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Occupational Therapy

Therapeutic and Creative Use of Activity

Edited by Meral Huri

OCCUPATIONAL THERAPY - THERAPEUTIC AND CREATIVE USE OF ACTIVITY

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Notice

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Meet the editor

After graduation from the School of Physical Therapy in 2000, Dr. Huri received her MS and PhD degrees in Occupational Therapy from Hacettepe University, Turkey. Her research focuses on occupational science and the impact of occupational therapy on practitioners, children, and individuals with cancer. She is the author of 26 journal articles, 8 book chapters and two books in occupational therapy and rehabilitation. She was awarded for her two studies in rehabilitation of patients with prostate cancer and interdisciplinary team approach in community health care. Dr. Huri is currently engaged in developing occupational therapy in Turkey, quality assurance processes in health sciences and research collaboration with colleagues from all over the world.

Contents

Preface

Occupational therapy focuses on optimizing the ability of an individual to perform the activities that they need and want to do and thereby participate fully in life. This book is the result of an ongoing deep interest in the importance of activity in occupational therapy and therapeutic use of activity in the holistic rehabilitation approach.

As an academician, my interactions with students and practicing occupational therapists inspired me to learn more about activity and its effects on the individual. My deep interest in learning how I might blend knowledge from the field of occupational therapy with my existing physical and occupational therapy knowledge gave me the chance to understand the creative, artistic and spiritual approach focusing on activity.

The core subject of this book is activity and the effects of activity participation on *human performance and participation*. This book aims to support valuable occupational therapy research and clinical practice and it presents different procedures for creating efficient occupational therapy programs for different groups of individuals to increase health, quality of life and well-being.

This comprehensive book lays the foundation of occupation-based practice and addresses the contextual issues in different occupational therapy practices. The chapters cover topics about the importance of occupational therapists' knowledge on how to use activity in their practice. The topics are covered from a basic to advanced level, including the ultimate level of independence of the individual who needs occupational therapy.

The findings from this book confirmed the need for a text addressing issues for use by educators, students and practitioners of occupational therapy at various levels of development.

While editing this book, I learned new things about occupational therapy, and my goal is to share with you what the authors have learned during their occupational therapy journey. Additionally, I dedicate this book to the exceptional therapists whose work is featured in this book. Generously, they contributed their time, personal reflections, and revealing stories of practice to serve the interest of education and knowledge development in occupational therapy.

I also want to dedicate this book to Melya, light of my life…

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Section 1

Occupational Therapy in Various Populations

Chapter 1

Occupational Therapy's Role in the Treatment of Children with Autism Spectrum Disorders

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Theodore W. Peterson

Additional information is available at the end of the chapter

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Abstract

Occupational therapists (OT) offer a wide range of therapies for individuals with ASD on the basis of specific deficits and difficulties. This chapter explores the role that OT plays, and the expertise, in relation to the interdisciplinary team. In addition, it discusses and presents empirical support for several therapeutic approaches commonly used by OTs working with individuals with ASD.

Keywords: occupational therapy, ASD, treatment

1. Learning objectives

After completing this chapter, readers will be able to:

1. Understand and explain the role of occupational therapy in the treatment of autism spectrum disorders.
2. Understand the application occupational therapy interventions to individuals with autism spectrum disorders.
3. Identify and describe a variety of popular therapeutic approaches utilized in occupational therapy for individuals with autism spectrum disorders.
4. Analyze popular therapeutic approaches for treating autism spectrum disorders using an evidence-based practice lens.

2. Occupational therapy

2.1. Introduction

Occupational therapists are part of the rehabilitation team for persons with injury, illness, and/or disability. The primary goal of OT is to promote functional independence.

2.2. Occupational therapy

Occupational therapy has been described as the art and science of helping people do the day-to-day activities that are important and meaningful to their health and well-being through engagement in valued occupations [1]. Occupational therapy draws on the centrality of occupations to daily life. It is concerned with helping clients engage in all the activities that occupy their time, enable them to construct identity through doing, and provide meaning throughout their lives [2]. As a part of the therapy provided, the client, group or population is expected to engage in meaningful occupation(s). Occupational engagement is the capacity to contribute to one's own health and well-being [3].

Ultimately, OT professionals (occupational therapists and occupational therapy assistants) help people of all ages participate in the things they want and need to do through the therapeutic use of everyday activities (occupations). Unlike other professions, occupational therapy helps people function in all of their environments (e.g., home, work, school, community, virtual) and addresses the physical, psychological, and cognitive aspects of their well-being through engagement in occupation(s) [1].

2.3. Occupation

In exploring occupational therapy (OT) and its role in the treatment of individuals with an ASD, time must be spent defining the term occupation. Historically, the term *occupation* was defined as the way in which people use or occupy their time [4]. Yerxa, one of the founders of occupational science, more recently defined occupation as the "specific chunks of activity within an ongoing stream of behavior which are named in the lexicon of the culture…. These daily pursuits are self-initiated, goal directed (purposeful) and socially sanctioned" ([5], p. 5). Other occupational therapy scholars have described occupation as everything people do to occupy themselves, including looking after themselves (self-care), enjoying life (leisure) and contributing to the social and economic fabric of their communities (productivity) [6].

