Portal 2 (2011) are first person puzzle games in which the player has a portal-shooting gun. The player can shoot two portals at a time and is able to walk in one and come out of the other. Another important aspect of the game is its narrative. Portal 2 has a lot more narrative than Portal. In Portal, the narrative heavy pieces of the game can be seen as resting moments, so it's interesting to see the differences between both games.

In Portal 1 the narrative part is mostly covered by GLaDOS. This is a robot who wants you to do 'tests'. These tests are the puzzles in the game. The player only hears GLaDOS' (autotuned computer) voice which mostly leaves you alone while solving a puzzle. But in the moments you're going from puzzle to puzzle you're mostly accompanied by her (it's a female robot I guess) voice. Her lines are very well written and often very funny. This is a good way to get the player out of 'puzzle solving mode'.

During the puzzles the player is sometimes able to 'break' out of the level and see things (s)he is not allowed to see as can be seen in *fig. 2.6*. The player gets very suspicious about the good intentions of GLaDOS. These secret areas also take the player out of the 'puzzle solving mode' but during the puzzle instead of in between puzzles.
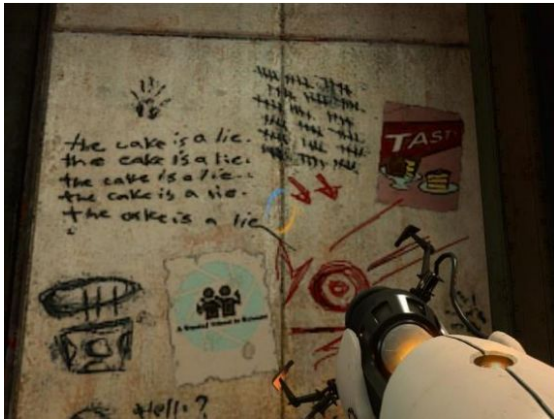
Fig 2.6: 'Secret' area

Fig 2.7: A Good Snowman Is Hard To Build

In Portal 2 there is a lot more focus on narrative. First of all, they introduce a new character named Wheatley. Because Wheatley travels on a rail he is able to show up practically anywhere at any time in the level. This allows the narrative to be more a part of the puzzles instead of unfolding in between the puzzles.

Portal 2 also has some parts in the game where you just have to walk for a while and sometimes have to shoot portals, but you don't have to solve any puzzles in those parts. In these parts the player learns more of the history of the company, and sometimes have some platforming in it.

Portal 2 is a bigger game than Portal 1 and takes longer to complete. This is probably the reason why Portal 2 has more moments of rest and more focus on narrative.

2.3 Alan Hazelden's games
Just take a look at his website *draknek.org* and you'll see the amount of games he's made. He is a game designer that mostly makes small Sokoban-like puzzle games. A couple of puzzle games he made are: *A Good Snowman Is Hard To Build* (2015) (*fig. 2.7*), *Sokobond* (2014), and *Max Capacitor* (2016).

His games often have one simple mechanic with which he can make a small game full of puzzles. He is known for his minimalist and elegant games. For example in A Good Snowman Is Hard To Build you obviously have to make snowmen. You have to roll balls of snow over a snowy part of the ground, this makes the snowball larger. The goal is to make three balls of varying sizes and roll them on top of each other from big to small to build snowmen. This designer is in this list because in almost all his puzzle games there are no resting zones, which is of course interesting for this paper.

Of course it's hard to compare his games to games like the Witness and Portal which take up a lot more of your time. The result of the absence of those moments of rest is a different flow of the game. If you would compare this flow with the ideal flow of Jesse Schell you would see some differences. The Witness has the same flow curve because the open world structure and the resting zones. Portal has it because of the resting zones, and because the simple fact that the difficulty of the puzzles keeps fluctuating. In contrast to Alan Hazelden's games, every time a new idea or mechanic is introduced the difficulty is reduced. From there it builds up again with more complicated puzzles with the same mechanic, or a combination of old mechanics and new ones.

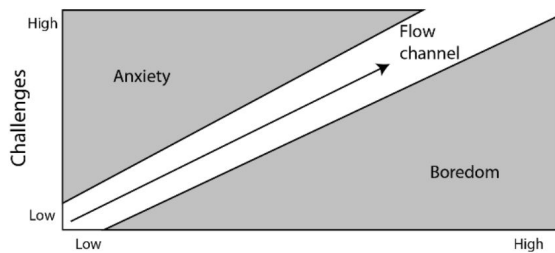The difficulty curve of Alan's games would look like *fig. 2.8*.

Fig 2.8: Alan Hazelden's difficulty curve

The reason that it looks like that is because it builds on one mechanic. He starts with a simple puzzle and keeps on throwing harder and harder puzzles at the player. In some way this is very elegant, because he is able to use this 'simple' mechanic in so many ways that the game never stops being interesting. Though in another way the player does not have any moment of rest. He is able to do that because his games are very short. He doesn't expect the player to have long play sessions like in the Witness or Portal 2.

