Evidence-Based Practice and Research: A Challenge to the Development of Adapted Physical Activity

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Evidence-based practice (EBP) is a growing movement in the health and educational disciplines that recommends emphasis on research outcomes during decision making in practice. EBP is made possible through evidence based research (EBR), which attempts to synthesize the volume and scientific rigor of intervention effectiveness. With the purpose of assessing the impact of this movement on adapted physical activity, this article (a) describes EBP/EBR and outlines its methodological development, (b) provides an historical perspective of EBP/EBR in APA, (c) examines EBR quality indicators in the review literature published in Adapted Physical Activity Quarterly, (d) identifies and synthesizes thematic domains appearing in these review articles, and (e) discusses practical examples of professional issues in APA arising from a lack of EBR.

How does a practitioner in adapted physical activity (APA) know that the program he or she has designed for a specific individual or group is the most effective one possible? Should it be based on the content of lectures and seminars from teacher or other professional education? Should it be based on the experience delivering the program? Should it be based on a continuous assessment of the scientific literature? Practitioners in many professions face situations requiring decisions, and they seek sources of information to assist them in selecting the most effective route. For example, a teacher in an inclusive setting may wonder if peer tutors would be effective in promoting skill acquisition for students with autism spectrum disorders without having a negative impact on students without a disability.

The aim of this article is to describe the terms “evidence based practice and research” (EBP/EBR) and assess its impact within APA. Specifically, the purpose is (a) to describe EBP/EBR and to outline its methodological development, (b) to outline an historical perspective of EBP/EBR in APA, (c) to examine EBR quality indicators in the review literature appearing in the field’s scholarly journal Adapted Physical Activity Quarterly (APAQ), (d) to identify and synthesize thematic domains appearing in these review articles with regard to disability conditions and content areas, and (e) to describe and discuss practical examples of professional issues.
arising from a lack of EBR. Based on these perspectives, a summarizing discussion will generate recommendations with regard to employing EBR in APAQ and across the APA field of study for establishing EBP.

**Evidence-Based Practice and Research**

Evidence-based practice (EBP) is the label for a movement begun in the medical sciences that is increasingly influencing the behavioral and educational sciences, aiming to use the current best research evidence with regard to practice (Sackett, Rosenberg, Muir Gray, Haynes, & Richardson, 1996). The term EBP is attributed to Archie Cochrane, a British physician and epidemiologist, who contributed greatly to the development of systematic literature appraisal for guiding research and practice. Cochrane’s text (1972) on the effectiveness and efficiency of medical interventions was the first to clearly acknowledge the importance of randomized controlled trials (RCTs) in evaluating the effectiveness of interventions, and his work led to the establishment of the Cochrane Collaboration world-wide endeavor dedicated to tracking outcome effects published in medical journals and evaluating their impact.

Although the assessment of previous clinical experience for actual practice has been performed since the early stages of medicine and other applied sciences, EBP is considered a new movement in the medical, other clinical, behavioral, and educational professions, due to its systematic approach. Using systematic and objective analyses of the scientific literature, the EBP movement adds a rational element into the decision-making environment, empowering the practitioner to critically review practices rather than to rely predominantly on personal experience and expert recommendation (Evidence-Based Medicine Working Group, 1992; Guyatt et al., 2004). For example, individual studies have strongly supported the effectiveness of using peer tutors in inclusive physical education settings (see Block & Obrusnikova, 2007 for a review and newer outcomes of Klavina & Block, 2008). Nevertheless, many physical education practitioners still do not engage peer tutors. Moreover, some of them continue to believe that inclusion of children with disability in their classes may disrupt the level of skill acquisition among their typically developing peers (Aufsesser, 1991; Block & Zeman, 1996; Lavay & DePaepe, 1987). One aim of the EBP perspective in APA could be to educate practitioners and attempt to change such erroneous beliefs (Jin & Yun, 2010).

EBP can be described as a three-legged model (Figure 1), originally proposed by Haynes, Devereaux, and Guyatt (2002) and reaffirmed for the behavioral and educational sciences by Spring (2007) and Paynter (2009). The three legs include (a) the best available research evidence provided by researchers and synthesized through qualitative appraisals of content compiled through systematic searches; (b) clinicians or practitioners who use evidence within their decision-making process to counterbalance potential bias and missing knowledge; and (c) patients or service recipients, who may have their own insights from previous experience, general knowledge, and intuition and who should ultimately approve the proposed intervention. Although this article focuses solely on the first leg—best research evidence—the importance of the other two legs (practitioners and service recipients’ perspectives) should not be diminished.
Thus, it becomes clear that EBP is made possible through evidence based research (EBR), which aims to systematically identify, evaluate, and disseminate practices that have scientific evidence of effectiveness (Odom et al., 2005). EBR includes systematic reviews, meta-analyses, and individual data-based studies directed at developing the scientific reasoning for practice-related decisions. An EBR systematic review typically includes (a) problem identification and definition, (b) searching and tracking for literature evidence, (c) critically analyzing and appraising the strength of retrieved evidence, and (d) formulating conclusions and solution statements for practical use (McKinlay, McLeod, Dowell, & Howden-Chapman, 2001; Tannenbaum, 1999).

