Which Game Narratives Do Adolescents of Different Gameplay and Sociodemographic Backgrounds Prefer? A Mixed-Methods Analysis

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Abstract

Objective: The aim of this study was to investigate which narrative elements of digital game narratives are preferred by the general adolescent population, and to examine associations with gender, socioeconomic status (SES), and gameplay frequency. Further, the study aims to discuss how results can be translated to serious digital games.

Materials and Methods: Adolescents were recruited through school to complete a survey on narrative preferences in digital games. The survey included questions on sociodemographic information, frequency of gameplay, and an open-ended question on what could be an appealing narrative for them. Data were analyzed in a mixed-methods approach, using thematic analysis and chi-square analyses to determine narrative preferences and the associations between game narrative elements and player characteristics (gender, SES, and frequency of gameplay).

Results: The sample consisted of 446 adolescents (12–15 years old) who described 30 narrative subthemes. Preferences included human characters as protagonists; nonhuman characters only as antagonists; realistic settings, such as public places or cities; and a strong conflict surrounding crime, catastrophe, or war. Girls more often than boys defined characters by their age, included avatars, located the narrative in private places, developed profession-related skills, and included a positive atmosphere. Adolescents of nonacademic education more often than adolescents of academic education defined characters by criminal actions. Infrequent players more often included human characters defined by their age than frequent players. After performing a Bonferroni correction, narrative preferences for several gender differences remained.

Conclusion: Different narrative elements related to subgroups of adolescents by gender, SES, and frequency of gameplay. Customization of narratives in serious digital health games should be warranted for boys and girls; yet, further research is needed to specify how to address girls in particular.

Keywords: Serious games, Digital games, Narratives, Adolescents, Mixed method, Health promotion

Introduction

SERIOUS DIGITAL GAMES are designed to be educational and entertaining,[1] and include all elements that make a game fun, such as rules, choices, and challenges.[2] They are a promising tool in health promotion,[3] can reach large numbers of adolescents,[4] and contribute to health effects.[5,6] Serious digital games are assumed to derive their potency from being enjoyable and engaging.[7,8] Enjoyment is a positive affective state during gameplay that drives engagement,[9] while engagement reflects the involvement and motivation of the player in gameplay[9] and can be conceptualized in terms of

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experience and behavior.[10] These are crucial elements for continued play, increased attention, and potentially increased game effects.[4,6] Given their importance, insight on how to achieve serious game enjoyment and engagement is needed.

Several features are assumed to increase game enjoyment and engagement,[9] one of which is being transported by a game narrative.[9–12] A narrative is a story that has a beginning, a middle, and an end, and refers to the scene, characters, and conflict (resolution).[13] Game players try to make sense of the causal relations of narrative events, and doing so make sense of their own real-life world.[14] A narrative may moreover decrease cognitive load, reduce counterarguing, increase motivation, create a personal experience, and trigger feelings of presence.[4,14,15]

Digital games are promising tools to reach adolescents, since they are preferred to traditional education and exercises.[16,17] Serious digital games for health promotion address a diverse range of health topics,[5] and have to appeal to a broad target group. However, serious digital games are often evaluated as being too educative.[18] They are advised to be as fun as commercial digital games.[19] Research shows that three subgroups of adolescents are currently less engaged in serious digital games. Research states that males are more engaged with digital games than females. Furthermore, research shows that infrequent players are less engaged in digital games than frequent players.[20] Lower education students showed a high dropout rate with a serious game for health, and are less engaged in serious games than adolescents of higher education.[21]

Serious digital games wish to involve nonhabitual gamers,[12] or those less attracted to digital games such as girls[22] and adolescents of lower socioeconomic status (SES) background.[21,23,24] Narratives have been identified as an important game element for nonhabitual players[12]; when players are unaware of or resistant to the desired health behavior[15]; and they were suggested as a way to increase appeal and effects of serious digital health games among adolescents of lower SES background.[21] Research on narrative preferences in serious games is however scarce, and more research focuses on narrative preferences in educational games. Therefore, digital game research can help create persuasive narratives for a large number of adolescents.[4] To reach a heterogeneous target group,[25,26] subgroup analyses are needed to differentiate between preferences among adolescents.[27–31]

