

2020

New Directions in Dance Medicine: Dancers with Disabilities, Blindness/Low Vision, and/or Deafness/Hard of Hearing

Mary Dubon

Rebecca Siegel

Merry L. Morris, *University of South Florida*

Mark Tomasic

Judith Smith

New Directions in Dance Medicine



Dancers with Disabilities, Blindness/Low Vision, and/or Deafness/Hard of Hearing

Mary Dubon, MD^{a,b,c,*}, Rebecca Siegel, MD^{b,c}, Judith Smith^d,
Mark Tomasic, MFA^e, Merry Lynn Morris, MFA, PhD^f

KEYWORDS

- Integrated dance • Inclusive dance • Dancers with disabilities • Adaptive dance
- Dance and disability • Dance medicine

KEY POINTS

- Dancers with disabilities, blindness/low vision, and/or deafness/hard of hearing (DWDBD) have received little attention in the dance medicine and science literature in terms of specific needs for healthy dance participation.
- Programs and companies for DWDBD continue to grow; thus, it is crucial that dance medicine begins to address the unique medical, injury prevention, and injury treatment considerations of DWDBD to facilitate their health and longevity in dance.
- The approach to safe and effective practices must be sufficiently nuanced in terms of both dance training and medical approach/treatment, because of the variety and uniqueness of DWDBD.
- Existing knowledge from dance medicine and para sports medicine can offer useful guidance, such as preparticipation physicals to support health, well-being, and injury prevention.
- More research is needed to better provide specific recommendations for DWDBD.

INTRODUCTION

Although dance medicine is a growing field, filled with up-to-date information on ways to promote healthy dance participation among recreational to elite dancers, to date, there has been little focus on dancers with disabilities, blindness/low vision, or

^a Boston Children's Hospital, 300 Longwood Avenue, Boston, MA 02115, USA; ^b Spaulding Rehabilitation Hospital, 300 1st Avenue, Boston, MA 02129, USA; ^c Harvard Medical School, 25 Shattuck Street, Boston, MA 02115, USA; ^d AXIS Dance Company, 1428 Alice Street Suite 200, Oakland, CA 94612, USA; ^e Santa Monica College, 1900 Pico Boulevard, Santa Monica, CA 90405, USA; ^f University of South Florida, 4202 East. Fowler Avenue, Tampa, FL 33612, USA
* Corresponding author.

E-mail address: mary.dubon@childrens.harvard.edu

deafness/hard of hearing (DWDBD). For the purposes of this article, DWDBD refers to dancers with physical disabilities (affecting physical functioning, such as spinal cord injury or amputation), intellectual/developmental disabilities (IDDs; affecting intellectual functioning and adaptive behavior or developmental/social skills, such as Down syndrome, fragile X syndrome, or autism spectrum disorders), blindness/low vision, or deafness/hard of hearing. Other than anecdotal information, little is known about injury patterns, injury prevention, or wellness strategies for DWDBD. However, there are increasing numbers of dance programs and companies involving DWDBD at pre-professional and professional levels. Dance teachers and choreographers may now encounter a more diverse terrain when training dancing bodies, and this requires a significant reexamination of traditional practices. This article reviews the history and experience of DWDBD and explores dance medicine considerations relevant to working with DWDBD.

A BRIEF HISTORY OF INCLUSIVE/INTEGRATED DANCE

Although it is difficult to find a clear and comprehensive history of integrated, mixed-ability, or inclusive dance, efforts in this area of dance training and practice have been in development for many decades. This article highlights some important historical moments, acknowledging that this brief summation does not capture a thorough history. In 1955, Gallaudet University, a university for deaf/hard-of-hearing (DHH) students, founded Gallaudet Dance Company, a premier dance company that still continues.¹ In Vasteras, Sweden, in 1975, the first competition for para dance sport (then called wheelchair dance sport), which is adapted from ballroom dance and uses the rules of the World Dance Sports Federation applied for dancers with physical disabilities affecting their lower extremities, occurred. Para dance sport became officially governed by the International Paralympic Committee in 1998.² In the 1980s, physically integrated dance companies, such as AXIS Dance Company and Dancing Wheels, began with professional performance goals, focused on producing high-quality choreographic work involving individuals with and without disabilities.^{3,4} Around this time, Alvin Ailey and Martha Graham began pioneering techniques to teach dance to blind students.⁵ In 2002, Boston Ballet partnered with Boston Children's Hospital to create a dance class for dancers with Down syndrome.⁶ Several similar programs have followed. In 2013, the International Bay Area Deaf Dance Festival was founded.⁷ In 2017, Blind Dance Company was founded.⁸ In 2019, dance sport was recognized as an official sport of Special Olympics International.⁹ At the time of the writing of this article, many dance companies and dance programs exist for DWDBD; however, more work still needs to be done to provide recreational to elite opportunities for DWDBD.

Initially, DWDBD frequently learned movement skills through choreographic processes because there was an absence of training opportunities geared toward professional or preprofessional dance.¹⁰ However, a variety of integrated dance companies now hold workshop intensives, teacher trainings, and community classes. Alito Alessi's DanceAbility International offered the first teacher training certification program for integrated/inclusive dance focusing on improvisation in 1996, and, in 2012, Dancing Wheels produced a teaching manual, focused on contemporary dance technique.^{11,12} The International Bay Area Deaf Dancer Festival offers dance workshops for DHH dancers.⁷ The Royal Ballet offers ballet classes geared toward blind/low-vision (BLV) dancers.¹³ Boston Ballet offers dance teacher training for adaptive dance for dancers with Down syndrome and/or autism spectrum disorders.¹⁴ However, more consistent, well-developed training opportunities in different locations are needed.¹⁵

The integrated/inclusive dance field is in a time of exceptional growth, making this article both relevant and timely. In July 2015, Dance/NYC held a conference entitled Dance. Disability. Artistry, a multiyear initiative coinciding with the 25th anniversary of the Americans with Disability Act.¹⁶ A research report was compiled reporting on the conference discussions, outcomes, and recommendations for future efforts in dance and disability. Furthermore, in May 2016, the first National Convening on the Future of Physically Integrated Dance in the USA was held in New York.¹⁷ As a continuation and outgrowth of the National Convening, 6 regional convening conferences discussing the future of the field were then held throughout the country. The convenings addressed challenges in the field, such as artistic quality, resources, training, recruitment, and sustainability.¹⁷ Shortly after these conferences, Dance/USA, a United States national service organization dedicated to professional dance, created a Deaf and Disability Affinity Group.¹⁸ Although knowledge of safe dance practices for DWDBD is scarce, there are efforts being made and it is hoped that this article can contribute to these efforts as well.

RATIONALE

To our knowledge, little literature exists on dance medicine considerations for DWDBD. Organizations such as International Association for Dance Medicine & Science, Performing Arts Medicine Association, and Dance/USA provide excellent guidance on how to keep dancers healthy through injury prevention, injury surveillance, appropriate nutrition, and mental health resources.^{18–20} Many of these considerations for dancers in general have overlap for DWDBD; however, there may be key differences. This article offers guidance on the topic of dance medicine considerations for DWDBD based on the limited research and evidence that exists, extrapolation from para/adaptive sports medicine literature, and expert opinion. However, more research is needed in this important area of dance medicine.