**Methodological Development of Evidence Based Practice and Research (EBP/EBR)**

During the 1990s, the EBP/EBR movement encountered many controversies with regard to fundamental aspects such as (a) the epistemological meaning of evidence (see Loughlin, 2006; Tonelli, 2006); (b) the evidence of EBR, that is, this procedure...
indeed improves treatment outcomes (Miles, Polychronis, & Gray, 2006); and (c) the decision-making process based on EBR (Haynes, Devereaux, & Guyatt, 2002; Spring, 2007). Nevertheless, it has had an enormous impact on the world of medicine and allied health professions (Guyatt et al., 2004; Maxwell, 2005; Schünemann, Fretheim, & Oxman, 2006). Health granting agencies, as well as service providers and recipients, increasingly require evidence supporting the effects and efficiency of existing health treatments. Thus, literature analyses assessing the quality of evidence have often become a prerequisite for grant approval or provision of financing services. Over one hundred data bases have flourished, utilizing quality indicators for appraising the level of individual research articles, building hierarchies within systematic literature analyses of EBR (Horner, Carr, Halle, McGee, & Odom, 2005) and ultimately becoming decision-making aids (Ebell et al., 2004).

Table 1 summarizes selected dimensions of evidence proposed within some of the most popular EBR databases. The Centre of Evidence Based Medicine (Oxford): CEBM (2009) is one of the most widely cited sources and is used in a variety of areas for scholarly research (see Atkins et al., 2004; Wright, Swiontkowski, & Heckman, 2003). It includes five main levels of evidence and several subcategories, rating the content of research articles (on a range of 1a = highest to 5 = lowest). In contrast, the Strength of Recommendation Taxonomy (SORT; 2009) is more suited to laymen, and therefore incorporates only three levels (on a scale of I = highest to III = lowest). The Cochrane Collaboration was acknowledged earlier as a follow-up endeavor of Cochrane’s mission. It gathers international scientists in an effort to provide meaningful literature analyses to health service practitioners and clients. This Collaboration has developed a five-point (I to V) scale for rating levels of scientific evidence. The American Academy for Cerebral Palsy and Developmental Medicine (AAC-PDM) is an example of a professional organization maintaining EBR guidelines (Ashwal et al., 2004), also using a five-point rating scale. Levels of evidence in most of these data bases typically appraise the systematic review and meta-analysis as the highest level of evidence, RCT as the second level, controlled studies with good methodology at a lower level, and case studies at the very lowest level of appraisal. Quasi-experimental or qualitative research is usually excluded or relegated to a low level of evidence in these sources. The Physiotherapy Evidence Database, PEDro (Centre for Evidence-Based Physiotherapy, 2009), is another example of a database in the movement sciences and utilizes a system of 11 categories to assess and indicate the quality of individual research articles (Table 2). The PEDro scale is based on the Delphi list developed by Verhagen and colleagues at the University of Maastricht (Verhagen et al., 1998). This system is often used for the purpose of ranking an article’s contribution to the body of evidence within systematic reviews. While most scales assessing evidence have not yet undergone rigorous scientific validity and reliability procedures (Swinglehurst, 2005), professional communities of practitioners in both physical therapy (Centre for Evidence-Based Physiotherapy, 2009) and occupational therapy (OTSeeker, 2009) have recently began providing reliability and validity criteria for the systems they use (e.g., Maher, Sherrington, Herbert, Moseley, & Elkins, 2003; Tooth et al., 2005). Since the diffusion and variety of available tools may confuse the practitioner (Ebell et al., 2004), it has become necessary to develop an appropriate system capable of coping with the specific issues defined within a particular field of study (Medina, McKeon, & Hertel, 2006).
<table>
<thead>
<tr>
<th>CEBM for Therapy/Prevention/Etiology/Harm</th>
<th>SORT #</th>
<th>Cochrane Library $</th>
<th>AAC PDM @</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a SR (with homogeneity) of RCTs</td>
<td>1</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High-Quality patient-oriented evidence</td>
<td>Good systematic review and meta-analysis (including at least one randomized control trial)</td>
</tr>
<tr>
<td>1b Individual RCT (with narrow confidence interval)</td>
<td></td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>1c All or none case-studies §</td>
<td></td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>2a SR (with homogeneity) of cohort studies</td>
<td></td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>2b Individual cohort study, including low quality RCT; (e.g., &lt; 80% follow-up)</td>
<td>2</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>2c “Outcomes” Research: Ecological studies</td>
<td></td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>3a SR (with homogeneity) of case-control studies</td>
<td></td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>3b Individual case-control study</td>
<td></td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>4 Case series (and poor quality cohort and case-control studies)</td>
<td></td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td>5 Expert opinion without explicit critical appraisal, or based on physiology, bench research, or “first principles”</td>
<td>3</td>
<td>IV</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disease-oriented outcomes; Bench research; Anecdotal evidence; Expert opinion</td>
<td>Expert opinion, influential reports, and studies</td>
</tr>
</tbody>
</table>