Research to date has mostly focused on narratives and game preferences among adolescents who frequently play games in their leisure time.[29] Further, it is assumed that adolescents of different educational types might have different game preferences.[29] Research also documented gender differences in storylines[18] and game genres.[18,30] Research on narrative preferences of girls, adolescents of lower SES, and nonhabitual gamers is scarce. Gender differences in gameplay have mostly been studied in relation to formal elements of digital games (e.g., competitive vs. cooperative gameplay).[31–33] Some research showed that female players were more interested in game features such as little violence, realistic or life-simulating settings, and developing neutral characters that fit less with gender–role stereotypes,[29–31,34–38] whereas boys preferred designing games in a fantasy world, with a large number of primarily male characters.[34]

The little research on game preferences by adolescent socioeconomic background suggested that adolescents in nonacademic track education were less engaged in a digital serious game intervention than those in academic education. In Belgium, SES maps well on adolescents' educational tracks, with those in nonacademic track education more often coming from lower SES families and those attending academic track education more often representing higher SES families.[39] Academic track (e.g., science, language) is a broad form of education preparing students for higher education, and nonacademic track offers education from a less theoretical perspective, and a more technical and practical approach (e.g., industrial science, and administration), or prepares secondary school students for the labor market immediately after secondary school (e.g., woodwork, hairdresser).

Boys in nonacademic track education preferred characters from commercial games, violent content, fantasy, arousal, challenge, and were motivated by purposes of relaxation for play, whereas boys in academic track education were more motivated by social factors to play.[29] Most insights on game preferences usually come from frequent leisure-time game players.[28,31,33,35–37] Juul[40] found that those who play less frequently prefer positive, pleasant, and simple fictional games, whereas more frequent players prefer difficult and emotionally negative fictional games (e.g., science fiction, vampires, and fantasy).

Serious game research needs to identify strategies to address girls, adolescents of low SES, and nonfrequent players to broaden the target group of serious games. Narratives are well received by a broad target group of adolescents, including narratives in serious games, which are shown to increase engagement in digital games. To broaden the target group of serious games, it is assumed that adding narrative preferences for digital games makes serious games more engaging. Research is needed to identify narrative preferences of adolescents, in particular, of the three subgroups to address a heterogeneous group of adolescents by means of serious games for health.

This study aimed to investigate which narrative elements in digital games are preferred by adolescents, specifically to differentiate between preferences by adolescent characteristics of (1) gender, (2) SES, and (3) frequency of gameplay. Since adolescents are not familiar with serious games, and as serious games often hide the serious purpose of the game and emphasize the fun elements of the game, this study investigated narratives in digital games among adolescents. Research shows that developing (serious) games in participatory design is appreciated among adolescents[41] and is increasingly implemented in serious games development.[42] Therefore, the study findings of digital games will be translated to narratives in serious games for health. The findings may provide insights for serious digital game developers targeting adolescents and may help create narratives for adolescents currently less reached by serious health games.

Materials and Methods

Sample description and recruitment

Eligible participants were adolescents from seventh, eighth, and ninth grade (12–15 years old). Data were collected from a convenience sample of 15 schools that offered academic or nonacademic track education, as part of a larger study on adolescent peer relationships among 1750 pupils in this age group.

TABLE 1. DEFINITIONS OF CHARACTER, LOCATION, CONFLICT, MOOD AND ATMOSPHERE,
AND TIME IN A GAME NARRATIVE

Game narrative elements	Dramaturgy elements clarifying the series of events in terms of time, place, character, conflict, and mood and atmosphere to engage the player emotionally in a game world
Character	The main protagonist, who takes the lead in the story and the antagonist, who is opposed to the protagonist.
Location	The place where the game is set (e.g., in a village, in a building).
Conflict	The happening of the event(s) and the reason why a certain conflict is caused.
Mood and atmosphere	The prominent tone or emotional quality of the scene (e.g., sad, excited, and scary).
Time	The time when the narrative takes place (e.g., during French Revolution, the week after a murder).

Data collection

As part of a larger study, a subgroup of adolescents completed a short questionnaire on digital games. The survey assessed sociodemographics, frequency of gameplay, and an open-ended question that asked adolescents to write down their idea for a digital game to elicit appealing narrative elements. To complete the question, they were asked to consider *where*, *who*, *what*, *which* game levels, and *what* would make it *enjoyable* to play. This is conceptually different from asking adolescents on narrative preferences in existing games and objectively measure their enjoyment and engagement in games.[30,43,44] Engagement is not only measured quantitatively but can also be measured qualitatively as it is characterized by attention, interest, and affect.[10,45] Furthermore, by applying this approach narratives are culturally embedded in what is relevant and perceived as engaging for adolescents.[46]

Since adolescents developed engaging narratives themselves,[46,47] the method of participatory design has the power to give a voice to adolescents who do not play games (frequently) and/or to support the development of serious games that are as much fun as (commercial) digital games.[19] Furthermore, participatory design may increase the acceptance of the developed game.[41,42] From 446 adolescents, answers to this open-ended question were the basis for the findings reported here. Schools received written information before participation and they were in-charge of obtaining passive informed consent from parents. Adolescents received oral information on the study and provided active informed consent. Ethical approval was received from the Ethical Committee of Ghent University (Belgium).

