Videogames as a Learning Tool: Measuring the efficacy of Game-Based Learning Interventions

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Pedagogical Value of Videogames

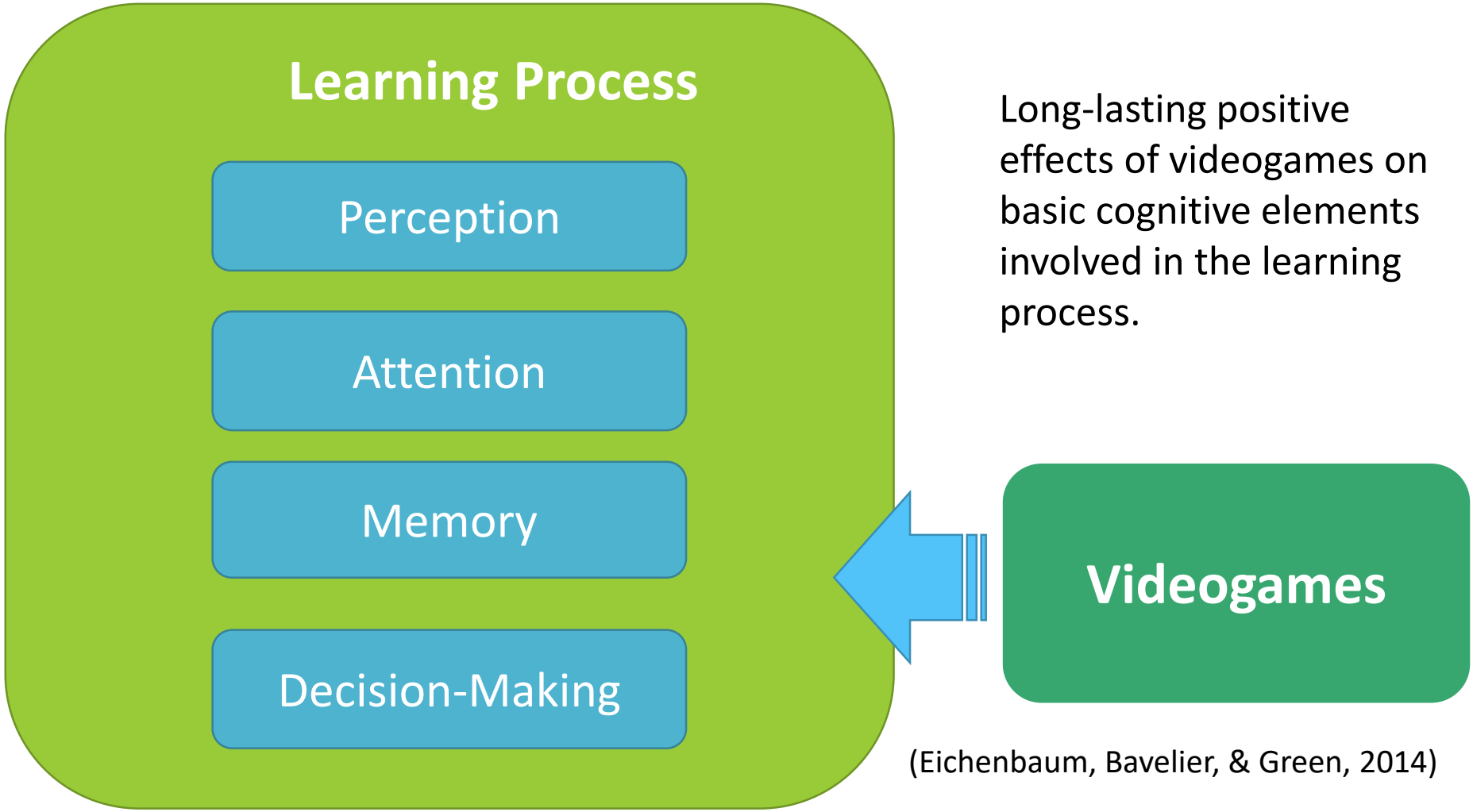
The potential of video games in learning has been increasingly studied and supported.

(Ashinoff, 2014)

- Its complexity requires the coordination of a number of variables, such as understanding complex processes, managing diverse social networks (such as teams or clans), and creative expression with digital tools.