Looking at the small games of Alan Hazelden we can conclude that resting zones or drops in difficulty are only necessary in large games that take a multitude hours to complete.

2.4 Metrico+

Fig 2.9: Metrico+

Metrico+ (2016) is a game developed by Digital Dreams, the company under which supervision I write this paper.

In Metrico+ is a puzzle platforming game inspired by infographics in which the player is able to move bar charts, line diagrams and graphs with the input the player gives. For example, walking left may result in increasing the value of a certain bar chart, making it taller.

In scope Metrico+ is larger than A Snowman Is Hard To Build but doesn't come close to games like The Witness or Portal 2.

Metrico+ tries to get players out of the 'puzzle solving mode' once in a while in different ways. It's interesting to look at Metrico+ because this game has many different ways to do it and they all take a short amount of time. So you're only in the 'relaxing mode' for a short while before going on with the next puzzle.

At the end of each world (the game consists of 6 worlds) there is a resting moment where the player has to make a decision about something that will happen to the player. These parts unfold some of the narrative of the game and allow the player to get his/her mind of the puzzles. But later in these parts there are little puzzles in it these choices. These puzzles are fundamentally very different from the normal puzzles the game provides you with, and are not as hard to solve. So it's interesting to see that it is possible to have small puzzles in a part of the game, but still get out of that puzzle solving mode. A big reason of why that can work is also the change in gameplay and the fact that the puzzles are not so hard.

During the rest of the world there is a high quantity of very small parts which consists mostly of walking and interesting surroundings for the player to see. Besides that there are a couple of levels which are completely platform based. These sections also provide a short break from the puzzles.

To conclude, in Metrico+ there are a lot of ways to achieve a resting state with the player. All these ways do not take a lot of time and they are in a high quantity.

2.5 Conclusion

The last paragraph covered a couple of different types of puzzle games with different types of resting moments.

In a non-linear game like The Witness the resting moments come more naturally because the player automatically walks around a lot more in the world. In The Witness they made good use of that fact and let the player be able to explore and enjoy the beautiful surroundings while walking.

In a linear puzzle game like Portal and Portal 2 there are certain moments where there's a focus on narrative exposition instead of puzzle solving. That in combination with the well balanced difficulty lets the player rest from time to time.

In small games like A Good Snowman Is Hard To Build it's not necessary to have resting moments, because it's not a big game and it's not expected of the player to have long play sessions.

In Metrico+ there are short resting moments with a high quantity.

It's hard to decide what the best way is to include resting moments in a game because all the games covered here approach it in such different ways. Most important is to think and consider why you want a moment of rest on a certain spot. A moment of rest is always affecting the flow channel. So be sure you place it on a moment in the game where you want a drop in difficulty.

We also saw that you could achieve the desired effect of a resting zone in a different way. For example with narrative heavy parts or platforming parts. Maybe the most important thing is to just do anything but puzzle solving, and you do not necessarily need rest. It's also possible that if your difficulty curve is very good you don't even need resting moments at all.

Paragraph 3

What other ways are there to change the experience of a level without changing the level itself?

Why do we actually need this rest? If a person plays a puzzle game you assume that (s)he wants to be solving puzzles. So it may seem weird that people need some parts where they are not solving puzzles for a moment. Why are you playing a puzzle game anyway if you want those resting parts in between? I think that's a question which you can ask of any game.

For example, in *Doom* (2016) (Fig 3.1) , the player is not always busy shooting demons, although that is the premise. A lot of time, maybe around a third of the total playtime, the player is walking and exploring, while not shooting. Does that mean that players actually don't like shooting? No, definitely not. It's all about the pacing of the game. It's about the flow channel in Fig 1.2. In Doom every fight is a challenge. If there would be a fight that was not a challenge a player would be disappointed. So, in order to maintain that flow channel they included these parts, so the actual fights could always be a challenge. In that sense puzzle games do not differ very much from other games.

Fig 3.1: Doom (2016)

In games, mostly puzzle games, we also see other ways to change the experience of a level besides resting zones, platforming parts or moments of narrative exposition. It can also be achieved by designing puzzles that directly affect another puzzle. This chapter is all about that. This chapter contains serious spoilers as I use solutions to puzzles as examples.

3.1 Antepieces
An antepiece can be used if you came up with a puzzle which is too complex for a player to solve. Sometimes in order to maintain the puzzle itself it cannot be made easier. An antepiece is a (part of a) level that has a very easy challenge that the player can complete almost without delay. But this level design technique is not made for the sake of that level itself. It's solely implemented so that the player could understand the next, more complex, level better.

