TIME PRESSURE AS VIDEO GAME DESIGN ELEMENT AND BASIC NEED SATISFACTION

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İREM GÖKÇE YILDIRIM

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submitted by **İREM GÖKÇE YILDIRIM** in partial fulfillment of the requirements for the degree of **Master of Science in Modeling and Simulation Department, Middle East Technical University** by,

Prof. Dr. Nazife Baykal
Dean, Graduate School of **Informatics** _____

Assoc. Prof. Dr. Hüseyin Hacıhabiboğlu
Head of Department, **Modeling and Simulation** _____

Assoc. Prof. Dr. Ahmet Uysal
Supervisor, **Psychology, METU** _____

Assoc. Prof. Dr. Hüseyin Hacıhabiboğlu
Co-supervisor, **Modeling and Simulation, METU** _____

Examining Committee Members:

Prof. Dr. Kürşat Çağıltay
Computer Education and Instructional Technology, METU _____

Assoc. Prof. Dr. Ahmet Uysal
Psychology, METU _____

Assoc. Prof. Dr. Hüseyin Hacıhabiboğlu
Modeling and Simulation, METU _____

Assist. Prof. Dr. Banu Cingöz-Ulu
Psychology, METU _____

Assist. Prof. Dr. Murat Yılmaz
Computer Engineering, Çankaya University _____

Date: August 12, 2015

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: İREM GÖKÇE YILDIRIM

Signature :

ABSTRACT

TIME PRESSURE AS VIDEO GAME DESIGN ELEMENT AND BASIC NEED SATISFACTION

Yıldırım, İrem Gökçe

M.S., Department of Modeling and Simulation

Supervisor : Assoc. Prof. Dr. Ahmet Uysal

Co-Supervisor : Assoc. Prof. Dr. Hüseyin Hacıhabiboğlu

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Over the last few decades, with the help of technological advancements in computational power and improvements in interaction design, video games have been prominent instruments for entertainment. With increasing number of players, researchers mainly have focused on revealing underlying psychological reasons behind gaming. By applying Self-Determination Theory (SDT) in gaming context, it is concluded that satisfactions of three basic intrinsic needs, namely, autonomy, competence and relatedness, are the predictors of motivation to play video games. However, only a few studies focused on game features supporting each of these three basic needs. Game developers might make use of the discovery of the specific game features contributing specific need satisfactions while designing games in which motivation and engagement are ensured. In this thesis, the relations between time pressure which is one of the commonly used game design element and autonomy and competence need satisfactions are observed. In an experimental design, time pressure is manipulated to establish two conditions (no time pressure in control group and time pressure in experimental group) by implementing countdown mechanics in a 3D survival shooting game. Mediating effects of autonomy and competence on the associations between time pressure and intrinsic motivation, flow, engagement, performance and enjoyment are also observed. Results showed that, although there was a significant difference in perceived time pressure of players, no significant differences were found in autonomy and competence need satisfactions between two conditions. Similarly, no differences in intrinsic motivation, engagement, performance and enjoyment between two conditions were revealed. The only significant difference was found in flow between

control and experimental conditions such that the participants in the experimental condition experienced more flow than those in the control condition. However, there were significant differences in flow and engagement among a subgroup of experimental condition, who failed to complete the goal in the game in the specified time limit, and other subgroups (both in control and experimental groups) who successfully completed the game in the given time. Competence and performance decreased with the increase in perceived time pressure within experimental group but the differences did not reach significance. On the other hand, flow and engagement were enhanced with the increase in perceived time pressure. These findings give us the idea that there may be an optimal time limit in which autonomy and competence are maximized and positively correlated, and thus intrinsic motivation, flow, engagement, performance and enjoyment are promoted throughout game play.

Keywords: Video Games, Time Pressure, Basic Need Satisfaction, Intrinsic Motivation, Self-Determination Theory

ÖZ

VİDEO OYUNU TASARIM ELEMANLARINDAN BİRİ OLARAK ZAMAN BASKISI VE TEMEL İHTİYAÇ DOYUMU

Yıldırım, İrem Gökçe
Yüksek Lisans, Modelleme ve Simülasyon Bölümü
Tez Yöneticisi : Doç. Dr. Ahmet Uysal
Ortak Tez Yöneticisi : Doç. Dr. Hüseyin Hacıhabiboğlu

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Son yıllarda, işlemci gücü ve etkileşim tasarımlarındaki gelişen teknoloji ile beraber, video oyunları önde gelen eğlence araçlarından biri olmuştur. Video oyuncularının sayılarının artmasıyla beraber de, araştırmacılar video oyuncularının oyunlara karşı olan motivasyonları konusuna odaklanarak, oyun oynamanın arkasındaki psikolojik çekiciliği incelemişlerdir. Özerklik Teorisi''nin video oyunları alanına uygulanmasıyla, temel olarak sayılan; özerklik, yeterlik ve sosyal ilişki psikolojik gereksinimlerinin giderilmesi, oyuncuların oyunlara karşı olan motivasyonun ve bağlılığın temel sebebi olduğu sonucuna varılmıştır. Ancak; bu üç temel gereksinimin her birinin destekleyicisi olarak oyun tasarımında bulunması gereken özellikler üzerinde az sayıda çalışma yapılmıştır. Her bir oyun tasarım elemanının hangi temel gereksinimlere katkı sağladığının bulunmasıyla ortaya çıkarılabilecek olan bir kılavuz kaynak, oyuncularının motivasyonundan ve bağlılığından emin olabilmek adına oyun tasarımcılarına bir kaynak oluşturabilecektir. Bu çalışmanın amacı; oyunlardaki zaman kısıtlamalarıyla yaratılan zaman baskısı algısının, özellikle özerklik ve yeterlik temel ihtiyaç doyumları arasındaki ilişkiyi incelemektir. Bu amaçla, zaman baskısı algısı, bir 3D üçüncü şahıs nişancı oyununda geri sayım mekanizması kullanılarak oluşturulan zaman kısıtlamasının uygulanmasıyla oluşturulan iki farklı deney düzeneğinde manipule edilmiştir (zaman baskısı olmayan kontrol grubu ve zaman baskısı olan deneysel grup). Zaman baskısının, özerklik ve yeterlik ihtiyaç doyumunun aracılığı ile içsel motivasyona, yoğunlaşma, bağlılık, performans ve eğlence üzerindeki etkileri ölçülmüştür. Sonuçlara göre; zaman baskısı algısı iki grup arasında önemli ölçüde farklı çıkmasına rağmen, özerklik ve yeterlik ihtiyaç doyumları ile içsel motivasyon, bağlılık, perfor-

mans ve eğlence açısından da bir fark gözlenmemiştir. Sadece yoğunlaşma miktarlarında önemli bir farklılık açığa çıkmıştır. Zaman kısıtlaması uygulanan deneysel gruptaki katılımcıların yoğunlaşmasının, kontrol grubundaki katılımcılara göre daha fazla olduğu görülmüştür. Ancak, deneysel grupta oyunu tamamlayamadan zamanı biten, göz ardı edilemeyecek sayıda katılımcılardan oluşan bir alt grup oluşmuştur. Bu alt grubun, deneysel ve kontrol gruptaki oyunu başarılı şekilde bitiren alt gruplarla karşılaştırılmasıyla; yoğunlaşma ve bağlılık ölçeklerinde önemli ölçüde farklılık gösterdiği görülmüş ve artan zaman baskısı algısıyla arttıkları ortaya çıkmıştır. Deneysel grup içerisinde yapılan karşılaştırmada ise bunlara ek olarak, artan zaman baskısıyla yeterlik temel ihtiyaç doyumu ve performans azalmış ancak önemli bir farklılık ortaya koymamıştır. Bu sonuçlar, özerklik, yeterlik ve diğer ölçülen deneyimlerin pozitif yönde ve azami seviyede etkilenebileceği optimum bir zaman kısıtlaması değerinin olabileceğini öneren bir çalışma niteliğindedir.

Anahtar Kelimeler: Video Oyunları, Zaman Baskısı, Temel İhtiyaç Doyumu, İçsel Güdülenme, Öz Belirleme Kuramı

To the researchers who will benefit from this study

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3D	Three Dimensional
NPC	Non-Player Character
MDA	Mechanics, Dynamics, Aesthetics (Framework)
MMO	Massively Multiplayer Online Game
PENS	Player Experience of Need Satisfaction
RPG	Role Playing Game
SDT	Self-Determination Theory

CHAPTER 1

INTRODUCTION

We are in a mobile, social and interactive era in which people use different kinds of new media as a means of enjoyment, communication and information. The advancements in technology and user experience studies are resulting in new kind of devices and interaction types. These developments make people feel more like they are at the fine line between reality and virtuality where they are able to go far beyond physical boundaries. Being one of the new media, video games promise more immersive experiences to players thanks to improved mechanics and intuitive interactions. As games are more easily accessible via different devices, the number of players is increasing steadily worldwide. For example, the increment in the usage of mobile devices has resulted in games reaching more players. This is especially so for social/casual games, the number of players of which has increased by 55% from 2012 to 2013 [1]. Those games have been the top video game types ever since, according to Entertainment Software Association (ESA)'s reports [1, 2].

Increasing number of game platforms has created more demand for games. With massive number of video games developed, it has become essential for game designers to engage players in game environments. Instead of observing the effect of a game on players and collecting feedback, it is more efficient to clarify what is exactly expected from the game before designing [3]. A survey conducted among 1,000 Korean players shows that game players' reasoning for gaming is primarily "for fun" (34.7%), which is followed by "stress release" (31.3%) [4]. Some research has been conducted on the definition of "fun" in games by both researchers and game developers during the recent decades. For example, gameplay enjoyment models and engagement factors are proposed within some game design taxonomies (e.g. Mechanics/Dynamics/Aesthetics (MDA) [5], GameFlow [6], Achievement/Social/Immersion [7]) and player type taxonomies (e.g. Achiever/Explorer/Socializer/Killer [8]) which consist of some game features that facilitate fun factor in games. On the other hand, some researchers have focused on underlying motivational appeal of games [9]. According to NPD Group's report, 8 in 10 core game players in US spend 22 hours playing per week on average [10]. While players play games for such long hours without external intervention, they might be unaware of the psychological needs they are looking for.

In recent years, research shows that the motivational factors behind gaming can help us understand why some games are more appealing since people play games for their own interests regardless of the existence of external rewards [11]. Based on the previous studies on understanding individual's behavioral tendencies, Deci and Ryan pro-

posed a taxonomy of human motivation, called Self-Determination Theory (SDT), revealing the difference between extrinsic and intrinsic motivations, the evolving relation between them and intrinsic motivation's critical effect on self-initiated and autonomous actions (defined as "self-determined behavior") [12]. Considering enjoyment as a measure of intrinsic motivation, SDT is applied in games and the studies revealed that autonomy, competence and relatedness which are the basic psychological needs, are strongly associated with the intrinsic motivation (and enjoyment) of players [13]. With this research, not only motivational reasons for gaming are explained, but also the positive outcomes of game play on well-being are revealed.