Notes. SR = Systematic Reviews; RCT = Randomized Controlled Trial; § Met when all patients died before the treatment (Rx) became available, but some now survive on it, or when some patients died before the Rx became available, but none now die on it.


# Ebell et al., 2004.

$ Cochrane Library, 2009.

@ Ashwal et al., 2004.
In addition, while attempting to develop appropriate systems for appraising research in the behavioral and educational sciences, several concerns have been recognized: (a) The volume of published research in these sciences is six to 12 times smaller than in medicine, as illustrated by a comparison of their disciplinary databases that is to say, PsychInfo and Eric versus Medline (Paynter, 2009); (b) Greater responsibility with regard to participants’ values, views, and ecological context is more common in behavioral and educational sciences than in medicine (Spring, 2007); (c) The evidence continuum ranging from RCT to case studies does not reflect the scientific tradition in behavioral sciences that may include small-scale experimental designs across baselines or anecdotal, qualitative, and theoretical approaches (Oliver et al., 2003); (d) Randomization, which is highly appraised in medically-determined EBR, may not be a good idea in the behavioral and educational sciences, where it could compromise an established relation between service provider and recipient, which is often considered an inherent and important part of the treatment process (Oliver et al., 2003). Nevertheless, the U.S. Department of Education has authorized the Institute of Education Sciences’ (IES, 2008) What Works Clearinghouse to bring “rigorous and relevant research, evaluation and statistics . . .”. Based on the research that meets particular standards, the WWC then reports on what the research indicates about the effectiveness of the program, policy, or practice, which can be abbreviated as the “intervention.” The WWC has developed a set of statistically-based criteria for estimating the strength of evidence in educational research, without considering the reservations stated above.

A different view with regard to whether and how to implement EBR is presented by the Council for the Exceptional Child (CEC), located in Arlington, Virginia,
USA, one of the most influential organizations in the area of special education. In the section devoted to EBP on its website, it declares that “While the law requires teachers to use evidence-based practices in their classrooms, the special education field has not yet determined criteria for evidence based practice, nor whether special education has a solid foundation of evidence-based practices. Also, those teaching strategies that have been researched are difficult for teachers to access” (Council for Exceptional Children, 2008). Nevertheless, a series of articles pertaining to the challenges of incorporating EBR to methods and practices in special education was published in the journal *Exceptional Children* in 2005, including a general discussion of the topic (Odom et al., 2005) and a specific contribution to each of the following categories of inquiry: (a) group experimental and quasi-experimental research (Gersten et al., 2005), (b) correlational research (Thompson, Diamond, McMilliam, Snyder, & Snyder, 2005), (c) single-subject research (Horner et al., 2005), and (d) qualitative studies (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005).

**Historical Perspectives of EBP/EBR in APA**

APA has been attributed to being a meeting point between pedagogical and therapeutic concepts (Kiphard, 1990). Therefore, it is likely that developments in the medical and educational scholarly framework will affect this field of inquiry. APA has many definitions (e.g., Reid, 2003; Sherrill, 2004). From a sport science perspective, APA has recently been redefined as “research, theory and practice directed toward persons of all ages underserved by the general sport sciences, disadvantaged in resources, or lacking power to access equal physical activity opportunities and rights” (Sherrill & Hutzler, 2008, p. 91). However, based on a rigorous literature survey, other scholars have concluded that APA is lacking “a rich conceptual framework or set of theories that not only provide structure to the field, but also promote quality research and practice” (Reid & Stanish, 2003, p. 224). Therefore, it is not surprising that no reference to EBP or EBR has been provided in the fields’ scholarly journal *Adapted Physical Activity Quarterly (APAQ)*. However, three references to this topic were encountered elsewhere, as follows.