THE DISABILITY SPECTRUM IN INTEGRATED/INCLUSIVE DANCE

As introduced earlier, various professional dance groups exist that are uniquely positioned for professional DWDBD. Some of these dance companies are specifically geared toward individuals with specific types of disabilities, whereas other groups are inclusive for dancers with various disabilities, and others are also inclusive for DWDBD and dancers without disabilities. **Table 1** reviews elite dance groups, including professional dance companies, dance competitions, and dance sport groups highlighting dancers with physical disabilities. Although there is not 1 centralized means of finding all professional dance companies geared toward inclusion of individuals with physical disabilities, AXIS Dance Company has information on their Web site about other physically integrated dance companies and organizations.²¹

Table 2 explores elite dance groups, including professional dance companies highlighting DHH and BLV dancers. Although the authors were unable to find specific elite dance companies, competition groups, or dance sport organizations geared toward professional dancers with IDD, there are many classes and programs specifically created with dancers with IDD in mind, as shown in **Table 3**.

It is important to acknowledge that not all DWDBD dance as part of a specific dance company, program, or competition group structured for DWDBD. Samantha Figgins, who is hard of hearing, is a professional dancer with Alvin Ailey American Dance Theater.²² Philip Martin-Nelson is a professional dancer with autism who dances with Les Ballets Trockadero de Monte Carlo.²³ Mana Hashimoto is a blind choreographer who had sight until her 20s, so she has the unique experience of dancing with and without

Table 1

Professional dance companies, dance competition groups, or dance sport organizations that are physically integrated, physically inclusive, or specifically for dancers with physical disabilities

Dance Organization	Location	Web Site	Genre
Abilities Dance Boston	Boston, MA	https://www.abilitiesdanceboston.org	Contemporary/modern
Amici Dance Theatre Company	London, United Kingdom	https://amicidance.org	Dance theater
AXIS Dance Company	Oakland, CA	http://www.axisdance.org	Contemporary
Candoco	London, United Kingdom	https://candoco.co.uk	Contemporary/modern
Dancing Wheels	Cleveland, OH	https://dancingwheels.org	Contemporary/modern
DV8 Physical Theatre	London, United Kingdom	https://www.dv8.co.uk/projects	Contemporary/modern
Full Radius Dance	Atlanta, GA	https://fullradiusdance.org	Contemporary/modern
Heidi Latsky Dance (The GIMP Project)	New York, NY	http://heidilatskydance.org	Contemporary/modern
Ill-Abilities	Montreal, CA	https://www.illabilities.com	Hip-hop
Infinite Flow: An Inclusive Dance Company	Sherman Oaks, CA	https://www.infiniteflowdance.org/home	Ballroom
Infinity Dance Theater	New York, NY	https://www.infinitydance.com/	Ballet and modern
Jess Curtis Gravity	San Francisco, CA	https://www.jesscurtisgravity.org/about-gravity	Contemporary/modern
Karen Peterson and Dancers	Miami, FL	https://www.karenpetersondancers.org/	Contemporary/modern
Kinetic Light	New York, NY	https://kineticlight.org/about	Contemporary/modern
Momenta	Chicago, IL	http://momentadances.org	Contemporary/modern
Remix Dance Company	Capetown, South Africa	https://www.myguidecapetown.com/things-to-do/remix-dance-company	Contemporary/modern
Restless Dance	Adelaide, South Australia	http://restlessdance.org	Contemporary/modern
REVolutions Dance	Tampa, FL	http://www.revdance.org/	Contemporary/modern
Rollettes	Los Angeles, CA	https://www.rollettesdance.com	Dance team
Stop Gap Dance Company	Farnham, United Kingdom	https://www.stopgapdance.com	Contemporary/modern
World Para Dance Sport	International	https://www.paralympic.org/dance-sport	Ballroom

Noncomprehensive list of national/international professional dance companies, dance competition groups, or dance sport organizations that either define themselves as a physically integrated dance company (employee dancers both with and without a physical disability) or companies in which all dancers have a physical disability.

Table 2
Dance professional dance companies highlighting deaf/hard-of-hearing and/or blind/low-vision dancers

Dance Companies Highlighting Deaf/Hard of Hearing Dancers	Location	Web Site	Genre
Company 360	Washington DC	https://www.companythreesixty.com	Contemporary/modern
Signdance Collective International	London, United Kingdom	https://www.signdancecollectiveinternational.com	Signdance theater
Urban Jazz Dance Company	San Francisco, CA	https://www.realurbanjazzdance.com/mr-antoine-hunter.html	Urban jazz dance
Gallaudet Dance Company	Washington DC	https://www.gallaudet.edu/departement-of-art-communication-and-theatre/gallaudet-dance-company	Modern/tap/jazz/incorporation of american sign language
Taiwan First Deaf Dance Group	Taiwan	https://www.facebook.com/taiwanfirstdeafdance/	Contemporary/modern
Dance Companies Highlighting Blind/Low Vision Dancers			
Wild Zappers	United States	http://www.invisiblehands.com/wildzappers.html	Jazz/funk/hip-hop
The Blind Dance Company	Culver City, CA	https://theblinddanceco.org/?fbclid=IwAR3Z6-sFV58N9dkyckB3hRyQXSQrlot87gtnFjjuVuY_IBCfaSKbX6XwKBw	Latin/hip-hop/ballroom

Noncomprehensive list of national/international professional dance companies that either define themselves as an integrated dance company, employing dancers both with and without deafness/hard of hearing or blindness/low vision, or companies in which all company members are BLV or DHH dancers.

Table 3
Dance programs for dancers with intellectual/developmental disabilities

Dance Program	Location	Diagnosis	Web Site
Arts for Autism	Miami, FL	Autism spectrum	https://www.spectrumdancetherapy.com
Ballet for All Kids	Los Angeles, CA New York, NY	Autism spectrum, developmental disabilities, physical disabilities, sensory disability, ADHD	https://www.balletforallkids.com
Be Beautiful Be Yourself: Global Down Syndrome Foundation	Denver, CO	Down syndrome	https://www.globaldownsyndrome.org/programs-conferences-grants/programs/be-beautiful-be-yourself-dance-class-2/
Boston Ballet's Adaptive Dance Program	Boston, MA	Down syndrome Autism spectrum disorder	https://www.bostonballet.org/Home/Education/Program/All-ages-programming/Adaptive-Dance.aspx
Free 2 Be Me Dance	Los Angeles, CA Dublin, Ireland	Down syndrome	https://www.free2bemedance.org
New York City Ballet Workshops	New York, NY	Autism	https://www.nycballet.com/Educate/Access-Programs/Workshops-for-Children-with-Autism.aspx
Special Olympics Dance Sport	International	Intellectual disability	https://www.specialolympics.org/our-work/sports/dance-sport
United Dance	Amsterdam, New York, Paris, Boston, Burlington, Genval, Antwerp	Down syndrome	https://www.uniteddance.org/program

Noncomprehensive list of national and international programs that specialize in teaching dance to individuals with IDD.