Among many game design taxonomies and player type concerns, SDT might be the most applicable theory based on purely fundamental psychological needs of players. Instead of specific games, genres and player types, underlying motivational factors in game play enjoyment should be focused [13]. Due to the introduction of new types of game mechanics and genres, new player types may emerge. Therefore, the relationship between game design elements and engagement should be investigated [13]. In game development process, implementing game design features based on the satisfaction of basic psychological needs can be the key for enjoyment and success of games. However, there are a few studies that examined the impact of game features on each of these three basic needs. For example, it was found that avatar customization, donations and dialogue choices are all together supportive elements for autonomy, and dynamic difficulty adjustment, heroism meter and achievement badges are supportive elements for competence [14]. Nevertheless, which of these elements has more contribution to the corresponding need satisfaction is not investigated. Therefore, an investigation on the influences of each game design elements on basic psychological need satisfactions is needed. Which element has an impact on autonomy, competence, relatedness? Are there multiple effects on these needs simultaneously? How much effect does it have? Does it support or hinder these needs? In which way (in terms of implementation style) should this element be provided? Is there a limitation in the amount of usage of this element not to change the direction of its effect on needs? Beyond their mutual relationships and motivational outcomes, answers to these questions may reveal the power of individual game elements and the interrelations of the need satisfactions. Therefore, the goal was to observe the effects of time limit, which is one of the game design elements, on need satisfaction. A set of need supportive or detractive game elements may result in the creation of new design heuristics for game enjoyment purely based upon satisfaction of psychological needs. This guideline can help game developers to design games ensuring the corresponding need satisfactions and engagement by providing the best design choices of features to be included in a game. The results of this study may contribute to the ultimate purpose of developing such a set of design principles to address need satisfaction in games.

Although there is a wide spectrum of game design approaches, there are common elements used especially in game mechanics. Time pressure is what this study is concerned about. It can be provided in different forms in games. For instance, completion of a task or changes in the pace of some game mechanic elements during game play are some types of implementations of time limit in games. Since people tend to feel being restricted and having less options under time pressure, it may have an undermining effects on autonomy (H1A). SDT suggests that competence need is satisfied by optimal challenges [13, 15]. Considering time pressure as a challenge,

the balance between the amount of time pressure and the ability of players to achieve the goal under that time pressure should be well designed. Similar to the effect on autonomy, people can feel less effective in their actions under time pressure since quick responses are required. As a result, their competence needs may not be satisfied (H1B). Therefore, in this study, it is expected that time limits in games may have the power of manipulation of autonomy and competence need satisfactions. Moreover, having control over actions, mastering opportunities and overcoming challenges can foster game flow, engagement and performance in game. Hence, as researches show, there is a positive association between autonomy / competence need satisfactions and intrinsic motivation (H2) [13]. It is also expected that time pressure may have an association with some other outcomes such as flow (H3), engagement (H4), performance (H5) and overall enjoyment (H6). In this thesis, the primary purpose is to uncover the effect of time pressure in games on players' autonomy and competence need satisfactions. If these relationships exist, second aim is to reveal the correlation between time pressure and intrinsic motivation, flow, engagement, performance (task completion time) and enjoyment with mediating effects of autonomy and competence need satisfactions.

In this study, the following hypotheses are proposed (See Figure 1.1).

- **H1 :** First, a significant difference in autonomy and competence need satisfactions between no-time pressure (control) and time-pressure (experimental) conditions is expected. The following framework is built upon this proposition.
- **H1A :** Time limit (pressure) game element will decrease autonomy need satisfaction.
- **H1B :** Time limit (pressure) game element will decrease competence need satisfaction.
- **H2 :** Time limit (pressure) game element will decrease intrinsic motivation because autonomy and/or competence need satisfactions, as the mediators, are thwarted.
- **H3 :** Time limit (pressure) game element will decrease flow because autonomy and/or competence need satisfactions, as the mediators, are thwarted.
- **H4 :** Time limit (pressure) game element will decrease engagement because autonomy and/or competence need satisfactions, as the mediators, are thwarted.
- **H5 :** Time limit (pressure) game element will decrease performance because autonomy and/or competence need satisfactions, as the mediators, are thwarted.
- **H6 :** Time limit (pressure) game element has overall negative effect on enjoyment because intrinsic motivation, flow, engagement and performance which are the predictors of enjoyment are thwarted.

Outline of the thesis is as follows:

- Chapter 2 provides relevant theories and definitions from the literature. Some game design elements which are manipulated to satisfy basic needs are presented. Then, their relationships with intrinsic motivations, flow, engagement

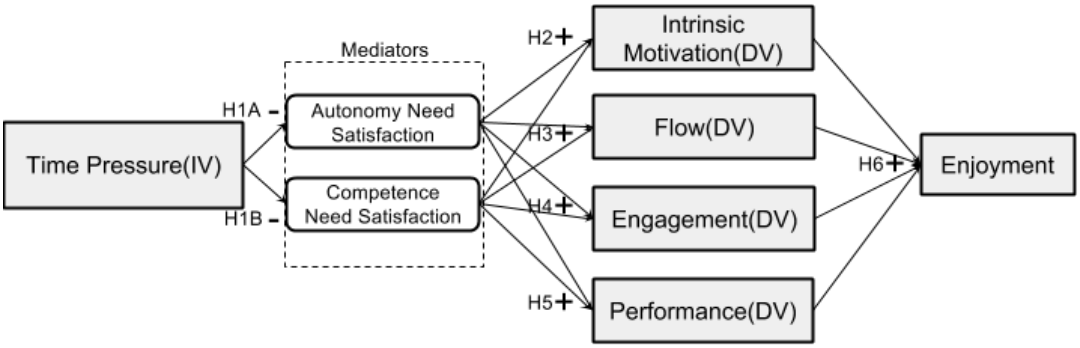

Figure 1.1: Proposed Research Framework

and enjoyment are summarized. Lastly, the reasons for picking time pressure element, among other design elements, is specified with findings.

- Chapter 3 introduces the method of the study including participant profile, experimental game design, applied measures and experiment procedure.
- Chapter 4 includes analysis and evaluation of the experimental data. The results are discussed and reasoning for unexpected results are pointed out.
- Chapter 5 presents the general limitations of the current experiment which effect study results and the concerns for future studies. It is followed by the conclusion of the study and future work.

CHAPTER 2

RELATED WORK AND BACKGROUND

This chapter brings the literature review on the motivational aspects of gaming. It offers background information and describes the components of a motivational theory and its applications in the video game field. In the following subsections, previous works that focus on the motivational reasons behind gaming are presented and the deficiencies are discussed as an explanation of why this thesis is necessary and important. The chapter also introduces examples of studies which investigate motivational affordances of video game design elements. The review of these studies help to formulate the proposed approach. The relationship between time pressure as one of the design elements and basic need satisfaction and its predicted outcomes such as intrinsic motivation, flow, engagement and enjoyment are explained.

2.1 Motivations Behind Gaming

Entertainment is an inherent part of people's lives. In the last decades, the motivational foundations of participating pleasurable activities have been studied. Along with the definition of enjoyment in traditional media domain, studies on the definition of human motivation have been conducted. As hedonism hypothesis in mood management theory suggests, some experiences are appealing because they offer pleasing moods (as cited in [11, 16]). However, offering pleasure is not enough for video games. Since "playing" is an action which is actively performed, this approach can not be applied directly to gaming field in which players have active roles over the course of experiences. On the contrary, motivation is a triggering means for people to take actions [17]. Therefore, opportunities for actions are essential for the motivation in video games.

In order to provide enjoyment in games, the reasons of gaming and attraction of game elements have to be investigated. There are many approaches to reveal the motivational factors in games. While some of them are derived from game elements, some others are based on player types. For example, it is suggested that challenge, fantasy and curiosity are intrinsically motivating factors used in games utilized for educational purposes [9]. On the other hand, after observing players of Multi-User Dungeons/Domains (MUDs) games, Bartle outlined four types of players; killers, achievers, socialisers and explorers, according to their motivations for acting or interacting in game environments [8]. Based on this taxonomy, Yee suggested ten game components under three main motivational factors of achievement (seeking for mastery;

advancement, mechanics, competition), social (establishing relationships in game; socializing, relationship, teamwork) and immersion (engaging in game; discovery, role-playing, customization, escapism) for Massively-Multiplayer Online Role-Playing Games (MMORPGs) [7]. For example, for achievement and social motivations, dungeons (which enables team work to accomplish a task and promises rewards in the end) in the games are presented as supportive elements [18]. Based on Yee's player motivations and Bartle's player types there are some studies conducted for revealing corresponding game feature preferences. For instance, it was found that while players with achievement motivation preferred advancement in games (power accumulation), challenging others, domination and time limit; players with exploration motivation preferred discovery, role-playing and character customization features in games [19]. Similarly, Davis, Jackson and McNamara categorized some game features such as feedback (verbal information, progress bar), incentives (levels, points, skill bar), control (choosing character or rewards) for player motivations [20]. Quick proposed a framework for game enjoyment (GEM) predicted by game features (grouped under main components of challenge, companionship, discovery, enjoyment, fantasy, fidelity, identity, multiplayer, recognition and strategy) and he searched for the relation between these feature preferences with gaming goal orientations (rooted in Elliot's goal orientations), game usage (like genre and multiplayer preferences) and genre of the players [21, 22]. On the other hand, with the proposition of Flow theory as a more universal approach, the engagement in games has been improved by implementation of mechanics for challenge-skill balance [6].

However, a valid explanation for the motivational pull of games could be constructed independently from game genres and player types. Some game components are appealing for some player types, however, how these components attract players should be discovered to propose a general motivational model for game playing. Based on psychological grounds, Ryan, Rigby and Przybylski asserted a formal approach of Self-Determination Theory (SDT) which explains the intrinsic motivational pull of video games [13].

2.2 Self-Determination Theory

Having inborn instincts to strive, explore, create and socialize; people regulate their actions according to these instincts. Intrinsic motivation is described as doing activities based on our own initiation and interests for the intrinsic appeal of the activity itself, not for the instrumental value of it [12]. Among many other types of motivation, intrinsic motivation is focused on self-regulated activities. Some of the preceding domains utilizing intrinsic motivation for positive outcomes such as learning, creativity and commitment are education and sport [23].

On the other hand, within extrinsic motivation, there are some external factors to take action besides of one's own intent such as external pressure and compliance, or outcomes such as rewards or punishment. Furthermore, even in the absence of obvious external factors, some introjected controls such as anxiety or guilt can act on players' intrinsic motivations to turn it to extrinsic (as cited in [24]). Therefore, although earlier experimental studies used "free choices" to continue doing the activity as a measurement of intrinsic motivation, self-reports are important to measure the effect

of such dimensions of motivation. Research shows that these two motivations are negatively correlated; while one of them is supported the other is diminished (as cited in [23]).

After a series of research on intrinsic/extrinsic motivation and increasing/decreasing factors conducted in learning and sport domains, Deci and Ryan constituted a well-formulated framework of self-initiated and autonomous actions (defined as "self-determined behavior"). SDT asserts that individuals have inherent tendencies to involve in particular actions that satisfy three basic psychological needs of autonomy, competence and relatedness. These needs are also proposed as enriching elements of psychological well-being and intrinsic motivation [25, 26, 17]. Earlier studies showed that autonomy and competence need satisfactions are the predictors of intrinsic motivation. When autonomy and competence are supported, intrinsic motivation is enhanced. On the contrary, when autonomy and competence are diminished, intrinsic motivation decreases likewise [12, 23, 13]. Moreover, SDT claims that competence exposes its facilitator effect on intrinsic motivation only if autonomy is supported [25].