Measures

Sociodemographics. Sociodemographic information included gender (boy/girl) and education type (academic/nonacademic track education).

Frequency of gameplay. Using a 5-point rating scale (never, one or two times in the last 6 months, two or three times per month, once a week, or several times a week), students indicated their gameplay frequency. This variable was dichotomized as player (≥ 2 or 3 times per month) and infrequent player (<2 or 3 times per month) as applied in earlier research.[48,49]

Analysis. This study used a mixed-methods analysis by identifying themes (qualitative analysis), which were next assessed for associations with adolescent characteristics (quantitative analysis). Open-ended question data on game narratives were first thematically analyzed, which is a method to identify repeated patterns of meaning (narrative subthemes),[50] using NVivo11 software. A topic list to define narrative elements (Table 1) was based on digital game and narrative literature.[13,51–53] Data were independently coded by two researchers (A.S. and L.M.). Inter-rater reliability was substantial ($\kappa = 0.64$, all themes ranging from 0.6 to 0.7),[54] whereas the agreement in percentage (99%) was considered high[54,55] Researchers compared coding until consensus was reached. The associations between game narrative subthemes and player characteristics (age, education type, and gameplay frequency) were assessed through chi-square tests in SPSS 25.0.

Level of significance was set at $P < 0.05$[56] and compared with the results after performing a Bonferroni correction. For the Bonferroni correction $\alpha = 0.05$ was divided by the total number of significance tests (i.e., 0.05 divided by 3 times 28 tests, resulting in $\alpha = 0.00059$). The Bonferroni correction increased the threshold to reach significance, which decreased the likelihood of detecting significant results. Results are presented with and without a Bonferroni correction. Both are presented since the study is explorative, and uncorrected findings may still present hypotheses for further examination in future research.[57] Nonsignificant findings using the Bonferroni correction may after all be due to a lack of power at such a strict significance level; these might yield significant results in a more focused study on fewer themes or when using a larger sample. Indeed, the power associated with a small effect size of 0.15 was associated with a power of $1 - \beta = 0.42$, given the sample size of 446 adolescents and an α level $= 0.00059$ (calculated in G*power software[58]). Phi effect sizes were calculated for significant results.[59]

Each category could be mentioned by a participant more than once, which was counted as such in the qualitative analysis, for example, mentioning two different characters in one narrative (unit of analysis: theme). In the quantitative analysis each variable that represents one category was dichotomized into either mentioning the subtheme in the narrative or not mentioning at all (unit of analysis: participant).

Results

Sample description

In the final sample, 446 adolescents were included. The sample was evenly split by gender (52.1% female) and grade (39.3% seventh; 31.9% eighth; and 28.8% ninth grade). There was a larger representation of nonacademic track

TABLE 2. NUMBER OF MENTIONED THEMES BY THE 446 PARTICIPANTS

Category	Description and quotes	Number of times this theme was mentioned
Characters		523
Human	Protagonist as "normal humans," "avatars," or "soldiers"	328
Profession	Celebrity or artist, athlete, soldiers or fighters, police officer or secret agent, party planner or fashion designer, teacher, manager or owner of a particular business	128
Gender	Male "strong men," female "a girl, whose parents died"	57
Age	Adults, peers, children	22
Relation to others	"to organize a surprise party for the birthday of friends"	50
Nationality	Belgian, German, American	6
Criminals	"mafia" and "gangs"	24
Customizability	"avatars"	87
Nonhuman	Antagonist as "mysterious creatures": monsters, zombies, ghosts, aliens, or "bad" characters, heroes, "with special forces," fairy tale or Disney characters	78
Animals	"Dogs," "super mouse," "bears," "horses"	32
Location		341
Public places	School, theme parks, football fields, shops or restaurants, hospitals; places with animals, cemeteries, fashion, sport places, governmental places, transportation or their own realistic-living environment	71
Private places	Building, "haunted house"	37
Urbanization	"Big city, Paris, London, Milan, New York," "deserted city"	73
Rural areas	Jungle, forest, desert, farm, North pole	26
Geographical location	Europe, America, Asia, Africa	68
Battlefield	War site, as "Iraq," "Vietnam," "Germany" or the civil war in "Spain"	34
Earth	"on the whole world," "earth," or "the real world"	24
Fantasy worlds	"magical places," "dark places," or "dark place with mysterious creations"	25
Conflict		150
(Nature) catastrophes	Earthquake, oil and virus catastrophe, or a situation "where everything goes wrong"	19
	Destroyed places or a destroyed transportation: "a crashed plane" or "bombarded Disneyland Paris"	
Crime	Murder scenes, disappeared or kidnapped people	26
War scenes	War between two countries	47
Attacks of nonhumans	Appearance of aliens, attack on humans by mummies or monsters	25
Skill development	Becoming famous, riding horses or managing a company or profession, traveling the world, competitions	31
Mood and atmosphere		36
Positive	"Excitement," "fun," "comical" situations, "building a country where everybody is happy"	23
Exciting or mysterious	"Dark, mysterious"	16
Time	"a boy who has to travel back to the middle ages time," "world of 2120"	47