In an attempt to quantify categories of evidence and focus of EBP in APA, Hutzler (2006) reviewed articles appearing in *APAQ*, as well as in *Physical Therapy*, the main scholarly journal in the physical therapy discipline. Similar to WWC, Hutzler (2006) used the term “intervention research” (IR) to describe all types of data-based research dedicated to studying the effectiveness of programs, activities, and treatments, and compared the amount of IR published in both journals. Due to differences in publication intensity (12 issues for *Physical Therapy* compared with four issues of *APAQ* per year), he reviewed five and ten volumes in *Physical Therapy* and *APAQ*, respectively, up until 2004. While a research synthesis of the literature published in *APAQ* was not Hutzler’s (2006) prime concern, the outcome of this comparative study generated some relevant data. Based on four basic design categories, (RCT, controlled, prospective uncontrolled, and case studies) differences were observed, suggesting that *APAQ* included relatively fewer RCTs and case studies and a greater percentage of controlled and prospective uncontrolled studies, compared with *Physical Therapy*. 
The generalization of these findings may be questioned, since IR in APA-related topics may appear in many different journals based on scientific discipline (e.g., in exercise physiology, biomechanics, special education, or sport psychology) or target population (e.g., *Developmental Medicine and Child Neurology, Journal of Intellectual Disability Research, Spinal Cord, Stroke*). However, large-scale documentary analyses performed about a decade ago have indicated that *APAQ* is the most popular source for publication of APA related scholarly articles (O’Connor, French, Sherrill, & Babcock, 2001; Porretta, Kozub, & Lisboa, 2000; Reid & Prupas, 1998). Therefore, it seems justifiable to assume that *APAQ* represents trends in APA data-based research. Nonetheless, when interpreting Hutzler’s study outcomes, it should be taken into account that APA and physical therapy have distinct philosophies and practices (Lorenzen, 1961; Perreault, & Vallerand, 2007; Rossow-Kimball, & Goodwin, 2009). APA is based on a pedagogical and self-deterministic perspective, while physical therapy follows a rather medical prescriptive model of exercise (see Hutzler 2007, 2008 for further discussion of the differences between these fields of study and practice).

Standal (2008) has approached EBP/EBR in APA from a philosophical perspective and argued that the practice model of APA should be acknowledged as *phronesis*, an Aristotelian term referring to praxis as an end in itself, compared with the notion of *techne*, which refers to applying means toward the realization of an externally defined object and typically reflects the medical perspective. Nevertheless, in spite of the reductionism incorporated in medically oriented EBP, Standal supports applying EBP in APA since “insecurity must not be a paralyzing condition that disables the practitioner. Rather, through meeting the unfamiliar with a productive insecurity, the practitioners are involved in a process of transforming their self-understanding” (Standal, 2008, p. 212). Thus, applying EBP in APA can be portrayed as a context-related event, and EBR as the facilitator driving the “insecure” practitioner toward proactive, effective, and efficient problem solving (see Figure 1). More recently, Jin and Jun (2010) discussed EBP in adapted physical education from an American, educational point of view. They argued that the U.S. Educational policy (Individuals With Disabilities Educational Act, 1997) requires teachers to establish their practice on “scientifically based research” and describe a three-step process by which (a) researchers create evidence, which (b) is disseminated to practitioners, who then (c) critically use it for their educational decision making.

**Evidence Based Research Levels of Evidence and Quality Indicators in APAQ Research**

Using sets of criteria for appraising quality of research designs and the outcomes of data-based studies is an essential method in EBR. In APA, such criteria were already proposed some 20 years ago. Reid (1989) recommended using theory as a preliminary prerequisite of formulating research questions. This practice has been very carefully maintained in *APAQ* (Reid, 1992; Sherrill, 1997). The systematic analysis of 38 data-based research articles published in *APAQ* during 1997 and 1998 (Sherrill & O’Connor, 1999) was another step toward creating a system of quality indicators in *APAQ*. The methods used within these research articles were analyzed and classified (Figure 2) to determine whether they complied (dichotomy: yes or no).
with 13 categories of scientific rigor, including (a) two items indicating relevance or significance of the topic; (b) six items referring to methodology, one of which (participant description) further broken into subcategories (see Figure 3); and (c) five items reporting presentation of information. Both Figures 2 and 3 demonstrate

![Figure 2](image1.png)

**Figure 2** — Scientific quality criteria for 38 data-based research articles published in *APAQ* during 1997 and 1998 (data taken from Sherrill & O’Connor, 1999).

