

Pleasantly frustrating, educationally useful?

Motivational effects of game checkpoints



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Introduction/Background

- In teaching–learning contexts, failure is often negatively viewed, potentially leading to avoidance behavior [1].
- By contrast, video games are characterized by cycles of trial and error, which are precisely what sustain their motivational impact; this has been described as ‘pleasantly frustrating experiences’ [2] and ‘graceful failure’ [3].

Research questions: (a) What are the relationships between typical game mechanics that foster learning through trial and error, frustration, competence experiences, and persistence? (b) What are the possible mechanisms by which video games enable failure to be experienced as motivating learning experiences?

Methods

- Typical game mechanic [4] for learning via trial and error: **checkpoints** that prevent total loss of progress after failure.
- Frequently used in platform games (e.g., Super Mario).
- For this study, two versions of an in-house 2D platform game were developed: one with and one without checkpoints.
- $n = 172$ participants were assigned to one of the two versions.

Experimental procedure

Investigated constructs

- **Change in experienced frustration** from before to after 20 minutes of play (7-point scale; EES-D [5]).
- 3 facets of **intrinsic motivation** (**interest and enjoyment**, **perceived competence**, **pressure/tension**; 3 items each, 5-point scale; KIM [6]).
- **Satisfaction/Frustration of basic psychological needs** (**autonomy**, **competence**, **relatedness**; 7-point scale; BANGS [7]).

Participants

- 86 female, 81 male, 5 non-binary.
- 18-62 years, $M = 26.53$, $SD = 8.66$.
- Video game experience: 33% low, 46% moderate, 21% high.

Results

Manipulation check: How did checkpoints affect gameplay behavior?

More completed levels: $p < .001$, $d = 0.59$ [0.29, 0.93]
More collected coins: $p = .003$, $d = 0.47$ [0.17, 0.79]
More failure (player demise): $p = .001$, $d = 0.50$ [0.21, 0.83]

➔ **More exploration, experimentation, trying things out?**

Relationships with changes in frustration and motivational aspects:

Less increase in frustration: $p = .006$, $d = 0.47$ [0.12, 0.84]
More perceived competence: $p = .004$, $d = 0.49$ [0.16, 0.81]
More pressure/tension: $p = .009$, $d = 0.44$ [0.10, 0.81]

➔ **Smaller increase in frustration; players feel more capable, but also have higher expectations?**

How do checkpoints affect the satisfaction/frustration of basic psychological needs?

➔ No significant difference in competence need satisfaction ($p = .631$), but **lower frustration** of this need when checkpoints are present ($p = .631$, $d = 0.44$ [0.11, 0.76]).

Possible mechanism underlying the effects of checkpoints:

Indirect effect: $ab = -0.39^*$ [-0.71, -0.09]
* $p < .05$, ** $p < .01$, *** $p < .001$

Summary and conclusions

- Checkpoints reduce the negative consequences of failure, thereby encouraging exploration and experimentation.
- This is associated with a smaller increase in frustration, greater perceived competence, but also higher expectations.
- Checkpoints do not enhance competence-need satisfaction, but they reduce competence-need frustration.
- This might free resources otherwise bound to affective regulation of failure for cognitively productive processes: focus can shift from affective processing of frustration to cognitively dealing with the challenge.