Unit of analysis: theme.

education (62.4%) and game players in the sample (72.4%). Players were often of academic track education (63.8%), whereas infrequent players mostly consisted of girls (79.7%).

Narrative preferences

Thirty subthemes were identified and are discussed by category (Table 2).

Characters

Character preferences could be largely grouped into human and nonhuman. Human characters were featured more often in adolescents' narratives than nonhuman characters, especially as protagonists. Human characters were often defined in terms of their (1) profession, sometimes in terms of their (2) gender or (3) age, but rarely in terms of their (4) relation to others or (5) nationality. Professions were diverse (e.g., athlete, teacher). A feature of human characters that was often mentioned was its customizability, especially relating to "avatars." Nonhuman characters included monsters, heroes, fairy-tale characters and were mainly featured as antagonists (Table 2).

Location

Places were described in terms of their (1) public or private setting, (2) urbanization or rural area, (3) geographical

location, or (4) fantasy. Public places were named most often, with school being the most common public place. Private places as buildings were mentioned by a few respondents only. Urbanization was also prominently featured, with cities being most often mentioned. While some adolescents just mentioned ''city,'' others were more specific and added a qualifier such as ''big city'' or ''deserted city,'' or a specific location such as ''Paris.'' Rural areas ranged in size from a farm to a jungle. Geographical location referred to a continent as Europe or America. Several stories were located in a battlefield, in which adolescents referred to particular countries. ''The world'' or fantasy worlds were rarely reported as a location (Table 2).

Conflict

Several adolescents defined the conflict of the narrative as the action that is taking place. Conflicts were described in terms of (1) (nature) catastrophes or crime, (2) war (e.g., conflict between countries), (3) attacks of nonhuman characters (e.g., aliens or monsters), or (4) skill development. Skill development was linked to the conflict of undeveloped skills and the need to improve (e.g., ''You are starting as a patient, then a nurse, and eventually you become a doctor''). Examples and quotes are provided in Table 2.

Mood and atmosphere

Mood and atmosphere were specified as positive or ''dark, mysterious,'' but were only rarely mentioned.

Time

Time was also rarely mentioned and ranged from the middle ages to the future.

Associations between game narratives and adolescent characteristics

After grouping subthemes to 28 variables, they were researched in association with gender, educational type, and gameplay frequency, and are discussed by variable (Tables 3–5).

Gender

Several gender differences were noted. Girls more often than boys included mood and atmosphere in their narratives. Further they described (1) characters by age, (2) by customizability, (3) a location in a private place (building), (4) conflict of skill development, and (5) positive mood. Boys more often than girls described (1) conflict, (2) time, (3)