Occupations occur throughout the lifespan, in context, and are influenced by the interplay among client factors (capacities characteristics and beliefs of the person), performance skills (goal directed actions), and performance patterns (habits, routines, and roles). Occupations occur over time; have purpose, meaning, and perceived utility to the individual; and can be observed by others (e.g. writing one's name) or known only to the person involved (e.g. morning grooming routine). Occupations can involve the execution of multiple activities for completion and result in various outcomes. The broad range of occupations are categorized by the American Occupational Therapy Association (AOTA) into activities of daily living

(ADLs), rest and sleep, education, work, play, leisure, and social participation [1]. To understand how these occupational categories are used in therapy, it is important to review the occupational therapy philosophy.

2.4. Occupational therapy philosophy

Hooper and Wood best articulated the philosophical underpinnings of OT, stating that "ever changing humans, interconnected with ever changing environments, occupy time with ever changing occupations, and thereby transform–and are transformed by–their actions, environment and states of health" ([7], p. 38). This philosophy supports the domain, process, and intervention of therapy practice.

2.4.1. Domain

The domain of occupational therapy practice is heavily influenced by AOTA's Occupational Therapy Practice Framework [1] and the World Health Organization's International Classification of Functioning [8]. The domain of occupational therapy includes the areas of occupation: activities of daily living, instrumental activities of daily living, rest and sleep, education, work, play, leisure, and social participation. The domain also encompasses aspects of functioning that impact occupational performance. According to AOTA, these aspects include performance skills (motor skills, process skills, and social interaction skills), performance patterns (habits, routines, rituals, and roles) and context/environment (cultural, personal, physical, social, temporal, and virtual) [1].

2.4.2. Process

The occupational therapy process involves the actions and reasoning of practitioners which are used to provide services that focus on the client's participation and performance in daily occupations. The occupational therapy process is designed to be holistic in nature capturing the client as the individual, his or her family, and other supports, while at the same time taking into consideration the individual's interaction with the physical, social and attitudinal contexts of function [1]. The process may be direct 1:1, group, and/or consultative in delivery, with the aim to create opportunities for optimal health, well-being, and lifelong engagement in occupations [1].

The evaluation aspect of the process includes gathering, interpreting and synthesizing information that is relevant to the client's past and current engagement and performance in meaningful occupations (ADLs, IADLs, play, etc.), in addition to his or her desired goals and priorities for the short and long term future [1]. Furthermore, the evaluating therapist assesses the barriers and supports that impact the client's health, well-being, and participation.

2.4.3. Intervention

The intervention process consists of skilled services provided by occupational therapy practitioners (OTs and occupational therapy assistants) in collaboration with clients to facilitate

engagement in occupations related to health, well-being, and participation [1]. The intervention process includes a plan, implementation, and review [9]. The aim of the intervention is to improve the client's desired and expected participation and performance in occupations through the implementation of techniques and procedures that are directed towards the client or towards his or her environment and/or activities [1]. A unique aspect of the intervention process is the standard procedure of practitioners using the collective influence of the client's context and environment, demands of the activity at hand, and the individual characteristics of the client [1]. This procedure is formally characterized as a task analysis [9].

In order to practice occupational therapy, practitioners must first gain an understanding of the domain, process, and intervention utilized in OT while completing their higher education at a school that is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE).

2.5. Education

The current degree required for entry-level occupational therapists is a master's degree. The Occupational Therapy Doctorate (OTD) is also available as an entry level-degree, but is not currently required by ACOTE. Obtaining graduate degree assures that practitioners have the knowledge and skills necessary to fully implement evaluation and intervention to remediate functional deficits.

In addition to occupational therapists, OT personnel are also comprised of occupational therapy assistants (OTAs). OTAs must minimally obtain an associate's degree from an ACOTE accredited institution. OTAs must work under the supervision of an occupational therapist and are generally tasked with implementing intervention and performing other tasks in support of the OT plan of care, which vary depending on the state in which the OTA practices.

After completing their formal education, both occupational therapists and OTAs are required to pass a national registration exam offered by the National Board for Certification in Occupational Therapy. OTs and OTAs who pass the registration exam are then eligible to apply for state licensure and to assume a practice role.

2.6. Occupational therapy roles

Occupational therapists can assume a variety of roles in clinical practice. These roles include, but are not limited to: clinician, manager, case coordinator, policy maker, educator, and advocate. Roles cross a variety of practice settings, such as acute care, subacute care, outpatient care, home care, early intervention, and school-based practice. In a survey study completed by the AOTA, approximately 24% of OT practitioners provide services in school and early intervention based settings while many additional therapists work in freestanding community-based clinics and hospital-based settings that include pediatric services [11, 12].

