

# International Encyclopedia of Rehabilitation

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*This publication of the Center for International Rehabilitation Research Information and Exchange is supported by funds received from the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education under grant number H133A050008. The opinions contained in this publication are those of the authors and do not necessarily reflect those of CIRRIE or the Department of Education.*

# **Adapted Physical Activity and Sport in Rehabilitation**

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## **Summary**

This chapter describes the evolution of sport as a means of active training and performance in rehabilitation and its current applications within a comprehensive rehabilitation system. Terminological developments in the past and present are considered first and central issues of adapted physical activity and sport within a rehabilitation framework follow, including: (a) The international classification of function, disability and health as a unified conceptual framework; (b) APA and sport vs. physical therapy in rehabilitation; (c) adaptation theory as the core concept; (d) the inactivity epidemic as a major source for current professional concern; (e) the motivational nature embodied in sport; (f) obligation to self-determination and empowerment as the typical mode of engagement; and (g) classification as a unique instrument for equalizing opportunities in disability.

## **Introduction**

The term “sport” has roots in the Middle English term *disporten*, that comes from Old French *desporter*, which means *to divert, to carry away*. (The American Heritage 2003). Thus, sport can be understood as an active means for recreation, carrying a person away from every day’s burden. Today, sport has different meanings depending on culture and history. In the Anglo-American culture it is considered as mostly a competitive form of organized physical exertion involving skills and regulations, while in the central European cultures it is typically understood in a broader sense and means “all forms of physical activity which, through casual or organised participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels.” (European Sports Charter 1992; revised 2001). In the context of rehabilitation, the relationship of sport and disability are particularly important, because the term to rehabilitate comes from the medieval Latin “*habilitas*”, meaning “to make able” (Merriam Webster Online Dictionary 2008) and involves building bridges over disruptions that have occurred between the past and present, and with regard to control over one’s life (Norman, Sandvin & Thommesen 2004). Rehabilitation is helping the individual achieve the highest level of functioning, independence, participation and quality of life possible (DeLisa 2004). The popular portrayal of sports in disability as “ability not disability

counts” (e.g., Dallas Mavericks online), suggests that the aim of sport and rehabilitation are actually similar, only at different ends of the normal distribution curve. Thus, the methods of training, increasing motivation, and social conduct in sport may be of particular relevance to rehabilitation efforts and structures.

The inclusion of physical activity and sports into rehabilitation services is associated with the legacy of the medical rehabilitation specialist Sir Ludwig Guttmann (1976) who was also known as the founder of the International Stoke Mandeville Games Federation. Later models of Jochem (1990); Rimmer (1999) and Schüle and Huber (2004) suggest physical activity programs within a health promotion delivery system of rehabilitation from hospital into the community (Figure 1). Today, physical activity and sports for participants with functional limitations and activity restrictions are increasingly being referred to within the framework of adapted physical activity (APA: Sherrill 2004; Steadward et al. 2003; Winnick 2005), Paralympics (Higgs and Vanlandewijck 2007), Special Olympics (Shapiro 2003; Farrell et al. 2004), health promotion ([Riley](#) et al 2008), and rehabilitation medicine ([Røe](#) et al 2008).

## **Historical roots of adapted physical activity and sports in rehabilitation**

The phrase *mens sana in corpore sano* (a healthy mind in a healthy body) is a famous Latin quotation of the Roman poet Juvenal of the first and second century (Satire X, 10.365), construed to mean that a healthy body is needed to produce or sustain a healthy mind. An editorial entitled with this phrase in the important medical journal *Annals of Internal Medicine*, highlights the role of physical activity in protecting brain structure and function, and the role of exercise in the elderly in reducing the risk for all-cause dementia and Alzheimer disease (Podewils and Guallar 2006). Physical activity had an important role in the lives of Ancient cultures including the Greek, Roman, and Jewish. King Herodikos of Seylembria (5th Century BC) was claimed by Plato (translated by Lee 1955) of abusing physical activity, apparently due to this King’s habit of promoting exercise in unsuitable cases (Bakewell 1997). The Roman physician Galen (129-210 AD) was apparently the earliest source for describing benefits of exercise by condition and intervention details in his famous work *De Sanitate Tuenda* (translated by Green 1951). In the middle ages, Moses Maimonides (Rambam), the Spanish physician, theologian and philosopher of the 12th century, who had a major impact on the Jewish and Arabic world at that time, praised exercise as a protective factor confronting illness (Posner 1998).

