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# BreathSenses: Classification of Digital Breathing Games

**Rakesh Patibanda**

RMIT University  
Melbourne, Victoria 3000  
Australia  
rakesh@exertiongameslab.org

**Matevz Leskovsek**

Breathinglabs.com  
Tehnološki Park 19, Ljubljana,  
Slovenia, EU  
mat@breathinglabs.com

**Flourian Mueller**

RMIT University  
Melbourne, Victoria 3000  
Australia  
floyd@floydmueller.com

**Jonathan Duckworth**

RMIT University  
Melbourne, Victoria 3000  
Australia  
jonathan.duckworth@rmit.edu.au

**Note:** We have submitted our full late-breaking work for selection. This is a shorter version of the same for the workshop.

**Abstract**

In recent years attention has increased around digital breathing games via new technology that allows interaction between breathing and video games. While some breathing games use breath as a fun form of interaction, other games use breath to improve mental health aspects a player in order to reduce stress and anxiety. So far, little research has been devoted towards understanding the design of breathing games. To develop an understanding towards the design of breathing games, we begin by proposing a taxonomy depending on the factors of game genre, game design analysis based on the human body senses involved, breathing technique used, aim of the breathing technique, technology used to experience the game world and technology used to measure breathing. To demonstrate the strength of our taxonomy, we analyze example games and discuss how the novel taxonomy could help game designers to create breathing games.

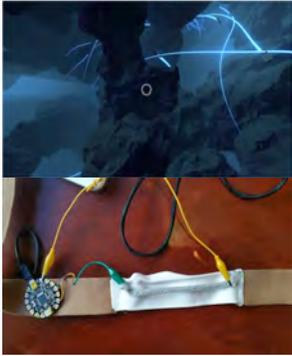
**Author Keywords**

Taxonomy; digital games; breathing; respiration.

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

## Game Screenshots



**Figure 1:** DEEP game screenshot and custom made controller.



**Figure 2:** Player playing deepsea wearing the custom made mask controller.



**Figure 3:** Flowy game and character.

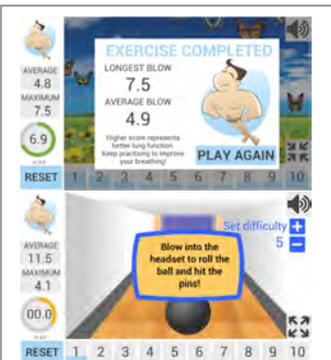
## Introduction

Breathing is something that we do all the time and yet we are mostly not aware of it. Bringing our focus intentionally onto our breath we can learn to observe it without reacting to it, simply watching each breath as it happens [1]. Further, various breathing techniques and exercises are considered fundamental for the development of both physical and mental well-being [2-4]. Inhaling makes us alert and ready for action, while exhaling calms us down, stimulates digestion and relaxes the muscles. Because breathing is the only conscious function that directly affects the heart, we can successfully treat illnesses such as hypertension and arrhythmias by controlling ones breathing [5]. Digital games offer promising opportunities for both the practice and research of breathing because the interactive nature of games allows for the development of experiential knowledge. This is important for breathing, as it will help players understand their breathing patterns and allow them to alter it if necessary [6]. Games can be engaging and that makes players forget about time and create an absorbing experience [7] unlike the traditional breathing exercises, which might lack motivation and engagement.

## Related Work

In recent times, breathing is increasingly being used in digital games and applications. Some of the games and applications intend to use breathing as a fun form of interaction while others intend to improve physical and mental well-being of players by reducing stress and anxiety.