(Squire, 2008)

Pedagogical Value of Videogames



Long-lasting positive effects of videogames on basic cognitive elements involved in the learning process.

(Eichenbaum, Bavelier, & Green, 2014)

Systematic Review with Metanalysis

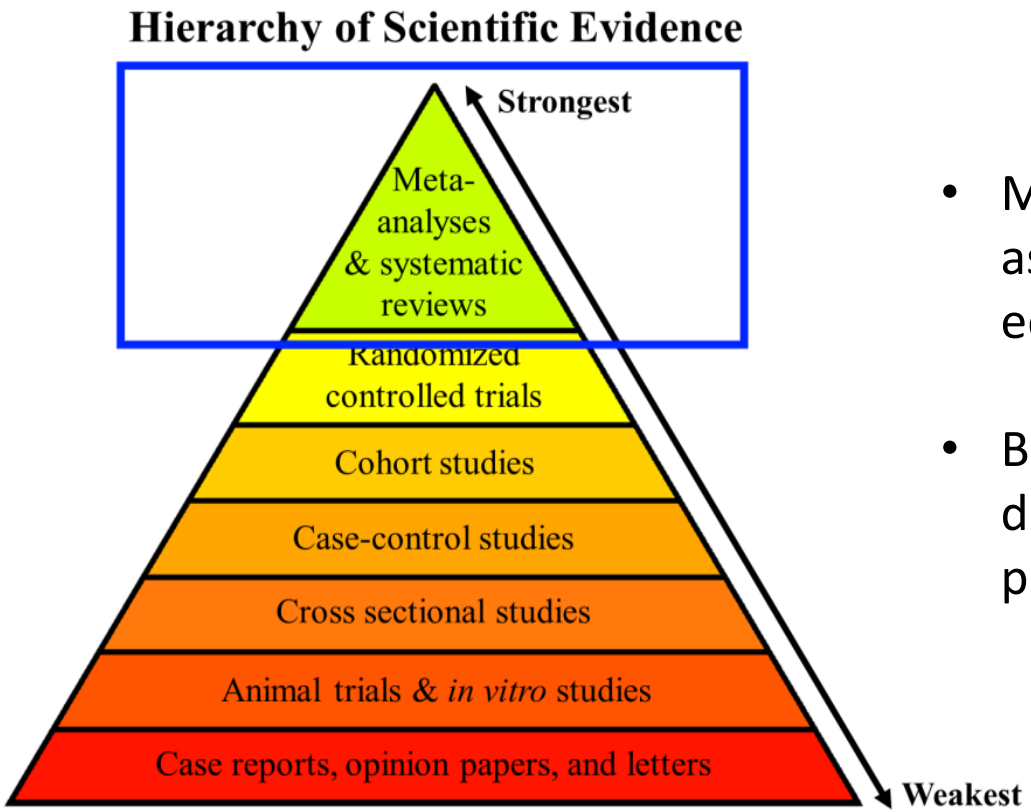
- Aims to bridge the gap between scientific research and policy through systematic synthesis of research findings (Sánchez-Meca and Marín-Martínez, 2010).

Relevant Points

- Provides knowledge base for policy-makers and practitioners;
- Helps to identify knowledge gaps and prevailing degrees of uncertainity;
- Promotes the cumulative development of science.

(Sutton, 2000)

Metanalysis in Education



(Shwab, 2015)

- Metanalysis has been increasingly used as a research design in the field of education;
- Between 1976 and 2011, a review of databases found a total of 5206 publications in this field.

(Ahn, Ames and Myers, 2012)

Objective

Summarize the learning improvements obtained with GBL approaches with RCT, materializing a meta-analysis procedure.

- To provide data on the efficacy of Game-based Learning interventions;
- To legitimate de role videogames can assume in the learning process, and their pedagogical value.

Method

Systematic search of existing databases

Scientific Databases

- B-ON;
- EBSCO;
- PUBMED;
- ACM;
- IEEE.