Abbreviation: attention-deficit/hyperactivity disorder, attention-deficit/hyperactivity disorder.

sight.²⁴ In 2019, Sydney Mesher, a New York City Rockette with an upper extremity limb deficiency, became the Rockette's first known dancer with a visible disability.²⁵ Ali Stroker, Broadway's Oklahoma lead and Tony Award-winning actress, singer, and dancer, is a wheelchair user.^{26,27}

ASSISTIVE DEVICES FOR USE IN DANCE

For a dancer with a physical disability, an assistive device (AD) can be integral to the dancer's experience. It is important to acknowledge that, similar to sport-specific devices, dance-specific ADs are typically not covered by insurance. There may be financial barriers to accessing ADs, particularly those that may be dance specific (such as a prosthetic device with a foot in the en pointe position). **Table 4** reviews grant organizations that may be helpful for individuals looking for assistance in supporting their dance-specific ADs. Many of these organizations provide assistance for athletic adaptive equipment through an application process.

Dance Wheelchairs

Depending on the physical disability, dancers may use manual wheelchairs, manual wheelchairs with power assist, or power wheelchairs for dancing. Manual wheelchairs for para dance sport often have 5 wheels, with 2 swivel casters anteriorly, 2 drive wheels, and 1 swivel caster posteriorly. A footplate is used to position and secure the dancer's feet and has the anterior swivel casters attached beneath it. This 5-wheeled setup allows smooth gliding transitions while maintaining stability to prevent tipping.²⁸ **Fig. 1A** shows a sample para dance sport wheelchair design.² In other dance forms, tipping is part of the movement strategy and this type of chair would

Table 4
Funding resources for assistive devices or adaptive equipment

	Funding Resource	Web Site
Nonspecific equipment for sports	Challenged Athletes Foundation	http://www.challengedathletes.org/programs/grants/
	Disabled Sports USA: grants	https://www.disabledsportsusa.org
	GoHawkeye Enabling Grant Program	https://gohawkeye.org/grants/
	High Fives nonprofit foundation	https://highfivesfoundation.org/
	IM Able Foundation	https://imablefoundation.org/programs/
	J-Rob Foundation	http://www.jrobfoundation.com/grant-application.html
	Kelly Bush Foundation: The Active Fund	https://kellybrushfoundation.org/
	PossAbilities	https://teampossabilities.org/grants-scholarships/
	Who Says I Can't	https://whosaysicant.org
Prosthetics for sports	Heather Abbot Foundation;	https://heatherabbottfoundation.org
	Jordan Thomas Foundation	https://jordanthomasfoundation.org
	Team Amputee Blade Runners	https://amputeebladerunners.com
	The Given Limb Foundation	https://givenlimb.org
	Wiggle Your Toes	https://www.wiggleyourtoes.org

A noncomprehensive list of different funding resources that can assist with funding for adaptive sports equipment.

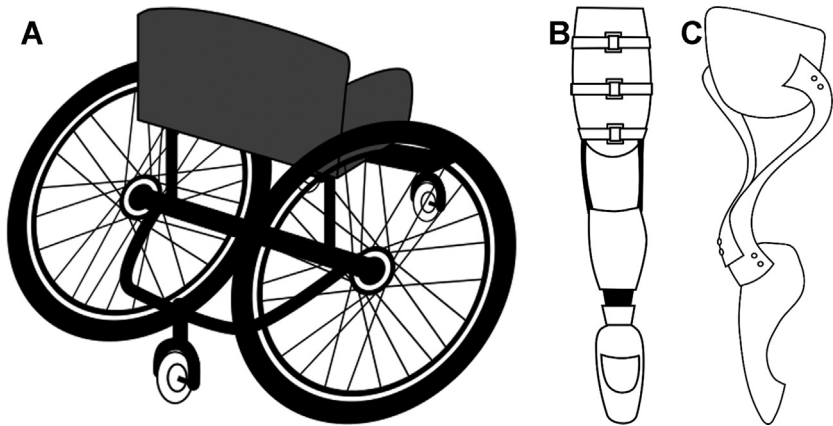


Fig. 1. Assistive device examples for dance. (A) A para dance sport wheelchair. (B) A prosthetic with a socket that allows for an interchangeable foot component, which in this case is a foot for pointe work (based on the prosthetic of Gabi Shull, social media influencer, dancer, amputee). (C) A dance-specific prosthetic, the Marie-T. ([A-B] Courtesy of R. Connaughton, PhD, Boston, MA. [C] Courtesy of R. Connaughton, PhD, Boston, MA and J. An, Seongnam-si, Korea.)

not be optimal. For instance, for a contemporary dancer who would like the ability to tip, this level of stability is not preferred, and, instead, a lightweight sports wheelchair without antitippers may be used. Sports wheelchairs should be lightweight, roll easily, and custom form fitting. The wheelchair seating system should have a snug fit, likened to the importance of a well-fitted shoe; have a stable base of support; and be optimized for prevention of pressure ulcers (eg, with a pressure-relieving cushion).^{29,30} One strategy for determining whether the seating system is fitted properly is to have the wheelchair user do the twist. The wheelchair should move with the individual.³⁰ There should be at least 50 to 75 mm (2–3 inches) between the anterior edge of the seat and the popliteal angle to result in appropriate fit and seating positioning within the chair to set the dancer in an appropriate posture for optimal biomechanics with decreased risk of injury and pressure ulcers. The elbow angle when the hand is at the superior midportion of the push rim should be 90° to 120° for appropriate biomechanics of wheelchair propulsion. The seat height, seat dump (angle of the seat with respect to the horizontal plane of the chair), and wheel diameter all affect these angles and can be adjusted to allow the proper fit.³⁰

Power wheelchair users may use their power wheelchairs to create smooth gliding movements of their chairs for dance. Some dancers have a manual wheelchair that has power-assist capability; for instance, a joystick power assist that may function in a similar fashion to a power wheelchair in terms of gliding movement ability. Separately, but perhaps of interest, Dr Merry Lynn Morris, in collaboration with engineers, designed a prototype power wheelchair that moves omnidirectionally and can be controlled hands free through leaning or tilting actions.^{31,32}

Dance Prosthetics

Dancers with upper extremity amputations or limb deficiencies may choose to dance without the use of an upper extremity prosthetic or they may use a passive hand, padded hook, externally powered prosthetic hand, or an energy-storing Super Sport

mitt (eg, for tumbling/acrobatics/handstands), depending on the desired functional use of the prosthetic.³³

Dancers with lower extremity amputations or limb deficiencies also may choose to dance without the use of a prosthetic, though dancers often choose to dance with a prosthetic. When determining a dancer's prosthetic, it is important to have an understanding of the dance genre, dance-specific needs for the device, and functional needs for the prosthetic outside of dance. In some cases, a prosthetic may be able to be prescribed that can be used both for dance and for daily functional use. In some instances, a dance-specific prosthetic, separate from a functional day-to-day prosthetic, may be most beneficial for optimal dance performance. In other cases, the daily socket can be used both for day-to-day use as well as dance use, with interchangeable foot and/or knee components depending on the activity.^{34,35}

