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### OBJECTIVES:

The goal of this review is to scratch the surface of the published research, case reports, and commentaries that describe the use of learning games and virtual learning simulations and environments within health contexts.

#### Questions prompting this literature review include:

- What does the literature tell us about the use of health games, sims, and virtual worlds?
- What studies or levels of evidence are represented in the published literature to date?
- What medical subject headings are assigned to the indexed articles?
- Does the current body of literature reveal any trends?

### BACKGROUND:

As graphic computer technologies mature and are increasingly incorporated into the mainstream, serious games and virtual learning environments are appearing as viable tools in healthcare settings. Coverage of interactive, immersive, health-based applications in the news media often provides the first glimpse of innovative approaches combining game play with traditional healthcare, behavioral interventions, medical training, life-style changes and communication of health information.

The ultimate effects, both positive and negative, of serious learning games for health or serious games as tools for prevention, intervention, training, therapy and educational approaches are still a mystery and a source of confusion for many. Computer/video games are often portrayed as harmful. Yet, there are signs on the horizon that attitudes are changing. Exercise games such as *Wii Sport*, *Wii Fit* and *Dance Dance Revolution (DDR)* are proving not only inviting and engaging, but also healthful.

Three concurrent channels of change are converging to impact the way we learn, teach and communicate healthcare information.

1) The rapid evolution of advanced technologies is making it much easier to develop and access sophisticated immersive, interactive digital spaces.

2) There is a growing realization that interactive learning can be both fun and effective. Game theory and the principles of game play can be valuable “wrappers” for serious information and applications.

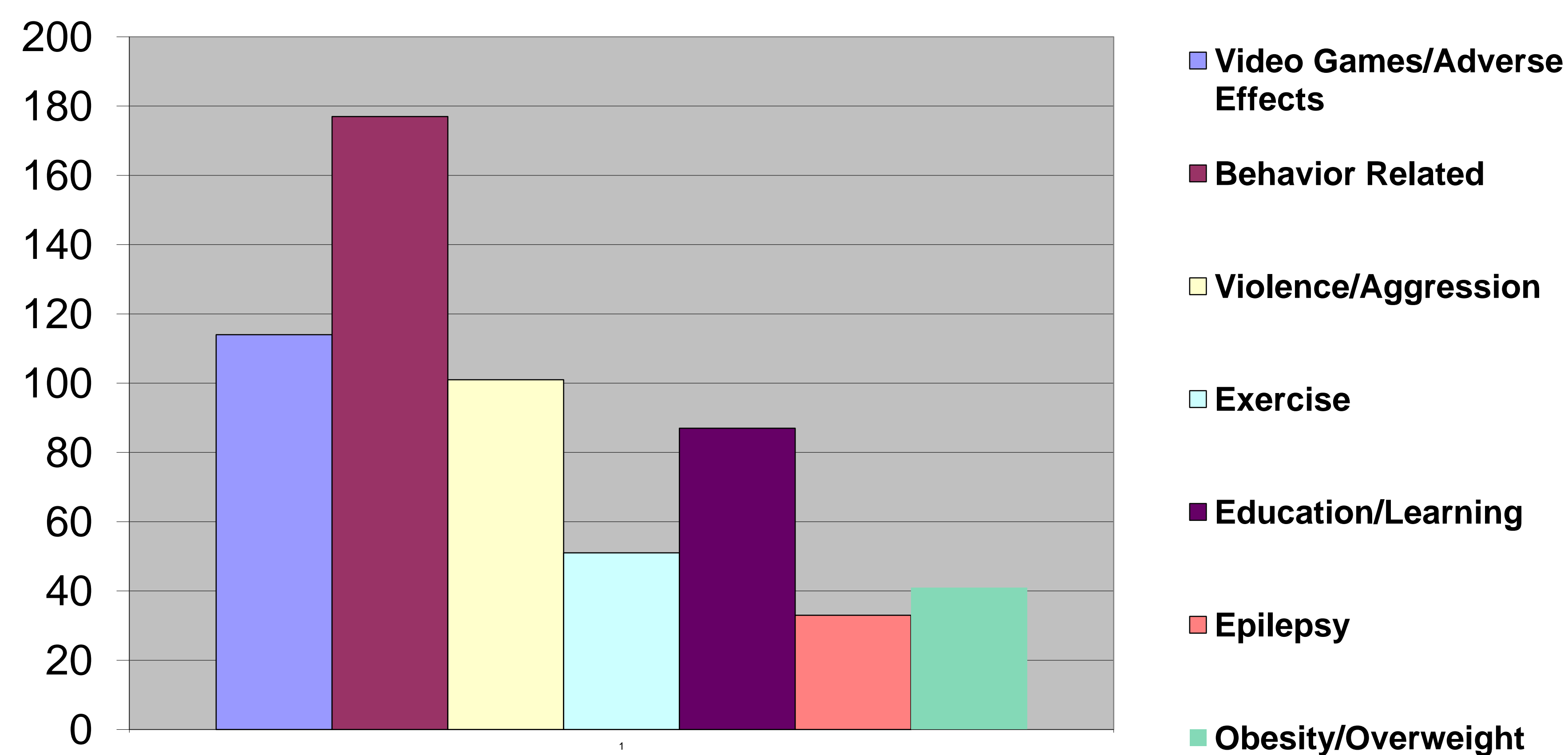
3) There is a growing level of expectation among children, adolescents and young adults that communication, learning and daily tasks should be interactive, engaging, challenge the senses and incorporate the best of evolving technologies.