The modern evolution of physical activity and sports as an active means of rehabilitation is attributed, among others, to the Swedish scholar Per Henrik Ling (1776-1839), who established in the 19<sup>th</sup> century a system of *medical gymnastics* in the University of Stockholm, Sweden after curing himself from rheumatism and paralysis through practicing fencing and gymnastics. The term *Medical gymnastics* was later transferred to other European and to American institutions of both medical and educational sciences, but was not accepted. It was transformed in the USA into *corrective gymnastics* and later *sports for the handicapped* (Strafford 1939), *Special Physical Education* (Dunn and Leitschuh 2005); *adapted physical education* (e.g., Winnick 2005), and ultimately *adapted physical activity* (APA: Reid 2003; Sherrill 2004). Following initial generation by French Canadian scholars in the late 1970’s, the term APA soon became the internationally accepted umbrella for conceptualizing,

conducting and implementing physical activities suitable for persons with disabilities (Hutzler and Sherrill 2007). A somewhat different evolvement of terminology occurred in the German language, where Lorenzen (1961) described terminological considerations leading him at that time to choose the term *Versehrtensport* (sport of the disabled) instead of other terms, including those reestablished during the 1990s: *Gesundheitssport* (health sport), and *Sporttherapie* (sport therapy). The term *sport therapy* was preferred in German by scholars referring to specific health benefits, aimed, specifically designed and pedagogically implemented through sport, play, and movement (Rieder1977; Schüle and Huber 2004). A more versatile view was represented by the German teacher, scholar, and Circus Clown E.J. Kiphard (1990). He identified the evolving field of practice as a meeting point between pedagogical and therapeutic concepts resulting in four German terms to be related to this field of inquiry: (a) “*Heilpädagogische Leibeserziehung*” which applies to *remedial, corrective or adapted physical education*, (b) “*Behindertensport*” (sports for the disabled), representing the competitive element of sports for persons with a disability, (c) “*Sporttherapie*” (sports therapy) referring to physical activity and sports as an active means of physical rehabilitation, and (d) “*Psychomotorische Erziehung / Therapie*” (psychomotor education / therapy) referring to physical activity and sports as an active means for psycho-social rehabilitation.

## **Central Issues of Adapted Physical Activity and Sports in Rehabilitation**

### **ICF as a conceptual framework**

Since the 1980's APA is strongly associated with an ecological understanding of the action system comprising of mutual interrelationships between the person, the environment and the task (Kiphard 1983; Newell 1986; Reed 1988). Accordingly, individuals possess resources enabling them to cope with environmental challenges. The task is a specific relation between an individual and the environment such as changing a position from one point in space to another, crossing a distance, or catching flying objects. The goal of a task may be purposefully determined by the person, or imposed by environmental stimuli, such as teaching, instruction or therapeutic treatment. This view is consistent with the major components included in the International Classification of Functioning, Disability and Health (ICF: WHO 2001) accepted among rehabilitation services worldwide. Defining APA intervention goals by ICF categories is simple and makes a very clear link to terminology traditionally used in Sport Sciences and to APA services and practices (Table 1). The ICF model has been proposed as a framework for conceptualizing physical activity behavior intervention (e.g., van der Ploeg et al. 2004), classification practices (Tweedy, 2002) and adaptation modalities (Hutzler & Sherrill 2007). While further research is warranted, the ICF appears to be a useful common platform for designing, studying and discussing APA practices together with other rehabilitation professionals using a common language and concepts, thus gaining tangibility and visibility of APA.

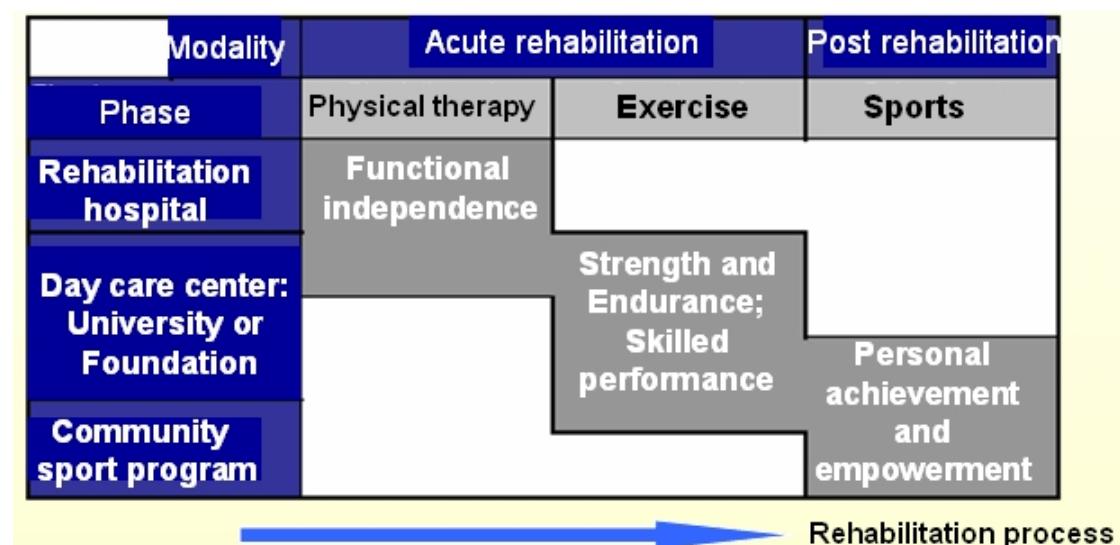
*Table 1:* Description of APA terms and service delivery by ICF and Sport Science categories (Adapted from Hutzler and Sherrill, 2007).