Socket liners composed of elastomeric gel can be helpful to decrease shear stresses from the multidirectional forces that are often expected with athletic activities. Socket fit and comfort are important for athletic and artistic ability as well as for safety, because prosthetic sockets that are poorly fitted can result in skin breakdown, shear, or blistering. Shock-absorbing foot components should be considered and, in cases where additional shock absorption is required, shock-absorbing pylons can be placed between the socket and the prosthetic foot.³⁴

In recent years, dance-specific prosthetics and dance-specific prosthetic components have gained media attention. Social media influencer and adolescent dancer Gabi Shull's story became known across the United States because she was a dancer before and after the diagnosis of osteosarcoma and subsequent Van Nes rotation-plasty (surgery in which the tumor is resected and the tibia is rotated 180° and fixed to the femur so that the ankle joint acts like a knee joint) followed by return to dance with use of prosthetics.^{36,37} Gabi has shared dance videos in which she performs tap or contemporary dance using 1 prosthetic foot and then is seen changing the foot component on her socket to a pointe-specific component to dance en pointe, similar to that seen in [Fig. 1B](#).^{36,38} Separately, the Marie-T prosthetic is an example of a dance-specific single-use (meaning for dance only) prosthetic that was designed to allow dancers with below-knee amputations to dance en pointe on their amputated legs ([Fig. 1C](#)).^{39,40} This design features a three-dimensional-printed socket, carbon fiber brace, with rotational molded foot, stainless steel toe, and rubber grip toe.⁴⁰

For dancers who choose not to use prosthetics on their upper or lower extremities, a custom limb protector may be beneficial, particularly in instances where the limb may be used for weight bearing.³⁴

Other Dance Adaptive Devices and Braces

Dancers may have other ADs or braces that they wear in the community and/or that may be useful during dance. Crutches, walkers, canes, or braces used in the community may or may not be the optimal devices or braces for use in dance, as is the case for wheelchairs and prosthetics, as discussed earlier. For instance, Bill Shannon, known as the Crutch Master, uses shock-absorbing fuel hoses at the bottom of each crutch to provide an improved grip while mobilizing through space.⁴¹ Similar to the design of the appropriate wheelchair or prosthetic, a good history of the type of dance and the desired use of the device is critical in determining an appropriate device. Working together with a creative rehabilitation team that may include the dancer (and, in some cases, the dance teacher or choreographer), a physiatrist, a prosthetist, an orthotist, a physical therapist, an occupational therapist, and/or vendor is key in the design of the appropriate, often customized, device.

DANCE CONSIDERATIONS FOR DANCERS WITH DISABILITIES, BLINDNESS/LOW VISION, AND DEAFNESS/HARD OF HEARING

Dance Considerations for Dancers with Physical Disabilities

Embodiment is an inroad to identity, to desire, to value formation, to body image, to competence, and to a sense of agency.^{42,43} The uniquely embodied way the device is used in dance contrasts with the normative perception often associated with a medical aid. Medical aids are traditionally understood as utility-oriented devices designed to fulfill basic activities of daily living and serving a type of rehabilitative purpose. They often are associated with a negative stigma.^{44,45} In dance, medical aids may be reimagined as creative catalysts facilitating an artistic intention, such as turning the device on its side or upside down to enable intriguing movement configurations and interactions, weight shifting off the vertical axis to evoke a flying or suspension quality, or using the device's shape or materiality to highlight a visual aesthetic or rhythmic dynamic. Although, traditionally, a cane is used to prevent falling, in dance, the dancer might use the cane to strategically fall in a way that reveals an expressive purpose or idea. In the dance context, what the AD is and how it is supposed to function may be radically upended. The wheelchair, crutch, or cane is transformed as a creative, embodied instrument outside the realm of traditional medical notions. For AD users in dance, the device often becomes an intimate part of the body, connected to the dancer's identity. This point is important, because it has implications for training and for how medical practitioners, teachers, and choreographers understand and engage with AD users. The same considerations of personal space and agency that are applied when touching or interacting with another person's body parts apply to interaction with a person's AD. When the dancer and the mobility device are viewed as both unique and integrated in terms of mobility, the approach to therapy, rehabilitation, AD prescription, conditioning, and dance training can be appropriately developed.

In current contemporary physically integrated dance, professional dancers who use wheelchairs may be seen pitching the chair off axis; descending to the floor in the chair via rolling, sliding, tipping, hoisting, or combinations thereof; rolling in succession on the floor with the device; altering their bodily orientation in the device; spinning at high speeds; and adopting strategies for moving in and out of their chairs. Dancers who use wheelchairs may also perform complex partnering work that can involve lifting or carrying the weight of other dancers on their backs, shoulders, legs, and/or parts of their chairs. Techniques for counterbalancing in duet and group choreographic work are often used. All of these types of movements require careful coordination, strength, and control, which require specialized conditioning approaches and attention to bodily uniqueness. A research study of 8 professional dancers who use ADs (manual wheelchair [6]; crutch [1]; power wheelchair [1]) indicated that speed regulation, nuanced control, stability, ideal seat positioning for maneuverability and partnering, appropriate friction between device and flooring, and a lightweight, small frame were high priorities for dancers who use ADs.⁴⁶

Again, not all dancers with physical disabilities use ADs. For dancers with physical disabilities who do not use ADs, physical accommodations may still be necessary, as in the examples of an individual with asymmetry from a unilateral amputation or a neurologic condition affecting coordination. Dance instructors/choreographers should work with each dancer on the individual accommodations and the individual movement interpretation.

Dance Considerations for Dancers with Intellectual/Developmental Disabilities

Strategies should also be considered for dancers with IDD. Consistent structured schedules/routines and clear visual aids for dance education can be beneficial for dancers with IDD. For example, the Boston Ballet's ballet program for dancers with Down syndrome uses different colored tape on the right and left shoes for ease of following the directions of the dance teacher.⁶ The dance teacher/choreographer should become aware of any sensory sensitivities the dancer has when considering props, footwear (or lack thereof), and costuming.⁴⁷

Dance Considerations for Blind/Low-Vision Dancers

BLV dancers may require tactile cues and clear verbal instructions to describe dance maneuvers and choreography, whereas dance teachers/choreographers have traditionally been trained to depend more heavily on visual cues.⁵ Dancers may need to rely on their proprioceptive skills, strength, and, if applicable, tactile cues of dance partners.⁵ Tactile modeling, during which the BLV dancer touches a model who is demonstrating a dance maneuver, can be a valuable tool used when teaching dance/choreography. An example is when Martha Graham was teaching Hellen Keller to jump and she asked what Martha Graham meant by this. Martha Graham had Hellen Keller place her hands on Merce Cunningham's back as Merce Cunningham demonstrated a jump.⁵ Teaching dance or choreography typically involves an element of physical demonstration of the maneuvers. This method likely is adjusted when teaching BLV dancers, either with demonstrations in closer proximity or with guiding the dancer's body through tactile cues.⁵