2.7. Occupational therapy and the treatment of autism spectrum disorders

In the evaluation and treatment of individuals with ASD, OT professionals tend to address ADLs, IADLs, adaptive behavior, rest and sleep, employment/pre-employment, and social

participation. Underlying these issues, therapists seek to improve performance with gross motor, fine motor, and visual-motor integration skills; visual perception; sensory processing; and behavioral regulation [1]. Additionally, the evaluation and treatment process of individuals with ASD includes context (conditions within and surrounding the client) and the environment (external physical and social conditions), activity demands (tools, space, action and performance skills needed) and finally client factors (underlying beliefs, abilities and values) [1]. The OT professional takes into account the setting where the services will be provided and the environments where the individual functions and/or plans to function [1]. Caregivers play a significant role in occupational therapy treatment and are recognized as the 'client' while evaluating the child with ASD. Factors such as socio-demographic characteristics, roles, habits, rituals and the occupational balance of caregivers are to be taken into consideration [10, 11].

The specific intervention techniques used in OT with individuals with ASD include; establishing new functional skills, modifying activity demands, creating healthy lifestyles, maintaining existing performance, and preventing future difficulties for clients at risk [12]. One of the hallmark features of individuals with ASD is their tendency towards strong preferences and focused interest. While this tendency may be considered maladaptive for the generation of new skills, the OT may use it to influence the client's self-esteem and motivation to take part in areas of occupation as well as the intervention process through judicious choice of treatment activities that tap into an individual's preferences and interest [1].

3. Treatment approaches for autism spectrum disorders utilized by occupational therapists

With the increase in awareness and identification of children on the autism spectrum, teachers, researchers, clinicians, and families have worked diligently to create programming that can meet the varied and unique needs of this population. Often these approaches are developed for use across all aspects of a child's life, and as such, are intertwined in all services provided. While some approaches are utilized primarily in occupational and physical therapy (e.g. Ayres Sensory Integration), others are used across all disciplines (e.g. Applied Behavior Analysis). Whatever approach is selected, it is important to remember to communicate with the interprofessional team in order to determine best practices with each individual child and that the interventions provide purposeful activity [13, 14]. Occupational therapy professionals place significant value on the individual with autism's community participation and that it can be increased through their participation in meaningful and purposeful activities [15, 16]. The following sections review some of the more commonly used approaches in therapy.

3.1. Sensory processing treatment approaches

Difficulty processing sensory information has been identified as a common feature of ASD. The current best estimates demonstrate that up to 96% of children with ASD demonstrate difficulty with processing sensory information as a part of their daily routines [13, 15, 17]. Restricted, Repetitive Patterns of Behavior, Interest, of Activities" and that one of those 4

has something to do with "sensory features" [18]. The inability to accurately process sensory information impacts all areas of child development, so approaches directed towards remediation of sensory processing deficits are often used by both occupational therapists.

3.2. Ayres sensory integration intervention

3.2.1. Purpose of the technique

Ayers Sensory Integration Intervention® (ASII) is a clinical procedure grounded in sensory integration theory [19]. The intervention focuses on aiding clients to register, process, integrate and adequately respond to internal and external sensations that occur within the clients' daily life, contexts, and relationships. Sensory integration has been defined as "the neurological process that organizes sensations from one's own body and from the environment and makes it possible to use the body effectively in the environment" ([20], p. 11). ASII is aimed at remediating integration disruptions and increasing participation and performance among individuals who experience sensory disturbances or a sensory processing disorder. An internet survey identifying treatments used for children with ASD indicated that Sensory Integration (a broadly used term) was the third most commonly requested intervention requested by caregivers [21].

3.2.2. Overview of the technique

Intervention guided by sensory integration theory [19] has been reported to be commonly used by therapists who work with children with various types of developmental delays and medical and behavioral conditions [22, 23]. ASII includes the following steps within the standardized intervention protocol:

1. ensure physical safety of the client,

2. present active sensory opportunities (tactile, proprioceptive & vestibular),

3. help the client attain and maintain appropriate levels of alertness,

4. challenge postural, ocular, oral and/or bilateral motor control,

5. challenge praxis and organization of behavior,

6. collaborate between the client and the therapist on activity choice,

7. tailor the activities to present a just right challenge for the client,

8. ensure that activities are successful,

9. support the child's intrinsic motivation to play, and

10. establish therapeutic alliance between the client and the therapist [24, 25].

3.2.3. Review of the evidence

Pfeiffer, Koenig, and associates conducted a randomized-control trial with 37 children diagnosed with ASD who were between the ages of 5–12 years of age [26]. Seventeen participants

were assigned to a control group focused on fine motor intervention and 20 participants were assigned to the experimental group who received ASII. The study reported no significant differences in the subjective perception of sensory processing difficulties via the Sensory Processing Measure and objective ratings on the Quick Neurological Screening Test, 2nd Edition, between the control and experimental groups. Yet the authors reported a significant difference between groups in the reduction of autistic mannerisms and social responsiveness as measured by the Social Responsiveness Scale. Both groups demonstrated statistically significant improvement with Goal Attainment Scaling (focused on sensory processing, motor skills, & social functioning). However, there was a higher effect size in the ASII group than in the fine motor group.