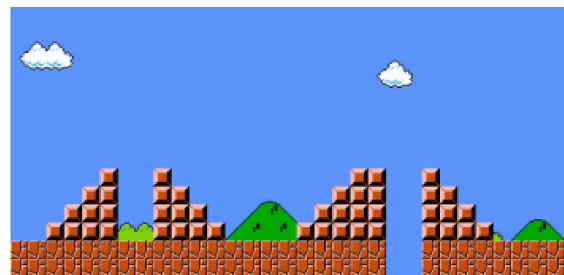Back in 1985 Super Mario Bros already used antepieces *(Fig 3.2)*.

Fig 3.2: Super Mario Bros. Antepiece

The antepiece is on the left, the setpiece is on the right. The antepiece lets you practice the skills you need to beat the setpiece.

In puzzle games this technique is used very often. Portal really excels in using it. Portal often has multiple antepieces right behind each other that teaches the player more and more about how the mechanics work. For example, there is a sort of phenomenon in Portal called "the fling". It's not really a mechanic but rather something that naturally arises when you play with portals. Basically it's the fact that if you jump down into a portal, and you come out of a portal against the wall, your downward speed is instantaneously changed into a forward speed (Fig 3.3).
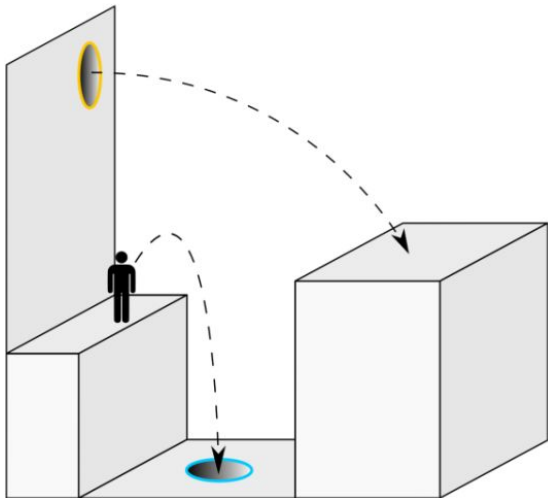

Fig 3.3: Portal, "the fling"

For the fling the designers of Portal use antepiece after antepiece to slowly unfold the true depth of the phenomenon. This way the player is constantly being challenged, without making it too hard for the player to understand. In the next images is shown how they do that.

Fig 3.4: Portal, "the fling" 2

You can clearly see how it starts out as something that is not even really a puzzle. Players finish this level mindlessly, not even noticing that the level is actually quite boring.

Fig 3.5: Portal, "the fling" 3

Because of the previous antepiece, this puzzle makes a lot more sense to the player. Purely because in the previous level he had to do almost the same. The only difference is shooting down what causes the momentum from the fall. Also notice the "diving board" above the pit. Players immediately feel like jumping down if they stand on top of that.

Fig 3.5: Portal, "the fling" 4
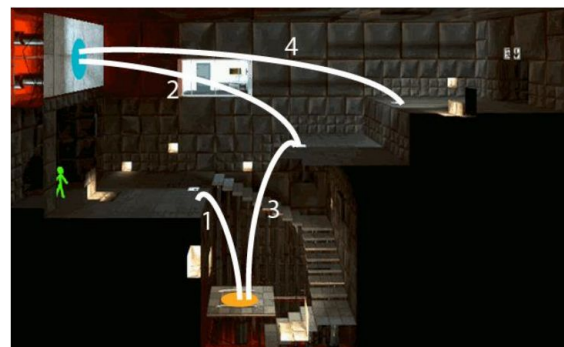
This level is obviously more complicated than the previous two. Paragraph 1.2 brought up the problem in puzzle games of complexity. Sometimes a puzzle just is complex. Making good use of antepieces is a good solution. This makes the general idea of what to do clear, and players only have to figure out how to do it. In Portal the iterations of the fling doesn't stop with the level in

fig 3.5. They have at least 7 more puzzles which make use of the fling. But each time they use it in a different way which the player has to figure on his/her self. [8] [9]

This set up with antepieces automatically has a good difficulty curve. That's why resting zones are less needed in Portal because the flow channel already has a good curve.

3.2 Reprises

Reprises are very similar to, and yet also kind of the opposite, of antepieces. This is when a level (or puzzle) is almost the same as the previous one, but the solution is totally different. With a reprise the player enters a puzzle with a certain expectation because the previous puzzle was almost the same. But the way to solve the puzzle is totally different. So where in antepieces the player is helped by a level before the complex level. A reprise makes it harder for a player because the player is tricked by playing the previous puzzle.