2.2.1 Basic Psychological Needs

Autonomy

Autonomy need is the need for being in control and acting volitional. If an activity is self-initiated or performed for personal interests, perceived autonomy is enhanced [13]. When autonomy is facilitated (for example, through choices [27, 28, 29, 30] and informative rewards [31, 32, 33]); interest, intrinsic motivation and other positive outcomes such as self-esteem, cognitive activity, creativity, physical and psychological well-being are enhanced [34, 13]. Autonomy need satisfaction has very important role in defining goals, plans and applying regulated actions accordingly [35]. Research shows that autonomy supported educational and work environments are better in terms of performance, learning and creativity [15, 17].

Competence

Competence need is the inborn need for self-efficacy and mastery [35]. In the face of challenges, people want to be able to overcome them and embrace the gratification of their success and improved abilities afterwards [15]. Progressive challenges with rewards [36], achievement goals [37], positive performance feedbacks [25, 38] are some of elements that promote the satisfaction of need for competence.

Relatedness

Relatedness is defined as the need for "meaningful connection to others" [15]. This need includes experience of interactivity, feelings of attachment and importance of self-presence. Instincts for sharing, caring and feeling secure with someone are some indications of relatedness needs [17].

2.3 Video Games and Basic Psychological Needs

After the introduction of open-worlds and procedural design in games, opportunities for actions have increased which led more autonomy support. Offering different types of challenges and options for character improvement, competence is provided by games more intensely. Adaptation of multiplayer support and providing web-based communities have enhanced relatedness satisfaction of players [23]. These improvements led to realization of motivational power of games which requires the psychological satisfactions of needs they already provide. In fact, video games are more applicable instruments for satisfaction of basic psychological needs with respect to traditional entertaining media [23]. Readily availability of games, consistency between expectations and outcomes in games and intensive exposition of all three needs are some key characteristics of motivational power of video games [15]. Since there is a wide range of alternatives for implementation of game design elements, it is much more easy to manipulate autonomy, competence and relatedness satisfactions.

How autonomy, competence and relatedness need satisfactions in games can be provided through some game mechanics are predicted as follows:

Autonomy in Games : Ryan and Rigby suggest that autonomy can be facilitated by "flexibility over movement and strategies" (such as open world designs and opportunities for actions), "choices over tasks", skills and characters (such as quests, unlocking new abilities and character customization), replayability [15, 13], rewards as positive feedbacks, "procedural" structure [23]. Moreover, limitless resources [39], difficulty balancing [40] and multiple paths [41] are some of autonomy supportive game features.

Competence in Games : Mastering (learning new skills, achievements), clear goals, progressive challenges, difficulty adjustments, "breadcrumb structure" (short term and continuous achievements), performance feedbacks (power-meters, rewards, levels, points, leaderboards), game's narrative (on heroic, masterful ability, strength and effectiveness), intuitive controls are some of the competence supportive game features proposed by Ryan et al. [15].

Relatedness in Games : Ryan and Rigby state that multiplayer support (including competitive and cooperative group play), social network integration, teammate interaction (healing or sending gifts) are some of features fostering the sense of relatedness in games [15]. Furthermore, virtual meetings [39], web forums and chat channels [23] are some characteristics of relatedness supportive game environments.

The primary application of SDT to video gaming by Ryan et al. within four studies showed that autonomy, competence and relatedness supportive games provide intrinsic motivation and short term change in well-being on players [13]. In these studies, Player Experience of Need Satisfaction (PENS) was used as a scale for measurement of autonomy, competence, relatedness, and additionally intuitive controls and presence in game play. In their first study, it was found that autonomy and competence are the predictors of intrinsic motivation, short-term well-being and immersion. Moreover, there was a positive correlation between intuitive controls and preference

for future play / enjoyment / continued play (which are stated as motivational outcomes) with mediation of competence need satisfaction. In the second study, the previous findings were applied on two different game, one of them is highly ranked and the other has very low ranking. Game preferences of players were in favor of more engaging ones, which in fact, provide more satisfaction of both autonomy and competence needs. Third study focused on the game content differences by applying within-person experiment and on the player differences by applying between-person experiment. A significant difference was revealed in both between- and within- subjects in terms of game preferences. The positive correlations between autonomy / competence need satisfactions and positive outcomes were found as in the previous findings. This study particularly shows SDT's power of applicability both on the choices made out of game and in-game [13]. In the last study, in addition to autonomy and competence, the positive correlation between relatedness and with positive outcomes (presence, enjoyment, future play) was shown in a MMO game. As limitations, they pointed out the effect of experimental environment on player's experiences, especially caused by the lack of self-initiative characteristic of autonomy.

After application of SDT on video games, some further studies following this approach has been applied. For instance, SDT approach is applied in an experimental setup where some game features (game controls and social play context) are manipulated and the definition of game enjoyment as the satisfaction of basic psychological needs is supported [11]. To observe the contributions of game design elements to basic need satisfactions and their effects on motivation via these satisfactions, some game elements have been manipulated in experimental studies. For example, autonomy supportive (avatar customization, donations and dialogue choices) and competence supportive (dynamic difficulty adjustment, heroism meter, achievement badges) game elements were manipulated in 2x2 factorial design in an exergame. These elements were found to be associated with enjoyment, motivation for future play, effort to play and self-efficacy with the mediating effects of corresponding need satisfactions [14].

It is shown that some game mechanics have simultaneous effects on more than one need satisfaction [11, 42, 43]. These effects can be positive or negative for each of the needs. For example, Baldwin, Johnson and Wyeth conducted a study aiming to find the relation between multiplayer dynamic difficulty adjustment (mDDA) and, enjoyment and performance. They conducted an experiment with three conditions; no mDDA, mDDA with no awareness (where players were not aware of existence of mDDA while playing) and mDDA with full awareness (where players were informed that mDDA was applied while playing). Difficulty adjustments were applied by assisting low performing players with extra shield and health points. It was found that assisted players' competence increased but autonomy and relatedness decreased in awareness condition [42].

From another perspective, a cognitive activity cycle in games based on Norman's seven stages of action principle is suggested. Activities in games are categorized under three main stages; goals and challenges (including balance with skills), action and interaction (including mastery, choices and controls) and interpretation (feedbacks). Heuristic checklists for activities in games are suggested and player experiences are evaluated with three different games. Evaluations for game activities and PENS measure are compared to reveal the relationship between activities and corresponding

need satisfactions. Results showed that players' experiences of need satisfaction are related to activities in games. For example, experience of intuitive controls are associated with the activities in action-reaction category in games [40]. Besides of video games, basic need satisfactions has been utilized in a method to increase the effectiveness of gamification[1] process [44].

2.4 Time Pressure and Basic Psychological Need Satisfaction

Although Ryan et al. [13] and Peng, Lin, Pfeiffer and Winn [14] highlighted the need for studies on specific game elements' contribution to need satisfactions, among many studies conducted with SDT approach, there are only a few focusing on the effects of game elements individually on these satisfactions (in both game and non-game context). Intuitive controls [11, 45], difficulty adjustment [46, 42], avatar customization [47], points / levels / leaderboards [48], feedback [43, 49, 50, 51, 52], rewards [53, 31], achievement goals [54], achievements [55] are some of game design elements observed in these studies (See Figure 2.1). As being one of the "ten ingredients of great games" (as cited in [56]) and commonly used game element, time pressure in games have not been observed for its effects on basic psychological need satisfactions. Therefore, in this study, it is decided to examine the relationship between time pressure and autonomy and competence need satisfactions. Due to its effect to limit the volitional acts and self-efficacy, it is hypothesized that implementation of time limits in games will result in a different levels of perceived autonomy and competence (H1).

[1] Gamification is described as using game design elements in non-game contexts to increase engagement and motivation

Game Design Element	Autonomy	Competence	Relatedness	Mediating Effect	Outcomes	Study
{Avatar customization, Donations and Dialogue choices}	★	-	-	★	Enjoyments, Motivations for future play, Effort to play, self-efficacy	(Peng, Lin, Pfeiffer, Karin & Winn, 2012)
{Dynamic difficulty adjustment, Heroism meter, Achievement badges}	-	★	-	★	Enjoyments, Motivations for future play, Effort to play, Self-efficacy	(Peng, Lin, Pfeiffer, Karin & Winn, 2012)
Multiplayer dynamic difficulty adjustment	-	★	-	-	Enjoyment and Performance	(Baldwin, Johnson & Wyeth, 2014)
Game difficulty	-	★	-	-	Enjoyment	(Schmierbach, Chung, Wu & Kim, 2014)
Control Device (Traditional vs Natural Mapping)	★	★	-	★	Enjoyment	(Tamborini, Bowman, Eden, Grizzard & Organ, 2010)
Co-Playing	-	-	★	★	Enjoyment	(Tamborini, Bowman, Eden, Grizzard & Organ, 2010)
Points, Levels and Leaderboards	-	-	-	-	Performance	(Mekler, Brühlmann, Opwis & Tuch, 2013)
Avatar custimization	-	-	-	-	- (Performance, Immersion, Enjoyment or Autonomy was expected)	(Dennie, 2012)

Figure 2.1: Studies Manipulating Some Game Elements for Basic Need Satisfactions and Positive Outcomes

Time pressure has many dimensions to be addressed as an element for manipulation of basic need satisfactions. Being under control is one of the strongest undermining factors for autonomy need satisfaction [17, 25, 57, 58] (as cited in [26, 13]). This feeling may negatively effect self-control over the completion of the task and lack of choices and reduction of decision time under time pressure may boost a decrease in the volitional part of the action. Therefore, it is expected that perceived autonomy in time limit condition will be relatively low compared to control group (H1A).

Time limit is a challenge itself [59, 60, 61, 62]. It enforces players to be adapted to an increased pace of game by using their abilities. Shortened decision making is required under time pressure [63]. This may lead players to use their skills effectively to accomplish a goal under time pressure. As a result, completing a task with this pressure may be perceived as more challenging. Therefore, players may feel less effective, especially if they fail, which results in a decrease in competence satisfaction. Beswick claimed that individuals who are intrinsically motivated "need time and freedom to make choices, to gather and process information, and have an appreciation of well finished and integrated products, all of which may lead to a greater depth of learning and more creative output" (as cited in [64]). Hence, time pressure is expected to diminish competence need satisfactions (H1B).

2.5 Basic Psychological Need Satisfaction and Consequences in Games

Along with satisfaction of basic needs, some positive outcomes emerge. Intrinsic motivation, enjoyment and immersion are some of them. As SDT proposed, Ryan et al.'s study suggesting enjoyment as an indication of intrinsic motivation showed that autonomy and competence need satisfactions are positively correlated with intrinsic motivation [13]. In many other studies with different game feature manipulations, the mediating effects of satisfaction of these needs between features and positive outcomes including intrinsic motivation are found. For instance, it was found that intuitive game controls (natural mapped controller vs. traditional controller) has an association with intrinsic motivation (enjoyment) which is mediated by autonomy and competence need satisfactions [11]. Similarly, there was a positive association between co-playing and relatedness need satisfaction which results in increase in intrinsic motivation (enjoyment) [11]. A recent study manipulating difficulty in a tower defense game showed that difficulty balancing is associated with enjoyment which is mediated by competence need satisfaction [46]. In addition to these findings, the effect of feedback on intrinsic motivation was found to be related to competence need satisfaction [26, 49].

