

Exploring avatar roles for motivational effects in gameful environments

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Abstract

This paper explores avatar roles and design principles in helping to develop motivation in game environments. Different avatar applications could influence the experience of players in at least three ways: as a customisation tool, game strategy, and personal identification. These possible influences could be enhanced by the application of avatar design for motivational purposes, reflected through the integration between game design elements and the avatar implementation. This paper aims to situate avatar design as a design strategy to motivate users to change their behaviour and promote adherence to new habits. We start by reviewing the current papers that address avatar design utilisations for motivation in to Serious Games. Then, we analyse the main elements in gameful applications (e.g. *Re-Mission*, *Pain Squad*, *CodeInGame* and *Monster Manor*), in order to understand and explore the design of avatars. The analysis is followed by the development of a model for Avatar Design in Motivational contexts (ADAM), which could be used to provide the necessary guidance for designers and developers of gameful systems for motivational environments.

Keywords: Avatar, Interface Design, Games.

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1. Introduction

Games are evolving in different ways, from massively multiplayer online games and casual mobile games to games designed to change people's behaviour. In this paper, we treat the applications that combine game design elements as gameful, following the definitions proposed by Deterding [7], in serious games and gamification in general. One example of the evolution is the integration of motivational principles with gaming technology, which is extensively applied in serious games and video games in general [23]. Gamification introduces the same purpose of providing a motivational effect and behavioural changes in order to encourage user interaction [8]. Studies that

integrate motivation and games tend to combine motivational effects before and after gameplay, as a reflection of autonomy, competence and relatedness [20, 23], which are concepts borrowed from the Self-Determination Theory (SDT) [22]. In fact, autonomy and competence are psychological outcomes that can emerge after gameplay [4]. This suggests that the game itself provides the necessary motivational aspects to make people feel more autonomous and competent. If this is indeed the case, then which are the key elements in a game that can create such effects in areas such as health management and education?

One way in which how different elements combine to help develop motivational impact is to look through the lens of game design at game mechanics and interface design, particularly for game immersion. One element that

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stands out when taking a design perspective is avatar design in virtual interfaces [4]. Apart from being a tool for strengthening the game's storyline [10], avatars can be used for self-identification and as a personalisation strategy [12, 17]. Avatar design can also enhance motivation, particularly through control in playing a game [23]. However, the integration of avatar design with other game elements in Serious Games remains a challenge, particularly for developing motivation. For example, avatar customisation could motivate players, but what is the impact of such customisation? What are the best practices for avatar design strategies for each motivational outcome? Therefore, the aim of this paper is to provide an integrated overview of avatar design applications in motivational scenarios related to Serious Games contexts (e.g. healthcare, education and learning, etc.). Considering this, we ask the following questions:

What are the current applications of avatar design strategies for improved motivation within entertainment games?

How can avatar design affect user motivation in Serious Games?

With this in mind, we present a review of current avatar roles in games in general and the potential of those avatar roles as motivational strategies for Serious Games. Following that, we analyse and explore four related applications to understand the effects of avatar design strategies on user motivation. Considering the exploratory nature of our paper, we discuss the process of synthesising our ideas from the literature, leading to a model for a motivational avatar design. The topics, which have emerged from our review, are discussed in the next section.

2. Background Study and Review

An avatar is described as a manipulation of human depiction [10]. In the context of gameplay, an avatar is perceived as the personalisation of the player [2, 20]. Another way to understand avatar design in games is through character design of game characters. In this paper, we treat both avatar and character design in the same way. The employment of game characters or avatars illustrates the combination of two functions: agency and empathy [11]. Agency is the way the character is represented in the game, which could be controlled by the player, whereas empathy is the emotional link that the avatar builds with the player. This could bring a sense of immersion and presence for the player. For example, players usually choose an avatar that can represent them in gameplay or an avatar that could hold the player's personality. This projection could help to build an emotional connection between the player and the avatar, especially when players feel that they are able to accomplish their tasks effortlessly. In this sense, players may believe they have some sort of chemistry with the avatar.