Dance Considerations for Deaf/Hard-of-Hearing Dancers

DHH dancers may use vibrations or visual cues for learning dance/choreography. Clapping, which offers a visual component for keeping the beat, may be valuable.⁴⁸ Feel the Beat Dance Studio uses a unique technology to create a vibrational dance floor that optimizes DHH dancers' ability to feel the rhythm of the music.⁴⁹

DANCE TEACHER/CHOREOGRAPHER CONSIDERATIONS

Dancer teachers with or without disabilities, blindness/low vision, or deafness/hard of hearing cannot assume their bodily experiences can easily approximate the bodily experiences of the individual DWDBD with whom they are working. Even among DWDBD, neurologic movement patterns and sensations can vary extensively. It is helpful for dance teachers and choreographers to be flexible and adapt to each individual and observe the dancer's pattern of movements or interpretations of movement, to try to put themselves in the position of the dancer (eg, for teachers or choreographers who do not use an AD, it may be beneficial to experiment in/with a similar AD when creating movement). DWDBD deserve the same right to be challenged, to fail, and to succeed as their counterparts. Movement vocabulary should be modified as skill levels increase to ensure physical, cognitive, and artistic development.

In designing movement vocabulary, instructors should be cognizant that adult students with disabilities may not have had access to early dance training. This lack of early training is caused by several factors, including a paucity of qualified instructors and relevant dance curricula as well as accessibility issues. In addition, because the prevalence of disabilities increases with age, many DWDBD come to the profession later in life.⁵⁰ DWDBD who are new to dance as adults are often placed in intermediate/advanced classes and pressured to catch-up with more experienced dancers.

Dance instructors, choreographers, and dance medicine physicians should be attentive to previous dance training, age of participants, and level of experience, and adjust exercises and expectations accordingly.

IMPLICATIONS FOR DANCE MEDICINE PRACTICE

Dance medicine physicians are trained and experienced in caring for the medical needs of dancers. Little has been known or addressed specifically to DWDBD. Although there are many overlapping areas, there are also many unique considerations for this population.

Preparticipation physicals are a mainstay for sports participation for youth and young adults in the United States; however, they are not a mainstay for dance participation. The authors strongly recommend dance-specific preparticipation physicals for health, well-being, and prevention of injury of all dancers, including DWDBD and dancers without disabilities, blindness/low vision, or deafness/hard of hearing. Interestingly, collegiate dancers have been shown to be not very likely to seek medical attention, particularly of a physician, for injuries.⁵¹ Collegiate sports athletes typically have had preparticipation physicals performed throughout their youth sports careers leading up to and including college, but this is less likely to be the case for collegiate dancers, because it is not a universal requirement for dance participation throughout youth. There is concern that collegiate dancers may not seek the attention of a physician for injuries, which can potentially lead to progression of injury. Perhaps, if the dance culture also promoted screening by a health team for safety, injury education, and injury prevention, dancers would be more likely to seek medical help when concerns do arise.

The Dance/USA Task Force on Dancer Health has an extensive preseason posthire health screen for professional dancers that is composed of a health history questionnaire and a physical assessment performed by trained dance medicine clinicians (physical therapists, athletic trainers, and/or physicians). This preparticipation assessment is an excellent means of screening professional dancers for safe dance participation, while also screening for possible injury susceptibilities and means of decreasing these risks, allowing the dancers to best prepare for a healthy season. Dance/USA now has adaptations to its health screen for professional dancers with disabilities; for instance, substituting some lower extremity screening components for ambulatory dancers with upper extremity screening components for wheelchair users.¹⁸

Preparticipation physicals performed for sports often have supplemental considerations for athletes with disabilities.^{52–54} Given the growing number of DWDBD, it is crucial that dance medicine begins to address the unique medical, injury prevention, and injury treatment considerations of DWDBD. **Table 5** reviews components of preparticipation examinations included in sports preparticipation history and physical examinations for athletes with disabilities.^{52–54} The authors believe that these same considerations and principles should be applied to preparticipation physicals and health screens for recreational through elite DWDBD. The purpose of this is not discrimination but for inclusion and assurance that DWDBD are kept safe and healthy for long careers in their art form. It may be important, for instance, that precautions are known to allow safe dance participation. **Table 6** reviews common precautions/safety/medical considerations that should be considered for individuals based on diagnosis.^{55–60}

Although there is a growing body of literature on injury patterns in athletes with disabilities, there is a lack of literature on injury patterns in DWDBD. For dancers with

Table 5**Components of preparticipation physical examinations for athletes with disabilities, deafness/hard of hearing, blindness/low vision**

General PPE History Components	Recommended Additional PPE History Components for Athletes with Disabilities	PPE Components
Medical History:	AD use	Vitals
Allergies	Atlantoaxial instability	Constitutional/general
Anemia	Autonomic dysreflexia history or risk	Ear/eyes/nose/throat
Cardiac symptoms/conditions	Bladder function (including neurogenic bladder/need for catheterization and any related complications such as urinary tract infections)	Lymph nodes
Concussions/head injuries	Bowel function (including neurogenic bowel/need for a bowel program)	Cardiovascular
Diabetes	Classification for para sport (if known)	Respiratory
Dislocations	Dietary considerations, such as use of a gastrostomy tube	Abdominal
Eating disorders/disordered eating/weight concerns	Disability diagnosis/cause of disability (eg, spina bifida, amputation, CP, SCI)	Integumentary
Fainting (particularly with exercise)	Functional level of independence for mobility and other relevant activities of daily living	Neurologic
Fractures	Hearing loss/deafness	Musculoskeletal
Headaches with exercise	Hematologic condition/history of easy bleeding	—
Heat illness	Hepatitis	—
Hernias	Latex allergy	—
Hospitalizations	Low bone mineral density	—
Immunizations	Motor impairments	—
Infections (including mononucleosis, herpes, MRSA, or blood-borne pathogens such as HIV or hepatitis B or C)	Neurologic/functional changes in recent history	—
Medical conditions	Orthotic use	—
Medications	Other medical conditions or comorbidities	—
Menstrual history	Precautions/restrictions for exercise	—
Mental health screen	Prosthetic use	—
Missing organs	Renal disease/unilateral kidney	—
Muscle cramps caused by exercise	Sensory impairments	—

(continued on next page)

Table 5 (continued)		
General PPE History Components	Recommended Additional PPE History Components for Athletes with Disabilities	PPE Components
Neurologic symptoms/history	Skin breakdown/pressure ulcers	—
Other concerns to be discussed with clinician	Spasticity/dystonia	—
Respiratory conditions/symptoms	Splenomegaly	—
Seizures	Thermoregulatory impairment	—
Sickle cell disease/trait	Visual loss/blindness	—
Skin concerns	—	—
Soft tissue injuries	—	—
Surgeries	—	—
Swollen joints	—	—
Vision history	—	—
Family history:	—	—
Cardiac conditions	—	—
Sickle cell disease/trait	—	—
Sudden/young death	—	—

This table, with some adjustments, summarizes recommendations for history and physical components for the PPE traditionally performed before sports activities. Most of the suggestions are from Ref.⁵⁴ with additional suggestions from Refs.52,53 and author expert opinion.

Abbreviations: CP, cerebral palsy; HIV, human immunodeficiency virus; MRSA, methicillin-resistant *Staphylococcus aureus*; SCI, spinal cord injury; PPE, preparticipation physical examination.

Adapted from Dubon ME, Rovito C, Van Zandt DK, Blauwet CA. Youth Para and Adaptive Sports Medicine. Curr Phys Med Rehabil Reports. 2019;7(2):104-115; with permission.

physical disabilities, extrapolation from adaptive sports medicine literature may be helpful until further literature is available for DWDBD. A critical review of the para sport literature revealed that athletes who were wheelchair users had a tendency toward upper extremity injuries (including shoulder, elbow, wrist, and hand injuries; muscle/tendon injuries; as well as mononeuropathies), whereas ambulatory athletes had a tendency toward lower extremity injuries.⁶¹ Shoulder pain and injury are common in wheelchair users; however, research has shown that the odds of shoulder pain in nonathlete wheelchair users is greater than in wheelchair athletes, suggesting that strengthening and conditioning likely decreases the risk of shoulder pain.⁶² The authors suspect that proper wheelchair propulsion biomechanics and periscapular strengthening are important for the shoulder health of wheelchair dancers; however, further research is needed to test this hypothesis.

Few data exist for injury patterns among dancers or any athletes with IDD. Limited data from Special Olympics indicate that musculoskeletal and skin concerns are frequent reasons for medical consultation at their large events; however, more research is needed on overall injury patterns among athletes and/or dancers with IDD.⁶³ Similarly, few data exist for BLV or DHH athletes or dancers. Football five-a-side is a Paralympic sport for BLV athletes. Research has shown a predominance of lower extremity, head, and neck injuries in this sport.⁶⁴ Given the significant

Table 6**Precautions/medical/safety considerations for athletes and dancers with disabilities, deafness/hard of hearing, and blindness/low vision**

Condition	Precautions/Medical Considerations
Spinal cord injury	<ul style="list-style-type: none"> • Motor impairments • Sensory impairments • Pressure sores • Low bone mineral density • Spasticity • Neurogenic bladder • Neurogenic bowel • Thermoregulation impairments • At risk for autonomic dysreflexia
Cerebral palsy	<ul style="list-style-type: none"> • Motor impairments • Spasticity • Dystonia • Low bone mineral density • At risk for pressure ulcers • Orthopedic comorbidities • At risk for seizures
Spina bifida	<ul style="list-style-type: none"> • Motor impairments • Sensory impairments • At risk for pressure ulcers • Low bone mineral density • Hydrocephalus/shunt • Chiari malformation • Neurogenic bladder • Neurogenic bowel • Cognitive impairment • Tethered cord • Orthopedic comorbidities
Congenital limb deficiency/amputation	<ul style="list-style-type: none"> • At risk for pressure ulcers/blisters • Phantom limb sensation/pain • Risk of appositional bone growth/terminal overgrowth in youth
Muscular dystrophies	<ul style="list-style-type: none"> • Exercise restrictions: concern for muscle damage, particularly with eccentric exercise • Pulmonary comorbidities • Cardiac comorbidities • Low bone mineral density • At risk for pressure ulcers
Arthrogryposis	<ul style="list-style-type: none"> • Decreased range of motion • Motor impairments • Pressure sores
Postpoliomyelitis/acute flaccid myelitis	<ul style="list-style-type: none"> • Motor impairment • Low bone mineral density • Respiratory impairments • Cranial nerve impairments
Brain injury	<ul style="list-style-type: none"> • Motor impairments • Cognitive impairments • Coordination impairments • Vision difficulties • Hearing difficulties • Spasticity

(continued on next page)

Table 6 (continued)	
Condition	Precautions/Medical Considerations
	<ul style="list-style-type: none">• Dystonia• Movement disorders• At risk for seizures• Sports clearance by physician needed after brain injury• Possible ongoing restrictions from contact/collision sports
IDDs	<ul style="list-style-type: none">• Many types• Medical comorbidity with known diagnoses• Complications associated with medication side effects• Considerations for Down syndrome• Atlantoaxial instability• Cardiac comorbidities• Ligamentous laxity
Achondroplasia	<ul style="list-style-type: none">• Foramen magnum narrowing increasing risk for cervical myelopathy• Hydrocephalus• Avoidance of gymnastics/tumbling/contact sports
Multiple sclerosis	<ul style="list-style-type: none">• Motor impairments• Cognitive impairments• Spasticity• Sensory impairments• Neurogenic bladder• Neurogenic bowel• Optic neuritis• Low bone mineral density• At risk for pressure ulcers
Deafness/hard of hearing	<ul style="list-style-type: none">• Associated renal disease• Associated balance difficulty• Associated visual impairment
Blindness/low vision	<ul style="list-style-type: none">• Cause of visual impairment and associated comorbidity

Data from Refs.^{55–60} Please refer to Ref.⁵⁵ for more details and more resources for a more in-depth review of the topic.

difference between this sport and dance, it is unclear whether these injury patterns are applicable for BLV dancers.

Disordered eating, female athlete triad (FAT)/relative energy deficiency in sport (RED-S), substance misuse, and mental health concerns associated with perfectionism have been reported in dancers; however, to our knowledge this has not been examined in DWDBD.^{65–67} However, a recent study indicates that para athletes have factors traditionally associated with FAT/RED-S, highlighting the need for more research in this area for para athletes and DWDBD.⁶⁸

When working with DWDBD, the general principles of dance medicine injury prevention should be applied, including the importance of dynamic stretching, conditioning, nutrition, and mental health support, but more research is needed in the area of injury patterns, injury prevention, and wellness in DWDBD to better provide more specific recommendations for this population.⁶⁹

SUMMARY

Dance medicine is a growing field. Similarly, there is a growing number of dancers with disabilities, blindness/low vision, and deafness/hard of hearing. This article provides

an overview of dance and dance medicine for individuals with disabilities, blindness/low vision, and deafness/hard of hearing. Considerations for dancers with physical disabilities may include prescription of an appropriate AD and adjustments to physical movement with or without AD use. Dance considerations for BLV dancers may include use of tactile modeling, whereas considerations for DHH dancers may include use of visual cues or vibration of the floor. Dance considerations for dancers with IDD may include use of memory strategies and visual aids to assist with remembering choreography and use of consistent structured class schedules. Little is known about dance injury patterns or wellness considerations for dancers with disabilities, low vision, or deafness/hard of hearing; however, the authors call for more research in this area and in the meantime recommend applying knowledge from dance medicine and para sports medicine. A high degree of collaboration and communication is vitally important for both dance professionals and health professionals working with DWDBD.

ACKNOWLEDGMENTS

The authors would like to acknowledge Cheri Blauwet, MD; Kristen Stevens; and Mar-ijeanne Liederbach PhD, PT, ATC, CSCS, for their assistance with the content and creative process of this article.

DISCLOSURE

M. Dubon has received funding from National Curriculum Initiative in Developmental Medicine, Deborah Munroe Noonan Memorial Fund/Health Resources in Action, Med-Strat (spouse's stock, spouse employment), Amazon (spouse's stock) and is Special Olympics Massachusetts MedFest Medical Director and Special Olympics Consultant for Sports Prevention of Risk through Incident Tracking (SPRINT). R. Siegel, J. Smith, M. Tomasic and M.L. Morris have nothing to disclose.

REFERENCES

1. Gallaudet dance company – Gallaudet university. Available at: <https://www.gallaudet.edu/office-of-development/gallaudet-dance-company>. Accessed May 9, 2020.
2. Para dance sport - about the sport | international Paralympic committee. Available at: <https://www.paralympic.org/dance-sport/about>. Accessed May 9, 2020.
3. About dancing wheels – dancing wheels. Available at: <https://dancingwheels.org/about-dancing-wheels-copy/>. Accessed May 9, 2020.
4. Mission — AXIS dance company. Available at: <https://www.axisdance.org/mission>. Accessed May 9, 2020.
5. Seham J, Yeo AJ. Extending our vision: access to inclusive dance education for people with visual impairment. *J Dance Educ* 2015;15(3):91–9.
6. Boston children's hospital. Adaptive dance - YouTube. Available at: <https://www.youtube.com/watch?v=OkWlpYK77SA>. Accessed May 9, 2020.
7. Bay area international deaf dance festival. Available at: <https://www.realurbanjazzdance.com/bay-area-international-deaf-dance-festival.html>. Accessed May 9, 2020.
8. Campodonico C. Moving blind: visually impaired performers dance from the soul - at this stage. Available at: <https://thisstage.la/2017/08/moving-blind-visually-impaired-performers-dance-from-the-soul/>. Accessed May 9, 2020.

9. Competitive cheer and dancesport adopted as recognized sports of special olympics. Available at: <https://www.specialolympics.org/about/press-releases/competitive-cheer-and-dancesport-adopted-as-recognized-sports-of-special-olympics>. Accessed May 9, 2020.
10. McGrath E. Dancing with disability: an intersubjective approach. In: Goodley Dan, Hughes Bill, Davis L, editors. *Disability and social theory*. Palgrave Macmillan UK; 2012. p. 143–58. https://doi.org/10.1057/9781137023001_9.
11. DanceAbility International I About Us. Available at: <https://www.danceability.com/about-us>. Accessed May 9, 2020.
12. Tomasic M, Verdi-Fletcher M. *Dancing wheels (Dance group). Physically integrated dance training : the dancing wheels comprehensive guide for teachers, choreographers and students of mixed abilities*. Cleveland (OH): NewVoices; 2012.
13. Schrock M. Go inside a dance class for the blind at the royal ballet - dance magazine 2017. Available at: <https://www.dancemagazine.com/go-inside-dance-class-blind-royal-ballet-2307053887.html>. Accessed May 9, 2020.
14. Boston ballet - education | adaptive dance teacher training. Available at: <https://www.bostonballet.org/Home/Education/Resources/For-Educators/Adaptive-Dance-Training>. Accessed May 9, 2020.
15. Aujla IJ, Redding E. The identification and development of talented young dancers with disabilities. *Res Dance Educ* 2014;15(1):54–70.
16. Disability. Dance. Artistry. | Dance/NYC. Available at: <https://www.dance.nyc/programs/dancenyc-events/2015/07/Disability.-Dance.-Artistry/>. Accessed May 9, 2020.
17. The Future of Physically Integrated Dance in the USA; 2017. Available at: <https://static1.squarespace.com/static/53a9f1f1be4b08edefaf5367d/t/59a4840e6f4ca3313b05c3fe/1503953949140/AxisDance-Report-DanceUSA2017-Final-AltTags%28lo-res%29.pdf>.
18. Dance/USA — the national service organization for professional dance. Available at: <https://www.danceusa.org/>. Accessed May 9, 2020.
19. International association for dance medicine & science. Available at: <https://www.iadms.org/>. Accessed May 9, 2020.
20. Performing arts medicine association | dedicated to the health of performing artists. Available at: <http://www.artsmed.org/>. Accessed May 9, 2020.
21. Resources — AXIS dance company. Available at: <https://www.axisdance.org/resources>. Accessed May 9, 2020.
22. How Ailey's samantha figgins dances with hearing loss - dance spirit. Available at: <https://www.dancespirit.com/samantha-figgins-single-sided-deafness-2635360817.html>. Accessed May 9, 2020.
23. Making dance/movement therapy the therapy of choice for autism spectrum disorder | ADTA. Available at: <https://adta.org/2015/04/20/making-dancemovement-therapy-the-therapy-of-choice-for-autism-spectrum-disorder/>. Accessed May 9, 2020.
24. Greene M. What it's like to be a dancer & choreographer when you're blind. *Dance magazine*. 2018. Available at: <https://www.dancemagazine.com/blind-dance-2621901530.html?rebellitem=4#rebellitem4>. Accessed May 9, 2020.
25. del Valle L. First visibly disabled radio city rockette takes the stage - CNN. CNN. 2019. Available at: <https://www.cnn.com/2019/12/24/us/disabled-radio-city-rockette-history-trnd/index.html>. Accessed May 9, 2020.

26. Perron W. Ali Stroker: first wheelchair performer on Broadway - dance magazine. dance magazine. Available at: <https://www.dancemagazine.com/ali-stroker-first-wheelchair-performer-on-broadway-2306985638.html>. Accessed May 9, 2020.
27. Kim S. Ali Stroker's tony award was only Broadway's first step to disability inclusivity. Forbes. 2019. Available at: <https://www.forbes.com/sites/sarahkim/2019/06/13/ali-stroker-tony-award/#cd410c17a734>. Accessed May 9, 2020.
28. Caldwell M, De Luigi AJ. Wheelchair dance sport. In: De Luigi AJ, editor. Adaptive sports medicine. 1st edition. Springer International Publishing; 2018. p. 171–9. https://doi.org/10.1007/978-3-319-56568-2_16.
29. Cooper RA, De Luigi AJ. Adaptive sports technology and biomechanics: wheelchairs. PM R 2014;6(8 SUPPL). <https://doi.org/10.1016/j.pmrj.2014.05.020>.
30. Cooper RA, Cooper R, Susmarski A. Wheelchair sports technology and biomechanics. In: De Luigi AJ, editor. Adaptive sports medicine. 1st edition. Springer International Publishing; 2018. p. 21–34. https://doi.org/10.1007/978-3-319-56568-2_2.
31. Morris M, M R, Messerschmidt T, T L, Edmonston N. US patent for omnidirectional remote-controlled mobility apparatus patent (Patent # 9,027,678 issued May 12, 2015) - Justia patents search. US Patent. 2015. Available at: <https://patents.justia.com/patent/9027678>. Accessed May 9, 2020.
32. Morris ML. Mobilizing possibilities: dance, disability and technology. J Humanit Rehabil . 2015. Available at: <http://artsanddisability.blogspot.com>. Accessed May 9, 2020.
33. Radocy B. Special considerations: upper-limb prosthetic adaptations for sports and recreation | o&p virtual library. atlas of limb prosthetics: surgical, prosthetic, and rehabilitation principles. Available at: <http://www.oandplibrary.org/alp/chap12-03.asp>. Accessed May 9, 2020.
34. De Luigi AJ. Technology and biomechanics of adaptive sports prostheses. In: De Luigi AJ, editor. Adaptive sports medicine. 1st edition. Springer International Publishing; 2018. p. 35–47. https://doi.org/10.1007/978-3-319-56568-2_3.
35. De Luigi AJ, Cooper RA. Adaptive sports technology and biomechanics: Prosthetics. PM R 2014;6(8 SUPPL). <https://doi.org/10.1016/j.pmrj.2014.06.011>.
36. Heigl A. Gabi shull: teen dancer uses prosthesis post-cancer | PEOPLE.com. People. 2016. Available at: <https://people.com/celebrity/gabi-shull-teen-dancer-uses-prosthesis-post-cancer/>. Accessed May 9, 2020.
37. Van Nes CP. Rotation-Plasty For Congenital Defects Of The Femur. J Bone Joint Surg Br 1950;32-B(1):12–6.
38. Zidepa L. This amputee defied the odds to become a ballerina | News24. You. 2016. Available at: <https://m.news24.com/You/Archive/this-amputee-defied-the-odds-to-become-a-ballerina-20170728>. Accessed May 9, 2020.
39. Marie . T — Jae-Hyun an. design. Available at: <http://www.jaehyunan.com/new-page-45/>. Accessed May 9, 2020.
40. Stahl J. There's a new prosthesis designed for dancing on pointe. Dance magazine 2018. Available at: <https://www.dancemagazine.com/prosthetic-pointe-2618740374.html>. Accessed May 9, 2020.
41. Davies T. Mobility: AXIS dancers push the boundaries of access. Text Perform Q 2008;28(1–2):8–42.
42. Standal ØF. Re-embodiment: incorporation through embodied learning of wheelchair skills. Med Health Care Philos 2011;14(2):177–84.
43. Iwakuma M. The body as embodiment: an investigation of the body by Merleau-Ponty. In: Corker M, Shakespeare T, editors. Disability, postmodernity, embodying disability theory. London (United Kingdom): Continuum; 2002. p. 76–87.

44. Jutai J, Day H. Psychosocial impact of assistive devices scale (PIADS). *Technol Disabil* 2002;14(3):107–11.
45. Scherer MJ, Sax C, Vanbiervliet A, et al. Predictors of assistive technology use: the importance of personal and psychosocial factors. *Disabil Rehabil* 2005; 27(21):1321–31.
46. Morris ML. Dance, disability, and assistive technology: probing interdisciplinary landscapes and re-imagining design 2017.
47. Cone TP, Cone SL. Strategies for Teaching Dancers of All Abilities. *J Phys Educ Recreat Dance* 2011;82(2):24–31. <https://doi.org/10.1080/07303084.2011.10598578>.
48. Edelstein C. The link between american deaf culture and dance: assessing nonverbal communication and recognizing the value of deaf dancers 2016. Available at: <https://digitalcommons.butler.edu/ugtheses>. Accessed May 9, 2020.
49. How? — feel the beat dance. Available at: <https://feelthebeat.dance/the-technology>. Accessed May 9, 2020.
50. Brault M. Disability status and the characteristics of people in group quarters: a brief analysis of disability prevalence among the civilian noninstitutionalized and total populations in the American community survey 2008. Available at: http://www.census.gov/acs/www/Downloads/2006/usedata/Subject_Definitions.pdf. Accessed May 9, 2020.
51. Air ME, Grierson MJ, Davenport KL, et al. Dissecting the doctor-dancer relationship: health care decision making among American collegiate dancers. *PM R* 2014;6(3):241–9.
52. Dec KL, Sparrow KJ, McKeag DB. The physically-challenged athlete: medical issues and assessment. *Sports Med* 2000;29(4):245–58.
53. Siow HM, Cameron DB, Ganley TJ. Preparticipation sports evaluation: issues for healthy children and athletes with disabilities. *J Pediatr Orthop* 2010;30(SUPPL. 2):S17–20.
54. Bernhardt DT, Roberts WO. American academy of family physicians. PPE : pre-participation physical evaluation. 5th edition. Itasca: American Academy of Pediatrics; 2019.
55. Dubon ME, Rovito C, Van Zandt DK, et al. Youth para and adaptive sports medicine. *Curr Phys Med Rehabil Rep* 2019;7(2):104–15.
56. Palmer T, Weber KM. The deaf athlete. *Curr Sports Med Rep* 2006;5(6):323–6.
57. Official website of IBSA - international blind sports federation. Available at: <http://www.ibsasport.org/>. Accessed May 10, 2020.
58. Visually impaired friendly athletics a guide for supporting visually impaired adults and children in athletics. Available at: <https://britishblindsport.org.uk/wp-content/uploads/2017/07/VisuallyImpairedFriendlyAthletics.pdf>. Accessed May 10, 2020.
59. Court H, McLean G, Guthrie B, et al. Visual impairment is associated with physical and mental comorbidities in older adults: a cross-sectional study. *BMC Med* 2014;12(1):181.
60. Chandan P, Dubon ME. Clinical considerations and resources for youth athletes with intellectual disability: a review with a focus on special olympics international. *Curr Phys Med Rehabil Rep* 2019;7(2):116–25.
61. Tuakli-Wosornu YA, Mashkovskiy E, Ottesen T, et al. Acute and chronic musculoskeletal injury in para sport: a critical review. *Phys Med Rehabil Clin N Am* 2018; 29(2):205–43.
62. Fullerton HD, Borckardt JJ, Alfano AP. Shoulder pain: a comparison of wheelchair athletes and nonathletic wheelchair users. *Med Sci Sports Exerc* 2003;35(12): 1958–61.

63. Wheeler PC, Williamson T, Stephens C, et al. A report of the medical team activity at the 2009 Special Olympics GB. *Br J Sports Med* 2012;46(2):143–9.
64. Webborn N, Cushman D, Blauwet CA, et al. The epidemiology of injuries in football at the London 2012 Paralympic games. *PM R* 2016;8(6):545–52.
65. Peric M, Zenic N, Sekulic D, et al. Disordered eating, amenorrhea, and substance use and misuse among professional ballet dancers: Preliminary analysis. *Med Pregl* 2016;67(1):21–7.
66. Robbeson JG, Kruger HS, Wright HH. Disordered eating behavior, body image, and energy status of female student dancers. *Int J Sport Nutr Exerc Metab* 2015; 25(4):344–52.
67. Padham M, Aujla I. The relationship between passion and the psychological well-being of professional dancers. *J Dance Med Sci* 2014;18(1):37–44.
68. Brook EM, Tenforde AS, Broad EM, et al. Low energy availability, menstrual dysfunction, and impaired bone health: a survey of elite para athletes. *Scand J Med Sci Sport* 2019;29(5):678–85.
69. Elson LE. *Performing arts medicine*. 1st edition. St. Louis: Elsevier; 2018.