There are studies focusing on the effects of time element on intrinsic motivation. Among many other dimensions of time pressure such as threats and surveillance; deadlines have undermining effects on intrinsic motivation if the activity is already interesting for individual (as cited in [43, 26]). For instance, Amabile, DeJong and Lepper conducted an experiment with a puzzle board game and evaluated the effect of setting time limit on completion of a task on intrinsic motivation. There were four conditions; no-deadline (no time limit), implicit deadline (given explicit time limit), explicit deadline (given explicit time limit with additional stricture by saying that completion of the task in the given time is required for their data to be evaluated) and work-fast (it was for comparing with second and third conditions' hidden effect on "working-fast" perception on players). Research showed time pressure diminished intrinsic motivation in all three deadline conditions [65]. From another perspective, time pressure in the form of an expectation of a reward promised being granted after completion of a task (experienced as controlling) is also an undermining factor for intrinsic motivation [31]. In the light of these findings, considering the direct relation between autonomy / competence need satisfaction and intrinsic motivation and their mediating effects between manipulated feature and outcomes, it is expected that time limit in games will lessen intrinsic motivation (H2).

Flow is an enjoyment model which claims that when skills and challenges are balanced while doing an action, people have a deep sense of enjoyment and immersed [66]. Having control over actions, one of the key experiences of flow, is associated with autonomy needs. Moreover, because of its characteristic of being a "challenge", time limit should be in balance with skills for the experience of flow [63, 67]. Since it is expected that time pressure will decrease autonomy and competence need satisfaction, the key ingredients for flow experience may be diminished. Moreover, as Csikszentmihalyi suggests that people perform at maximum when they are in the 'flow' state [66], the decrease in the performance triggered by time pressure may be accompanied by a decrease in the flow. Therefore, in this study, it is hypothesized that time pressure has negative effect on flow (H3).

Engagement in games is defined as being involved in game environment emotionally and immersed without physical boundaries [68]. The effects of time pressure on engagement are observed in some studies. In one of them, MMORPG games are observed. It is stated that when time pressure is associated with objectives, then it leads to more involvement [69]. Moreover, the importance of unpredictable time pressure in which players are expected to react for unexpected events (and quests) was pointed out. On the other hand, another study conducted with difficulty manipulation using game elements (target size, target type , time limit etc.) showed that as time limit gets shorter, engagement decreases [70]. Since time pressure may reduce self-interest and self-efficacy, in this thesis, time pressure is hypothesized to have negative effect on engagement by the mediating effects of autonomy and competence need satisfactions (H4).

Time pressure is also a diminishing factor for creativity and performance. First of all, the decisions made under time pressure apt to be wrong [71]. People speed up in terms of information gathering under time pressure. They "filter" some information and omit some parts of it which may lead to less comprehension and learning (as cited in [72, 63]). Shortened decision-making process under time pressure leads to a decrease in performance [63]. For example, Bankowski et al. showed that the number of failures (as an indicator of decrease in performance) increases when number of tasks increase under time pressure [73]. Similarly, a study conducted with difficulty manipulation using game elements (target size, target type , time limit etc.) showed that as time limit gets shorter, players' performance decreases [70]. Moreover, players prefer default choices under time pressure, because it becomes harder to make a decision when faced with lots of choices [74]. In other words, applying effective strategies is very hard under time pressure [75]. As for the creativity perspective, research showed that creativity lessen under time pressure which is mediated by intrinsic motivation [72]. It was also found that there is a positive correlation between competence need satisfaction and performance [49, 45, 43]. Hence, it is hypothesized that under time pressure, players' performance will decrease with mediation of need satisfactions (H5).

The primary aim of game design is to achieve enjoyment. Flow is one of the models evaluating enjoyment. Based on flow approach, GameFlow is a game enjoyment assessment tool. It includes elements of flow which are tasks in game, concentration, challenge-skill balance, sense of control, clear goals, immediate feedback, immersion and social interaction. Furthermore, engagement in games is related to motives of players and experience of enjoyment [76] and it intensifies enjoyment (as cited in [68]). From motivational perspective, enjoyment is one of the measurements of intrinsic motivation. Moreover, performance is associated with enjoyment in games such that self-efficacy is the mediator [77] and players experience higher enjoyment with easier games in which their perceived performance are high [78]. Therefore, it is hypothesized that intrinsic motivation, flow, engagement and performance will predict enjoyment (H6).

While flow is a model of optimal experience based on seven components of clear tasks, feedbacks, concentration, challenge-skill balance, control, diminished awareness of self and altered sense of time, it is "intrinsically rewarding" by the definition [79, 80]. Because the experience of flow results in deep enjoyment with maximum performance with almost no effort. On the other hand, intrinsic motivation is based on

satisfaction of basic psychological needs rather than the components of flow. Furthermore, motivation can help a person "persevere through difficult challenges or continue on even though the task is boring" [80]. However, flow and intrinsic motivation have enjoyment and engagement in common.

There are several implementation types of time in games alongside of its temporal characteristic. Twitch gameplay which requires player's quick reactions is also applied on many game genres such as action, puzzle or casual games and it provides engagement [81]. In these games different types of game mechanics are implemented to simulate temporal pressure. Cycles, countdown, triggers [82], approaching elements (e.g. in Tetris), characters running behind (in endless run games), change in size or number of game elements, increasing pace as player progress (e.g. in Tetris), timer or threat of negative consequences [63] are some forms of implementation of time pressure in games. In this study, time limit is implemented with count-down mechanics to simulate time pressure in the game used in experimental condition.

In the literature findings, need satisfaction, its motivational and engagement related outcomes and its implications for video games are analyzed. It is seen that some game elements are utilized to ensure basic psychological need satisfaction and thus outcomes such as intrinsic motivation and enjoyment. One of the important direction for future works is pointed out as an investigation on the contributions of specific game elements to the corresponding need satisfactions. There are studies revealing the effects of combinations of some game features on basic psychological needs, however, there are only a few focusing on specific game elements. Since time limit is a commonly used game design element and it has not been observed by existing studies from the perspective of need satisfaction, this study aims to reveal the relationships between time pressure in games and autonomy and competence need satisfactions with the related outcomes such as intrinsic motivation, flow, engagement, performance and overall enjoyment.

CHAPTER 3

METHOD

In the literature review, it was endorsed that an observation on the contribution of an individual game design element to the need satisfaction is necessary. Although some game elements were manipulated to reveal their effects on basic need satisfaction, time limits were not one of them. Thus, this research focuses on time pressure in games to investigate its motivational and enjoyment-related outcomes. This chapter presents the method of this study including the information of the participants, the measures used for the evaluation, the experiment procedure and the experimental game designed for this study.

3.1 Participants

Undergraduates and graduate students (69 male; 37 female) from Middle East Technical University Psychology Department and Informatics Institute graduate programs participated in the experiment. Students from Psychology Department received bonus credits for participating.

3.2 Measures

In this study, autonomy, competence, intrinsic motivation, flow, engagement and performance and enjoyment were dependent variables. Moreover, autonomy and competence need satisfactions were conceived as mediating variables on the relation between time pressure and other dependent variables. All the corresponding measures except performance were accessed by participants through a web-based online survey service by SurveyMonkey.

3.2.0.1 Demographics and Game Play Questionnaire

In the demographics part of questionnaire, participants were asked their age, gender, faculty; and in the game play part, they were asked how many hours they play video games in a week, how many years they had been playing games, what genres of games they played, what game features they like in game design, which gaming

platforms they were using and which type of goal orientation they had. At the beginning of the questionnaire informed consent form information was prepended and a nickname was asked for matching questionnaire data with the experimental sessions (See Appendix B).

3.2.0.2 Manipulation Check Scale

A Manipulation Check Scale was created for this study and it was used to check the effect of time pressure on participants to validate the manipulation. It consists of eleven 7-point Likert scale items related to player's experience with game play; two of them for measuring the perception of time pressure, one of them for measuring perceived task difficulty and eight filler items. Perceived task difficulty was measured because of its potential confounding effect (See Appendix C). Cronbach's alpha[1] was .85 for the two item measuring the experience related to time limit in the game.

3.2.0.3 PENS Scale

Although there is an adapted version of Basic Need Satisfaction in General Scale[2] by Deci et al.[83] to Turkish for autonomy, competence and relatedness[84], there is no adaptation of Player Experience of Need Satisfaction Scale for these needs to Turkish. Therefore, In-Game Autonomy and In-Game Competence subscales of PENS were translated to Turkish for this study and the wordings were checked by an expert in this field. The reliability analysis showed that all of Cronbach's alpha coefficients were above .7 and the reliability was secured.

- In-Game Autonomy Scale: This scale consists of three 7-point Likert scale items to measure players' perceived autonomy regarding satisfaction with choices, interesting opportunities and freedom the game provided. The items from Dennie' study [47] which is based on the Autonomy subscale in the Player Experience of Need Satisfaction Scale by Ryan et al. [13] were translated to Turkish. Sample items include "The game provided me with interesting options and choices" and "I experienced a lot of freedom in the game" ($\alpha = .84$)[1] (See Appendix D).

- In-Game Competence Scale: This scale consists of three 7-point Likert scale items to measure players' perceived competence regarding experiences of efficacy, capability in game play and skill-difficulty balancing the game provided. The items from Dennie' study [47] which is based on the Competence subscale in the Player Experience of Need Satisfaction Scale by Ryan et al. [13] were translated to Turkish. Sample items include "I felt very capable and effective when playing." and "3 My ability to play the game was well matched with the game's challenges." ($\alpha = .83$)[1] (See Appendix D).

[1] In statistics, Cronbach's alpha (α) coefficient is used as an estimation of the reliability of a scale based on the correlation between the items of the scale

[2] Retrieved from `http://www.selfdeterminationtheory.org/basic-psychological-needs-scale/`

3.2.0.4 IMI Scale

IMI scale consists of fourteen 7-point Likert scale items to assess players' perceived enjoyment and intrinsic motivation towards the game. It is an adapted version of the Intrinsic Motivation Inventory for gaming activity (IMI; Ryan, 1982)[3]. In the adapted version, all items from intrinsic/enjoyment subscale, three items from effort/importance subscale (to measure possible confound effects) and four items from pressure/tension subscale (to measure the pressure triggered by time limit in the game) were used. Although there is an adapted version of IMI to Turkish [85], the items were translated to Turkish for gaming context and the wordings were checked by an expert in this field. The reliability analysis showed that all of Cronbach's alpha coefficients were above .7 and the reliability was secured ($\alpha = .83$)[1] (See Appendix E).

3.2.0.5 GameFlow Scale

GameFlow scale consists of five 7-point Likert scale items to assess how much players are immersed within game environment. It is an adapted version of Immersion subscale of GameFlow model by Sweetser and Wyeth [6]. Since flow is mainly based on the experience of immersion, taking the factor loadings into consideration[86], five items of the immersion subscale, which has the highest factor loadings[4], were used. Since there is no translation of GameFlow scale into Turkish, the items were translated to Turkish for this study and the wordings were checked by an expert in this field. The reliability analysis showed that all of Cronbach's alpha coefficients were above .7 and the reliability was secured ($\alpha = .88$)[1] (See Appendix F).

3.2.0.6 Engagement Scale

Game Engagement scale consists of ten 7-point Likert scale items to assess game play engagement within game environment. It is an adapted version of Game Engagement Questionnaire by Brockmyer et al. [68]. Some items which could not be applied in the procedure of the experiment were ruled out such as "If someone talks to me, I don't hear them", "I don't answer when someone talks to me" or "I play longer than I meant to". Since there is no translation of GEQ scale into Turkish, the items were translated to Turkish for this study and the wordings were checked by an expert in this field. The reliability analysis showed that all of Cronbach's alpha coefficients were above .7 and the reliability was secured ($\alpha = .76$)[1] (See Appendix G).