TABLE 3. ASSOCIATIONS BETWEEN NARRATIVE
PREFERENCES AND GENDER

Category	Gender	Effect size
Characters	$\chi^2 = 0.61$, $P = 0.437$	
Human	$\chi^2 = 0.75$, $P = 0.388$	
Profession	$\chi^2 = 14.72$, $P < 0.001$[a,b,c]	$\Phi = 0.182$
Gender	$\chi^2 = 2.32$, $P = 0.128$	
Age	$\chi^2 = 5.86$, $P = 0.015$[b,d]	$\Phi = -0.115$
Criminals	$\chi^2 = 10.51$, $P = 0.001$[a,b]	$\Phi = 0.154$
Customizability	$\chi^2 = 7.92$, $P = 0.005$[b,d]	$\Phi = -0.133$
Nonhuman	$\chi^2 = 0.03$, $P = 0.861$	
Animals	$\chi^2 = 1.94$, $P = 0.163$	
Location	$\chi^2 = 0.86$, $P = 0.355$	
Public places	$\chi^2 = 0.00$, $P = 0.997$	
Private places	$\chi^2 = 10.78$, $P < 0.001$[b,d]	$\Phi = -0.156$
Rural areas	$\chi^2 = 0.38$, $P = 0.538$	
Urbanization	$\chi^2 = 0.27$, $P = 0.605$	
Geographical location	$\chi^2 = 5.29$, $P = 0.021$[a,b]	$\Phi = 0.109$
Battlefield	$\chi^2 = 13.66$, $P < 0.001$[a,b,c]	$\Phi = 0.175$
Dark place	$\chi^2 = 1.31$, $P = 0.252$	
Earth	$\chi^2 = 0.05$, $P = 0.830$	
Fantasy worlds	$\chi^2 = 0.19$, $P = 0.665$	
Conflict	$\chi^2 = 6.00$, $P = 0.014$[a,b]	$\Phi = 0.116$
Crime	$\chi^2 = 1.57$, $P = 0.210$	
War scenes	$\chi^2 = 19.64$, $P < 0.001$[a,b,c]	$\Phi = 0.210$
Attacks of nonhumans	$\chi^2 = 2.18$, $P = 0.140$	
Skill development	$\chi^2 = 4.61$, $P = 0.032$[b,d]	$\Phi = -0.102$
Mood and atmosphere	$\chi^2 = 7.22$, $P = 0.007$[b,d]	$\Phi = -0.127$
Positive	$\chi^2 = 9.06$, $P = 0.003$[b,d]	$\Phi = -0.143$
Exciting or mysterious	$\chi^2 = 0.86$, $P = 0.355$	
Time	$\chi^2 = 4.11$, $P = 0.043$[a,b]	$\Phi = 0.096$

[a]Significant for boys.
[b]Significance at 0.05 level.
[c]Significance at 0.00059 (Bonferroni correction) unit of analysis: participant; all tests with df = 1.
[d]Significant for girls.

TABLE 4. ASSOCIATIONS BETWEEN NARRATIVE
PREFERENCES AND EDUCATION TYPE

Category	Education type	Effect size
Characters	$\chi^2 = 0.97$, $P = 0.324$	
Human	$\chi^2 = 1.18$, $P = 0.278$	
Profession	$\chi^2 = 1.90$, $P = 0.169$	
Gender	$\chi^2 = 0.87$, $P = 0.352$	
Age	$\chi^2 = 3.59$, $P = 0.058$	
Criminals	$\chi^2 = 5.53$, $P = 0.019$[a,b]	$\Phi = 0.182$
Customizability	$\chi^2 = 0.00$, $P = 0.956$	
Nonhuman	$\chi^2 = 1.50$, $P = 0.221$	
Animals	$\chi^2 = 1.35$, $P = 0.246$	
Location	$\chi^2 = 0.71$, $P = 0.398$	
Public places	$\chi^2 = 0.01$, $P = 0.929$	
Private places	$\chi^2 = 0.36$, $P = 0.551$	
Rural areas	$\chi^2 = 0.26$, $P = 0.611$	
Urbanization	$\chi^2 = 0.44$, $P = 0.509$	
Geographical location	$\chi^2 = 1.21$, $P = 0.271$	
Battlefield	$\chi^2 = 1.33$, $P = 0.250$	
Dark place	$\chi^2 = 0.12$, $P = 0.728$	
Earth	$\chi^2 = 0.77$, $P = 0.379$	
Fantasy worlds	$\chi^2 = 2.19$, $P = 0.139$	
Conflict	$\chi^2 = 5.38$, $P = 0.020$[b,c]	$\Phi = -0.111$
Crime	$\chi^2 = 1.11$, $P = 0.293$	
War scenes	$\chi^2 = 1.9$, $P = 0.166$	
Attacks of nonhumans	$\chi^2 = 0.08$, $P = 0.773$	
Skill development	$\chi^2 = 1.38$, $P = 0.241$	
Mood and atmosphere	$\chi^2 = 1.65$, $P = 0.199$	
Positive	$\chi^2 = 3.48$, $P = 0.062$	
Exciting or mysterious	$\chi^2 = 0.02$, $P = 0.881$	
Time	$\chi^2 = 0.49$, $P = 0.485$	

[a]Significant for nonacademic.
[b]Significance at 0.05 level.
[c]Significant for academic.