Another randomized-control trial evaluated the efficacy of ASII among 32 children aged 4–8 years old, diagnosed with ASD [27]. In this trial, the experimental group using ASII ($n = 17$) scored significantly higher at posttest in the areas of self-help skills and socialization, than did the control group ($n = 15$) who received standard care. Additionally, the authors reported that children in the ASII group were better able to reach specific goals than the control group when measured using Goal Attainment Scaling. Children in the ASII group also experienced greater decreases in sensory related behaviors than the control group.

Iwanaga et al. utilized a quasi-experimental design to explore the use of ASII on 20 preschool aged children with high functioning autism [28]. It was reported that the children in the experimental group, who received ASII, demonstrated significantly higher total post test scores on the Miller Assessment of Preschoolers when compared to the control group. Significant improvements were noted specifically in the areas of motor coordination, nonverbal cognitive abilities, and sensory motor abilities following ASII treatment.

Case-Smith et al. conducted a systematic review on sensory integration with standardized administration protocols that occurred in clinics that used sensory-rich, child directed activities to improve a child's adaptive responses to sensory experiences [15]. They found and reviewed two randomized controlled trials, which reported positive effects for ASII on the participants (children with ASD) using Goal Attainment Scaling (with reported effect sizes ranging from .72 to 1.62); the additional studies analyzed included Level III–IV research studies, that reported positive effects on reducing challenging behaviors linked to sensory processing difficulties.

Kashefimehr et al. reported improvement in a sensory integration intervention group ($n = 16$) over a control group ($n = 15$) among children with ASD. The authors reported that the participants in the intervention group demonstrated significant improvements in the subjective measures of the Short Child Occupational Profile and the Sensory Profile. Of significant note the authors reported improvements not only in sensory processing domains (tactile processing, vestibular processing, etc.) but also in occupational performance based upon the Model of Human Occupation [29, 30].

It is important to make a clear distinction between ASII and other sensory-based interventions, as ASII has strict implementation protocol that may not always be followed accurately. In a review of more than 70 published research articles examining the efficacy of ASII, it was found that only three adhered to the theory and intervention protocols [25, 29, 30]. The reason for this disparity is that research conducted (in occupational and speech therapy, special education and psychology) generally did not report if the researchers designed the

intervention to represent Ayres' original therapeutic principles. Furthermore, it was not noted if the researchers monitored intervention delivery during the studies to ensure that a high degree of fidelity to the ASII was maintained [30–32]. This is an important notation when evaluating the efficacy of ASII, as the majority of the research claiming to be examining the effects of sensory integration treatment may really be evaluating sensory-based and sensory-motor-based interventions.

3.3. Sound-based interventions

3.3.1. Purpose of the technique

Sound-based interventions (SBIs) are a type of sensory-based intervention used by occupational therapists and some physical therapists with children diagnosed with ASD. SBIs originated from the work of Tomatis [33, 34], whose research on the ear and its connection to the nervous system led to his theory that one's "listening function" affects voice, language, motivation, coordination and learning abilities [35]. The theory that Tomatis postulated was that by listening to certain frequencies, the brain could retrain itself by creating new neural pathways, thereby compensating for dysfunctional brain structures or pathways. Tomatis's ideas led to the development of several SBIs, including the Tomatis Method®, Auditory Integration Training®, Therapeutic Listening®, Integrated Listening Systems® and The Listening Program®.

3.3.2. Overview of the technique

SBIs involve listening to psychoacoustically modified music, yet the manufacture of each SBI differs in the dosage, type of music used, how it is combined with other intervention techniques. In most cases therapists (occupational and some physical therapists) use SBIs as combined modality with other sensory-based treatment or to augment Ayres Sensory Integration Intervention.

3.3.3. Review of the evidence

Because the evidence supporting the use of SBIs with children with ASD is mixed, these techniques are non-reimbursable and should be considered experimental. To date, most research on SBIs has been focused on the Tomatis Method and Auditory Integration Training and has produced mixed empirical results [36, 37]. Some studies have suggested that these interventions may be effective for individuals with ASD, citing improvements in areas such as language, psychomotor skills, personal and social adjustment, non-verbal communication and adaptation to change [38, 39]. However, other research has found little to no significant improvement in individuals who received SBIs as compared to the control groups [40, 41]. Recent single case research indicated that some children with ASD using home-based SBIs demonstrated mild to moderate improvements in behavioral and sensory tolerance [42]. Other case studies observed a reduction in behaviors and scores related to auditory sensory over responsivity, as well as a reduced number and duration of self-stimulatory behaviors after using a SBI in conjunction with occupational therapy [43, 44].