<b>ICF Category</b>	<b>Sport Science Categories</b>	<b>Significance to participant</b>	<b>Service provider, level; track accent</b>	<b>Examples of activity goals</b>
Body structure	System: cardiorespiratory Joints, neuromuscular, neurological	Have physical foundation & acceptable appearance	APA specialist; accent on rehabilitation (European perspective) coworking with therapists	Reduce weight; align posture; Increase bone density; Increase muscle mass
Body function	Abilities: Aerobic and anaerobic endurance, Muscle strength and endurance, Joint flexibility, Psychological traits	Be able to perform	APA specialist; accent on rehabilitation (European perspective). In USA, this could be a rehabilitation fitness instructor coworking with therapists	Restore range of motion; increase muscle strength and power; increase lung & cardiovascular function; increase energy efficiency
Activity or task performance, related to physical activity	Skills: Fundamental motor skills, Sport specific skills, Psychological skills	Doing meaningful tasks	APA specialist coworking with teacher / instructor / coach, each with additional APA knowledge and or professional support; accent on education, recreation, & sport	Reach for the ball; finish 10 laps in swimming; maintain position; cross the road; ;enter a bus
Participation in physical activity	Tactics and Strategies ; Academic learning time; floor time.	Being accepted as part of a reference group	APA specialist co-working with tehrapist / teacher / social worker / psychologist / important significant others; accent on education & recreation	Participate in ball games; be assertive; be accepted among peers; achieve leadership; compete; assume responsibility
Elimination of barriers to goal achievement	Advocacy; Social support systems	Having no restrictions, or opposition to participation (Equity)	APA practitioner across levels together with social worker, volunteer community activist; accent on recreation & sport	Change attitudes, set rules for; use law and affirmative action

## APA and Sport in rehabilitation vs. physical therapy

Many professionals and laymen exhibit difficulty in separating APA and sport in rehabilitation from physical therapy. Surprisingly, most differences suggested in 1961 by Lorenzen are still evident today namely: (a) medical orientation in PT, compared to pedagogical in APA; (b) intervention goals are mostly referring to the impairment in PT compared to the whole person and participation in APA; (c) activity is typically prescribed in PT, compared to self-motivation in APA; (d) participant is passive and active in PT but only active, mostly in group settings, in APA; (e) the goal in PT is mostly restricted to specific biological changes, while in APA the goal is promoting activity across the lifespan; and (f) the intervention is mostly identified as treatment in PT, compared to self-determined action in APA. Furthermore, a literature analysis comparing articles in the journal Adapted Physical Activity Quarterly (APAQ) and the journal Physical Therapy (PT) has shown considerable differences in distribution of clinical trials between both journals with about third of the articles referring to participation issues in APAQ, while only about 7% in PT (Hutzler 2006). Figure 1 describes, a service delivery model depicting the specific accents of each profession, based on rehabilitation phase and goals. Thus, multidisciplinary collaboration and combination of contextual frameworks is recommended.

Figure 1: Health promotion model of APA in rehabilitation. Adapted from Rimmer (1999) and Schüle and Huber (2004).