As a reflection of agency and empathy, avatar design could function as a motivational factor for players, particular when considering games and gamified systems for behaviour change [2, 20]. Another way to understand avatar design in games and virtual spaces is through identity projection [20]. For example, the choice of avatar could enhance players' identification and projection inside the game, influencing their game experience [10]. In addition, players can also experience psychological effects, often related to the ownership of the digital environment. This perceived ownership is related to a sense of control over the use of objects in the digital world, combined with the investment of one's time and energy [17]. This means that the digital world supports the player's interactions inside the game. These interactions can also enhance cognitive evaluations, affective reactions and emotions inside the game environment [17]. Thus, when considering gameful applications, the implementation of avatars could have at least two functions: cognitive and emotional.

The utilisation of avatars for cognition could be a mechanism to interpret and deliver a particular message through avatar design and choice inside the game. This aspect could also function as a motivational factor; for example, the cognitive role of avatar design could indicate a sense of competence. In parallel, the use of avatars as a tool for emotional strategies could be a part of the player's personalisation and identification with their in-game role. The ability to personalise a game character could be a reflection of autonomy, which could help players to feel more motivated inside the game.

Avatar personalisation can also be related to competence. For example, players are able to personalise their avatar for superior self-representation, showing the player's abilities and their level of achievement inside the game [15, 20]. This personalisation concept has shown an increase in players' emotions and interactions while playing the game. In fact, avatar choice can also give players the opportunity to manipulate and use alter egos to enhance their capabilities in winning a game [34]. Thus, the identification with avatar representation is a key component when looking for aspects that enhance individual's motivation and performance in games.

Avatar representation also refers to other characters in games, known as non-player characters (NPCs). With the right graphics and animations, NPCs can attract players' attention and could influence their memory [2]. Customised features of the avatar in the game can also help players in improving their skills and learning ability and offer opportunities for creativity [2]. When considering the impact in Serious Games, Baylor [4] indicates that virtual representations of the self can influence behaviour change in real life. This means that personalising an avatar could provide self-direction, which could increase the choices of avatar appearance inside the game and affect the player's experience. These choices also refer to identity fidelity in such a way that the player could choose the same kind of avatar when playing a game. Thus, having the sense of belonging, related to

the player's own character choice and personalisation could augment the power of avatar design as a motivational factor. Moreover, having control over the avatar could encourage players to sustain their involvement in the gameplay. Besides personalisation, a game character can be related to the game narrative and immersion.

Immersion is defined as the level of game involvement and engagement, by which the player feels submerged in the gaming environment [24]. This means that a game would provide aspects that encourage immersive reactions in the players. Personalising an avatar, for example, can influence immersion since it enhances the player's sense of autonomy and creativity [2, 4]. Teng [27] argues that players expect to experience a fantasy world within the character's story, in order to feel more immersed in the game. In addition, game characters are part of the game narrative [24]. This means that the integration of the avatar and the environment of the game may be crucial for immersion. According to Qin et al. [21], character control could evoke player involvement. Hence, character control and the integration of the character in the game could help the players to transform the gameplay according to their choices. This suggests that the gameplay, NPCs and game narrative should be integrated

with avatar design choices, in order to build emotional connections and a sense of control in the game.

From another perspective, avatar design can be perceived as a powerful communication tool [10, 12]. Ducheneaut et al. [10] believe that avatar design goes beyond message communication, as its representation allows players to perform their choices inside the game. The avatar selection also influences the way players perceive each other. Based on this selection, it is also possible to bring other behavioural effects, including attitudes and emotional reactions [12]. Self-identification, personalisation, control, sense of belonging, emotional and cognitive links could be considered as the main roles of avatar design. Autonomy, relatedness and competence could be enhanced by those different roles. However, the challenge is to integrate those perspectives with the other game design elements and the player's context. Based on the previous studies on avatars, we summarise the utilisations and strategies of avatar applied in Table 1.

The main ideas discussed in the previous literature were related to user/player engagement and motivation, rewards, status, immersion and sense of presence, loyalty, control, autonomy, customisation, achievement indicators and influence in the game world, where the environment of interaction takes form [14].