TABLE 5. ASSOCIATIONS BETWEEN NARRATIVE
PREFERENCES AND GAMEPLAY

Category	Gameplay	Effect size
Characters	$\chi^2 = 1.22$, $P = 0.269$	
Human	$\chi^2 = 2.76$, $P = 0.097$	
Profession	$\chi^2 = 0.13$, $P = 0.719$	
Gender	$\chi^2 = 0.36$, $P = 0.547$	
Age	$\chi^2 = 5.83$, $P = 0.016$[a,b]	$\Phi = -0.114$
Criminals	$\chi^2 = 4.95$, $P = 0.026$[b,c]	$\Phi = 0.105$
Customizability	$\chi^2 = 0.13$, $P = 0.719$	
Nonhuman	$\chi^2 = 1.22$, $P = 0.270$	
Animals	$\chi^2 = 0.69$, $P = 0.408$	
Location	$\chi^2 = 3.25$, $P = 0.071$	
Public places	$\chi^2 = 0.98$, $P = 0.322$	
Private places	$\chi^2 = 0.94$, $P = 0.332$	
Rural areas	$\chi^2 = 0.16$, $P = 0.687$	
Urbanization	$\chi^2 = 4.24$, $P = 0.039$[b,c]	$\Phi = 0.098$
Geographical location	$\chi^2 = 2.97$, $P = 0.085$	
Battlefield	$\chi^2 = 6.01$, $P = 0.014$[b,c]	$\Phi = 0.117$
Dark place	$\chi^2 = 0.26$, $P = 0.612$	
Earth	$\chi^2 = 1.51$, $P = 0.219$	
Fantasy worlds	$\chi^2 = 0.41$, $P = 0.520$	
Conflict	$\chi^2_{(1)} = 5.38$, $P = 0.020$[b,c]	$\Phi = 0.050$
Crime	$\chi^2_{(1)} = 1.04$, $P = 0.309$	
War scenes	$\chi^2_{(1)} = 4.75$, $P = 0.029$[b,c]	$\Phi = 0.103$
Attacks of nonhumans	$\chi^2_{(1)} = 4.70$, $P = 0.030$[b,c]	$\Phi = 0.103$
Skill development	$\chi^2_{(1)} = .63$, $P = 0.427$	
Mood and atmosphere	$\chi^2 = 2.49$, $P = 0.115$	
Positive	$\chi^2 = 1.22$, $P = 0.269$	
Exciting or mysterious	$\chi^2 = 1.69$, $P = 0.194$	
Time	$\chi^2 = 5.34$, $P = 0.021$[b,c]	$\Phi = 0.109$

[a]Significant for infrequent players.
[b]Significance at 0.05 level.
[c]Significant for players.

characters by profession and their criminal actions, (4) a geographical location (continent) or battlefield, and (5) war scenes (Table 3).

After a Bonferroni correction was performed several gender differences remained, as boys more often than girls described (1) characters by profession, (2) a location on a battlefield, and (3) war scenes (Table 3).

Educational type

Some associations with educational track were found. Adolescents of academic track more often included conflict in their narratives than adolescents from nonacademic track. Adolescents from nonacademic track more often described human characters by criminal actions (Table 4).

After a Bonferroni correction was performed, no significant associations for education type remained.

Frequency of gameplay

Players more often than infrequent players described (1) time, (2) conflict, (3) characters by criminal actions, (4) urbanization or a location of battlefield, and (5) war scenes and attacks as conflict. Infrequent players more often than players described: human characters by their age (Table 5).

After a Bonferroni correction was made, no significant associations for frequency of gameplay remained.

Discussion

This study aimed to investigate which narrative elements are important to adolescents, and how narrative preferences vary depending on (1) gender, (2) SES, and (3) frequency of gameplay. This study used a novel approach in asking adolescents to develop narratives according to their own preferences, which also enables the generation of themes and narrative combinations not yet currently applied in digital games. Adolescents mainly described narratives featuring human characters and avatars as protagonists, and nonhuman characters mainly as antagonists. Public and urban places were prominent in location descriptions. Crime, catastrophes, or war were central themes of conflict.