Researchers Social Networks

- Researchgate;
- Academia.edu

Trying to acess *grey literature* "produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers"

(Farace, 1998)

[game-based learning AND (randomized control trial OR rct) AND (videogames OR digital games)]

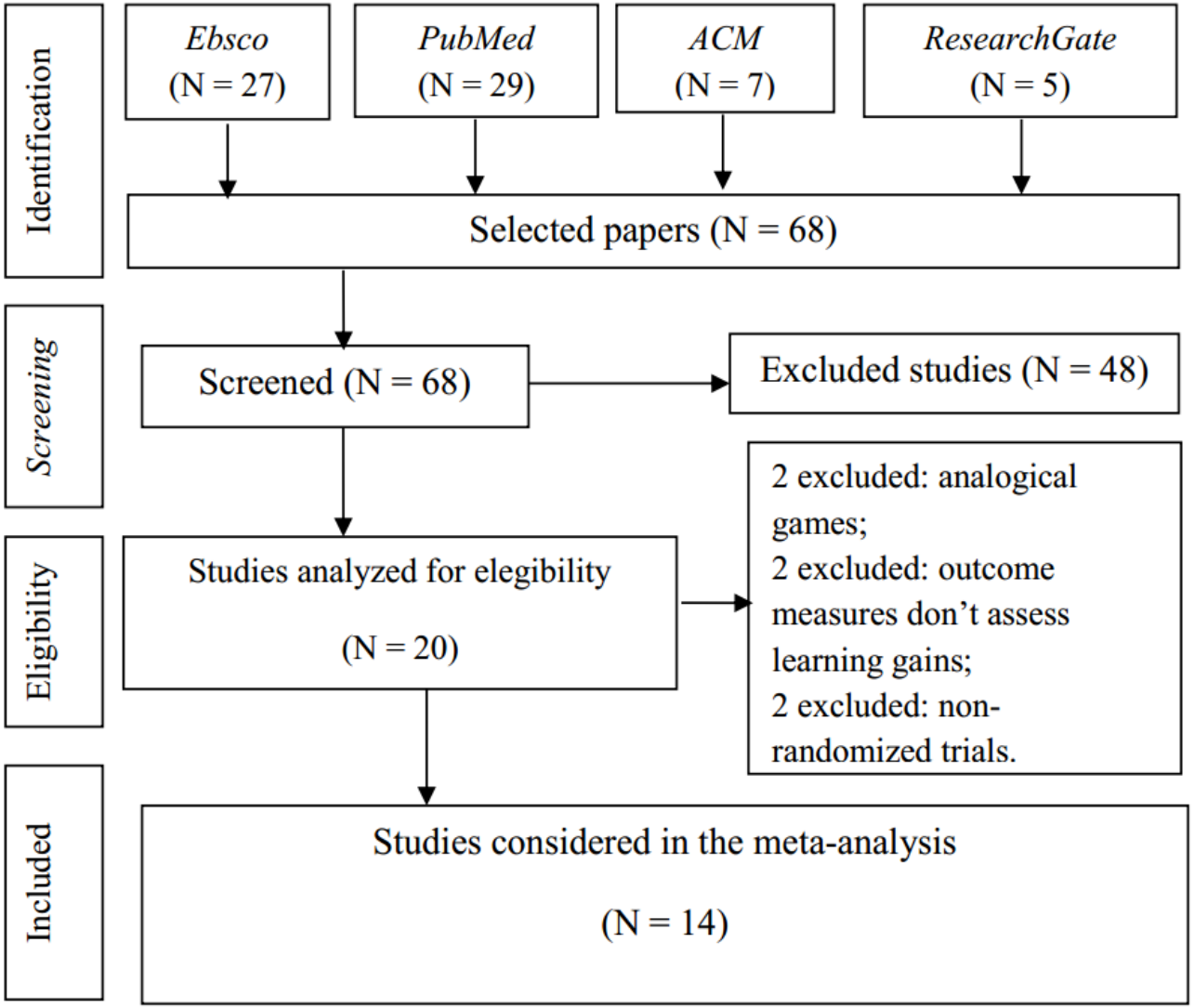
Method

Sample Inclusion Criteria

- Experimental research design, using Randomized Control Trials;
- Use digital GBL strategies (videogames) with clear learning objectives;
- Outcome measures to evaluate concrete learning gains;
- Compare learning gains with gains obtained using a traditional approach (without videogames).