![Figure 3](image2.png)

**Figure 3** — Scientific quality criteria with regard to reporting participants criteria within 38 data-based research articles published in *APAQ* during 1997 and 1998 (data taken from Sherrill & O’Connor, 1999).
that some criteria were highly adhered to (e.g., using “person first” language and describing gender and age of participants above 80%), while others were less consistent with the quality criteria (e.g., reporting effect-size, race, socioeconomic status, and skill and education level of participants—below 30%). These quality indicators have been used thereafter as benchmark criteria for research published in *APAQ* and elsewhere (e.g., a systematic review on attitude research appearing in *Quest*; Hutzler, 2003). Hodge, Kozub, Robinson, and Hersman (2007) added quality criteria evaluated in both *APAQ* and the *Journal of Teaching in Physical Education* for time periods from the 1980s to 2005; data were analyzed using frequency counts for journals. As can be seen in their findings, scholars have particularly ignored issues related to the cultural diversity of the samples. However, the authors acknowledged that progress has occurred throughout the periods evaluated in both journals with regard to adhering to the indicated quality criteria.

There appears to be very little similarity between the quality indicators proposed within the *APAQ* framework reported here and those proposed by medical authorities. For example, none of the criteria appearing in Figures 1 and 2 correspond to those proposed by the PEDro scoring sheet (Table 2). Such a difference should be expected, given the different perspectives of quality in medically-oriented EBR and APA research. Nonetheless, as a unique body of knowledge and professional expertise, it may be expected that APA scholars develop a position and a rating mechanism toward quality indication of EBR.

In an effort to explore appropriate criteria for appraising and promoting EBR within APA, an analysis of criteria used across review articles appearing in *APAQ* could be beneficial. The section that follows provides a systematic analysis of review articles in *APAQ* with regard to their appraisal criteria. A secondary purpose of this analysis was to explore their thematic focus in an attempt to help structure and systematize scientific evidence perspectives in APA.

### EBR Account Based on APAQ Review Articles

A systematic search of the *APAQ* internet database (103 issues January 1984—August 2009) was conducted. The database was searched using the term “review” for articles that summarized research evidence. Articles were included when the contents related at least partially to intervention programs in APA and/or to evidence with regard to intervention needs. Initially, 133 records were obtained using the search term. The records were visually inspected by title and abstract to avoid repetition and assure consistency with the inclusion criteria. The types of articles included in the final sample were editorials, viewpoint, and review articles. Non data-based articles referring to review, as well as abstracts of reviews appearing in the *Research Digest* section of *APAQ*, were excluded. Sixteen articles conformed to the inclusion criteria (including one article specifically pertaining to disability sport: Reid & Prupas, 1998). Articles that entered the final stage were examined for research focus and for the specific review attributes common in EBR types of systematic reviews, including (a) describing the systematic search criteria and outcomes across literature databases, (b) summarizing articles into tables for describing major design attributes, (c) using quality indicators to summarize article design attributes, and (d) demonstrating effect estimations’ inference between samples. Table 3 summarizes the articles entering the analysis of review accounts in *APAQ*.
encompassing research focus and criteria affiliated with EBR. When interpreting these outcomes, it should be remembered that the original purpose in some of the review articles included in the analysis was not EBR, but general research quality. This may have contributed to the many “no”s observed in Table 3; however, this outcome may also suggest a need to adjust APAQ editorial policy. Indeed, in March 2010, the Board of APAQ accepted a protocol proposed by the current Editor in Chief of APAQ for assessing review articles. This protocol includes many of the features expected in EBR.

Quality Indicators for Appraising Research

It is interesting to observe that from 1998, most reviews provided a detailed description of the search and inclusion criteria and outcomes, while those published earlier did not yet adhere to this basic review practice. Only one review (Frey, Stanish, & Temple, 2008), pertaining to physical activity behavior in youth with intellectual disability, included a rigorous search, assessment, and documentation of the literature, based on specific inclusion and selection criteria. The authors of this review did not use a numerical quality indicator; however, they did include narrative reviewer comments, which signified levels of evidence. Frey et al. (2008) as well as Harvey and Reid (2003) also structured outcomes using a comprehensive summary table that is common in EBR, but not in the other reviews appearing in APAQ. While some of the other reviews also included summarizing tables, most of them only regarded selected criteria of interest rather than a comprehensive view of research design and outcomes. No review article in our sample reported effect sizes. Two articles (Goodman & Hopper, 1992; Skaggs & Hopper, 1996) included a scale for indicating significant effect of difference between samples. It can be concluded that using quality indicators and summary tables for research design and outcomes does not yet seem to be a common practice in review articles published in APAQ. As EBR volume increases in APA, scholars may have to (a) agree upon acceptable quality indicators and (b) apply quality indicators and their study assessment in tabular format to enhance the visibility and usability of the review outcomes. Such quality indicators could borrow from the structure and not necessarily the content of the PEDro scale described earlier. As reflected through this research synthesis, as well as by the preceding theoretical discussion, randomization may not be a good choice as a requirement. Blinding of program supervisors may often be unacceptable as well, due to the same reasons that oppose randomization, i.e., the ecological context of familiarized relationships between service providers and recipients.