Table 1 Avatar Utilisation and Strategy

Avatar utilisation	Strategy	References
Avatars as a representation of the player's abilities of standing as a train commuter	Engagement, status	Kuramoto, Ishibashi, Yamamoto & Tsujino (2013)
Avatars as a representation of the player's achievements	Status, indicator	Otake <i>et al.</i> (2014)
Avatars as the player's presentation in a virtual learning application	Engagement, status	Barata <i>et al.</i> (2013)
Avatar customisation helps the player to explore the game narrative	Customisation impact in the game world	Caetano <i>et al.</i> (2012)
Avatars as the player's representation in games.	Identification, motivation	Jang <i>et al.</i> (2010)
Avatars allows the players to make choices in the game world	Control, autonomy	Ducheneaut <i>et al.</i> (2009)
Avatar customisation provides more immersion and game loyalty	Immersion, loyalty	Teng (2010)
Avatar customisation can influence player engagement	Engagement, sense of presence	Bailey, Wise and Bolls (2009)
Avatar choices as the player's representation in a virtual bookstore.	Immersion, Engagement, status	Yoo, Pena, Drumwright (2015)
Avatar as the player's representation in e-health learning environment	Motivation, rewards system	Jin, S. (2011) Birk, M. V. Et al (2016)
Avatar choice motivate to keep playing	Motivation, identification, customization	Turkay, S. & Kinzer, C. (2016)
Avatar identification collaborates for the feelings of gamr addiction	Identification, Self-Esteem	You, S., Kim, E., & Lee, D., (2017)
Avatar personalisation as player decision strategy	Identification, status, familiarity	Leavitt, A., Clark, J., & Wixon, D., (2016)
Choice of Avatar as player's health representation	Motivation, impact to behavioural change	Hwang, S., Mamykina, L. (2017)
Avatar as a representation of individual's alter ego	Manipulation of avatar body image, influence to self-esteem	Villani <i>et al.</i> (2016)

While analysing the design strategies employed in the literature review, it was possible to group the avatar utilisations in three categories of avatar design: game customisation, game strategy and identification with avatar representation. These three characteristics show that the manipulation of the avatar inside games and interactive environments could help to enhance concepts related to motivation (e.g. autonomy, relatedness and competence).

Autonomy, for example, could be augmented through character control and manipulation. The player could have the opportunity to view his/her impact in the game. In parallel, character choices could influence NPC's behaviour inside the game, influencing the game narrative. For autonomy to occur, players should be able to customise and choose their own avatars. Competence could be translated through avatar choice as a reflection of a strategy inside the game; players could feel that they have the skills to succeed in the game considering their character choices. At the same time, this aspect could be an expression of narrative design, particularly if the storyline supports the power and accessories of different game characters. Finally, relatedness could be strongly associated with identification with avatar representation; in multi-player games, for example, a character choice can be a personal representation, influencing the way the others interact and perceive the player inside the game.

The literature indicates that although manipulations and utilisations of avatars inside games could provide enough user interaction to provide motivational outcomes, there is still an impact of such choices in the other elements of the game. Moreover, research in avatar design has focused on games, but not on serious games or gamification, which have a purpose that goes beyond entertainment. This opens an opportunity to explore avatar design for motivational reasons in serious applications.

Taking the above points into account, the area, which lacks study, is the integration between the strategies developed around avatar design and the other elements in serious games and gamification for motivational effects. Furthermore, the exploration of avatar utilisations through representation, identification, customisation and sense of control could also augment the potential motivational applications of avatar design. To further understand the elements that emerged from the review, we analyse different gamified applications. In our analysis, we explore how avatars were utilised in these existing applications and how avatar design strategies could motivate players differently. This is explained in the next section.

3. Analysis of Gameful Application

Following the avatar design utilisations described in Table 1, we apply this perspective in serious games and gamification. For this purpose, four significant applications were chosen, including Pain Squad (PS), Re-

Mission, Monster Manor, and CodeinGame. These applications were chosen because of their popularity and significant effect in Serious Games, such as in healthcare and education. We start by summarising the main elements and characteristics of each system. The description of each system is followed by the exploration of their avatar roles for motivational effects.

3.1 Characteristics

The Pain Squad (PS)[†] is a gamified application created to encourage young cancer patients to report their pain daily. By reporting, patients can notice the status of their pain, either reducing, or increasing, or varying. The PS also aims to help young patients to have some control over their pain during treatment. The application allows the doctors to monitor and analyse data provided by patients in order to provide a personalised experience to the patients.

Re-Mission[‡] is a serious game developed to help patients to learn about the nature of cancer. *Re-Mission* aims to help patients to have a better understanding of what happens when cancer is inside their body. Because of that, the patient could have a better adherence to medication, and positive attitude towards their treatment schedule and appointment.