As the number of game-related products, applications and studies extend their reach across generations, ethnic groups, genders, socio-economic levels, learning environments and health-related disciplines, it is time to take a closer look at what the research tells us. As the number of serious games and games for health continue to increase, it is important to measure their vital signs, to assess their efficacy and plot their impact.

This review organizes published literature indexed in PubMed/MEDLINE that reflects an emphasis on computer/video games in conjunction with health topics. The review looks at the major health issues discussed, levels of evidence found among the results, the volume of publications over the years and journals represented.



### Index Terms\* Most Frequently Assigned



### METHODOLOGY:

**PubMed/MEDLINE** <<http://pubmed.gov>> was chosen as the only database for this literature search because of its size (over 18 million articles indexed), its scope (largest biomedical database) and because it is easily accessible to all via the Internet.

**The search used the medical subject heading (MeSH) “Video Games.”** This MeSH term was chosen because it most closely defines the parameters of serious games, virtual simulations and virtual worlds under consideration. This term was introduced to PubMed/MEDLINE in 1996. Its definition is “a form of interactive entertainment in which the player controls electronically generated images that appear on a video display screen. This includes video games played in the home on special machines and on home computers, and those played in arcades.”

**References to gambling were excluded.** Final search construction is “Video Games[MeSH]” NOT gambli\*. Search was **limited to humans and by date range:** 12/31/1990 – 12/31/2008. Some older records with dates before 1996 are included due to reverse indexing by the National Library of Medicine.

**625 unique article records were retrieved during the initial search.** Articles, in the citation display mode, were moved to a bibliographic management system (RefWorks) and then to a Microsoft Excel spreadsheet. Because subject headings for each citation transferred to one cell in the spreadsheet, these had to be manually separated to permit data sorts. This might have introduced some margin of error.

**ONLY major MeSH terms were analyzed** due to the numerous subject terms assigned to many individual records. Concentrating on the major emphases of each article was sufficient for this review.

Once the spreadsheet represented all distinct citation fields, **separate data sorts were performed for major MeSH terms**, for years of publication, publication types and journal titles. Sub-sorts were performed to capture numbers found in each category.