Research Foci

To reflect on the research foci in the APA field of study and their relevance to EBR, the following criteria were examined: (a) disability conditions targeted by the review articles and (b) disciplinary or practice-related content. The findings revealed that five (31%) of the reviews regarded mixed samples of disability conditions. When it came to specific conditions, intellectual disability/Down syndrome ranked first, with four reviews (25%), attention deficit disorder ranked second with three reviews (19%), teachers attracted two reviews (12.5%), and hearing and visual impairments one review each (6%). With regard to topic, skill and fitness in different disability conditions attracted six reviews (37.5%), inclusion three
## Table 3  Review Articles in APAQ Referring to Research Evidence

<table>
<thead>
<tr>
<th>#</th>
<th>Authors</th>
<th>Year</th>
<th>Audience</th>
<th>Topic</th>
<th>Focus Criteria</th>
<th>Search</th>
<th>Table</th>
<th>Quality</th>
<th>Effect</th>
<th>Remarks</th>
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</thead>
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<tr>
<td>1</td>
<td>Frey, Stanish, &amp; Temple</td>
<td>2008</td>
<td>ID</td>
<td>PA</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Block &amp; Obrusnikova</td>
<td>2007</td>
<td>Gen</td>
<td>Inclusion</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Harvey &amp; Reid</td>
<td>2005</td>
<td>ADHD</td>
<td>Skill &amp; Fitness</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Kozub &amp; Lienert</td>
<td>2003</td>
<td>Teachers</td>
<td>Inclusion Attitudes</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>5</td>
<td>Reid &amp; Stanish</td>
<td>2003</td>
<td>Gen</td>
<td>APA</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
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<td>Y</td>
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<td>Porretta, Kozub &amp; Lisboa</td>
<td>2000</td>
<td>Gen</td>
<td>Gen</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Reid &amp; Prupas</td>
<td>1998</td>
<td>Gen</td>
<td>Sport</td>
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<td>Y</td>
<td>N</td>
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<td>9</td>
<td>Skaggs &amp; Hopper</td>
<td>1996</td>
<td>Visual</td>
<td>Skill &amp; fitness</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
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<td>Sig effect by items:</td>
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<td>1994</td>
<td>ID</td>
<td>Skill &amp; fitness</td>
<td>N</td>
<td>N</td>
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<td>N</td>
<td>N</td>
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<td>Hearing</td>
<td>Skill &amp; fitness</td>
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<td>13</td>
<td>Churton</td>
<td>1989</td>
<td>ADHD</td>
<td>Gen</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Winnick</td>
<td>1986</td>
<td>Teachers</td>
<td>Gen</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Hoover &amp; Wade</td>
<td>1985</td>
<td>ID</td>
<td>Skill (reaction time)</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Dunn &amp; Fredericks</td>
<td>1985</td>
<td>Gen</td>
<td>Behavior management;</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** N = No; Y = Yes; Sig = Significant; Gen = General; DS = Down Syndrome; ID = Intellectual Disability; PA = Physical Activity; APA = Adapted Physical Activity; ADHD = Attention Deficit and Hyperactive Disorder.
reviews (19%), and the other topics included APA in general, disability sport, and physical activity participation. These findings are partially comparable with the trends observed in previous studies of data-based research in APAQ (Porretta & Sherrill, 2005; Reid & Stanish, 2003). The population attracting most research focus appears to be Intellectual Disability (ID, previously referred to as mental retardation) together with those who have Down syndrome, comprising nearly 30% of the samples in data-based research appearing in APAQ. Persons with physical disabilities and multiple samples follow, however, without a similar representation of review articles. Furthermore, when counting the number of articles reporting intervention (accounting for EBR), the percentage of articles that were published in APAQ throughout the decade (1995–2004) pertaining to persons with ID increased to over 50%, and the number of articles reporting outcomes of intervention in persons with physical disabilities (specifically spinal cord injury and cerebral palsy) decreased to less than 10% (Hutzler, 2006).