Monster Manor (MM)[§] is a game designed for children who live with Type 1 diabetes to manage their blood sugar testing, having fun by completing challenges, and communicating with families and doctors. By logging their blood sugar result, the game allows kids to unlock a lot more challenges in the game. This game will encourage children to keep on reporting their blood sugar level, and by doing so will also help the family members and doctors to monitor the child's condition. Players can learn from the application and consequences/tips are provided to the kids if their blood sugar results are not normal.

CodeInGame^{**} is a learning application that helps players to learn to code aspect in various games, such as shooting, repetitive actions, code optimisation, and puzzles. The game is also a platform for programmers to help each other in solving a programming problem. There is also a programming contest for programmers to participate in, with many prizes provided. In the game, every contribution and every success will be given a point, and players will know from leaderboards how far their contribution have gone, and it provides a situation conducive for programmers to develop their programming skills.

[†] <http://www.sickkids.ca/Research/I-OUCH/Pain-Squad-App/How-to-use-Pain-Squad/index.html>

[‡] <http://www.gamesforchange.org/play/re-mission/>

[§] <http://www.pharmafile.com/news/181348/sanofi-launches-monster-manor-diabetes-app>

^{**} <https://www.codingame.com/start>

In summary, each of the gameful applications showed different avatar utilisations and applications. In the next subsections, we summarise these utilisations in each game according to three avatar roles, which emerged from previous research. These roles are represented by the integration between the three categories of the utilisation of avatar design summarised in the literature (game customisation, game strategy and personal representation) and the characteristics of each system. For each avatar utilisation, we address particular conditions that connect the roles of the avatar design and motivational effects in a gamified application. For example, avatar customisation could bring a sense of control and autonomy, representing a connection between the way the avatar is designed and motivational effects (e.g. autonomy and control). Therefore, in order to make the link between motivational effects (e.g. autonomy, competence and relatedness) and avatar design, we will examine the following conditions:

- (i) Avatar customisation is a method used to support autonomy and provide the player with a sense of control. Thus, while analysing the games, we will look for design aspects that provide customisation of the avatar.
- (ii) Personal identification is enhanced by avatar personal representation in the game. Thus, while analysing the games, we will look for aspects that provide identification with avatar representation.
- (iii) Strategy relates to a sense of competence, as the game could provide ways for the player to choose particular avatars that might have different powers or abilities in order to achieve a particular goal. Thus, while analysing the games, we will look for aspects that could connect strategy and avatar design.
- (iv) Relatedness is enhanced by the integration between the game narrative and NPCs. Thus, while analysing the games, we will look for aspects that connect NPCs and game narrative to strengthen the avatar utilisation.

These four conditions mentioned above will be used in the analysis of the four games. The main objective for this analysis is to illustrate and explore patterns and connections between motivational effects, avatar design and avatar utilisations. These features are explained in the next subsections.

3.2. Personalisation and identification

In *PS*, the patient is represented by a humanised figure. The patients are required to report where they feel pain in their body by touch and choose the area of their figure in the application. There is an implicit projection of their bodies into a representation in the application. They are themselves the “avatars”. The application has given choices as to which avatar they like, and thus give identification to the patient.

In *Re-Mission*, a pilot 3D avatar is the patient’s representation in the game. The game does not allow

patients to choose their own representation in the game. *Roxxi* is the default name for the pilot. However, a patient can set other name for the pilot. *Roxxi* was designed as a strategy to motivate patients in fighting the cancer cells.

In *Monster Manor*, players are presented with a 2D avatar, which is selected by themselves from a range of characters; this avatar is the players’ identification in the game. In *CodeInGame*, players are allowed to set their own avatar as their identification in the game. The avatar can be anything as long as the avatar is a picture format.

3.3. Customisation and autonomy

In *PS*, as the application requires patients to report their pain, a lot of customisation to the patient’s avatar is involved in the application. *PS* also provides a sense of control when the patient is given the autonomy to customise and decide on their avatar.

In *Re-Mission*, the game does not allow much customisation, as the 3D avatar has a fixed design. During the game, the 3D avatar develops different powers and abilities, but it is not possible to change the avatar features. In terms of manipulation, it is possible to say that *Re-Mission* does not provide much control over the avatar character. While playing the game, it is possible to control the 3D avatar movements with clear control. Although this manipulation could evoke a sense of ownership, there are many controls to be memorised.

In *Monster Manor*, players are not allowed to customise their avatar. However, players are able to create other characters (NPCs), such as monsters and cute pets, when they have achieved certain levels or points. Additionally, the player is able to add furniture, decorate rooms, collect cute pets for the monsters, and collect other rare items in the game. These functions could bring a sense of control, having ownership to manipulate the game world and NPCs, but not the player’s own avatar.