3.4. Weighted blankets

3.4.1. Purpose of the technique

Sleep and rest disturbances are important self-care challenges that are commonly faced by many children with ASD, with 44–83% of individuals reporting some form of sleep disturbances [45]. Humphreys and associates found that children between the ages of 18 months and 11 years with ASD slept 17–43 min less each night than their typically developing matched peers, with decreased sleep patterns found to be most pronounced in children between the ages of 30 and 42 months [46]. Additionally, Malow and associates found that children with ASD who slept poorly showed an average decrease in rapid eye movement sleep, possibly providing a partial explanation for their finding that disordered sleep in children with ASD exacerbates behavioral problems during the day [47].

As sleep is important for overall wellbeing, occupational therapists may work with individuals to establish healthy sleep routines in their clients, commonly including children with ASD and their families. They often assist such children in obtaining adequate sleep by experimenting with different sleep routines, using cognitive and behavioral interventions, and/or implementing sensory-based interventions [48]. Weighted blankets are an example of a sensory-based intervention commonly used in helping children with autism spectrum disorders attain adequate sleep participation. The underlying theory behind their use is that weighted blankets provide deep pressure touch without movement restrictions. This deep pressure, in turn, releases endorphins and serotonin to relax and calm the individual and help the individual to modulate sensory input [49, 50]. These relaxing sensations, it is hypothesized, allow the individual to be better able to fall asleep and stay asleep.

3.4.2. Overview of the technique

Typically, weighted blankets are applied to children during sleep-time activities (nighttime and naps). The weight of the blankets used anecdotally is 10% of the child's body weight. The blankets size is large enough to cover the child's body, not including face and/feet. The intention is that the blanket will remain on top of the child throughout the duration of sleep.

3.4.3. Review of the evidence

The evidence to support the efficacy of using weighted blankets is scarce. Creasey and Finlay were unable to find any relevant primary or secondary evidence exploring the effectiveness of weighted blankets' impact on sleep in children with ASD [51]. Despite this lack of evidence, there is parental/caregiver anecdotal support of use, and as such, many advocate for the use of weighted blankets. One study published after Creasey and Finlay's review studied 73 children, aged 5–16 years, all of whom had an autism spectrum disorder diagnosis and reported sleep disturbances [52]. Using a crossover design, study participants were given a weighed blanket to sleep with for 2 weeks, followed by a period during which they slept with a non-weighted blanket that was provided by the researchers. The core findings were that weighted blankets were no more effective than a typical blanket in helping children with ASD improve

their total sleep time or other qualitative and quantitative sleep measures. Parents of the children in the study, however, reported an improvement in next-day behaviors, a finding that the authors hypothesized might have been due to improved bedtime behaviors, improved parent/child interactions, or inflated reports by parents wishing to please the study team.

Gee and associates conducted a study to explore the efficacy of weighted blankets with children with an ASD and sleep disturbances using a single case, multiple baseline design [44]. This study focused on two children with an ASD and sensory over-responsivity. The authors found that there were minimal changes reported via caregivers after 14 nights of use, yet they indicated improvement in the areas of time to fall asleep, number of wakings in the night, duration of sleep and behavior in the morning. Gee and associates, utilizing a similar demographic, sample size, and measures, reported that children with ASD and sensory over-responsivity demonstrated a correlation between their morning mood and the number of hours slept the previous night [53]. Furthermore, it was reported that morning mood of the participants improved during the intervention phase of the ABA design.

Overall, the evidence supporting the use of weighted blankets continues to be weak, as such, this technique is considered experimental and should be used with caution.

3.5. Weighted vests

3.5.1. Purpose of the technique

Weighted vests have been used for individuals with ASD presumably to influence their somatosensory systems [54]. Specifically, weighted vests are often used to provide deep pressure for individuals who demonstrate sensory over-responsiveness, and resistance to those with sensory under-responsiveness/seeking behaviors. However, the use of weighted vests has become popular with children with ASD in hopes of increasing attention, on-task behaviors, and social engagement [55], while decreasing stereotypical behaviors [56].

3.5.2. Overview of the technique

A weighted vest is a type of sensory-based intervention. A weighted vest is a garment that typically has 1–4 lbs. (approximately 10% of the child's total body weight) of total weight evenly distributed across it [56]. These vests are primarily applied to preschool and elementary school-aged children with the diagnoses of ASD or attention deficit disorder [56]. The weighted vest is worn according to a pre-determined schedule at certain times of the day, including during everyday activities and for specified tasks at home, in the classroom, or in the community. The vest is typically applied for less than 1 h, one to two times per day during tabletop type tasks [56]. These are general intervention recommendations, but not a manualized approach. Lacking a standardized protocol for the weighted vest, most occupational therapists rely on clinical reasoning in devising an appropriate wearing schedule [57].