3.2.0.7 Game Play Data

Game play data consisting game end condition ("successful", "no health" or "no time" in time limit version game), spent time, left enemy, left health (as a perfor-

[3] Retrieved from `http://www.selfdeterminationtheory.org/intrinsic-motivation-inventory/`

[4] Factor loading is a coefficient for the correlation between factors and variables, which indicates the percent of variance in a variable explained by the factor

mance indicator) and last distance to target was gathered from game play sessions (See Appendix H).

3.3 Procedure

Experimental data was collected at a computer lab at the Department of Psychology with one participant at a time. The experiment was conducted in three stages: pre-questionnaire (Demographics and Game Play) session before coming to lab, game play session and post-survey session in the lab. At the first part, after completing Demographics and Game Play Questionnaire, participants made reservations for lab sessions over an online service. Lab sessions took 15 minutes.

A between-subject experiment with two conditions (control and experimental) were tested using two different versions of a game. In the control group, participants played no-time-limit version of the game and in the experimental group participants played the time-limit version of the game. In both groups, the game was exactly the same, except from time limit implementation. Participants were randomly assigned to the control or experimental group. Before a participant arrived at the lab, the researcher opened the application window of the assigned version of the game in the lab computer so that the participants would not know which conditions they were in while playing. When the participant came to the lab, the researcher guided him to the computer. After an introductory speech, the participant was asked to put on the headset and started with the tutorial of the game which was followed by a training play. After the training part, researcher left the lab and participant started to play the game which approximately takes two minutes. When the play session was over, participant called the researcher back to the lab and researcher opened the online post-survey (including Manipulation Check, Autonomy, Competence, Intrinsic Motivation (including Enjoyment scale), Flow and Engagement scales) on screen and left the lab again. After completing the survey which took approximately 8 minutes to fill in, the participant called the researcher back again. The researcher made a closing speech and the participant left.

3.3.1 Target Game

The game was a third-person shooter. It was modified from one of the open-source tutorial project, "Survival Shooter" by Unity Technologies. Applying an in-house developed game might not be effective enough to engage player within a specific time limit like two minutes. Moreover, an already well-known game was not preferred due to game play data collection concerns. If a similar version of a very popular game was developed for the experiment, then the participant might have a tendency of comparison it with the original one and this might lead disengagement in gameplay and result in floor effect. Therefore, an audio-visually immersive, not complex, intuitively controlled and highly rated game from Unity's Asset Store was selected and modified according to objectives of this study [87]. To increase freedom and the probability of different play times, an open-world type of game was selected. For example, in case of a platform game, which offers a linear space, time limit might not result in very

different completion times. On the other hand, setting a goal ensured a minimum play time in this open world for both conditions of this study.

In the game, the player controls a baby character who is trying to reach his bed. However, his hated dolls are in his way and approaching him. Baby has his water gun with him to shoot them. The player is expected to reach the bed after beating all the dolls. In time limit version of the game, this task should be completed in a specified time, in 120 seconds. However, if a doll touches the baby, he gets hurt. There are three different types of dolls with different damage skills and there are five from each of them. Their spawn points and generation times are same for both conditions. Nickname of the player, health bar, number of left dolls, a helper arrow showing the direction of the closest doll at that time and a count down timer (in time limit version) are used as progressive feedback elements on the game screen (See Figure 3.3 and Figure 3.4). In tutorial screen before gameplay, the aim and ability of the baby character are explained in a narrative approach (See Figure 3.1). In the training screen, players get familiar with the game controls and in game interactions with dolls aiming to ease the learning curve for the actual game play (See Figure 3.2).

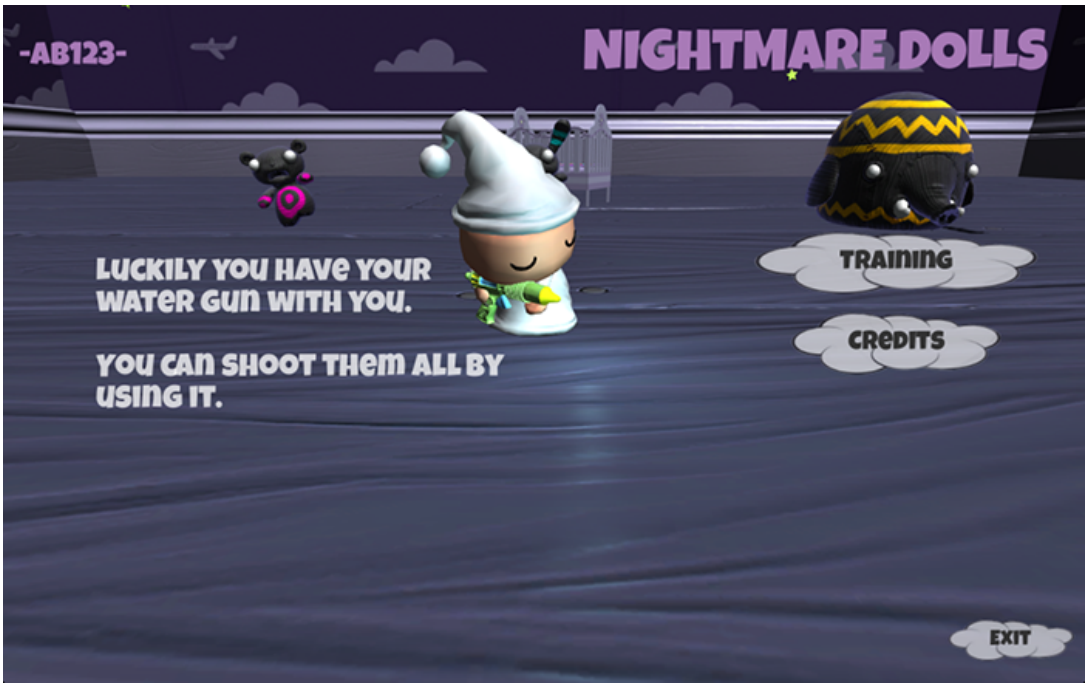

Figure 3.1: Screenshot from Story Integrated Game Shell of the Modified Version of *Survival Shooter* Game by Unity Technologies

Figure 3.2: Screenshot from Gameplay in the Training screen of the Modified Version of *Survival Shooter* Game by Unity Technologies

Being free in an open-world like environment, third-person point of view, controlling the character's abilities easily, this game was expected to have elements for autonomy support. Intuitive controls, beating dolls effectively, dolls' approaching from unpredictable directions, applying some strategies for multiple kills in open world environment were predicted as competence supportive features of the game. In addition, time pressure caused by the time limit was hypothesized as a detrimental factor for the satisfaction of these two needs. In time-limit version, to increase the effect of time pressure, every four seconds a clock sound was triggered as a warning to hurry the player up and the count-down time indicator makes grow/shrink visual effect to grab player's attention. In the last 20 seconds the frequency of these audiovisual feedbacks are continuously increasing. Since the game did not allow an interaction with other players or NPCs, evaluation of relatedness need satisfaction was omitted from this study.

Figure 3.3: Screenshot from Gameplay of No-Time Limit Version of the Modified Version of *Survival Shooter* Game by Unity Technologies (used in Control Group)

Figure 3.4: Screenshot from Gameplay of Time Limit Version of the Modified Version of *Survival Shooter* Game by Unity Technologies (used in Experimental Group)

Before the experiment, a user study was applied with 11 core game players (six in experimental, five in control group) to measure an optimum time limit to set for the gameplay, to make controls more intuitive and to make sure the manipulation (time

pressure effect) was working. According to verbal feedbacks, mouse was preferred as being more engaging control. The average time spent was 111.94 seconds, therefore time limit was set to 120 seconds for the experiment considering also naive player profiles.

CHAPTER 4

RESULTS

Being one of the commonly used game elements, the impact of time pressure on basic need satisfaction and intrinsic motivation, flow, engagement, performance and enjoyment was observed. A 3D shooter game was modified with the implementation of countdown timer to simulate time pressure and tested in the study. Accordingly, this chapter presents the main results of data analysis and concludes with the discussion of the results.

4.1 Preliminary Analysis

4.1.1 Manipulation Check

Firstly, to observe the effect of time pressure (manipulated variable) between experimental and control groups, T-Test analysis was applied on manipulation check scale answers. There was a significant difference in perceived time pressure between control ($M = 2.29, SD = 1.62$) and experimental conditions ($M = 4.39, SD = 2.07$); $t(98) = 5.65, p < .001$ (See Table 4.1). Perceived task difficulty was not significantly different between two conditions. Experimental group found the task more difficult, but it did not reach significance. Therefore, the presence of confound variable was ruled out.

Table 4.1: T-Test Results for Manipulation Check

	Control Group (n=50)	Experimental Group (n=51)	
Time Press. Manipulation Scale	M (SD)		t(99)
Realization of time limit	2.64 (2.02)	5.45 (1.72)	7.53*
Perceived time pressure	2.29 (1.62)	4.39 (2.07)	5.65***
Perceived task difficulty	2.30 (1.61)	2.96 (1.95)	1.86

$^{*}p$ <.05, $^{***}p$ <.001

4.2 Primary Analysis

It was expected that experimental group would experience less autonomy and competence because of perceived time pressure. However, there was no significant difference between two conditions except from flow and game completion time. It was revealed that the players who were subjected to time pressure ($M = 5.38, SD = 1.02$) experienced more flow than the participants in the control group who were not ($M = 4.84, SD = 1.44$); $t(99) = 2.21, p = .030$. Other dependent variables, which are intrinsic motivation, engagement, performance and enjoyment were not significantly different between two groups (See Table 4.2).

Table 4.2: T-Test Results for Dependent Variables

	Control Group (n=50)	Experimental Group (n=51)	
Dependent variables	M (SD)		t (99)
Autonomy	3.03 (1.31)	3.37 (1.36)	1.24
Competence	4.83 (1.56)	4.86 (1.40)	0.11
Intrinsic Motivation	3.82 (0.88)	3.96 (0.90)	0.76
Flow	4.84 (1.44)	5.38 (1.02)	2.21*
Engagement	3.52 (0.88)	3.81 (0.95)	1.62
Performance (Left Health / 100)	92.7 (17.4)	94.5 (11.3)	0.62
Enjoyment	4.83 (1.41)	4.94 (1.01)	0.46
Game Play Spent Time (in sec)	130.62 (39.4)	110.49 (10.9)	3.51**

*p <.05, **p <.01

At the end of the experiment, three different game-end conditions in game play data emerged due to how the game ended (See Appendix H). "No health" condition included participants who were dead because of losing health caused by the damages of dolls. Secondly, "no time" condition included participants who could not complete the task in the specified time-limit (for experimental condition only). The last condition was "success" condition in which the participants successfully achieved the goal in the game regardless of the group (control or experimental) they were assigned to. It was necessary to apply exactly the same procedure to both experimental conditions, except for the implementation of independent variable (i.e. time pressure). The participants were only expected to complete the goal in the game successfully regardless of the conditions they were assigned. Since the players in no health subgroup could not achieve the goal in the game like other participants in successful subgroups, to make a reliable comparison, participants in "no health" game-end condition were omitted from the data analysis. Only participants' data in "successful" and "no time" game-end conditions were analyzed (See Table 4.3).