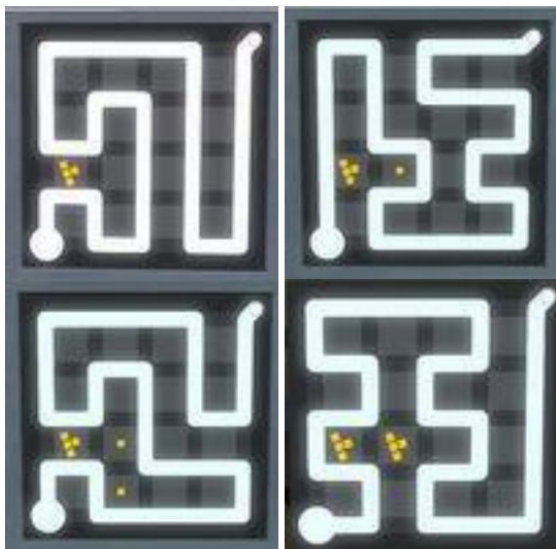The Witness makes very good use of reprises. In *fig 3.6* is an example of one.

Fig 3.6: The Witness, reprises

For people who never played The Witness: I'm not explaining how the symbols are working in this game, only the game is able to teach that. But I think everybody should be able to understand what a reprise is by looking at these puzzles.
There are four different line puzzles in the image. The first one only has the Tetris-like tetromino as a symbol. You can see that the second puzzle (at the

right side of the first one) only has a single square added next to the tetromino symbol. The player is tricked by the previous puzzle and is most likely to try to solve the puzzle in somewhat the same way as the first puzzle. But if you look at the line (the solution) you see that it is totally different than the first one. This is exactly what a reprise is.

The third one is again totally different then the second one. But this time, the solution is a bit similar to the first solution. The brilliance of these puzzles is that in each puzzle there's only one extra symbol added. The fourth puzzle breaks the tradition of adding a symbol by replacing one. This is still a reprise though.

Just like the antepieces, reprises can help to provide a well balanced difficulty curve.

3.3 Conclusion

By looking at both antepieces and reprises we learned that we can 'easily' change the experience of a puzzle by adding a puzzle in front of the puzzle to help the player with antepieces, or by adding a puzzle after a puzzle to trick the player with a reprise. These techniques greatly influence the flow channel. This means resting zones are not the only way to change the experience of a level or puzzle. As a designer you should consider what to use at what time.

Paragraph 4
Playtests

Until now all the research was done by looking at other games and drawing conclusions from that. But although you do get a clear view of how it's used in other games, you cannot really know how those games would be like if they would not have these resting zones.

That's why this paragraph is fully focused on playtesting and analyzing the data that will come from these playtests.

For these playtests I use a prototype of the game Complex, a game which is not even in full development yet by Digital Dreams. I'm going to make a collection of 10 puzzles in a linear order with a difficulty curve similar to the Jesse Schell one. But I'm going to make 2 builds of those same levels. One version has resting zones in it and the other one has not. The resting zones will be placed

after the 2nd, the 5 th and after the 8th level as can be seen in *fig. 4.1*.
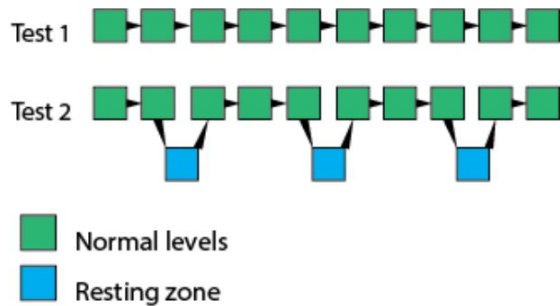

Fig 4.1: Playtest Map

The playtesters are of course going to test one of the two builds, and they will not know up front that others tested another version with or without resting zones.

The playtesters are primarily students at HKU University of the Arts Utrecht who study Game Design, Game Development, Game Art or Interaction Design. So the playtester already have affinity with games.

The 3 resting zones are different from each other and are very colorful. The rest of the levels are all just made up of 3 colors and the resting zones always have different colors. All resting zones are just linear paths, but they feel a bit maze-like because of the colors and the way the path is set up.

During the playtest I will collect certain data. After each level I will ask the tester to quickly fill in some data.

I will fill in their name, the level they play in and the time it took to complete the level. The players will fill in how confused they were in the level (a number from 0-2) and how satisfied they were (also a number from 0-2). Besides that they have to draw a cross somewhere on the affection grid (*Fig 4.2*).
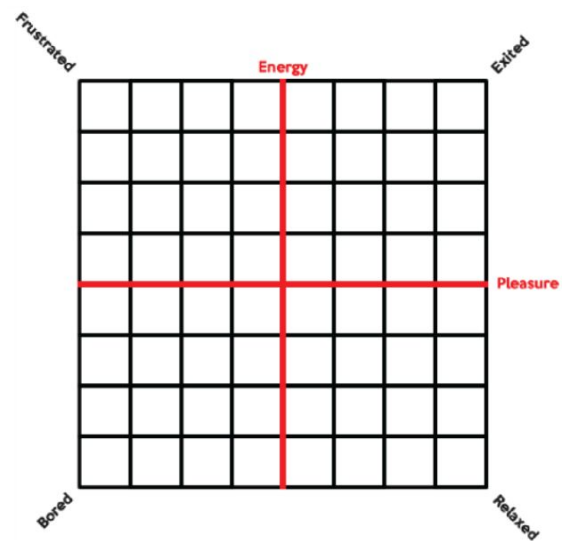
Fig 4.2: Affection Grid

If the cross is more to the left the pleasure of the level was low, so the overall experience is negative. To the right is positive. The higher the cross is placed the more energetic the player felt while playing and the lower, the less energetic. This can both be either positive or negative. At Digital Dreams they also use this grid for their playtests.