In *CodeInGame*, we could say the avatar is customisable, in the sense that the player can change their avatar picture at any time and with any picture they please.

3.4. Strategy and competence

Avatar design’s role as a strategy in *PS* is seen as a motivational encouragement. The motivational aspect of avatar design could be integrated with the other elements. This means that as a motivational strategy, avatar design could not be treated as a single design element.

As in *Re-Mission*, the 3D pilot becomes a strategy for patients to perform in the game. Although there is no avatar choice in the beginning or during the game, the character’s attributes fit the challenges of the game (e.g. *Roxxi* is microscopic and has tools to kill the enemies that are also microscopic). In *Monster Manor*, choosing an avatar from an available range of options is seen as a challenge. The avatar encourages them to play, and with a suitable one, it is possible to spot an interaction between

the avatar and the player. This avatar will help the player to get into the game and thus, more easily achieve the goal of the game.

Looking into *CodeInGame*, some players used their avatar identification as their strategy to show off their achievements or skills in programming to other players. Alternatively, perhaps, this could be understood as a symbol of confidence in coding (e.g. expert). In this sense, the avatar could also arouse the players' motivation in the game.

3.5. Relatedness and NPCs

NPCs and the game world are elements that could help to enhance the power of avatar design in gameful environments. Looking at how NPCs are embedded in the game world and how the avatar design is connected to those NPCs, it is possible to say that NPCs and the game world are related to each other in order to strengthen the gameplay effect and motivate the players to stay in the game. As in *PS* and *CodeInGame*, we can say that there are no NPCs representations since the avatar in the application is mainly for the player. However, if we consider the fact that NPCs are other characters in the game that are not being controlled by the main player, it is possible that family members and other people involved in the system could be virtual NPCs. For example, other programmers and their avatars could be other characters, particularly if they influence the player's performance. This could enhance the motivational aspect of relatedness and social integration. In *Re-Mission*, the cells, other robots and elements in the game world are considered as NPCs. This could make players feel that they are part of something bigger than themselves, awaking their sense of relatedness. In *Monster Manor (MM)*, players could create NPCs (the monsters and the cute pets) as a form of reward when completing certain tasks. The NPCs are the monsters and the cute pets.

Based on all the four games, NPCs act mostly as a supporting element in a gameplay and an element that evokes player's motivation while addressing relatedness. The main different is that in some applications, like *PS* and *CodeInGame*, NPCs could be represented by real people, while for *MM* and *Re-Mission*, NPCs are artificially intelligent characters that are part of the game world.

3.6 Narrative integration

Avatar design can help strengthen the narrative of an application. We can say that the instructions given to the player also form a narrative, as a way to deliver instructions in the form of a story. However, the narrative is not involved with the avatar and not applicable in *PS*. The same can be said of *CodeInGame*. As for *Re-Mission*, the narrative was delivered in line with the movement of

avatar in the game. We can say that the narrative guides the player on which way to go, and what to achieve in the game. The integration of story in *Re-Mission* is also applied in the same way in the *Monster Manor*.

From the analyses of games, it was possible to spot some insights about the interconnection that exists between the avatar roles, motivation and the other game design elements that are part of each interactive system. In the next section, we describe a model we developed that emerged from the literature review and from the analysis of real applications.

4. A model for avatar design for motivational effects in gameful environments

In order to develop a model for avatar design that could motivate players in gameful environments, we first explain how we get to the model. Firstly, the elements for the model were extracted from the literature review; after this, the extracted elements were further explored in existing gamified applications, in which we considered these elements as perspectives of avatar design. The applications analysed had game design elements implemented for contexts that require individual motivation, such as healthcare or education. As we previously argued in our analysis, there are connections between motivation (autonomy, competence, relatedness) and avatar design utilisation (identification, customisation, strategy), which could affect the player's context. From these connections, we come out with a model for the avatar design applications for motivation in gameful environments. Figure 1 shows the integrated model that could be utilised in gameful environments for motivational purposes. The model is known as the Avatar Design Applications for Motivation or ADAM.