- Analogical GBL approaches weren't considered (e.g. Board Games, Card Games, etc…) -

Method


Identification
Ebsco (N = 27)
PubMed (N = 29)
ACM (N = 7)
ResearchGate (N = 5)
Selected papers (N = 68)
Screening
Screened (N = 68)
Excluded studies (N = 48)
Eligibility
Studies analyzed for elegibility (N = 20)
2 excluded: analogical games;
2 excluded: outcome measures don't assess learning gains;
2 excluded: non-randomized trials.
Included
Studies considered in the meta-analysis (N = 14)

Data Analysis

1st

- Categorization of each study main characteristics
  - Year of publication;
  - Sample size (N);
  - Context of the study;
  - Population;
  - Learning goals;
  - Outcome measures;
  - Type of videogame (depending on author's definition);
  - Platform.

Statistical Package for the Social Sciences (IBM SPSS), version 22

2nd

- Studies were analyzed considering the reported results

Comprehensive Meta-Analysis Software (CMA), version 2

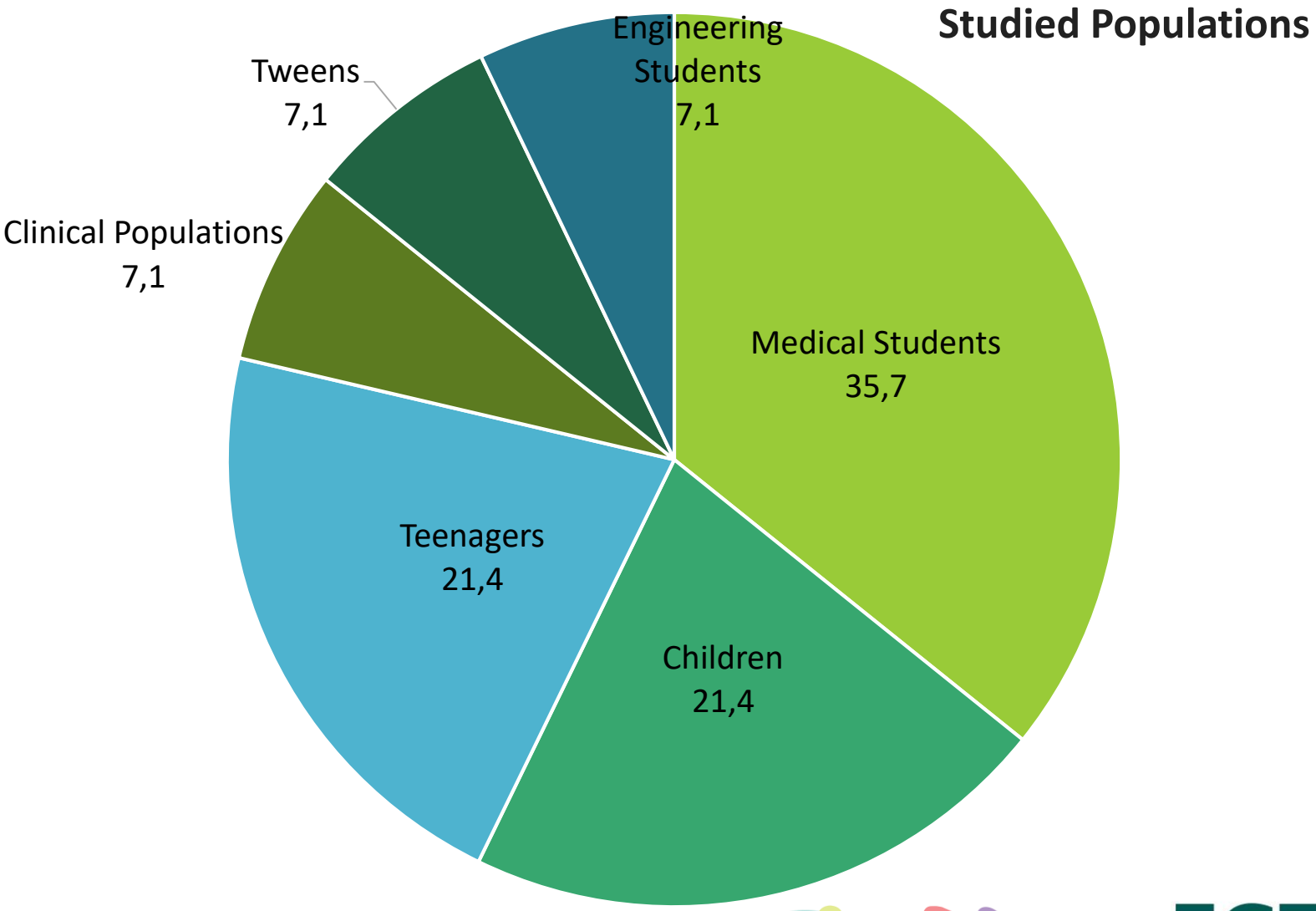
Results

- Total sample of 1685 subjects, with an average of 120,35 individuals per included study;