3.5.3. Review of the evidence

According to reviews, studies regarding the use of weighted vests are limited in size, scope, and quality. In a meta-analysis study of single subject designs, Stephenson and Carter

reported that using weighted vests among young children was on the ineffective side, partially due to small sample sizes and poor methodology within the literature [58]. In another meta-synthesis by Losinski and associates, the research studies included were found to be of low quality, with the effects of deep pressure via weighted vests for individuals with disabilities (including ASD) were small among the variables of attention, disruptive behavior, self-injury, and stereotypy [59].

Small scale studies offer mixed results of the use of weighted vests. McGinnis and associates, reported that young children with ASD actual enjoy using weighted vests, and the application of these vests may serve as positive reinforcement, rather than bringing about changes in sensory processing [60]. Another study using an AB single subject design, found that weighted vests did not decrease problem behaviors (distraction, emotional reaction, withdrawal, escape/avoid, etc.) nor facilitate joint attention with primary caregivers among four toddlers with ASD and sensory processing difficulties [55].

The evidence in support of using weighted vests to address challenging behaviors rooted in sensory processing is almost absent, with additional research exploring the intervention with more typical behaviors among individuals with ASD. As such, AOTA does not include the use of weighted vests as a therapeutic technique in its publications. This is exemplified in two recent seminal works that therapists rely upon to guide practice: *Autism: A Comprehensive Occupational Therapy Approach* [61] and *Occupational Therapy Practice Guidelines for Individuals with Autism Spectrum Disorder* [62]. Due to the lack of evidence, weighted vests should be used with caution. Any use of weighted vests should be aligned with strong diagnostics related to sensory processing behaviors, deficits, and outcomes.

3.6. Task-oriented treatment approaches

Task-oriented treatment approaches assist children with ASD to develop the skills necessary to complete a particular task. Children with ASD often have difficulty completing tasks due to a variety of difficulties in communication, socialization, motor skills, and sensory processing. Task-oriented approaches consider the task to be completed and ways in which to accomplish the goal. Task-oriented approaches are utilized by both occupational and physical therapists to teach functional skills.

3.7. Treatment and Education of Autistic and Related Communication-Handicapped Children (TEACCH)

3.7.1. Purpose of the technique

The Treatment and Education of Autistic and Communication-Handicapped Children (TEACCH) program is intended to assist children in completing daily tasks by providing instructions that are clear and understandable in an environment that is highly structured and supportive [63]. TEACCH is considered a structured teaching program that recognizes the characteristics commonly associated with autism spectrum disorder, specifically communication problems, preference for visual information, sensory-related difficulties, attention variability, intense interests/impulses, and time management issues [64]. By offering a highly structured teaching environment focused on each child's individual ASD characteristics and

the task at hand, learning development can occur. TEACCH is considered to be a multi-disciplinary approach, focused on collaboration between a variety of service providers, including teachers, therapists, family, and community [65].

3.7.2. Overview of the technique

The TEACCH program was developed in 1972 by Eric Schopler, Ph.D. at the University of North Carolina at Chapel Hill [66]. The program focuses on utilizing structure in a manner that encourages learning. According to Mesibov and Shea, structure in TEACCH comprises four components: physical structure, timing structure, task structure, and work/activity system structure [66]. Physical structure requires that the environment be set up in order to focus learning. This includes offering visual cues in the environment. Timing structure incorporates the use of a schedule, including scheduling cues. Organizing the task into manageable chunks is part of the task structure, this includes offering explicit directions. Finally, work/activity system structure involves synthesizing smaller tasks into a complete activity. By controlling these four structural elements, care providers can create an environment that maximizes functional capabilities of the child with ASD.

Along with utilizing TEACCH in a school or clinic setting, it is recommended that a home TEACCH program be developed for carry-over by parents/caregivers [67]. Ideally, the home TEACCH program would provide training and clinician supervision to parents/caregivers to assist them in structuring the home environment in order to support teaching skills in self-care, academics, and communication [67].

3.7.3. Review of literature

As TEACCH was developed and has training facilities housed within the University of North Carolina at Chapel Hill, there are researchers embedded in the program who have worked to establish a strong research base. When analyzing efficacy, it is important to identify potential bias that might occur by reviewing studies conducted only by researchers working where the technique was developed. To avoid that bias, a number of studies from within and outside the University of North Carolina at Chapel Hill were reviewed.

A meta-analysis of intervention studies using TEACCH (level 1 evidence) was conducted by Virues-Ortega, Julio, and Pastor-Barriuso in 2013 [68]. This meta-analysis utilized 13 studies, with a combined sample of 172 children diagnosed with ASD, assessing perceptual and motor skills, adaptive behaviors, and language and cognition. Results indicated that TEACCH had a small magnitude impact on perceptual, motor, verbal and cognitive skills, a negligible impact on communication, activities of daily living, and motor functioning, and moderate to large gains in social behavior and maladaptive behavior. The overall effect of the TEACCH program on all the outcomes measured in the meta-analysis was moderate, with effects in older children being higher than those in younger children. The authors cautioned that while these findings indicate success with TEACCH, the small number of studies and sample size should be considered.