Our model shows the integration between avatar and other elements that are part of gameful systems, such as the game world and NPCs. Thus, the main elements that compose the ADAM are:

- Avatar: represented by the roles of identification, customisation and strategy
- Game world: the environment in which the interaction takes form
- NPCs: other characters or people involved in the system

The ADAM model also shows the integration between each of those elements. The arrows in the Figure 1 represent this integration. The main relationships are:

- Avatar-Player: in order to motivate players through identification, customisation and strategy
- Avatar-Game world: in order to provide a sense of control and manipulation over the game world

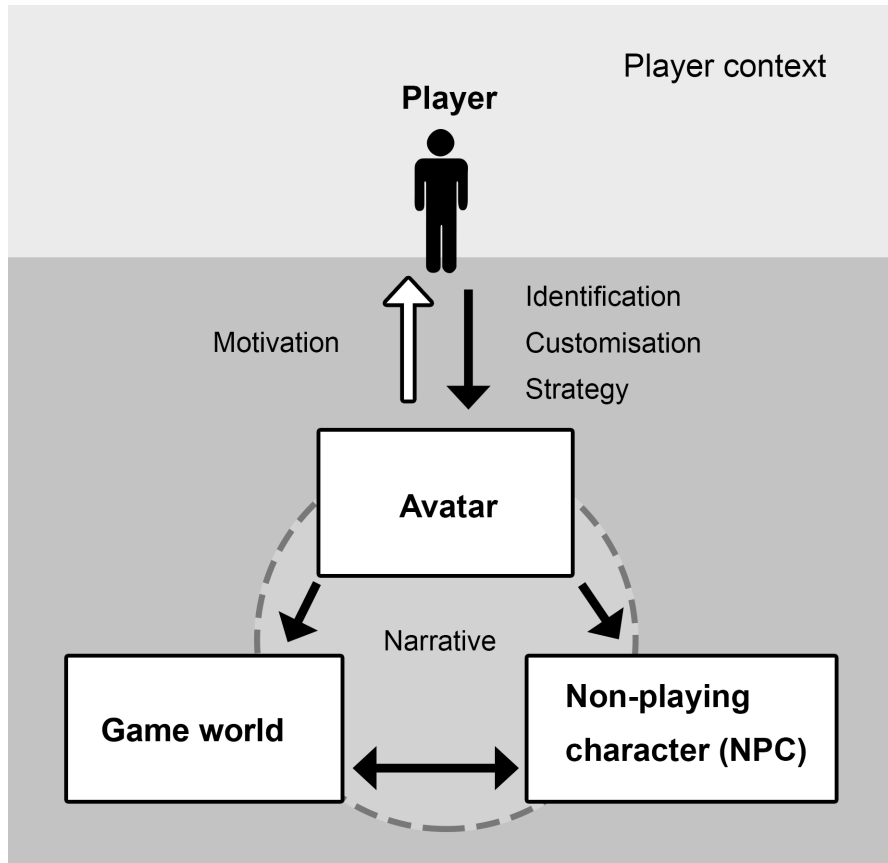


Figure 1 The Avatar Design Applications for Motivation in gameful environments

- Avatar-NPCs: in order to achieve particular goals and provide a sense of orientation inside the game world/environment

What the ADAM model demonstrates is the impact of avatar design utilisation and strategies for motivation in a more holistic way, without overlooking the other elements that are part of the system. When considering the relationships between avatar design and the other elements, the relationship between Avatar-Player is still the main point of interaction. In other words, while players interact with an avatar, there is an impact in the other elements that supports the player's action. As the main interactive point is through the player by the use of the avatar, three motivational outcomes (e.g. autonomy, competence and relatedness) emerge from this interaction. Those aspects were discussed in the analysis of real applications, supported by:

- Personalisation, representation and identification: players create a connection between their personalities and the avatar and this will vary according to the player's personality
- Customisation and autonomy: players can customise their avatar, providing a sense of autonomy and control over the experience. This

is important as it helps to augment or bolster the player's personality.

- Strategy and competence: players can choose the best avatar to deal with the challenges in the game as a strategy.
- Relatedness and NPCs: the choice of the avatar could influence the way NPCs behave in the game.
- Narrative integration: the choice of the avatar impacts the course of the narrative, guiding the player towards a more playful action in the game, which could result in the enhancement of motivational outcomes

The ADAM model shows an integration of different aspects that could evoke motivational effects through avatar design. We expect that our model could be utilised in order to clarify the design choices of avatars in the development of gameful systems. For example, in health-related environments, designers and developers could work together in order to address the choices of avatar design in a more holistic way. What is the impact of the customisation of the avatar in this environment? How can users feel more motivated to change their behaviours through avatar customisation? Questions like these could

emerge in the development stage, while addressing motivational issues.