## Adaptation theory as a leading paradigm

APA is a generic term that links physical activity with adaptation of various environmental, social and individual systems. Thus it may be viewed as a practical application of the Darwinistic concept of *adaptive strategies*, i.e., a mode of coping with competition or environmental conditions on an evolutionary time scale (Darwin 1859). Adaptive strategies and *adaptive systems* are strongly anchored in contemporary information theory, mathematics and biology, referring to systems that have the capacity to change and learn from experience (Bar-Yam, 1997). Adaptation theory (Sherrill 1995; 2004) suggests a philosophy, concepts, models and strategies applicable not only to physical activity adaptations required for performing under

disability conditions, but also to age, gender, and heterogeneity-related adaptation principles. Following experimental work of Burton and associates (Davis and Burton 1991; Burton et al. 1993), Hutzler (2007a; 2007b) suggested a Systematic Ecological Modification Approach (SEMA) for designing, implementing and analyzing intervention outcomes, referring to five main modification criteria (task, environment, equipment, rules and instruction) widely accepted in the literature (e.g. Lieberman and Houston-Wilson 2002; van Lent 2006). This model links person and environment factors to the rehabilitation task goals, desired performance criteria as well as limiting and facilitating factors, adheres to ICF terminology, and provides a useful guide for practice. A variety of applications for adapted sport activity within the rehabilitation frame of reference are discussed in the following sections.

## **Inactivity epidemic**

A recent source of concern, contributing to the expansion of sports in rehabilitation is the trend of sedentary lifestyle and physical inactivity, *challenging* the “Western” society, causing serious health problems and increasing costs for health agencies (CDC 1996; Cavill et al. 2006). Inactivity and its detrimental outcomes are even more common in individuals with disability (Brown et al. 2005; Rimmer, 1999; 2005; Rimmer et al. 1996). Data of Brown et al. (2005) based on a survey of 74,900 adults 50 years of age and older, depict a considerable decrease of respondents with disability being active at the recommended level (28.8 and 43.4%, respectively) and an increase in inactive respondents with disability (35.5 and 17.5 %, respectively), compared to peers without disability. According to Boslaugh and Andersen (2006) only 25% of a representative sample of US adults with disability met the recommendation for moderate physical activity level. Post-rehabilitation community sport programs are, therefore, a promising area for APA professional engagement, study and research. Based on multi site focus group and content analytic research, Rimmer et al. (2004) have identified a series of barriers and facilitators to participation in fitness and recreation programs/facilities among persons with disabilities. Lifetime fitness and adapted physical activity programs are becoming recognized as a crucial element in the maintenance of health and prevention of secondary complications for example in stroke survivors (Gordon et al. 2004; Stuart et al. 2008; Macko et al. 2008; van de Port et al. 2007). Models and programs have been suggested, focusing on a service delivery from acute through rehabilitation to post-rehabilitation community-based programs. While in the acute programs medical supervision dominates, the community-based program warrants psycho-social interaction and education processes contributing to life long physical activity (Rimmer 1999; Schüle 2001). Community based educational programs require the pedagogical expertise of APA practitioners and thus provide a promising field for innovative design and implementation of health programs.

## **The motivational nature of physical activity and sports**

Physical activity has very tangible outcomes. When mastery and success are accomplished through learning a new motor skill, such as swimming, riding, cycling, batting, etc., or through increasing the strength needed to push the body away from the floor, thus initiating different modes of locomotion, individuals of all ages and abilities gain confidence in their body and consequently their life. As proposed by Lorenzen (1961), APA is mostly accomplished in group settings, thus further

providing a social motivational factor based on model learning. The advantage of motivating activities such as virtual reality in rehabilitation has been summarized elsewhere (Weiss et al. 2004). The motivational effects of APA in a health and rehabilitation context have been linked not only to initiating a desired exercise behavior, but mainly for maintaining it, thus increasing the probability of life-long adherence (Rieder 1996). Evidence supporting the motivational effect of sport in rehabilitation is mostly qualitative and anecdotal (Hutzler and Sherrill 1999), with few exceptions, one of which comes from psychiatric rehabilitation, where based on 180 respondents, Huber (1999) determined five factors, including (a) perceived self-efficacy and control, (b) increased performance in activities of daily living (ADL), (c) social support, (d) improved body-image and control, and (e) endured health competence. A model for studying and implementing physical activity in rehabilitation based on the ICF terminology and motivational theories has recently been introduced (van der Ploeg et al. 2004), acknowledging self-efficacy, intention and attitude as important personal attributes and transportation, accessibility, assistance, adapted equipment and supports as environmental factors.