### CONCLUSIONS:

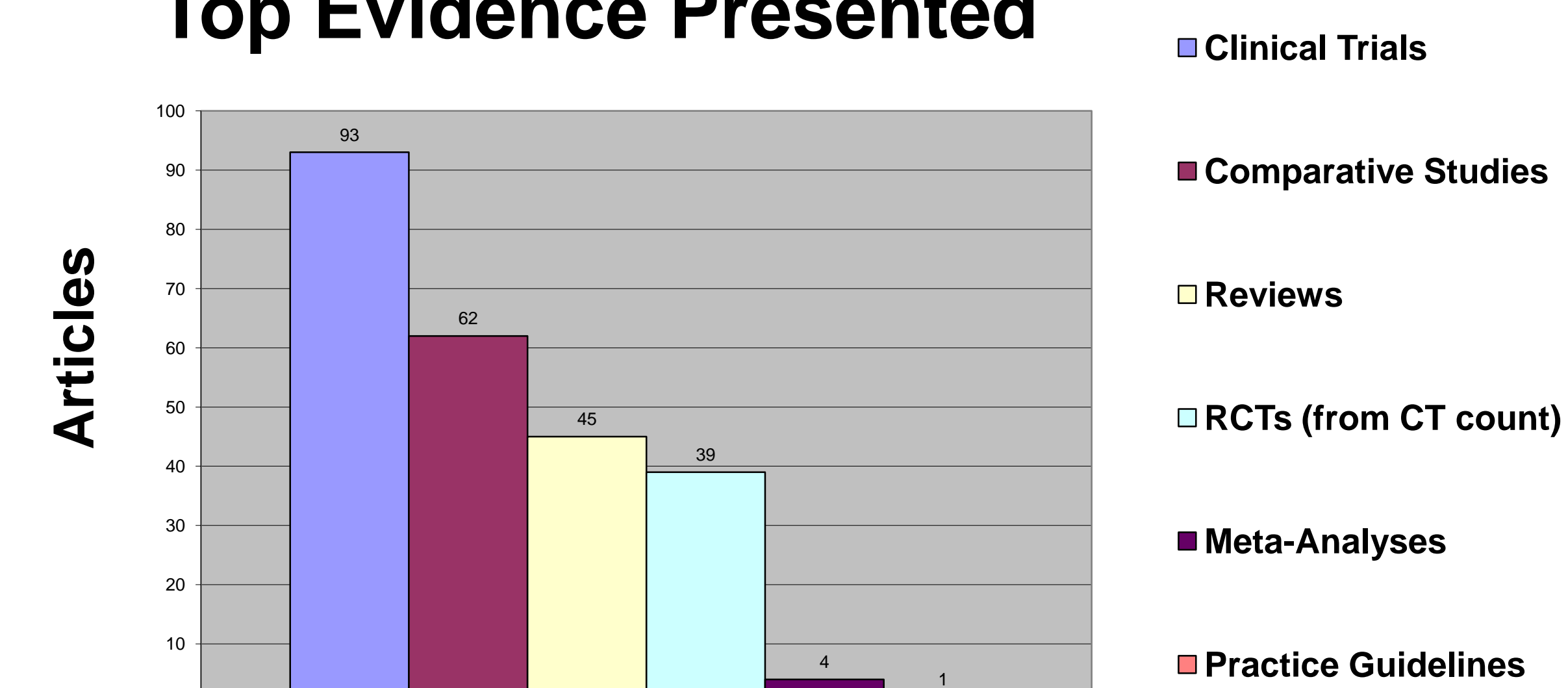
This literature review aims to capture an overview of the published literature available through 2008 which, in some fashion, deals with video games and health-related topics and issues. It is a snapshot, not an inclusive review. Searching only PubMed/MEDLINE provides a baseline, but should not be construed as definitive or exhaustive research. It is a beginning.

#### Findings include:

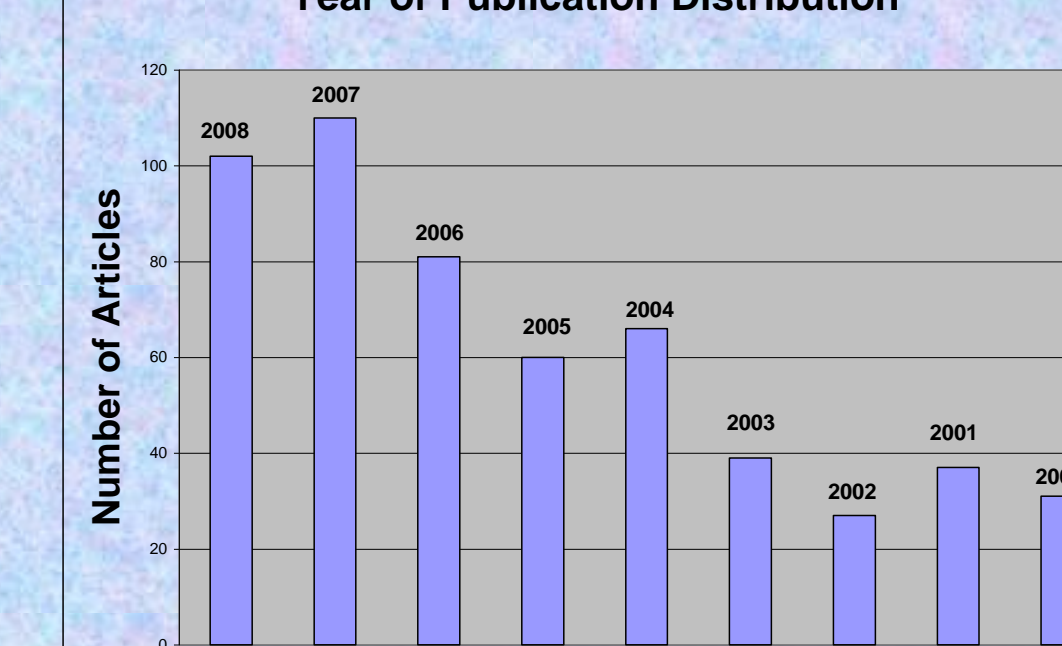
- Literature in this area is growing in volume
- New technologies are being incorporated into health contexts
- Detect shift away from analyzing negative impact to exploring health benefits
- Indexed literature of virtual worlds, e.g. Second Life, is still limited