- Studies are from the last 10 years (most recent scientific evidence in the field of learning through videogames);

Year of Publication	
2017	1 (7,1%)
2016	2 (14,3%)
2015	1 (7,1%)
2014	3 (21,4%),
2013	2 (14,3%)
2010	1 (7,1%)
2009	2 (14,3%)
2008	1 (7,1%)
2007	1 (7,1%)

Results



Results

Videogames are used to improve learning in several areas/subjects

- Medical Practices;
- Health Literacy;
- Physics;
- Computer science;
- Mathematics;
- Science;
- History;
- Pedestrian safety;
- Engineering principles.

Context of the Studies

- Higher Education (42,9%);
- Basic Education (28,6%);
- Secondary Education (21,4%);
- Clinical Rehabilitation (7,1%).

Results

Types of Videogames

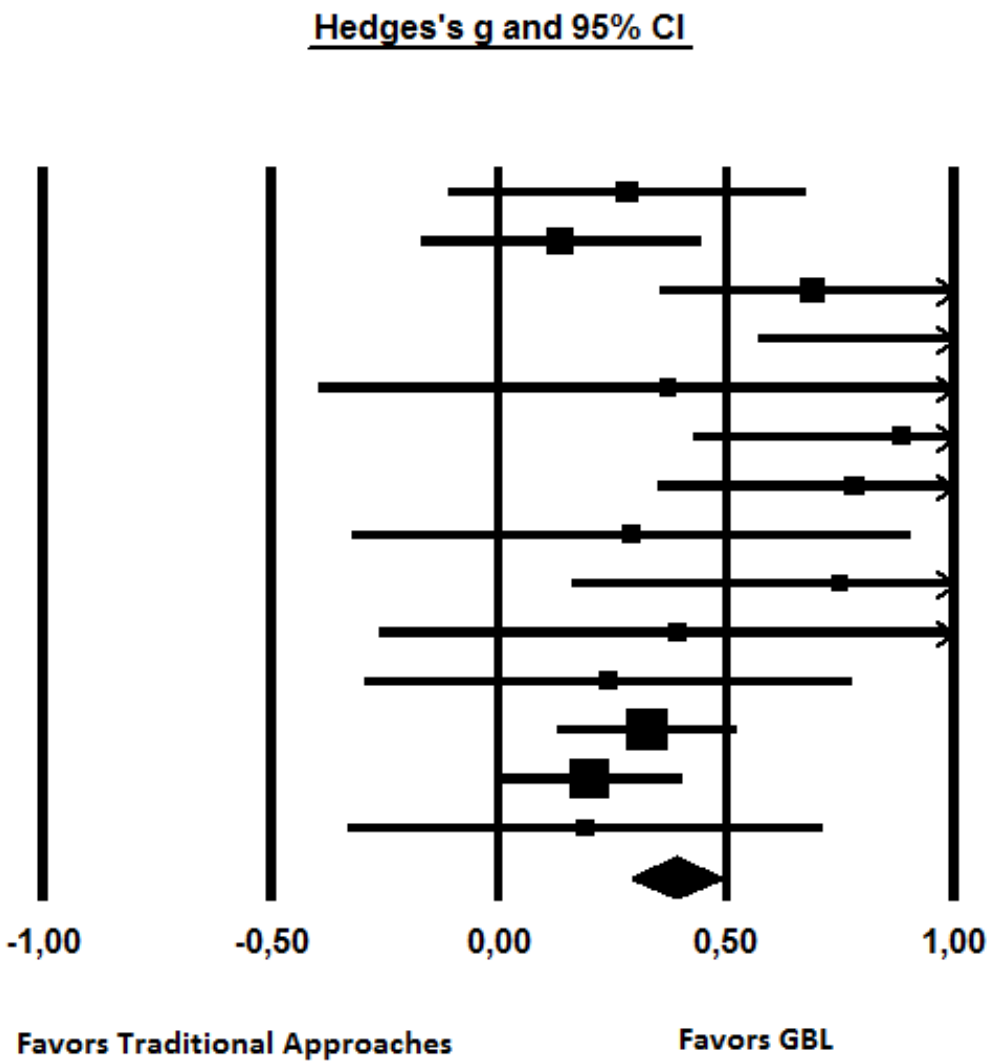
- Educational games (28,6%)
- Serious games (28,6%)
- Computer-based board games (14,3%)
- Role-playing games (7,1%)
- Simulation games (7,1%)
- Quizzes (7,1%)
- Virtual reality games (7,1%)
- GPS/location based games (7,1%)