Table 4.3: Frequencies of Game End Conditions in the Target Game of the Experiment

	Control Group (n=53)	Experimental Group (n=53)
Game End Conditions	n	
Successful	50	29
No Health	3	2
No Time	-	22

According to these results, none of the hypotheses of this study were supported by the statistical analyses. Since the sample size of "no time" subgroup in experimental group was relatively high (n = 22, nearly the half of sample size of that group) and considering the possible effects of failures caused by time limit on the experience of participants, it was decided to evaluate their data in comparison with the "successful" subgroups' data.

One-Way between subjects ANOVA was applied to the three subgroups' data (successful-control, successful-experimental, no time-experimental) to compare the effects of perceived time pressure on autonomy, competence, intrinsic motivation, flow, engagement, performance and enjoyment. Results showed that autonomy and competence still did not significantly differ between subgroups. However, there was a significant difference in perceived time pressure, flow and engagement at the $p < .05$ level for three conditions [$F(2, 98) = 21.4, p < .001$ and $F(2, 98) = 3.70, p = .028$ and $F(2, 98) = 3.24, p = .043$ respectively] (See Table 4.4). Since no association between perceived time pressure and autonomy/competence need satisfactions was found, all of the hypotheses were not supported.

Table 4.4: One-Way ANOVA Results for Dependent Variables between No Time and Successful Subgroups in Control and Experimental Conditions

	Control Group (n = 53)	Experimental Group (n = 53)			
	Successful (n = 50)	Successful (n = 29)	No Time (n = 22)		
		M		F (2,98)	Sig.
Perceived Time Pres.	2.29	3.76	5.23	21.4	.000***
Autonomy	3.03	3.20	3.56	1.23	.30
Competence	4.83	5.23	4.38	2.16	.12
Intrinsic Motivation	3.82	3.83	4.12	0.96	.39
Flow	4.84	5.14	5.69	3.70	.028*
Engagement	3.52	3.60	4.10	3.24	.043*
Performance	92.7	98.1	89.8	2.31	.11
Enjoyment	4.83	4.93	4.97	.11	.89

*p <.05, ***p<.001

Post Hoc comparisons using the Tukey HSD test indicated that the mean scores of perceived time pressure for successful subgroup of control group ($M = 2.29, SD = 1.62$) were significantly lower from successful ($M = 3, 76, SD = 2.08$) and no time subgroups of experimental group ($M = 5.23, SD = 1.77$). Players experienced time

pressure most when they played under time limit and ran out of time to complete the task in the game.

Another Post Hoc comparison showed that the mean scores of flow for successful subgroup of control group ($M = 4.84, SD = 1.44$) was significantly lower from no time subgroup of experimental group ($M = 5.69, SD = .98$). This finding suggested that under more time pressure, players experienced more flow even though they ran out of time and failed to complete the task.

The last significant result revealed was between the mean scores of engagement for successful subgroup of control group ($M = 3.52, SD = .86$) and no time subgroup of experimental group ($M = 4.10, SD = .97$), similar to those of flow. This result indicated that under more time pressure, players were more immersed in the game play (See Figure 4.1).

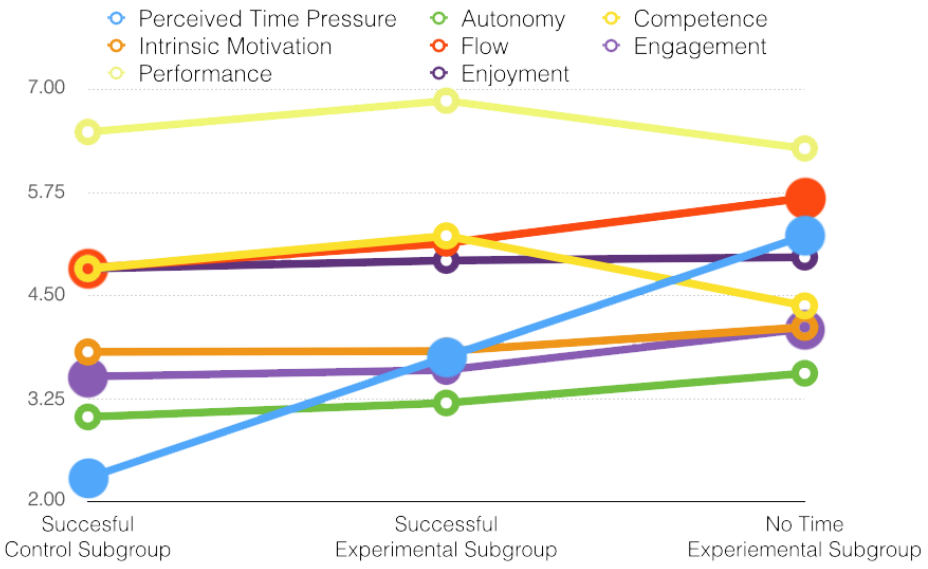

Figure 4.1: Mean Scores of the Dependent Variables for Successful Control Subgroup, Successful Experimental Subgroup and No Time Experimental Subgroup. *Note: Performance results are scaled to the range 0-7 from 0-100. Significantly different variables in groups are represented as dots.*

Although there was no significant difference in competence between both two main groups (control and experimental) and three subgroups, it approached significance between successful and no time subgroups of experimental group ($M = 5.23, SD = 1.22$ and $M = 4.38, SD = 1.48$ with $p = .10$, respectively). Similarly, the difference in performance between successful and no time subgroups of experimental group also approached significance ($M = 98.1, SD = 4.25$ and $M = 89.8, SD = 15.4$ with $p = .11$, respectively) (See Figure 4.2). Furthermore, positive correlation between competence and performance [r = .43, n = 53, p = .001] was revealed in the results of experimental group (See Table 4.5).

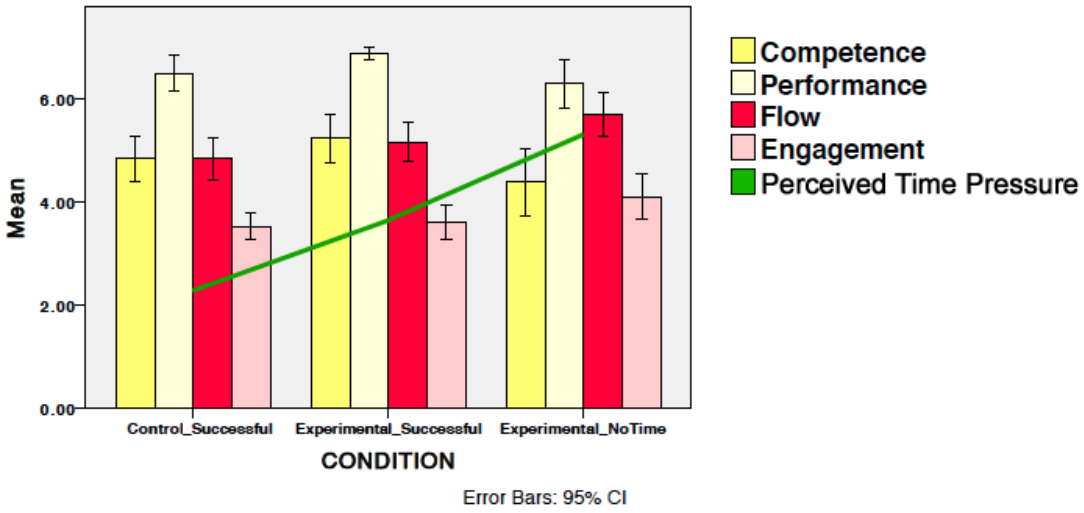

Figure 4.2: Mean Scores of the Competence, Performance, Flow and Engagement for Subgroups in the Control and Experimental Conditions

Table 4.5: Pearson Correlation between Time Pressure and Dependent Variables for Experimental and Control Groups

Experimental Group	Control Group							
	Time Pressure	Autonomy	Competence	Intrinsic Motivation	Flow	Engagement	Performance	Enjoyment
Time Pressure	-	.31*	-.16	.48**	.21	.30*	-.04	.06
Autonomy	.17	-	.32*	.53**	.05	.25	.01	.46**
Competence	-.13	.33*	-	.26	.33*	.34*	.26	.56**
Intrinsic Motivation	.43**	.41**	.09	-	.54**	.61**	-.10	.77**
Flow	.12	.44**	.14	.38**	-	.65**	.10	.42**
Engagement	.27	.63**	.15	.61**	.67**	-	.06	.46**
Performance	.08	-.10	.43**	-.11	-.30*	-.23	-	-.07
Enjoyment	.14	.41**	.35**	.66**	.31*	.38**	-.04	-

*p <.05, **p<.01

Note. n = 53 *for both groups. Correlations for Experimental Group lies on the lower part of the diagonal, correlations for Control Group lies on the upper part of the diagonal.*

Table 4.6: Pearson Correlation between Time Pressure and Dependent Variables for all the Data

	Time Pressure	Autonomy	Competence	Intrinsic Motivation	Flow	Engagement	Performance	Enjoyment
Time Pressure	-							
Autonomy	.27**	-						
Competence	-.13	.32**	-					
Intrinsic Motivation	.44**	.48**	.18	-				
Flow	.25*	.24*	.26**	.48**	-			
Engagement	.33**	.46**	.24*	.62**	.65**	-		
Performance	.05	-.03	.33**	-.09	-.02	-.06	-	
Enjoyment	.11	.43**	.48**	.72**	.39**	.42**	-.06	-

Note. n = 106.
*p <.05, **p<.01

4.3 Discussion

In this study, time pressure manipulation did not cause a significant difference in players' autonomy and competence, or any other dependent variables, except from flow,

between control (no-time limit) and experimental (time limit) groups. Therefore, hypotheses which suggested the mediating effects of autonomy and competence were not supported. It was revealed that players in experimental group experienced more flow and engagement than control group and the difference in the mean score for engagement approached significance level. However, when subgroups of experimental group ("successful" who successfully competed the task in the given time limit and "no time" who ran out of time to complete the goal in the game) were compared with"successful" control group, flow and engagement dependent variables were both significantly different, in addition to perceived time pressure (See Table 4.4).

It was also revealed that the players in no time subgroup of experimental group experienced flow and engagement significantly higher than the successful players in the control group. This was quite the opposite of what was expected. These findings suggest that players experienced more flow and engagement even though they failed in the game because of time limit. These results may be an indication of Zeigarnik effect, which states that interrupted or unfinished tasks take people's attention until they're finished [88]. Under time pressure, the goal in the game could have been interpreted as an unfinished objective interrupted by time limit so that players focused on to complete it immersively. As Murphy et al. stated that Zeigarnik effect is triggered by performance feedback on the gameplay screen (e.g. progress bar for completed tasks, counter items for collected items or killed enemies) to engage players to work on the tasks in game [80], the countdown timer, left health and doll indicators on the screen may have stimulated this effect.

Before setting the value of time limit for the target game, a pilot study was conducted so that most participants would feel the time pressure but still successfully complete the game. This might have resulted in an unsolicited optimization of the time limit. In fact, this optimization in terms of time pressure-skill balance might have resulted in an increase in the participants' experience of flow in the experimental group.