## **Self-determination and Empowerment as Community Related Rehabilitation Outcomes**

The principal aims of Rehabilitation Medicine are to optimize social participation and quality of life. This normally involves helping to empower the individual to decide upon and to achieve the levels and pattern of autonomy and independence that they wish to have, including participation in vocational, social and recreational activity (White paper 2007)

APA calls for increasing choice, empowerment and responsible decision making of the rehabilitation client, leading to counseling initiatives providing alternatives for participation in sport activities in the community. Randomized comparative interventions consisting of personalized tailored counseling with regard to (a) sport stimulation and (b) daily physical activity promotion programs revealed, however, that only a combined intervention of sport and exercise had increased sports participation and daily physical activity behavior nine weeks and one year after the end of inpatient or outpatient rehabilitation, in contrast to sport only and exercise only during the corresponding rehabilitation programs (van der Ploeg et al. 2006; 2007). Further initiatives based on the Salutogenesis model (Antonovsky 1987), have acknowledged the impact of sports as a protective factor (Hamsen et al. 2004; Schüle and Huber, 2004). These factors are very much in common with the personal and environmental facilitators postulated in the ICF model. Attributes such as increased physical fitness can be recognized as protective factors in a variety of senses: (a) buffering the detrimental effect of environmental hazards (e.g., stress;) on psychological function (e.g., depression); (b) mediating a sense of perceived physical self-efficacy and thus facilitation motivation toward performing recreational and vocational activities, and (c) increasing the actual capacity of accomplishing tasks in daily life and leisure time, such as gardening, crossing a busy road fast enough, enjoying the environment through hiking etc.). Evidence supporting this approach is yet to be disclosed.



## **Classification as an activity enhancing and human rights agent**

One of the major agents enhancing the participation of individuals with disability in sport programs has been the classification principle. In sports of participants with disabilities the classification system is aimed at increasing participation of all individuals including those with severe disabilities across the life span (Strohkendl 1991). Therefore, ranges of functional limitations are identified, forming competitive categories enabling relatively equal but also broad enough competition. The Classification systems in sports for persons with disabilities are aimed to provide an equitable starting point based on functional ability, i.e. performance should depend upon training, talent, motivation and skill rather than on belonging to a favored or disadvantaged group based on functional capacity (Richter 1993; Vanlandewijck and Chappel 1996). By means of the classification systems both able-bodied and relatively severely impaired participants can be included and enjoy participation for example in reverse integrated wheelchair basketball (Brasile 1990; Tweedy 2003; Vanlandewisck et al. 2004). Thus, the continuous establishment of classification systems in sports would increase the likelihood of equal status participation, conforming to the UN Convention on human rights of persons with disability (Article 30 of the United Nations Commission for Equal Rights of People with Disabilities).

## **Conclusions and recommendations**

### **APA and sport as service in rehabilitation**

1. It is strongly recommended that intervention research be enhanced to establish evidence based practice. All levels of evidence, but particularly those with randomized recruitment of participants and multi-site samples are still needed in a variety of populations.
2. The motivational aspects incorporated in physical activity, such as task mastery and group modeling, should be increasingly tested for their effectiveness and recommended as a low-cost service relative to other health services.
3. The coupling of APA professionals with emerging technological devices such as VR and tele-rehabilitation as well as other health professionals is warranted within a service delivery team approach in order to provide for linking utilization of competencies achieved at an early level of rehabilitation to later stages in a community setting.
4. All aspects of article 30 of the convention on human rights for persons with a disability are to be explored and lines of action developed for their implementation and monitoring their utilization.

### **APA as a profession in rehabilitation**

1. It is recommended that a gradual education system be developed that allows for teaching knowledge bases of APA to a variety of other professionals, particularly those at the lower end of the wage structure such as home personal aids, teacher assistants, etc.

2. Counseling and marketing competencies should be incorporated in the professional profile of the APA specialist, since he or she is expected to interact with a variety of professionals and compete in providing their services with other similarly efficient professions.
3. Professional identity of APA specialists is to be enhanced by means of consensus statements and clear tangible guidelines of practice. The theory and criteria of adaptation appears promising as a unique body of knowledge that can provide some aspects of this goal.
4. A common language with other rehabilitation professions should be guaranteed by spreading the use of the ICF terminology, thus increasing visibility and comprehensibility of APA among other professionals.
5. Service providers in the wellness and health industry need to be encouraged to increase their application of APA services and approaches to a growing (elderly and movement impaired) client population that may benefit from utilizing these services.
6. The adaptive principles of APA should gain particular importance in 3rd world countries and in rehabilitation of victims in post-disaster and war zones (Chew 2008).

### **APA as a field of study**

1. It is recommended to enhance the range of populations attracting research in APA. Aging individuals with disability is one area that still lacks research. Also, the effectiveness of exercise and training regimens adapted for specific individual need to be studied.
2. The effectiveness of adaptations used while providing APA should increasingly be identified and become a research priority, thus enhancing both evidence-based practice and professional identity.

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