In educational contexts, for example, ADAM could be utilised in order to address competence, particularly if learners do not feel motivated to finish a task. Depending on the user, a gamified system that has an avatar could be strategically designed in order to provide a better sense of competence, enhancing the user's skills and sense of achievement through the avatar. The integration between the avatar and the other elements, in this case, is crucial. Users could visualise their achievement through changes and transformations in their avatar, while NPCs could encourage them to accomplish tasks. In this scenario, the narrative could support such transformation, which could also have an impact in the game world. Thus, in other words, what ADAM suggests is an integrative way to understand and address avatar design for motivation without overlooking the other elements that are part of the system.

Discussion

Considering the player context, avatar design could be employed in different environments, such as healthcare, education, and marketing. With this in mind, it is possible that those applications could be extended as game design elements that could be employed in gamified strategies. By definition, gamification is the design process that includes the application of game mechanics, elements, and design into what was normally considered a non-gaming context [9]. Gamification relies on the elements discussed to be applied to the whole Serious Game [9]. Hence, as character design is one design element, particularly from the gaming environment, the avatar could be manipulated as a gamified strategy. For example, avatars can be constructed by specific attributes like skin colour, hair, face shape, and others. Animation and avatar behaviour can also bring life and response to character design. This could help players to build an emotional connection between their actions in the application and the avatar.

Often people are motivated more when they can express their alter ego. For example, research showed that individuals relate more to avatars that allow them to use alter egos to enhance their in-game capabilities [34] [35]. This also comes to down to developing greater self-esteem and identification. This self-esteem can drive a person to engage more in a game and also motivate them to go for extra levels and further enhancement of the avatar. Thus, the ADAM model indicates the key elements with the avatar choice and design playing an important role in this scenario.

In terms of applications, avatar implementation in real contexts such as in healthcare, education, or marketing could be realised in several ways. As an example, in healthcare applications, avatar design can be applied as either the patient's avatar or as NPCs for practitioners, doctors, or nurses. Through the manipulation of avatars,

patients can create or customise their own identification and at the same time, the avatar could be manipulated to show their health condition. Moreover, in health-related games, the avatar could work as a protagonist of a story, influencing the player through empathy and learning activities, such as eating healthy food or doing physical exercises, acting as a virtual coach [3]. Meanwhile in education, the avatar design could be structured to provide autonomy and control to students, which can build a better engagement within the learning content. Moreover, avatar choice is seen as an element that could enhance a learner's identification and possibly result in more motivational outcomes in the educational systems. From the marketing perspective, avatar customisation can influence loyalty [27]. For instance, in games like advergames (i.e. games for advertising), the choice of avatar could provide a sense of control. In addition, in advergames, character design is strongly related to the brand characteristics, bringing a relevant stimulus for the player [16].

When considering the context of the player and the avatar design strategies, the ADAM model could help to develop approaches that are more appropriate to each player action. For example, our model could help developers and designers to understand that there is a connection between context and player interactions. This could be explored through algorithms that learn from player interactions within the applications and it could be reflected on the way the avatar gives feedback to the player or through the reactions of the NPCs involved in the game or application.

Conclusion

Avatars offer different roles in providing a better effect on Human-Computer Interaction (HCI). These variations lead to the application of avatar design in Serious Games, particularly as a motivational strategy. Thus, there are three ways to understand avatar design strategies in gameful environments: 1) as a customisation or control mechanism, 2) as an element of strategy and 3) as an identification tool. Those applications reflect the choices of presentation towards player motivations and in-game challenges. The analysis of the games indicates that avatar representation may depend on the purpose of the avatar, either for strategy implementation, identification or customisation. Through the analyses of avatar and its relations to motivational elements, the main contribution of this paper is a proposed the Avatar Design in Motivational contexts model (ADAM). This model can help serious games designers to develop games with avatar variety and manipulations to help players engage with the game content, looking at the role of avatar choice and design. Due to its holistic characteristic, the ADAM model could help players to get in a higher level of immersion and engagement with new habits, especially in areas such as health and education, which require deeper levels of motivation and adherence to better behaviours. It

is also expected that the model could incorporate cultural values, making it even more effective and relevant in Serious Games development.

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