Immersion in the virtual environment: The effect of a musical score on the video gaming experience

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Thank You

- Prof. Toshihara
- Kyushu University
- COE & its members
enhancement of the aural component

- ultra-high fidelity surround sound systems are present
  - nearly 100,000 theaters (Dolby Lab, 2004)

- sonic accompaniment for video games has progressed
  - synthesized waveform beeps of *Pong* (Atari, 1975)
  - role-playing games (RPGs)
    - *Tony Hawk’s Underground* (Activision, 2003)
      - customizable lists of commercial music tracks
    - *Medal of Honor Frontline* (Electronic Arts, 2002)
      - specially composed orchestral scores
personal computer & game systems
(Sony PlayStation 2, Microsoft Xbox, and Nintendo GameCube)

- significantly faster data processing capabilities
- greatly increased storage capacity
- recently developed methods for compressing the audio and video components of these games
  - audio-visual (A-V) quality that begins to rival the quality of film and television.
significance & need for study

- amount of time spent by individuals using or interacting with media
  - an average of five and a half hours a day for children in the United States (Rideout, 2004)

- serious attention given to the audio aspect of motion pictures and in the most recent generation of video games (Hill, 2003)
  - significant financial investment
past research

Film music and animation – growing number
- for a more detailed review, see Cohen 2001 or Lipscomb and Tolchinsky, in press.

Video games – very few
  - SD scales (same as Iwamiya, 1997)
  - three conditions
    - game with music, game without music, music only
Complex relationship exists

- The positive correlation of the “neatness” axis vs. the “lightness,” “calmness,” and “performance score” vectors, shows that a “dark, agitated” excerpt provides a “mixed” impression to the game, and, in turn, results in a negative effect on driving performance. In order to obtain high performance scores, players must concentrate on manipulating the control unit. The negative effect on performance may be a result of music disturbing the players’ concentration.
musical excerpts selected from a wide range of varying musical styles for use in the experiment based on a music-only semantic differential rating task
- results of the study are likely to be significantly different from those in which a musical score has been specifically composed to accompany events as a dramatic narrative unfolds

Present study
- incorporates the music of Academy Award-winning composer Howard Shore
limitations

- focus solely on the impact that the musical score has on the video gaming experience
- without consideration of improvement or degradation of performance scores
research questions

- Do players perceive a game differently due to the presence of music?
- If so, in what ways does music impact the aesthetic experience of gaming?
- Do attribute variables (e.g., gender or age level) significantly impact participant responses?
We predicted that responses to a number of verbal scales – particularly those associated with Osgood et al’s (1957) “potency” dimension – would be positively enhanced by the presence of the musical score and would intensify the overall gaming experience for the player.
method

N = 76 students
- 63 college (19 males and 44 females)
- 13 high school (6 males and 7 females)

Random assignment to one of three experimental conditions
- game-with-music (GwM)
- game-without-music (GwoM)
- music-only (MO)

Each responded on 21 VAME scales after playing/listening to three segments from LR:TT
- VAME scales vs. SD
Generating stimuli

GwM & GwoM
- option of turning the musical soundtrack on or off without affecting the presence of ambient sounds

MO
- not possible to turn off the non-musical sound unless the auditory component is eliminated completely
MO stimuli

necessary to extract segments of the in-game musical soundtrack multiple times
- digitally sampled audio output from the PlayStation 2 with a MOTU 828 audio interface connected to a Macintosh G4 Powerbook running Logic Audio Platinum5
- excerpts were then edited to ensure that all non-musical sounds were eliminated and reconstructed into an intact, natural sounding musical soundtrack
- lengths of the music-only stimuli for the three video game segments were 54, 86, and 85 seconds in duration, respectively
- in comparison, scenes chosen for the game playing conditions (GwM & GwoM) were approximately 120 seconds each
selected game segments

- Weather Top
- Moria
- Amon Hen
in this second-level segment, the player’s primary objective is to protect the character Frodo from menacing creatures known as Ringwraiths. The nighttime setting is high atop a mountain ruin, surrounded by forest. The player must repeatedly re-light and wield a torch in order to fend off the enemy.

the musical score consists of a driving rhythm with string glissandi at the beginning, gradually replaced by a low string ostinato with a prominent presence of a vocal choir, singing words in one of the languages of Middle Earth. This excerpt maintains a clear sense of tonality throughout.
In this segment encountered later in the second level, the player must fight through a marsh while unhuman creatures (Orcs) attack from the water and arrows fly from surrounding cliffs. This scene is also very dark, as if at night, and the player experiences periods of relative quiet, punctuated by an occasional attack from Orcs hidden in the marsh.

The musical score for this excerpt is highly dissonant, loud, and brash, initiated at the outset by a series of ascending chromatic motifs played by brass, woodwind, and string instruments, followed by a brief section of pounding percussion rhythms that is interrupted briefly by the same chromatic ascending motifs, then returning to the pounding rhythm. The tonal clusters in this excerpt result in an atonal harmonic context.
In this excerpt from the seventh level of the video game, the player must fight ferociously to make a path through the forest, as numerous fierce fighters (Uruk-Hai, a stronger and larger breed of Orc) are encountered. The daytime scene is set in a forest and includes a large number of enemies in close combat situations.