Serious digital games that aim to appeal to a wide range of adolescents should incorporate these elements in a prominent manner. Existing serious digital games that showed effects on health,[12] however, mainly used fantasy settings and characters (e.g., Squire's Quest!), or human comic characters (e.g., Boy Scout 5ADay Badge; Escape from Diab!) instead of real-life human characters (e.g., Balance; Fun, Food & Fitness!; Escape from Diab!; Nanoswarm: Escape from Inner Space). The narrative of current serious digital games is often related to the "serious" topic (e.g., target health behavior).[12]

Differences were found for narrative preferences by subgroups of adolescents. Differentiating between subgroup characteristics (customization) within one game may help nuance games to adolescents' preferences. Customizing narratives by preferred narrative elements may hold promise for female and male preferences among adolescents. Applying customization may thus help reach a wider range of adolescents. Research showed that applying the customized approach instead of the one-size-fits-all approach to create persuasive games for players results in more effective games.[7,60] Until now customization in serious games was often limited to "avatar customization."[34,38,61–64] Our findings showed gender differences in narrative preferences, which are in line with previous studies: boys preferred violent content and war site settings, whereas girls preferred realistic settings.[32,34,38,65–67] Also, girls' preference for character development of an "avatar" is a persuasive narrative element in line with previous research, stating to increase engaged gameplay.[66,68]

After performing a Bonferroni correction, three core elements remained important to boys' preferences: customize avatars by profession, locate the narrative on a battlefield, and create conflicts in war scenes. These are core findings that are in line with previous research. However, this study added that defining the profession of the human character might be relevant for boys. Preferences of girls no longer remained significant, after performing a Bonferroni correction. This suggests that gender differences in narrative preferences exist, as stated by previous studies, yet, deserve future research to specify the narrative elements that may hold promise for girls. Some gender differences in literature were however not significant in our study, such as boys' preferences for fantasy figures and places[34] and a lower interest in these among girls.[32,38] Our study approach, however, differed from earlier research that included children and used a participatory approach of narratives in discussion among children and game developers, using an iterative thought process that spanned 6 months.[34] Including narratives to serious games may help engage girls in serious

digital games, who are currently less engaged with digital games.[20] Research on narrative preference differences between adolescents of different educational types is scarce.

To reach adolescents of nonacademic education, our findings suggest that narratives should integrate characters with criminal actions. However, this finding does not hold promise after performing a Bonferroni correction. The small number of differences that do not hold promise for adolescents of different educational types, after doing a Bonferroni correction, might indicate that differences are less prominent. Our findings do not show a greater interest among adolescents in nonacademic track for fantasy elements, unlike previous research.[29] This previous research, however, used a different approach than our study and only asked adolescents to rate their favorite existing digital games.[29] Including particular narrative elements to serious games is not confirmed to engage adolescents of nonacademic education, who showed to drop out of serious game interventions.[21] Very little research exists on narrative preferences among infrequent game players. Findings are in line with previous research on preferences for nonhuman and complex narrative elements among players.[40] Yet, our findings suggest that human characters that are specified by age are of interest to infrequent players.

After performing a Bonferroni correction, differences in narrative preferences between players and infrequent players do not hold promise. This might indicate that a number of differences exist; yet, future research needs to conceptually specify on the particular narrative elements that are preferred by infrequent players. The lack of differences (or even absence of differences after performing a Bonferroni correction) in narrative features between players and infrequent players may result from narrative preferences not only being influenced by gaming motivation and experience but also by other cultural and media influences such as recommendations made by peers as part of a peer group cultural experience.[65] Including specific narrative elements to serious games is not confirmed to engage infrequent players who are currently less engaged in digital games.[20] Further research is needed to determine how to increase engagement among infrequent players.

Customizing narratives by preferred narrative elements may hold promise for female and male preferences among adolescents. However, customization should also extend to narratives, for example, by using interactive digital narratives or storytelling, in which players can create their own narrative experience that is shown to be feasible to implement for game developers.[11,68–74] This has shown to increase players' motivation and engagment.[4,11,75–77] This approach is in line with the concept of serious storytelling, stating the importance of adapting schemas to narrative elements to convey experience and accomplishing the purpose of knowledge and wisdom creation for a particular topic. Thereby, storytelling is not arranged in single events, but according to patterns or schemas that are relevant to the health topic. The audience creates the narrative flow through interaction.[78] A storytelling approach that is customizable to the target group, which creates the narrative flow through interaction with topic-related schemas, holds promise.