Results indicate that players' perceived competence increases with time limit; however, if perceived time pressure increases under that time limit, it starts to affect players' competence negatively. It was also revealed that players' performance increased with the introduction of time limit in the game; however, it diminished with an increase in the perceived time pressure. While the increases in competence and performance might be facilitated by the immersion created by the Zeigarnik effect, the decreases might have resulted from a drop in self-efficacy caused by time pressure and failures in achieving of the goal in the given time. As Santos and Ramalho stated the difficulty of a quest can be manipulated by setting time limits for the quests (e.g. in time-based quests in World of Warcraft), the difficulty triggered by time limit has an effect on players' performance, and therefore on their engagement [89]. Mean scores of one item of competence scale which is "I felt competent at the game" for successful control subgroup ($M = 5.28, SD = 1.67$), successful experimental subgroup ($M = 5.97, SD = 1.35$) and no time experimental subgroup ($M = 4.36, SD = 1.81$) appear to support this assumption (The difference between successful and no time subgroups of experimental group is significant with $p = .002$ and approaches significance between successful control subgroup and no time experimental subgroup with $p = .074$). These results may also be an indication of curvilinear relationship between competence (and performance) and time pressure such that competence (and performance) changes in an inverted-u shaped manner as time pressure changes (similar to

the relationship between engagement and challenge as cited in [70]) (See Figure 4.3). Since time pressure is a kind of challenge, players may exhibit optimum performance at an intermediate level of challenge with maximum competence. Moreover, because the players in the experimental condition were engaged in the game more immersively, they might have tried to get less damage and focus on the objective to complete the game in the given time. This can be an explanation for the increase of performance scores as well as competence scores from control and experimental groups, and their correlation in the subgroups' scores in the experimental group (See Figure 4.1).

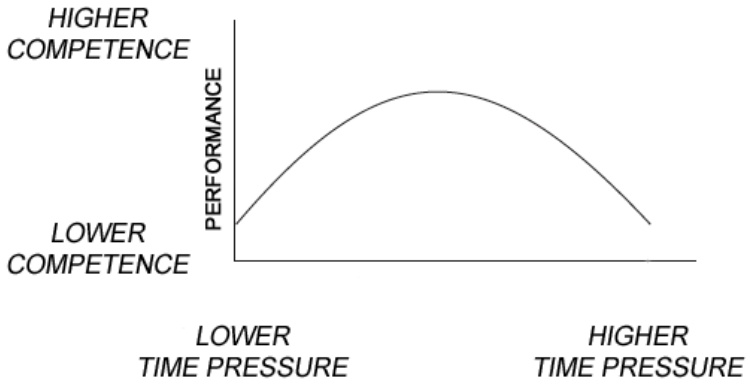

Figure 4.3: An illustration of Curvilinear Relationship Between Competence-Performance and Perceived Time Pressure

Players' behavior under time pressure may be dependent on previous gaming experience, familiarity with controls and game genre. There was a positive correlation between participants' performance and weekly game play hours in both the data of control and experimental conditions together [r = .26, n = 106, p = .008], and the data of experimental condition [r = .31, n = 53, p = .023]. Moreover, 5 of 6 core game players (totally 6 of 100 participants were core game players playing 15+ hours in a week) were in the experimental group and 4 of them were in the successful subgroup in the experimental group. However, One-Way ANOVA analysis conducted after omitting these core game players' data showed no differences in the results. Although there was a positive correlation between performance and competence in the previous results, the result of this analysis showed that the difference in competence between no time and successful subgroups in the experimental group approached significance and the difference in performance between these subgroups decreased. Nevertheless, this distribution of game play experiences among the conditions may be a confound between time pressure and performance and competence outcomes when sample size increases. Since time limit as a challenge is easier to overcome for experienced players (more challenge-skill balance) than for naive players, this might have been responsible for the increase in performance and competence in the successful subgroup of experimental group.

Yet another result indicated that while perceived time pressure increased, autonomy also slightly increased. It should be noted that autonomy and competence need satisfactions were affected oppositely by the same game element (time limit). Although it was not significant, while competence diminished with an increase in perceived time pressure in experimental condition (in the comparisons between successful and

no time subgroups), autonomy increased. However, players' intrinsic motivation and enjoyment scores did not significantly differ in all conditions. It might be caused by the lack of autonomy and competence support in the game. Since the target game was not a fully open-world and did not provide many options for actions and skills, exploring and mastering abilities, autonomy and competence support might have been diminished.

Results suggest that time limit may increase flow experience and there may be an optimal perceived time pressure-competence balance for the implication of time limit in game by which players experience flow and engagement accompanied by the satisfaction of competence at maximum. The positive correlation between competence and performance may be an indication of their mutual relationship based on the optimal challenge-skill balance.

CHAPTER 5

CONCLUSION AND FUTURE WORK

This chapter presents conclusion of the study and offers some future work implications that may inspire subsequent works. Additionally, some limitations of the study are highlighted.

5.1 General Limitations

5.1.1 Participants

The results of this study showed no significant differences in dependent variables except from flow between control and experimental groups. However, when subgroups of these groups (emerged by "successful" and "no time" game end conditions) were compared, engagement was also found to be significantly different between these subgroups, in addition to flow. Moreover, the difference in competence and performance scores would be promising to be significant if sample size was increased. A wide range of participants with more game play experience (totally 6 of 100 participants were core game players playing 15+ hours in a week), wide distribution of age (the average was 23, 86 of 101 participants were between 20 and 26) and experience with wide range of game genres and controls should be included in further studies for more reliable results. With an increase in sample size, the power of the experiment can be enhanced.

5.1.2 Game Genre Effect

Although there are many applications of time limit in shooter or RPG game genres as time based quests, the effects of time pressure on motivational outcomes were not revealed in this study. Since time limit is commonly applied in puzzle games, casual games or action games, it might not have been effective on perceived autonomy and competence in a third-person shooter game. Moreover, some participants complained about their inefficacy in mouse control. Mastering controls such as the price of admission might have constrained players to engage in the game play and feel autonomous.

5.1.3 Other Supportive Game Elements

Some game elements become effective on autonomy and competence need satisfactions in the presence of other supportive game elements. Davis et al. posits that isolated game features may not be very effective unless they are supported by some other game elements in facilitating motivation [20]. In the target game used in the experiment there were no options, no character customization, no mastery on skills, no progressive feedback about approaching the target (as the task was reaching to the bed), positions of dolls (e.g. on a mini-map) or no recovery choices (e.g. regaining health with collective power-ups). Therefore, autonomy and competence supportive game elements in the game design might not have been sufficient to reveal significant differences between two conditions when they were accompanied by time pressure. Moreover, different implementation types of time limit using other game mechanics (e.g. increasing pace, changing sizes, approaching elements) should be considered for the further studies.

5.2 Implications and Future Works

Since the power of this study was low to conclude about the effects of time pressure on autonomy, competence, intrinsic motivation, engagement, enjoyment and performance, further studies with a larger sample sizes may reveal the effects. Moreover, a factorial design with several different time limits may be conducted to observe the effects of different time limits. This can reveal the existence of an optimum time limit by which players experience autonomy, competence and other motivational outcomes as much as possible and perform at maximum. Moreover, some items could be added to the scales to detect Zeigarnik effect and the influence of failure (and the need for replay triggered by this failure) on flow, engagement, performance and competence.

As Ryan and Rigby stated there could be a formulation of need satisfactions for a wide range of game genres [15]; therefore, time limit implementation on different game genres should be studied. For future improvements, the interrelations between game design elements to facilitate the need satisfactions should be considered. Since the presence of other need satisfaction supportive game elements can catalyze the effects on motivational outcomes, some studies on the effects of combined design elements may be conducted (e.g. time limit with rewards, time limits with progressive feedbacks, time limit with choices or with repetitive game play, replayability). Furthermore, different implementation types of time limit such as increase in pace or approaching elements, and their applications on other game genres should be investigated to make a generalization about the effects of time limit on need satisfactions. This study lays the groundwork for a series of studies investigating the effects of time pressure in games on need satisfaction and user experience outcomes.

With the findings of studies revealing each game design elements' contributions to the need satisfactions, a motivational design heuristics for games suggesting how these game elements effect each of these needs can be provided. Therefore, both game designers and developers can benefit from these heuristics to make better games satisfying players' autonomy, competence and relatedness needs. As an ultimate sug-

gestion, a "need satisfaction factor" for games (i.e. how much a game promises to satisfy which of these needs based on the design elements implemented in the game) may be developed as a formulation based on the utilization of these heuristics. As in-house games developed by indie game developers are increasing in addition to the productions of large game studios, this checklist may be a very useful guideline to provide effective gaming experience to gamers. Findings from these studies can also be utilized for positive outcomes in other fields such as learning, health and behavior change, via gamification[1] approach.

5.3 Conclusion

In this study, the contribution of a game element to the motivational pull of video games is observed. How time limit feature influences autonomy and competence need satisfactions and other motivational and engagement-related outcomes is empirically tested. Perceived time pressure is manipulated effectively between two experimental conditions (using no-time-limit version of a game in the control group and time limit version of the same game in the experimental group). The results showed that the players in the experimental group who failed to complete the objective in the given time perceived the time pressure most. Along with the increase in the perceived time pressure, time limit had a positive effect on players' flow and engagement experience even though they failed in the game because of it. As Shneiderman and Bederson posit that people in flow state "may perceive the elapsed time as much shorter than the actual time", this may be a reason why participants in the no time subgroup in the experimental group experienced flow and perceived pressure more compared to other subgroups [90].

The increase in competence and performance scores in the experimental group with the increase in perceived time pressure might have been a consequence of the Zeigarnik effect that drives people's attention to complete the unfinished tasks [91], to a certain degree. However, a further increase in perceived time pressure resulted in a decline in performance and failures which was accompanied by a decrease in competence (approached significance). Although in previous studies it was found that successful performance results in greater flow [92], according to our results, performance was negatively correlated with flow in the experimental group. The challenging characteristic of time pressure might have an influence on players' perceived self-efficacy such that players' perceived competence diminished followed by failures in games. The negative association between time pressure and performance is in line with the findings of the previous studies. For example, Bourne and Yaroush found that error rates increase under time pressure [93] and Lomas et al. showed that as time limit gets shorter, performance decreases [70]. On the other hand, the positive correlation between performance and competence is also supported by previous findings as research shows that low competence is followed by poor performance [49, 45, 43].

One of the main contribution of this study for game design is that there may be an optimal level of perceived time pressure (as a challenge) provided by time limit mechanics in games, which results in maximum competence and performance accom-

[1] Gamification is described as using game design elements in non-game contexts to encourage engagement and motivation

panied by flow and engagement. This study suggests that designers should conduct a user study to compare the effects of different time limits on players' competence, performance, flow and engagement and decide on the optimal time limit for their games. Moreover, this study is promising for future research on the power of game design elements over the positive outcomes such as flow, engagement, enjoyment and performance which can be explained from the perspective of basic need satisfaction and self-determination theory.

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APPENDIX A

INFORMED CONSENT FORM

Genel Bilgiler

Bu çalışma ODTÜ Enformatik Enstitüsü Oyun Teknolojileri Yüksek Lisans Programı öğrencilerinden İrem Gökçe Yıldırım tarafından yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek icin hazırlanmıştır.

Bu calışmanın amacı bazı oyun tasarım özellikleri ve edinilen psikolojik deneyimlerin arasindaki ilişkileri incelemektir. Arastırma internet üzerinden doldurulacak bir anket, devamında tamamlanacak olan bir laboratuvar çalışmasını içermektedir. Anket yaklaşık 5 dakika, laboratuvar çalışması ise 15 dakika sürecektir.