Two identifiable areas of study exist - one looking at potential uses of serious games/sims in structured environments to improve health and, the second, as extracurricular activities associated with adverse effects.

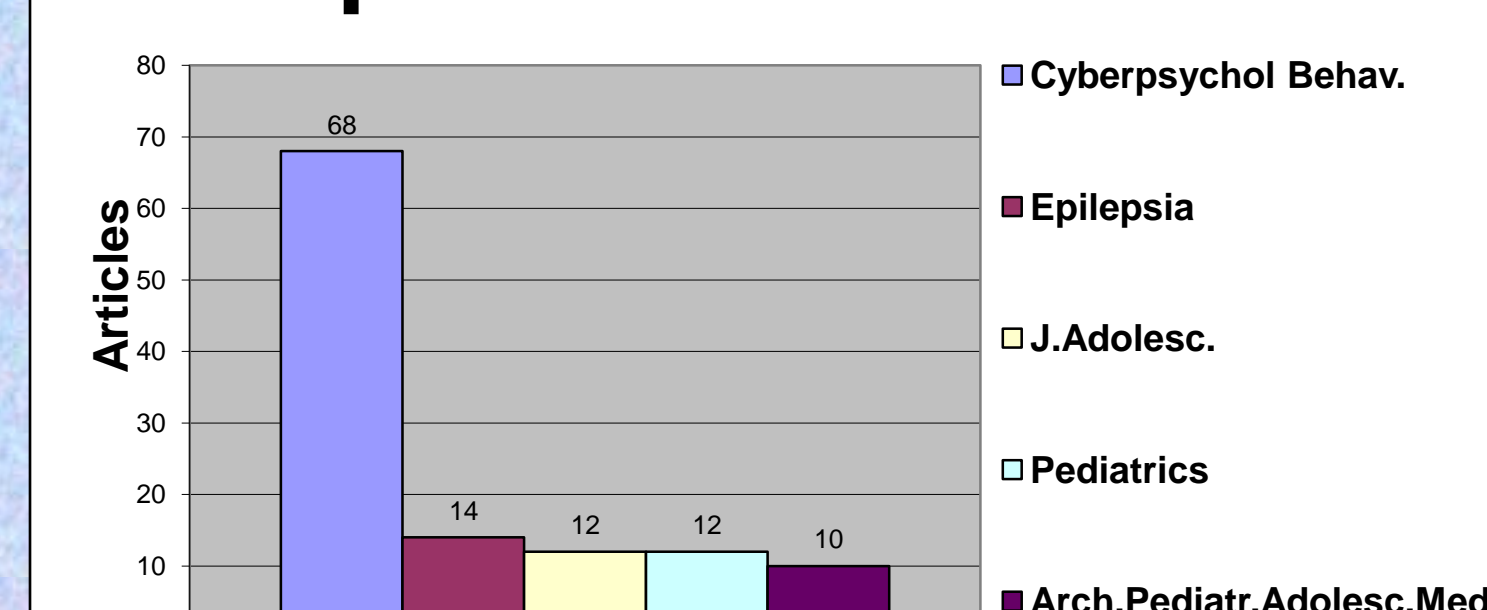
### Top Evidence Presented



### Year of Publication Distribution



### Top Cited Journals



### CONTINUING RESEARCH:

#### Future refinements to the research should include:

- Search additional databases, e.g., PsycINFO, ERIC, EMBASE, CINAHL
- Use MyNCBI and RSS updating features to capture running count of new records
- Expand MeSH and keyword terminology in PubMed/MEDLINE
- Include running count of most recent and non-indexed records in PubMed/MEDLINE