So for each player and for each level I get the time they were in the level, the confusion, the satisfaction and a cross on the affection grid.

4.1 Data analyses

Now it's time to actually look at the data. I've had 8 playtesters for test 1 and 7 playtesters for test 2. Most playtesters completed the playtest, but some did not because of a lack of time or some other reason.

Let's first analyze the affection grid data. For each cross the player has set I put a red circle in the grid with an amount of transparency. So if there are multiple circles overlapping each other the circle gets darker. This way you can see in one glance what people think of your level because it becomes some kind of heat map.

Let's look at a grid that contains every player and every level and both tests:
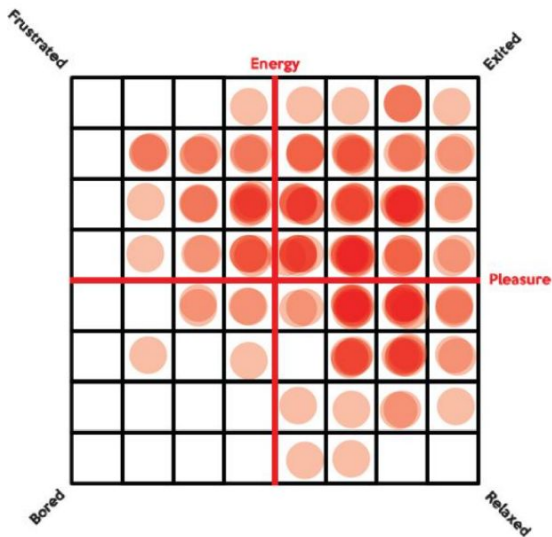
Fig 4.3: Affection Grid: All Data

So what we see here is that the general feeling is excitement, after that relaxed, then frustrated and then bored. But the real hotspot is somewhere on the border of excited and relaxed on the pleasure side. This is an overall good score for the levels. But let's see now what the differences are between test one and test two.

Fig 4.4: Affection Grid: Test 1, No Restzones

Fig 4.5: Affection Grid: Test 2, Restzones

Ok, now there is some actual data to analyze. Let's first look at the pleasure variable. Both values look roughly the same. Although there are obviously less circles on the left side of the pleasure variable in test 2. And it looks like there are slightly more on the right side on test two. So it looks like the resting zones are responsible for a more pleasurable experience.

But what is more convincing is the energy variable. Apparently players experience the levels as more energetic if they come in a resting zone once in a while. Of course that makes a lot of sense because relative to resting zones the levels are more energetic.

But what happens if we only look at the levels that are right behind the resting zones; levels 3, 6 and 9?

Fig 4.6: Affection Grid, Test 1, after Restzones
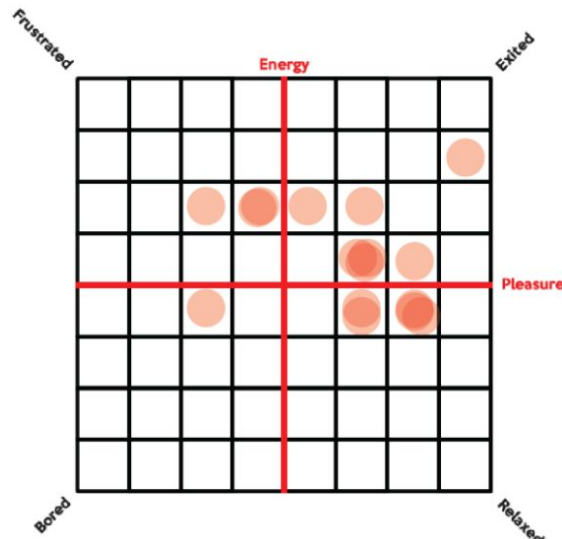
Fig 4.8: Affection Grid, Test 1, before Restzones
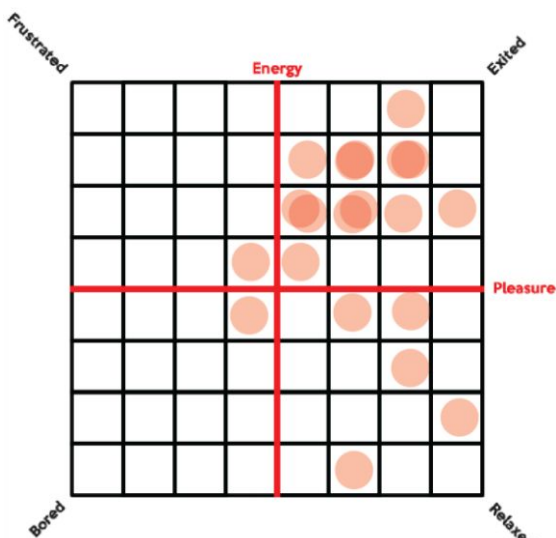
Fig 4.7: Affection Grid, Test 2, after Restzones
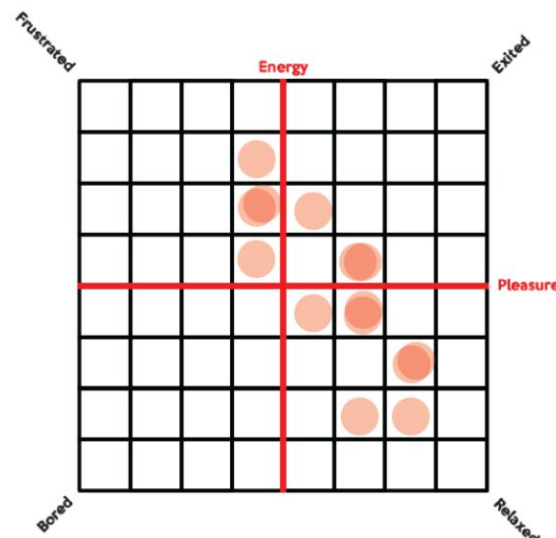
Fig 4.9: Affection Grid, Test 2, before Restzones