Since the field of serious storytelling is still young, further research should provide insight into the design of serious storytelling in serious digital games for health and show how identified narrative elements link to relevant schemas. Thereby, a translation from digital game narratives to serious game narratives can be made, applying to the specific type of serious game for health (e.g., physical activity, mental health). This study investigated narrative elements that are engaging to adolescents. These elements can be combined to a new narrative that suits the particular serious game for the certain field of interest.[79,80] Serious storytelling takes different application areas into account, among others health and education.[64,78] Narrative elements that are socially unacceptable (e.g., crime), but perceived as exciting, may still be integrated to serious game narratives, but are advised to be approached in a proactive manner.[79] For example, the proactive action would be a detective that responds to ongoing criminal actions in a city. Serious game developers and researchers are advised to develop games that are fun, and well balanced between engaging health-promotion elements and gameplay.[80]

Strengths and limitations

The sample consisted of Flemish adolescents, which might impede the generalizability to other cultural settings. However, Wang et al.[81] showed that narratives can be successfully applied from one culture to another. Our study offers separate themes that can be included in a narrative, but future research is needed on how to coherently integrate these themes in a narrative for serious digital games, and more efforts are needed to align plot, character, and environment in a coherent way.[12,82] Collecting data in a participatory approach for an extended period of time as applied in Kafai[34] could have increased prolonged engagement of qualitative data. Research showed that engagement can also be researched in qualitative studies,[10,45] whereas it is unclear how comparable this method is from engaging in narratives. However, as indicated participatory design may increase the acceptance of the developed game and influence engagement.[41,42] Further, member checking could have increased the credibility of the data.[83]

The inter-rater reliability is moderate when judging by the kappa value, whereas the percentage value indicates strong agreement. The coding nodes in NVivo11 included a large number of subcategories, and the data set included a large number of narratives in which each narrative was structured differently (e.g., length of narrative, structure of narrative, and inclusion of narrative elements). The rarity of some coded subcategories of the qualitative data may have influenced the kappa value. Previous research on game narratives used predetermined lists of broader and fewer themes, with unsurprisingly a higher prevalence per theme and higher kappa values.[84–86] Gwet's AC1 inter-reliability score takes such low prevalence into account and usually yields higher reliability scores when the coded item is rare.[87] This form of reliability score may be more recommended in future research for studying rare themes. Furthermore, the high number of individual tests may have impacted the results, and these results therefore need to be interpreted with care.

The effect sizes are small and may not substantially aid in differentiating between subgroups of adolescents in future studies and game developments. The developmental differences in adolescents have not been considered. Yet, in future studies this may be addressed, since literature shows that developmental differences may impact narrative preferences and writing skills of adolescents.[30,88] For example, the writing task (of writing game narratives) may be distributed

across time, among classmates of different cognitive skills or guided by the researcher.[11,88]

Game experience differed between participants, as most participants were players and infrequent players were especially female. Research states that female adolescents are often considered as infrequent players. Even though frequent and infrequent players were not equally distributed, this is one of the first studies that investigated game narrative elements and included infrequent players. Making a distinction between player experience in the context of game narratives should therefore be considered as a strength of this study. However, it should be noted that in game literature that does not apply to narratives, a distinction between game experience is often made. A standardized measurement for this characteristic is however still largely lacking and direly needed in future research.[30] Even though the sample appears representative of the population of Flemish adolescents in terms of game experience,[89] results should be interpreted with care in regard to the generalizability. This may especially be the case for nonplayers who are female and who are underrepresented in the sample. Therefore, the small effect sizes could have been impacted by the homogeneous sample.

Further strengths of the study are that it contributed to the limited research topic of digital game narratives, applied to the field of serious digital games for health. Results on the differences between infrequent players and players add a new perspective to the existing research on game narratives.[40,72,90] A further strength of the study was the large sample of 446 adolescents for qualitative analysis and the methodological rigor of independent coding by two researchers.[83] The mixed-methods approach allowed us to combine the in-depth richness of narratives created by adolescents and their background characteristics to assess the need for customization of narratives in serious digital games.

Conclusion

Adolescents in general preferred human characters as protagonists; nonhuman characters only as antagonists; realistic settings, such as public places or cities; and a strong conflict surrounding crime, catastrophe, or war. Different narrative elements are persuasive for different subgroups of adolescents, and storytelling should be customized to adolescent characteristics. To reach adolescent girls, narratives may include real-life locations and characters, and take place in a positive atmosphere. Boys are more attracted to time-specific conflict narratives, involving characters that show criminal actions and are set in battlefield or continent locations. Time- and location-specific narratives including criminal actions, conflict, and war are also preferred by frequent players, whereas infrequent players are more attracted by narratives with real-life characters. To reach adolescents in academic track education narrative may include conflict-driven narratives; yet, no specification can be made to reach adolescents of nonacademic education. These findings may support serious digital game developers targeting adolescents, in creating narratives for those currently less well reached by serious health games and increase the engagement with serious games for health. Customization of narratives in serious digital health games should be warranted for boys and girls; yet, further research is needed to specify how to address girls specifically.

Author Disclosure Statement

The funding agency had no role in study design, analysis, or report writing. No competing financial interests exist.

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