With regard to the content areas of the reviews explored here, fitness and skills in specific disability conditions, as well as the inclusion of participants with disability in physical activity, attracted most interest (62.5%). In reference to the International Classification of the World Health Organization (ICF; WHO, 2001) pertaining to functioning, disability, and health (see Hutzler & Sherrill, 2007), these areas demonstrate a central focus on activity and participation factors. A similar trend of nearly 70% of the IR in APAQ pertaining to activity and participation across one decade was reported by Hutzler (2006). When contrasting the findings in APAQ to a summary of IR research in the medically-oriented journal Physical Therapy, predominant foci on structure and function issues in the latter were demonstrated. Following Butler (2004), many health professionals became interested in intervention outcomes pertaining to participation factors, such as the rate of participation in daily and leisure physical activity (see Allen, Dodd, Taylor, McBurney, & Larkin, 2004) and personal participation experiences during training (see McBurney, Taylor, Dodd, & Graham, 2003). In the section that follows, examples will be presented suggesting that the increased interest of physical and occupational therapists in physical activity and participation research is accompanied by engagement in intervention topics at schools, typically associated with APA. It will be demonstrated how the lack of EBR may deprive APA of practice opportunities and decision-making alternatives. These examples have been selected to reflect the variety of domains and populations served in APA.

**Narrative Examples of EBR From the Educational Environment**

**Strength Training in Cerebral Palsy**

Until two decades ago, health care authorities rejected strength training for young persons with cerebral palsy (CP), claiming it might increase spasticity and be detrimental to their functioning (Bobath, 1990). Spasticity and cocontraction are typical disorders of motor control due to an insult to the central nervous system during its early years of maturation (Bar-Or & Rowland, 2004; Bax et al., 2005). APA professionals (Healy, 1958; McCubbin & Shasby, 1985) were the first to publish studies supporting the use of specific strength training in participants with CP.
During the last decade, exercise regimens have increasingly been recommended by physical therapy and medical authorities for these populations (Allen et al., 2004; Dodd, Taylor, & Damiano, 2002; Dodd, Taylor & Graham, 2003; McBurney et al., 2003; Morris, Dodd & Morris, 2004; Weiss, Suzuki, Bean, & Fielding, 2000). Furthermore, repeatedly physical therapy professionals are those who ultimately administer, instruct, and study exercise and skill enhancement programs for children with CP in schools and in the community instead of APA professionals (Blundell, Shepherd, Dean, & Adams, 2003; Palisano, Copeland & Galuppi, 2007; Unger, Faure, & Frieq, 2006; Verschuren, Ketelaar, Takken, Helders, & Gorter, 2007). The school should be an environment for cooperation between the therapist and APA professionals, who are expected to “enhance educational efficacy by applying, consciously or unconsciously, therapeutic understanding and therapeutic empathy” (Kiphard, 1990, p. 11). However, in a recent literature review, Block and Obrounikova (2007) provided very little evidence reflecting program outcomes with regard to physical education goals, such as improving skill and fitness of children with CP conditions (or any other particular conditions restricting the accomplishment of these educational goals).

While APA has not provided EBR to support educational program development for children with CP, professionals such as physical therapists have started to use the physical education environment to facilitate their therapeutic goal setting, that is, the functional development of children and adolescents with CP, and to establish practices and evidence in this regard. Due to their medical orientation, predominant attention to research outcomes with regard to the function and activity level has been indicated by these professionals (Verschuren et al., 2007). In contrast, focusing on intervention outcomes from an APA perspective might uncover important effects with regard to daily activity, participation level in school and community activity, self- and social competence, and quality of life.

Skill Training in Children With Developmental Coordination Disorder

Similar situations to those that have been demonstrated above are also visible in the school practice of children with developmental coordination disorders (DCD). This is the current term depicting restrictions in the learning and performance of motor skills compared with those of typically developing children, replacing a variety of previously used terms such as clumsiness, physical awkwardness, and dispraxia (see Wright & Sugden, 1996). Traditionally, children with DCD have been a major focus of the APA literature (e.g., Cratty, 1971; Kiphard, 1983). As seen in literature analyses (Porretta & Sherrill, 2005; Reid & Stanish, 2003), children with DCD were ranked fourth in the distribution of APA research. Once again, however, very little, if any, of this research succeeded in increasing EBR and providing significant support for EBP. A feature article in *Occupational Therapy Journal* entitled “Leisure time physical activity energy expenditure in boys with developmental coordination disorder: The role of peer relations self-concept perceptions” (Poulsen, Ziviani, & Cuskelly, 2008) demonstrates the role occupational therapists have recently acquired in school and leisure time programs. Consensus statements with regard to educational goal setting in conditions such as CP and DCD, and establishing significant bodies of evidence in support of such statements, are needed to consolidate the position of APA practitioners in this regard.
Inclusive Sport Games

Competitive sport games comprise an important part of regular physical education, interscholastic sports, and leisure-time sports. They have a foremost impact on the social atmosphere of youngsters as well as adults in our society. However, reports on the opportunities to participate in competitive games have been very inconclusive (Kozub & Porretta, 1998). Most of the literature pertaining to adaptation options in this regard is anecdotal (e.g., Hodge, Murata, Block, & Lieberman, 2003; Lieberman & Houston-Wilson, 2002; van Lent 2006), with only a limited amount of group studies providing equivocal outcomes relating to perceived competence (e.g., Ninot, Bilard, & Delignières, 2005; Riggen & Ulrich 1993). Furthermore, cross-sectional and qualitative research (see Block & Obrusnikova, 2007; Hutzler, 2003 for review) suggests that teacher attitudes, training, and practices are still far from supporting inclusion. Thus it is unlikely that practitioners will attempt to include these children without a strong evidence base supporting their action.