The distinction between the two is now more obvious. We can draw the same conclusion here but then with more certainty: The players experience the levels as more energetic and slightly more pleasant in test 2 with resting zones.

But can we really conclude this? Both tests had at least 7 testers. Is that enough? One way to find this out is to compare just the first two levels of both tests. There should be no real difference here because the resting zones could not have any effect yet.

The results are a bit spread out, but that is probably because these are just two levels. The average seems to be the same.

The affection grid is not the only collected data. There's also the playtime, confusion and satisfaction. So let's take a look at that data.

But first some information about the data. As mentioned earlier, some players did not complete the full test, because of time reasons. I still take into account their data because the conclusion comes from averages of the players and not from individual players.

On the far left there are the levels. Level 11 is in gray because I decided during the playtest

that that level was too hard and therefore could influence the end results too much. The data of that level is not taken into account in any way anywhere else. Only the people who wanted to play it played it.

The column next to that are the total times of how long the player is playing in total from the beginning. Next to that is the playtime per level with at the bottom the average playtime. The resting zones are never taken into account. Not with any measurement, the timer was paused while the player was in a resting zone.

Next to the time are the confusion and the satisfaction with at the bottom the average confusion and satisfaction.

The double lines after the 2nd, 5th and 8th level represent the resting zones.

Non Rest	Alex Tot. Time	Time	Confused	Satisfied	Tim Tot. Time	Time	Confused	Satisfied
1	00:20	00:20	0	2	00:36	00:36	0	2
2	01:06	00:46	1	1	02:42	02:06	1	1
3	01:27	00:21	0	2	06:24	03:42	0	2
4	02:36	01:09	2	2	07:00	00:36	2	2
5	03:55	01:19	1	2	11:53	04:53	1	2
6	08:19	04:24	2	1	15:40	03:47	2	1
7	10:42	02:23	2	2	17:50	02:10	0,5	2
8	12:16	01:34	1	2	21:15	03:25	0,5	1
9	15:16	03:00	2	1	27:24	06:09	1,5	1,5
10	17:20	02:04	1	1				
11	23:59	06:39	2	2				
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	17:20	01:44	1,2	1,6	27:24	03:03	0,944444	1,611111

Non Rest	Sophia Tot. Time	Time	Confused	Satisfied	Lennart Tot. Time	Time	Confused	Satisfied
1	02:03	02:03	2	2	03:02	03:02	2	1
2	04:47	02:44	0	2	04:11	01:09	1	1
3	05:34	00:47	1	1	05:05	00:54	0	1
4	06:36	01:02	1	2	06:17	01:12	0	2
5					07:58	01:41	1	2
6					10:21	02:23	1	2
7					12:35	02:14	1	1
8					13:48	01:13	0	1
9					16:54	03:06	1	1
10					24:47	07:53	1	2
11					37:16	12:29	1	2
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	06:36	01:39	1	1,75	24:47	02:29	0,8	1,4