In a study conducted by Krestina and Andrew, "The Journey to Wild Divine" was investigated as a biofeedback management tool to teach breathing skills to children with Attention-Deficit/Hyperactivity Disorder (AD/HD). The children played the game by manipulating their heart rate using breathing techniques taught in the game [8]. Spatial poem by Choi et.al, offers a new type of visual interaction expressing the player's own creative narrative as a real-time visual by playing a musical instrument, which is an emotional human behavior. When a player blows the instrument, to make sounds, the blow changes into energy that makes the player walk continuously in a virtual space [9]. Marshall et.al, explored the potential of breathing as an effective and engaging way to enable the control of individual seats on physical amusement rides. Tactics for designing rides in the future that could possibly incorporate breath control were proposed in their research [10]. Moraveji says that influence over behavior can happen with the most basic physiological change that we have conscious control over i.e., breathing. He further states that feedback would help change the simplest behavior that matters and in our context, it is breathing [6]. He has not pursued breathing from a playful perspective, but his words about feedback point towards gaming as a potential way to change behavior [11]. This work inspired us to build the taxonomy towards understanding the design of breathing games. We call this the breathsenses taxonomy.



**Figure 4:** Screenshot of the Pinball Game by Breathing Labs.

Game Genre	Example Game	Breathing Technique Used	Aim of the Breathing Technique	Game Design Analysis using MDA Framework Based on Human Body Senses Involved During the Gameplay							Technology Used To	
				Touch	Movement	Sight	Hearing	Taste	Smell	Balance	Experience The Game World	Measure Breathing
Open World	Deep	Diaphragmatic Breathing	Reduced Stress, Calm & Playful	M	Movement of the belly detects the breathing	A circle on the screen indicates the players breathing	The ambient sound of an underwater world keeps the player immersed				Uses Oculus Rift VR headset to immerse the player	A custom made waist belt is placed around the players belly to measure breathing
				D	Breath rate is fed back into the game	The circle expands and contracts while the player breaths	The movement in the water is supported by the sound					
				A	Calm, Joy	Calm, Joy	Calm, Joy					
Audio	Deep Sea	None	Playful Experience	M		The sense of sight is obscured by the mask worn by players	The players hold their breathe to hear alien sounds.				Custom made mask is used to plunge them into a world of darkness	A microphone inside the mask donned by the player measures breathing
				D		This enables players to focus on ambient sounds in the game.	Aim and shoot into darkness hoping to hear the sound of the alien die					
				A		Fear, Excitement	Fear, Joy & Excitement					
Casual	Flowy	Breath Retaining	Reduced anxiety while being playful	M	Players swipe and collect coins while breathing	Players replicate the breathing by looking at the screen					Uses a smart phone to immerse the player	Flowy does not measure breathing of the player
				D		Players replicate the characters breathing movement	Ambient sound of the character breathing creates an illusion of					
				A	Joy, Excitement	Calm	Joy, Excitement	Joy, Excitement				
Casual, Racing, Music	Breathing Games by Breathing Labs	Pursed Lip Breathing	Reduced breathing a stress related problems while being playful	M	Players' breathing is sensed by the device and taken an as input						Uses a smart phone to immerse the players	Breathing + is a custom made device used to measure breathing
				D		Dynamics range from speeding, to intensity of the wind instrument and more						
				A		Joy, Excitement						

**Table 1:** The BreathSenses Taxonomy: Towards Understanding Breathing Games

**Taxonomy**

BreathSenses is the taxonomy we propose shown in table 1.0. The taxonomy consists of the following factors:

- Game genre
- Game design analysis based on the human body senses involved
- Breathing technique used
- Aim of the breathing technique
- Technology used to experience the game world

- Technology used to measure breathing

### **Future Opportunity**

While the breathsenses taxonomy informs game designers about how breathing games have been designed, it also helps them by showing the gaps that have been highlighted in orange color, indicating unexplored territory. Game designers who intend to design breathing games, can use the unexplored territory and design games by involving more combinations of human body senses during gameplay. Game designers also have the opportunity to explore combinations of breathing techniques and technologies as shown in the breathsenses taxonomy. Further, game technology enthusiasts might benefit from the breathsenses taxonomy and design new and exciting gaming interfaces. This might be possible by considering different combinations of human body senses that they want to involve while playing games.

### **Conclusion**

Although this might not be the only way, but the breathsenses taxonomy is one of the ways towards understanding the design of breathing games. We believe that it can act as a stepping-stone for game designers who intend to design breathing games. Our next step, post this work is to design and develop our own breathing games and receive feedback from relevant audiences. With our work, we hope that people will learn to breathe better and game designers will start designing more breathing games.

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