Platform

- PC (57,1%);
- Web-based games (28,6%);
- Games for smartphone (7,1%)
- Nintendo Wii® (7,1%)

Web-based games were considered separately, since they can assume a multi-platform use (PC, smartphone, tablet, etc.).

Results



(Using a fixed-effect analysis)

- The effect ratio for the 14 studies is 0,387;
- Confidence interval of 0,291 - 0,484;
- Game-Based Learning approaches can increase the learning process outcomes by 28% - 47% in comparison with traditional approaches (expository or self-study).
- Z = 7,870, SE = 0,049, p <.001

Discussion

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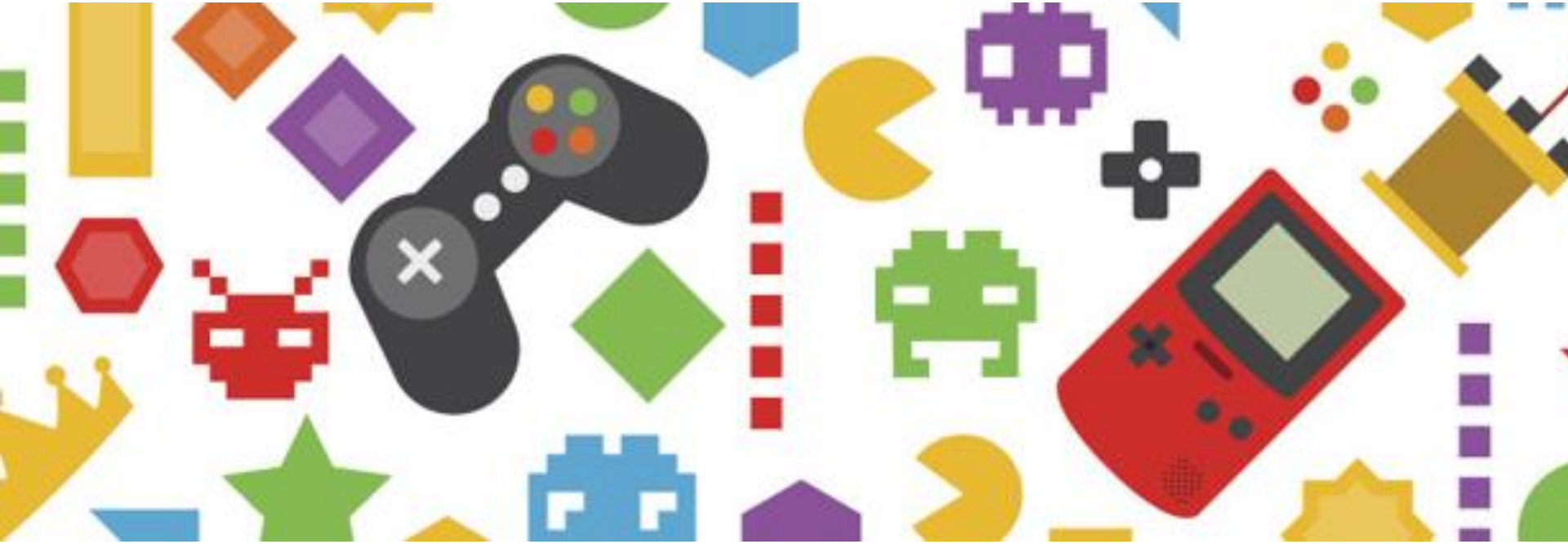

gami LEARNING

UNIVERSIDADE LUSÓFONA

VIDEOGAMES AS AN ART FORM

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA