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Exploring the Components of Therapeutic Exercise Program(TEP) for Children with Developmental Disabilities

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This study aimed to identify and categorize the components of therapeutic exercise program (TEP) for children with developmental disabilities, potentially to increasing their remedial effects and physical activities. A TEP refers to the restoration process of physical functions and performance of human beings by engaging in a form of physical exercise. A comprehensive and objective category was developed systematically based on the extensive review of literature in the fields of therapeutic exercise, patient management, sports medicine, sports science, and other related areas. The identified categories included (a) anatomical features (e.g., physiological functions), (b) motor and skills (e.g., flexibility, physical strength), and (c) personal background (e.g., medication, family history). In addition, three training components (those with upper limbs, whole body, and lower limbs) were proposed for each of the five standard anatomical positions (i.e., standing position, prone position, supine, lateral recumbent, sitting potion). Based on the results, the value of this study and some practical guidelines (e.g., customization of TEP) were discussed.

Key words: Therapeutic Exercise Program (TEP), Developmental Disabilities, Component

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Introduction

Due to the recent COVID-19 pandemic, many countries have been enacting government-level regulations to prevent the spread of COVID-19, such as social distancing and wearing a mask. While many physical activities became limited under these regulations, the Korean government decided to financially support online-based physical education programs for students attending primary and secondary school, according to the Korean Ministry of Education (2020). In addition, the government announced to provide students with greater opportunities for various physical activities and social exchanges in the line of promoting school-based sports clubs (e.g., QR code in a promotion poster, YouTube channel). Although there has been a growing attention to physical activities and health promotion among children and adolescents, attentions to the underserved population, such as those with developmental disabilities, have been highly limited from the government as well as the academia. However, given that children with developmental disabilities tend to have less opportunities to engage physical activities in both a sport program and a daily routine, many health-related problems have been reported, including mental depression, overweight/obesity, and increase in blood sugar. Thus, it is imperative to pay more attentions to these health inequalities, and specifically, the physiological and psychological outcomes due to the lack of physical activities among children with developmental disabilities

Previously, studies on the physical activity program for children with developmental disabilities have been conducted worldwide with different perspectives, mostly relying on the government-level research fund. However, this issue has been highly ignored in Korean society, compared to other countries. In particular, physical activity programs specifically designed for children with developmental disabilities are not often available in the educational or therapeutic settings in Korea (Chung, 2019).

Although relevant studies are limited in the Korean context, a couple of researchers identified major components (e.g., sensory perception exercise, basic motor skills, games and sports, physical exercise) that should be included in the physical activity programs for those with developmental disabilities, and showed that one's participation in the program resulted in many positive outcomes, in terms of psychomotor, cognitive, and characteristic dimensions (Yoon, Park , 2017; Chung, 2019).

Fundamentally speaking, the key objectives of physical activity programs for those with developmental disabilities are to increase one's physical movements and improve remedial value. Based on these principles, studies started to delve into the issue from a wide range of perspectives (e.g., health promotion, medical treatment, ecological approach, etc.) with multi-disciplinary educational tools and research paradigms, including the fields of medicine, information technology, education, and so on (Kang, Kang, 2015; Chung, 2019; Must, Curtin, Hubbard, Sikich, Bedford, Bandini, 2015; Obrusnikova, & Cavalier, 2011). Specifically, therapeutic exercise programs have been launched lately

in schools and communities by engaging a variety of physical activities, such as pilates, aqua exercise, functional training, proprioceptive neuromuscular facilitation, sling exercise, and emblass exercise (Crollick, Mancil & Stopka, 2006; Ding & Li, 2013; Sara?o?lu & ?irinkan, 2016).

Generally, therapeutic exercise refers to the restoration process of physical functions of human beings by engaging a form of exercise. It often aims to improve one's balance, cardiovascular endurance performance, coordination, flexibility, mobilization, muscle performance, neuromuscular control performance, postural control, postural stabilization, and stabilization (Saunders, 2007; Shin & Hwangbo, 2015; Brumitt, Matheson & Meira, 2013; Kisner, Colby & Borstad, 2017). In the context of therapeutic exercise program among children with developmental disabilities, it is necessary to systemize specific body movements and actions that the children present and perform during the program. The systematic tool will help us record and collect their movements in a more objective and accurate way. Therefore, relying on the constructs identified from the literature, the current study aims to identify and categorize components of therapeutic exercise programs (TEP) for children with developmental disabilities. It is expected that the key components can be applied to better designing effective and balanced TEPs.

Method

The literature and previous studies were comprehensively reviewed and analyzed in order to identify key components of TEP for children with developmental disabilities. The literature included a wide range of areas that may improve the objectiveness, concreteness, and comprehensiveness of the category system, including therapeutic exercise, sports rehabilitation, sports medicine, patient management, exercise effectiveness, etc. The literature was retrieved from the archives of relevant academic societies, scholarly journals, and books (ACSM's Guidelines for Exercise Testing and Prescription). The potential components were collected and categorized primarily. In addition, they were compared with the basic body movements identified from the on-going therapeutic programs in the field. The components were finalized in consideration of some anatomical positions, such as standing position, prone position, supine, lateral recumbent, and sitting position. In order to increase applicability of the program, the final components consisted of those that do not require any training tools and that can be performed individually on a flat ground.

Results and Discussion

<Table 1> shows a variety of components of TEP based on the literature. The final categories included (a) anatomical features that were related to the physiological functions, (b) motor and skills that were based on the physical performance, and (c) personal background.

Table 1. *Components of the therapeutic exercise program*

Division	Literature	Components
Anatomical features	ACSM	Physical ability test, Physical function ability, Ligaments and joint function, Gait function, Neuromuscular function, Spine function, Spine stabilization, Spine activation
Motor & Skills	ACSM	Flexibility, Mobilization, Stretching, Spine Strength exercise, Therapeutic strength exercise, Balance exercise, Rehabilitation exercise, Coordination ability, Strength, Breath exercise, Gluteus strength exercise, Ergonomic exercise, Coordination exercise, Endurance, Personalized exercise, Core exercise, Pelvic strength exercise, Shoulder strength exercise, ROM(Passive/Active range of motion), Isometric, Constant, Isokinetic, Open/Close Kinetic
Personal background	ACSM	Medication, Disease, Family history, Internal medicine test, Sedentary life, Drug, Motivation of low level, Epidemis, Learning ability, Surgery history, Risk prediction, Corrective exercise movement

Specifically, the division of anatomical features presents physical ability test, physical function ability, ligaments and joint function, gait function, etc. The division of motor and skills includes flexibility, mobilization, stretching, spine strength exercise, therapeutic strength exercise, balance exercise, rehabilitation exercise, coordination ability, strength, breath exercise, gluteus strength exercise, and so on. Lastly, personal background indicates such individual properties as medication, disease, family history, internal medicine test, sedentary life, drug, motivation of low level, epidemics learning ability, surgery history, etc.

In addition, physical activities or body movements should be examined by observing and portraying the objects in a systematic and objective manner. In this regard, the standard anatomical position provides a useful and fundamental framework in explaining standard positions and physical movements of human body as an organic system. Thus, it has been used widely as a referent criterion to elaborate human body and its movements by many scholars and experts in medicine and sports science (Kumagai, Hiki, Nunobe, Kamiya, Tsujiura, Ida & Sano, 2018).

The current study also utilized the standard anatomical position. As <Table 2> shows, the components of TEP were identified based on training with upper limbs, hole body, and lower limbs in the five positions (i.e., standing position, prone position, supine, lateral recumbent, sitting potion).

Table 2. *Components according to 5 standard anatomical positions*

Division	Picture	Components		
		Training with upper limbs	Training with hole body	Training with lower limbs
Standing position		Cervical mobilization, Shoulder mobilization, Lumbar mobilization, Cervical stretch, Lumbar stretch, Shoulder stretch, Phalange mobilization, Lumbar strength, Abdominal strength, Shoulder strength	Shoulder mobilization, Lumbar mobilization, Knee mobilization, Pelvic mobilization, Pelvic strength, Thigh strength, Lumbar strength, Back strength, Shoulder strength, Calf strength, Abdominal strength, Cardiovascular, Balnce	Pelvic mobilization, Knee mobilization, Ankle mobilization, Lumbar Mobilization, Pelvic stretch, Hamstring stretch, Lumbar stretch, Thigh stretch, Calf stretch
Prone position		Arm strength, Shoulder strength, Lumbar strength, Abdominal strength	Pelvic strength, Lumbar strength, Thigh strength, Shoulder strength, Abdominal strength, Arm strength	Pelvic stretch
Supine		Shoulder strength, Abdominal strength, Lumbar strength	Lumbar strength, Abdominal strength, Pelvic strength,	
Lateral Recumbent		Lumbar strength, Abdominal strength	Pelvic strength, Thigh strength	Pelvic strength, Lumbar strength, Abdominal Strength
Sitting potion		Shoulder strength, Abdominal strength, Lumbar strength	Lumbar strength, Abdominal strength, Pelvic strength, Thigh strength	

To recap the purpose and process of this study, it aimed to examine key components of TEP for children with developmental disabilities based on an intensive review of literature. It assumes that the lack of physical activities among those with developmental disabilities should be improved. During the continuous restoration process, TEP can help improve their physiological functions and physical performance, minimize disease-related symptoms, and/or delay the progress to worse health conditions, by engaging voluntary muscle training and body movements. In this regard, TEP embraces a broad

spectrum of disease treatment, restoration, and prevention. It is worth noting that a home-based exercise program is necessary for children with developmental disabilities. While the positive outcomes of physical activities are widely known (e.g., decreased mortality, prevention of cardiovascular diseases and hypertension, management of body weight and blood sugar level), the impacts of physical activities can be over and beyond these outcomes among those with developmental disabilities.

In designing TEP for children with developmental disabilities, there are a few key considerations. One of them is that the program should be customized to an individual person while every component of TEP should be balanced in one's program. The components proposed in this study embraced this perspective by including 'personal background.' Each person has different strengths and weaknesses in his/her physiological functions and physical performance. For example, an individual has different capabilities in terms of range of motion (ROM), flexibility/stretching, and muscle strength, and thus, these should be taken into account in designing the program (Geslak, 2017; Wang, Cai, Liu, Herol, Zou, Zhu & Chen, 2020).

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