Non Rest	Koen Tot. Time	Time	Confused	Satisfied	Arjan Tot. Time	Time	Confused	Satisfied
1	01:25	01:25	1	2	00:34	00:34	0	1
2	05:21	03:56	2	2	01:16	00:42	0	2
3	05:41	00:20	0	2	01:35	00:19	0	2
4	06:49	01:08	1	2	02:42	01:07	1	2
5	08:27	01:38	1	2	04:45	02:03	1	1
6	12:58	04:31	2	2	08:02	03:17	2	2
7	22:27	09:29	2	2	10:15	02:13	0	2
8	23:46	01:19	1	2	11:24	01:09	0	2
9	28:09	04:23	1	2	13:21	01:57	0	2
10	30:28	02:19	1	2	16:02	02:41	0	2
11	45:07	14:39	2	0	19:13	03:11	0	2
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	30:28	03:03	1,2	2	16:02	01:36	0,4	1,8

Non Rest	Caroline Tot. Time	Time	Confused	Satisfied	Daan Tot. Time	Time	Confused	Satisfied
1	01:16	01:16	1	1	01:32	01:32		
2	03:53	02:37	1	1	03:16	01:44		
3	04:16	00:23	0	1	03:45	00:29		
4	06:12	01:56	1	1	04:12	00:27		
5	10:14	04:02	1	2	08:15	04:03		
6	13:36	03:22	2	2	09:55	01:40		
7	18:58	05:22	2	1	12:25	02:30		
8	21:53	02:55	0	1	18:45	06:20		
9	25:08	03:15	0	1	21:23	02:38		
10	27:37	02:29	0	2	28:48	07:25		
11								
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	27:37	02:46	0,8	1,3	28:48	02:53		

Test 2 With resting zone

Rest	Tobias Tot. Time	Time	Confused	Satisfied	Melissa Tot. Time	Time	Confused	Satisfied
1	00:42	00:42	1	2	03:35	03:35	0,5	1,5
2	02:03	01:21	2	1	03:41	00:06	1	2
3	02:36	00:33	0,5	1	04:07	00:26	0,5	1,5
4	06:13	03:37	2	1	06:20	02:13	0,5	1
5	08:42	02:29	1	0	14:04	07:44	2	1,5
6	10:51	02:09	0,5	1	14:41	00:37	1	1,5
7	13:19	02:28	1	1	19:31	04:50	1,5	1,5
8	14:44	01:25	0,5	2	28:17	08:46	2	0,5
9	16:27	01:43	0	2	32:56	04:39	2	1,5
10	19:39	03:12	1	1	44:43	11:47	2	1
11								
Tot. Time / Avg. Time / Confused / Satisfied	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	19:39	01:58	0,95	1,2	44:43	04:28	1,3	1,35

Rest	Leon Tot. Time	Time	Confused	Satisfied	Emiel Tot. Time	Time	Confused	Satisfied
1	03:07	03:07	1	2	00:50	00:50	1	1
2	06:37	03:30	1	1	02:40	01:50	2	1
3	07:01	00:24	0	0	03:36	00:56	1	1
4	07:50	00:49	0	1	05:07	01:31	2	2
5	11:57	04:07	1	1	07:04	01:57	1	2
6	15:50	03:53	1	2	12:11	05:07	2	2
7	20:55	05:05	1	1	15:07	02:56	1	2
8	22:50	01:55	0	1	18:08	03:01	0	2
9	24:51	02:01	1	2	23:38	05:30	1	1
10	27:07	02:16	0	1	31:08	07:30	1	0
11	30:38	03:31	1	2				
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	27:07	02:43	0,6	1,2	31:08	03:07	1,2	1,4

Rest	Paul Tot. Time	Time	Confused	Satisfied	Robin Tot. Time	Time	Confused	Satisfied
1	00:54	00:54	1	2	00:39	00:39	0	2
2	01:32	00:38	1	1	01:31	00:52	0	2
3	02:59	01:27	2	1	01:57	00:26	1	2
4	03:52	00:53	1	2	03:23	01:26	1	2
5	04:42	00:50	2	2	06:44	03:21	1	2
6	05:59	01:17	2	2	09:24	02:40	1	1
7	07:20	01:21	2	1	16:12	06:48	2	2
8	08:20	01:00	2	2	17:21	01:09	0	2
9	11:07	02:47	2	2	21:00	03:39	1	2
10	13:29	02:22	2	2	29:38	08:38	2	2
11	23:06	09:37	2	2	36:15	06:37	1	2
	Tot. Time	**Avg. Time**	**Confused**	**Satisfied**	**Tot. Time**	**Avg. Time**	**Confused**	**Satisfied**
	13:29	01:21	1,7	1,7	29:38	02:58	0,9	1,9

Rest	Romar Tot. Time	Time	Confused	Satisfied
1	00:52	00:52	0	2
2	02:07	01:15	0	1
3	02:23	00:16	0	0
4	03:07	00:44	0	2
5	04:47	01:40	0	2
6	07:12	02:25	1	2
7	10:02	02:50	1	1
8	12:56	02:54	1	0
9				
10				
11				
	Tot. Time	**Avg. Time**	**Confused**	**Satisfied**
	00:00	01:18	0,375	1,25