The musical score for this segment is majestic in tone featuring a steady, syncopated rhythm in the percussion and low strings with brass instruments in the melodic foreground over a clearly tonal harmonic structure. Eventually, following the sound of a hunter’s horn, the brass instruments are supplanted by strings in a chordal homophonic texture, and then, the brass return to the majesty of the opening section.
Following each segment of game play, participants responded on a series of 21 verbal scales. Those assigned to the music-only condition simply listened to the musical score, then responded using the same verbal scales.

**MEDS (Kendall, UCLA)**
- using a computer interface and a scroll bar that recorded the responses on a scale from 0 to 100
- VAME scales presented in random order
<table>
<thead>
<tr>
<th>VAME scales</th>
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<tbody>
<tr>
<td>active</td>
</tr>
<tr>
<td>annoying</td>
</tr>
<tr>
<td>bright</td>
</tr>
<tr>
<td>busy</td>
</tr>
<tr>
<td>cold</td>
</tr>
<tr>
<td>colorful</td>
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<td>dangerous</td>
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<td>good</td>
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<td>high</td>
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<td>intense</td>
</tr>
<tr>
<td>labored</td>
</tr>
<tr>
<td>loud</td>
</tr>
<tr>
<td>masculine</td>
</tr>
<tr>
<td>pleasant</td>
</tr>
<tr>
<td>powerful</td>
</tr>
<tr>
<td>relaxed</td>
</tr>
<tr>
<td>simple</td>
</tr>
<tr>
<td>strange</td>
</tr>
</tbody>
</table>
data analysis

- repeated measures ANOVA
  - between-subjects
    - experimental condition
    - gender
    - age level (college – HS)
  - within-subjects
    - video game segment
    - VAME scale
results

- between subjects variables
  - no main effects or interactions
- within-subjects variables
  - highly significant main effects & interactions
Significant Differences
(within-subjects)

- main effects
  - VAME scales ($F(20,1280)=22.606, p<.0005$)
  - age level ($F(20,1280)=1.760, p=.020$)
  - game segment ($F(40,2560)=1.464, p=.031$)
  - experimental condition ($F(40,1280)=1.522, p=.020$)

- interactions
  - gender x game segment ($F(40,2560)=1.657, p=.006$)
  - age level x game segment ($F(40,2560)=1.622, p=.008$)
  - VAME scales and experimental condition ($F(80,2560)=1.330, p=.028$)

  confirming that the verbal ratings provided by participants do appear to be significantly influenced by the presence or absence of music.
a 2\textsuperscript{nd} ANOVA was calculated for each VAME scale independently to determine which specific scales were influenced by experimental condition

- increase in probability of \textit{alpha} determined appropriate for such an exploratory investigation
  - revised \textit{alpha} = 1 – (.95 \times .95) = .0975
VAME scales revealing NO significant difference

- **Evaluative**
  - cold
  - good
  - pleasant

- **Activity**
  - active

- **potency**
  - exciting
  - gentle
  - high
  - intense
  - loud
  - powerful
statistical significance

- experimental condition
  - colorful, dangerous, relaxed, simple
- experimental condition x gender
  - dangerous, busy
- experimental condition x game segment
  - annoying, strange
- experimental condition x age level
  - labored
experimental condition main effect

Group Differences - Main Effects

- Mean Rating
- Experimental Condition:
  - game without music
  - music only
  - game with music

- Colorful
- Dangerous
- Relaxed
- Simple
experimental condition main effect

Group Differences - Main Effects

Mean Rating

- colorful
- dangerous
- relaxed
- simple

Experimental Condition

game without music  music only  game with music

additive
Experimental condition main effect

![Graph showing mean ratings for different experimental conditions.](image)

- **Mean Rating**
  - Colorful
  - Dangerous
  - Subtractive
  - Simple

- **Experimental Conditions**
  - Game without music
  - Music only
  - Game with music

The graph illustrates the main effects of group differences across various experimental conditions, highlighting key trends and comparisons.
Musical transference
experimental condition main effect

Group Differences - Main Effects

Mean Rating

- colorful
- dangerous
- relaxed
- simple

Experimental Condition:
- game without music
- music only
- game with music

combinatorial negativity
some, but not all, of the VAME scales exhibited a statistically significant difference due to the presence of a musical score.

both gender and age level were shown to be significant factors for some, but not all, of the VAME scales.

recall that there were NO statistically significant differences in the main effects for these between-subjects variables.
Conclusions

confirm Yamada’s conclusion that there is a highly complex and varied relationship between the musical component and the game playing experience

identified specific *types* of relationships between music & other A-V components
types of music-visual relationships

- **additive**: rating for the GwoM is lowest with a higher rating for MO, but the GwM combination is rated highest
- **subtractive**: GwoM rating is highest and MO is lower, but GwM is the lowest
- **musical transference**: rating of GwM is nearly identical to MO condition, regardless of GwoM rating
  - visual transference: [hypothesized]
- **combinatorial negativity**: GwoM & MO ratings are nearly identical, but the combination (GwM) results in a significantly lower rating
future research

- series of studies using same method to determine to what extent these results can be generalized to other gaming contexts
  - other RPGs
  - other types of video games
Thank you for your attention

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References


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