D'Elia and associates conducted a longitudinal study of low-intensity TEACCH in preschool aged children [65]. The study followed a sample of 30 children, aged 2–6.11 years,

diagnosed with autistic disorder or pervasive developmental disorder – not otherwise specified over a 2 year period. The group was split evenly into a control group that did not receive TEACCH and an experimental group that received the TEACCH intervention 2 h per week at school and 2 h per week at home. Results for the main outcome indicators of severity of autism, language, and adaptive functioning showed no significant difference between the control group and the experimental group. Results for the secondary outcomes of parental stress and psychopathological comorbidity indicated significant differences between the control group and the experimental group. Both secondary outcomes indicated greater improvement in the experimental group. The authors indicate that the lack of significance in primary outcomes could possibly be attributed to the low intensity of the TEACCH intervention, which is not standard protocol. The positive secondary outcomes indicate potential of the TEACCH program in decreasing parental stress and child behavioral/emotional problems.

With home-based TEACCH being a major component of the program, it is important to determine the efficacy of that particular approach. Weterlin and associates conducted a study on the efficacy of the Home-TEACCHing Program (HTP) on toddlers with ASD [67]. The sample included twenty 2–3 year old children and their parents. Children and their parents were randomly assigned to either the treatment (HTP) group or the waitlist (WL) group. WL group members were informed that they would receive the treatment at the conclusion of a 12 week wait period. This study yielded three major findings: (1) HTP improved children's independent work skills; (2) Parents were able to structure the physical environment to improve child outcomes; (3) Parents improved their effective prompting, including using visual prompts. Although the sample size was small, findings demonstrate support for the use of the Home-TEACCHing Program.

Overall, research to date on effectiveness of the TEACCH program is very encouraging. Therapists use the components of TEACCH to assist children with ASD in learning tasks. Specifically, therapists using this technique will structure the physical environment (including visual cues), and organize the task with explicit directions in order to assist the child in learning new skills that aid in improved functional outcomes.

3.8. Cognitive orientation to occupational performance (CO-OP)

3.8.1. Purpose of the technique

The Cognitive Orientation to Occupational Performance (CO-OP) is a task-oriented, problem-solving approach that uses cognitive skills to improve occupational performance. It is typically a verbally based approach that emphasizes teaching clients to incorporate self-talk and problem-solving to address difficulty with the execution of various motor skills [69]. According to Missiuna and associates, elements of CO-OP include concepts related to problem-solving, learning theory, motor learning theory, cognitive strategies, client-centered practice, goal setting, and motivation [69]. CO-OP has been observed to be highly individualized, starting with clinician generated verbal guidance, followed by the development of client internal self-dialog, and finally independent application of problem-solving strategies ([70], p. 190).

Missuana and associates identified that the three main objectives addressed by CO-OP are: (1) skill acquisition in client-chosen goals/tasks, (2) cognitive strategy development, and (3) generalization of subsequently learned skills and strategies to a variety of contexts. Specifically, in the CO-OP process the client is learning a new motor skill or improving performance on one that has not yet developed sufficiently to be functional [69].

In CO-OP, a client-centered approach is used to encourage clients to select their own goals for the intervention plan. The CO-OP cognitive strategies are used to influence skill acquisition. Generalization and transfer of skills is supported through the use of an executive, or problem-solving, strategy that trains the child to monitor his performance and self-evaluate the outcome [69].

Rodger et al. have argued that in order for clients with ASD to be successful in taking part in CO-OP, therapists need to ensure they have accommodated the language and communication needs of the clients, given that the technique relies heavily on language and communication [71]. The goal of CO-OP is to create a process to teach clients how to think, instead of what to think.

3.8.2. Overview of the technique

According to Polatajko and Mandich, during CO-OP, clients are instructed on a global cognitive strategy and are then guided in the process of discovering other cognitive strategies that are relevant to their chosen goals. The global strategy used in CO-OP is "the goal, plan, do, check" [70]. Specifically, this foundational strategy involves working with the client to identify "what needs to be done, planning how to achieve this, carrying out the plan and then evaluating its effectiveness" ([72], p. 184).

Domain specific strategies (DSS) are specific cognitive strategies that are task, child or situation specific and focus on facilitating or improving performance [69]. The child is guided to develop his/her own strategies based on the problems encountered during tasks [72].

3.8.3. Review of the evidence

CO-OP has been evaluated across diverse populations (pediatric and adult) and conditions (ASD, cerebral palsy, developmental coordination disorder, cerebral vascular accident, traumatic brain injury) [73–76]. The current research of CO-OP among children and adolescents diagnosed with high functioning and/or mild ASD have emerged using case studies/series approaches.

Several case studies (Level IV-V) have been conducted among diverse segments of the spectrum of children/adolescents with autism. Phelan and associates reported general improvement on the Canadian Occupational Performance Measure and the Performance Quality Rating Scale among two children with ASD [77]. Visual analysis indicated consistent increase in performance on both subjective scales and across the three client-centered goals across a 10 session plan of care.