Kalyvas and Reid (2003) provided an excellent example for an attempt to establish evidence-based adaptation. A Newcomb game (volleyball lead-up game) was modified, and the effects of the adaptations on objective participation criteria and the children’s enjoyment of participants with and without disabilities were studied. Adaptations included (a) environment modification by reducing field dimensions and net height; (b) equipment modification through increasing and changing the mass of the ball, or using a balloon instead of the original ball; and (c) changing rules relative to passing, touching, and serving the ball. Results indicated more successful passes (activity criteria) and more active time (participation criteria) in children with and without disabilities during the adapted compared with the nonadapted game. Thus, this study, although in an educational and not a rehabilitation setting, complied with ICF criteria that have been recommended as a common ground for EBR in medically oriented literature (e.g., Simensson et al., 2003), as well as that of APA literature (Hutzler, 2007, 2008).

Additional data reported in the study of Kalyvas and Reid (2003) with regard to enjoyment enabled the detection of specific age group (older) and gender (male) criteria by which children without disability began to get bored and to dislike the inclusive activity. Replicating this study in a variety of contexts, types of ball games, and age and skill levels would considerably increase the body of evidence with regard to activity and participation outcomes, improve the teachers’ knowledge of “what works,” and improve their perception that they are competent to cope with inclusive environments and the diverse abilities of their students, thus increasing the likelihood of reducing attitudinal barriers and participation restrictions.

Conclusions and Recommendations for Practice and Further Research

Based on the synthesis performed in this article of the review literature in APAQ, a mixed picture is portrayed in which many systematic reviews of the scientific evidence do not include quality indicators needed for validating the scientific rigor, while others incorporate some quality indicators that are usually recommended by the medically-oriented EBR movement. The use of additional quality indicators such
as “establishing research on theory” have been encouraged and followed. Therefore, when facing the increasing requirement to establish practice on decision-making processes incorporating EBR, APA practitioners would benefit from a reliable decision-making model such as the one proposed in Figure 1, as well as a set of appropriate quality indicators for appraising EBR, as indicated in this synthesis. Although not restricted to intervention research, the quality criteria proposed by Sherrill and O’Connor (1999) had a substantial impact on APA research, and therefore could be a starting point indicating EBR design rigor for APA. Additional criteria that should be considered for this purpose have appeared in the series of articles published in the journal Exceptional Children (e.g., Odom et al., 2005) and more recently in the practice study manual for classifying the state of evidence for special education professional practices (Council of Exceptional Children, 2008). It is likely that such a system could help academic institutions and granting agencies to assess APA professionals’ careers and the research background of grant proposals based on ranking criteria specific to APA, rather than on WWC or medically oriented systems. APA journals such as APAQ might be interested in considering introducing a section dedicated to “intervention research” or to “program evaluation” to symbolize their dedication to promoting research in this direction.

With regard to the scope of study, it appears that activity and participation are at present the most strongly represented foci determining APA research. It is recommended that rehabilitation establishments recognize the relative advantage of APA practitioners and scholars in these domains and include APA professionals in teams aiming at the development of rehabilitation and special education services and programs in the community, as well as in assessing their outcomes. An excellent example for such a practice has been operationalized at the Beitøstolen Health Sport Centre in Norway (Røe, Dalen, Lein, & Bautz-Holter, 2008). While describing their intensive rehabilitation program at this medical institution, which lasts an average of 28 days and supervised up to four hours daily by APA professionals, the authors state that “The rehabilitation programme is based on physical activities, adapted to the specific needs of each individual with disabilities. ‘Adapted’ means facilitating participation in an activity in spite of, and not because of, a disability” (Røe et al., 2008, p. 411).

In summary, based on the literature review and the empirical evidence provided in this article, there appears to be a vital need to delineate and use levels of evidence and quality indicators appropriate for the APA field of study. Such criteria should be used within individual studies and literature reviews in APAQ and other scholarly journals, demonstrating the research evidence in APA for the benefit of populations that may gain participation and improve quality of life.

References