Araştırmada yaklaşık 100 katılımcı hedeflenmektedir. Üniversite öğrencileri katılımcı olarak davet edilecek, çalışmaya katılanlar bu duyurunun yapildiği ders için bonus puan alacaklardir. Alinacak puan dersin oğretim üyesi tarafından belirlenecektir.

Riskler ve Faydalar

Araştırma katılımcı için herhangi bir risk veya fayda içermemektedir.

Gönüllülük Esası

Bu çalışmaya katılmak tamamen gönüllülük esasına dayalıdır. Çalışmayı istediginiz zaman bırakabilir, çalışma esnasında cevap vermek istemediğiniz sorular olursa boş bırakabilirsiniz.

Gizlilik Esası

Çalismaya katılanlardan toplanan veriler tamamen gizli tutulacak, veriler ve kimlik bilgileri herhangi bir şekilde eşleştirilmeyecektir. Katılımcıların isimleri bağımsız bir listede toplanacaktır. Ayrıca toplanan verilere sadece araştırmacılar ulaşabilecektir.

Bu araştırmanın sonuçları bilimsel ve profesyonel yayınlarda veya eğitim amaçlı kullanılabilir, fakat katılımcıların kimliği gizli tutulacaktır.

Irtibat

Çalışmayla ilgili soru ve yorumlarınızı araştırmacıya gokce.aydin@metu.edu.tr adresinden iletebilirsiniz veya 543 342 4219''lu telefondan İrem Gökçe Yıldırım''a ulaşabilirsiniz.

Katılımcı Onayı

Yukarıdaki bilgileri okudum ve bu araştırmaya gönüllü olarak katımayı kabul ediyorum.

Ad-Soyad: **Imza**

APPENDIX B

DEMOGRAPHICS AND GAME PLAY QUESTIONNAIRE

1. Yaşınız?
   _____

2. Cinsiyetiniz?
   ☐ Kadın
   ☐ Erkek

3. Lisans Anadalı Fakülteniz?
   ◯ Mühendislik
   ◯ Fen Bilimleri
   ◯ Mimarlık
   ◯ Eğitim
   ◯ Sosyal Bilimler
   ◯ İktisadi ve İdari Bilimler
   ◯ Diğer (Lütfen Belirtiniz) _____

4. Video oyunları oynar mısınız?
   ☐ Evet
   ☐ Hayır

5. *Haftada kaç saat video oyunları oynarsınız?
   ◯ 1 saatten az
   ◯ 1-5
   ◯ 5-10
   ◯ 10-15
   ◯ 15'den fazla

6. *Kaç senedir video oyunları oynuyorsunuz?
   ◯ 1'den az
   ◯ 1-3
   ◯ 3-5
   ◯ 5-7
   ◯ 7'den fazla

7. Hangi tip oyunları oynamaktan hoslanırsınız?(Çoklu seçim yapabilirsiniz.)
   ☐ Birinci Şahis Nişancı Oyunları (First Person Shooter)
   ☐ Rol Yapma Oyunları (Role Playing Games)

☐ Devasa Çok Oyunculu Çevrimici Rol Yapma Oyunları (MMORPG)
☐ Aksiyon Oyunları (Action Games)
☐ Macera Oyunları (Adventure Games)
☐ Puzzle Oyunları (Puzzle Games)
☐ Strateji Oyunları
☐ Gerçek Zamanlı Strateji Oyunları (Real Time Strategy Games)
☐ Sıra Tabanlı Strateji Oyunları (Turn Based Strategy Games)
☐ Gündelik Oyunlar (Casual Games)
☐ Platform Oyunları
☐ Spor Oyunları
☐ Simulasyonlar
☐ Diğer(Lütfen Belirtiniz) _____

8. Oyunlarda en çok hoşunuza giden özellikler nelerdir?(Çoklu seçim yapabilirsiniz.)
☐ Arayüz
☐ Karakterler-Modeller
☐ Ses Efektleri-Müzik
☐ Stratejik Davranabilme
☐ Zaman Baskısı
☐ Oyun Mekaniği
☐ Hareket Kabiliyetleri ve Kontroller
☐ Çoklu Oyun Oynayabilme
☐ Hikaye
☐ Başarı ve Kazanımlar
☐ Avatar Özelleştirebilme
☐ Diğer(Lütfen Belirtiniz) _____

9. Kullandığınız oyun platformları nelerdir?(Çoklu seçim yapabilirsiniz.)
☐ PC
☐ Xbox
☐ PlayStation
☐ PlayStation Portable
☐ Wii
☐ Android Mobil Cihazlar
☐ iOS Mobil Cihazlar
☐ Diğer(Lütfen Belirtiniz) _____

10. Kendinizi nasıl hedefi olan bir oyuncu olarak tanımlarsınız?
◯ Öğrenmeye ve yetkinliklerini arttırmaya çalışan
◯ Öğrenememekten ve yetkinliklerini arttıramamaktan endişe duyan
◯ Diğerlerinden daha iyi performans göstermeye çalışan
◯ Diğerlerinden kötü perfomans göstermekten kaçınan

APPENDIX C

MANIPULATION CHECK SCALE (TIME PRESSURE)

Aşağıdaki her bir ifadenin sizin düşüncenize göre ne kadar doğru olduğunu, aşağıdaki ölçek skalasını kullanarak belirtiniz.

1	2	3	4	5	6	7
Kesinlikle katılmıyorum			Ne katılıyorum ne katılmıyorum			Kesinlikle katılıyorum

1. Oyundaki görseller guzeldi.
2. Oyunda kullanılan objeleri kolayca tanımlayabildim.
3. Oyunu oynarken zaman kısıtlamasi vardı.
4. Oyunda kullanılan müzikler ve ses efektleri etkileyiciydi.
5. Oyunun kontrolleri öğrenmek oldukça kolaydı.
6. Oyunu oynarken zaman baskisi altındaydım.
7. Oyunda ortamı gezip, objeleri incelemek istedim.
8. Oyunda hedef görevi gerçekleştirmek zordu.
9. Bu oyunu oynamaya gelecekte devam edebilirim.
10. Oyun kontrolleri sezgiseldi.
11. Oyunda birşey yapmak istediğimde, karşılık gelen kontrolleri hatırlamak kolaydı.

APPENDIX D

PLAYER EXPERIENCE OF NEED SATISFACTION (PENS) SCALE

Aşağıdaki her bir ifadenin sizin düşüncenize göre ne kadar doğru olduğunu, aşağıdaki ölçek skalasını kullanarak belirtiniz.

1	2	3	4	5	6	7
Kesinlikle katılmıyorum			Ne katılıyorum ne katılmıyorum			Kesinlikle katılıyorum

In-Game Autonomy Scale

1. Oyun ilginç seçenek ve tercihler sunuyor.
2. Oyun ilginç seyler yapmanıza olanak sağlıyor.
3. Oyunda çok fazla özgürlük hissettim.

In-Game Competence Scale

1. Oyunda kendimi yeterli hissettim.
2. Oynarken kendimi becerikli ve etkili hissettim.
3. Oynama yeteneğim ile oyundaki mücadeleler çok dengeli bir sekilde örtüşüyordu.

APPENDIX E

INTRINSIC MOTIVATION INVENTORY (IMI)

Aşağıdaki her bir ifadenin sizin düşüncenize göre ne kadar doğru olduğunu, aşağıdaki ölçek skalasını kullanarak belirtiniz.

1	2	3	4	5	6	7
Kesinlikle katılmıyorum			Ne katılıyorum ne katılmıyorum			Kesinlikle katılıyorum

1. Oyunu oynarken keyif aldım.
2. Oyunu oynamak eğlenceliydi.
3. Oyunun sıkıcı olduğunu düsünüyorum. (R)
4. Oyun dikkatimi toplayamadı. (R)
5. Oyunu oynamayı çok ilginç buldum.
6. Oyunu oynamanın oldukça keyifli olduğunu düşünüyorum.
7. Oyunu oynarken, oyundan ne kadar keyif aldığımı düşünüyordum.
8. Bu oyunda çok fazla efor sarfettim.
9. Oyunda çok fazla çabaladım.
10. Oyunda iyi yapabilmek benim için önemliydi.
11. Oynarken kendimi çok gergin hissettim.
12. Oynarken çok rahattım. (R)
13. Oynarken kendimi endişeli hissettim.
14. Oynarken üzerimde baskı hissettim.

APPENDIX F

GAMEFLOW SCALE

Aşağıdaki her bir ifadenin sizin düşüncenize göre ne kadar doğru olduğunu, aşağıdaki ölçek skalasını kullanarak belirtiniz.

1	2	3	4	5	6	7
Kesinlikle katılmıyorum			Ne katılıyorum ne katılmıyorum			Kesinlikle katılıyorum

1. Oynarken etrafımdakilerin daha az farkındaydım.
2. Oynarken daha az farkındalık sahibiydim ve günlük yaşam hakkında daha az kaygılıydım.
3. Oynarken değiştirilmiş bir zaman deneyimi yaşadım.
4. Kendimi duygusal olarak oyunun içindeymişim gibi hissettim.
5. Tüm duyularımla kendimi oyunun içindeymişim gibi hissettim.

APPENDIX G

GAME ENGAGEMENT SCALE

Aşağıdaki her bir ifadenin sizin düşüncenize göre ne kadar doğru olduğunu, aşağıdaki ölçek skalasını kullanarak belirtiniz.

1	2	3	4	5	6	7
Kesinlikle katılmıyorum			Ne katılıyorum ne katılmıyorum			Kesinlikle katılıyorum

1. Herşey kendi kendine oluyor gibi gözüktü.
2. Kendimi farklı hissettim.
3. Kendimi korkmuş hissettim.
4. Oyun çok gerçekçiydi.
5. Oynarken telaşlandım.
6. Oynarken oyuna dalıp gittiğimi hissettim.
7. Düşüncelerim aklımdan hızlı bir şekilde akıyordu.
8. Oyunu oynarken nerede olduğumu unuttum.
9. Nasıl oynayacagimi düşünmeden kendiliğimden oynadım.
10. Oynamak beni rahatlattı.

APPENDIX H

GAME PLAY DATA

The following player data is collected during game play:

1 **Completion Status:** This data stores the game-end condition of game play (one of the variables below) depending on the achievement of the goal in the game.

   (a) Successful: Regardless of the experimental conditions the player is assigned, if the player completes the game successfully by achieving the goal.

   (b) No Time: If the player couldn't achieve the goal in the given time in the experimental condition.

   (c) No Health: Regardless of the experimental conditions the player is assigned, if the player lose his health completely and die in gameplay.

2 **Spent Time:** Regardless of the experimental conditions the player is assigned, this data stores the gameplay duration.

3 **Left Enemy:** Regardless of the experimental conditions the player is assigned, this data stores the number of left enemy at the time game ends.

4 **Left Health:** Regardless of the experimental conditions the player is assigned, this data stores players' left health (over 100) at the time game ends.

5 **Distance to Target:** Regardless of the experimental conditions the player is assigned, this data stores the left distance to the target at the time game ends.

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☐

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☒

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : Yıldırım
Adı : İrem Gökçe
Bölümü : Modelleme ve Simülasyon (Oyun Teknolojileri)

TEZİN ADI (İngilizce) : Time Pressure as Video Game Design Element and Basic Need Satisfaction

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. ☒
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullancılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

Yazarın imzası ..... Tarih 12/08/2015