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Averages test 1 & 2

	Average Tot. Time	Test 1 Time	No Confused	Restzones Satisfied	Average Tot. Time	Test 2 Time	With Confused	Restzones Satisfied
1	01:21	01:19	0,857143	1,571429	01:31	01:31	0,642857	1,785714
2	03:19	01:58	0,857143	1,428571	02:53	01:22	1	1,285714
3	04:13	00:54	0,142857	1,571429	03:31	00:38	0,714286	0,928571
4	05:18	01:05	1,142857	1,857143	05:07	01:36	0,928571	1,571429
5	07:55	02:48	1	1,833333	08:17	03:10	1,142857	1,5
6	11:16	03:21	1,833333	1,571429	10:53	02:35	1,214286	1,642857
7	15:02	03:46	1,25	1,666667	14:38	03:45	1,357143	1,357143
8	17:35	02:34	0,416667	1,5	17:31	02:53	0,785714	1,357143
9	21:05	03:30	1,1	1,5	21:40	03:20	1,166667	1,75
10	24:10	04:09	0,75	1,8	27:37	05:57	1,333333	1,166667
11								
	Tot. Time	Avg. Time	Confused	Satisfied	Tot. Time	Avg. Time	Confused	Satisfied
	24:10	02:32	0,901667	1,63119	27:37	02:41	1,028571	1,434524

The last two tables covering the average data are the most important (as long as there is not a player with extreme different data). If we compare the two average tables with each other we can ascertain certain findings.

First of all, the time it took to complete the test for players in test 1, with no rest zones, was 03:27 shorter than the time it took for players in test 2. Keep in mind that the time in rest zones is not counted. The difference of the average time it took to complete a level was 9 seconds. That means that the players who did not have the resting zone could finish level quicker than the players that did have resting zones. Although the difference is perhaps not very significant it is a difference nonetheless. This could mean that player had a harder time with the puzzles, but it could also mean that the player just took more time because they played more relaxed.

That's not the only thing. People who play without resting zones are 0,12 less confused and 0,21 more satisfied. Perhaps it can be said that it is an actual difference, but the difference is so insignificant that it's negligible.

If we look back at the time though we can see something weird. We saw that the players without resting zones were faster. But if we only compare the levels right after the resting zones we see that the players in test 2 were faster in all of those levels.

It's really hard to draw the right conclusion here. Maybe people are faster after a resting zone and by pure coincidence the people in test two were slower in general than the other group. That would mean I did not have enough playtesters. Or maybe the benefits of a resting zone only works right after the resting zone and after that it loses effect. That would mean there should be a resting zone right before each puzzle.

4.2 Conclusion

This paragraph showed us a lot about to what extent a puzzle game is influenced by resting zones. The affection grids showed us that the players experienced the levels as more energetic and slightly more pleasant if there are resting zones. And that the closer to the resting zone, the stronger that difference is. We also saw that the time it took for players to figure out the puzzles were shorter in the levels right after the resting zones, but longer in the total test. The conclusion is that a linear puzzle game could benefit from resting zones provided that the resting zones are placed frequently throughout the game. Maybe the results would have been different if I'd made the resting zones longer or shorter, or maybe more platform based or action based. It would be good to test that as well.

Paragraph 5
Conclusion

Is it possible to answer the question: To what extent do resting zones influence the experience of a puzzle game? I have concluded that I can partially answer the main question.

What we know for sure is that most other (successful) puzzle games have resting zones and that it does influence the flow channel of the game. But there are a lot of different factors that can influence the flow channel as well. For example, a good difficulty/learning curve, or any part in which you basically just do anything but solving a puzzle, like platforming, exploring or simply enjoying the beautiful surroundings. You can even change the flow channel with adding antepieces or reprises. We also found that short puzzle games like the games from Alan Hazelden, don't necessarily need resting zones.

From the playtests we can also draw several conclusions.
Resting zones did influence the experience of the game.
Play testers felt the levels were more energetic, especially the levels right after a resting zone.
The time it takes to figure out a puzzle is shortened, but only for a short time after the resting zone. In this case 1 level after the resting zone. But in the other levels people only were slower on average.

The reason why the answer is partially answerable is because in order to give a right answer we should test more variations of resting zones. We should find out what a resting could be. I only tested the most obvious version of a resting zone: one which is placed in a linear environment, with different colors and in which you (almost) only had to walk.

To really test this in a good way, there should also be tests about resting zones in a non-linear environment. We should also consider what the resting zone should or can be. What kind of playstyles can exist within a resting zone? Or maybe music can play a large role in resting zones beside colors.

To test it even better, there should be a test with brain scans to see which part of the brain is active in a puzzle and which part of the brain is active inside a resting zone, we could then measure the difference of the activity of the brain parts and compare the results.

We did discover that there is a lot of potential in resting zones for puzzle games. And that it has a lot of benefits and it could be used to tackle multiple problems especially to maintain a well-balanced flow channel.

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