In another case study of two participants with ASD, Rodger and Brandenburg found that after 10 weekly sessions using CO-OP, the participants demonstrated improvements on the

pre and post-intervention assessment [78]. Specifically, moderate to significant improvement was noted on the caregiver subjective scale using the Canadian Occupational Performance Measure, Performance Quality Rating Scales and the Vineland Adaptive Behavior Scales.

Overall, the CO-OP approach for children and adolescents with ASD has yielded positive findings, enhancing function and participation in meaningful activities as a part of activities of daily living and instrumental activities of daily living and supports its use in clinical practice, yet more research needs to be conducted using more robust designs.

3.9. Behavioral treatment approaches

Behavioral treatment approaches to ASD incorporate components of operant conditioning in order to manipulate behavior to create positive outcomes. When considering ASD, the primary behavioral treatment approach used is Applied Behavior Analysis (ABA), which is applied in a variety of forms (school-based, clinic-based, home-based, discrete trial training, Lovaas therapy, inclusive programs). Generally, occupational and physical therapists will follow an ABA approach if the child is currently enrolled in a program that specifically uses ABA, or if the child is learning a discrete skill that would benefit from an ABA approach (e.g. toileting, shoe-tying).

3.10. Applied behavior analysis (ABA)

3.10.1. Purpose of the technique

The purpose of Applied Behavior Analysis (ABA) is to teach discrete skills by modifying the environment in order to manipulate behavior [79]. To teach these skills, therapists utilize the "ABC technique" to determine why a behavior is occurring: *antecedent*, *behavior*, *consequence* [63]. Antecedent refers to what is happening prior to the behavior. The *antecedent* prompts the behavior to occur. The *behavior* is what the child does in response to a stimulus (antecedent). Finally, the *consequence* is what the child receives as a response to the behavior. The consequence can perpetuate or extinguish the behavior. Once therapists have determined the "ABC," then they can create a structured plan that addresses each component to create an optimal outcome.

3.10.2. Overview of the technique

Based on principles developed by B.F. Skinner in the 1950s, Clinical Psychologist O. Ivar Lovaas created ABA as a behavior modification program for use in children with ASD [63]. The program is intended for use across a variety of instructional formats, including both group and individual sessions, which allows for independent and observational learning [80].

In ABA programming, once a functional behavior assessment has determined the ABC (antecedent, behavior, consequence), the therapist will determine the target behavior and how the environment will be modified to achieve that behavior. Additionally, the therapist will determine what reinforcement to use and the reinforcement schedule. Reinforcement is a critical component of ABA, and determining appropriate reinforcers is crucial for program success. Often people are tempted to use edible reinforcers (candy, chips). This practice is

highly discouraged, as it can lead to unhealthy eating habits and an inability to develop other motivating reinforcers [80].

Therapists using ABA must be cognizant of their surroundings and the influence of all types of reinforcement, applying a variety of positive reinforcement to keep the child focused and on track. Knowledge of what may reinforce poor behavior is as important as knowing what impacts pro-social behavior. For example, if a child seeks attention and receives it every time he or she acts out, then the attention serves to positively reinforce the acting out behavior. Therapists need to be aware of this and modify reinforcement accordingly.

Once the reinforcement is determined, ABA can begin. A commonly used form of ABA is called Discrete Trial Training (DTT). DTT identifies a specific task, then teaches the task by breaking it into its component parts and repeatedly presenting it to the child until mastery is achieved [63]. This is a repetitive process that often involves multiple presentations over days or weeks. Reinforcement occurs each time the child correctly responds, or in the case of a developing skill, when the response approximates the skill.

3.10.3. Review of literature

The seminal research for the use of ABA for children with ASD was conducted by Lovaas in 1987. This study specifically investigated DTT on a group of 4 year olds over the course of 2–3 years. Lovaas found that 47% of the children in the ABA demonstrated functional improvements, compared to only 2% in the control group. This study has been replicated numerous times across the years, with similar results, indicating that DTT improves IQ, communication, and socialization in children under 4 years old with ASD [63].

A systematic review of behavioral and developmental interventions for children with ASD was conducted by Ospina and associates [81]. In regard to ABA, this review specifically examined 31 studies with a total sample of 770 subjects. Findings related to DTT were inconsistent, with motor and functional outcomes trending positively, while speech outcomes trended negatively. High intensity Lovaas therapy was found to be superior to low intensity programming, and treatment was consistently found to be better than standard care.

Virues-Ortega conducted a meta-analysis of ABA and autism in 2010 [82]. The review analyzed results from 22 studies that included a total of 323 subjects in intervention groups that ranged in age from 22.6 to 66.3 months old. Results indicated positive effects in IQ (18 studies), receptive language (11 studies), expressive language (10 studies), and adaptive behaviors (communication, daily living skills, and socialization, 11 studies). The author did note that analysis was difficult due to the varying methodology used, but indicated overall that ABA intervention is associated with medium to large positive effects in IQ, language, and adaptive behavior.

Overall, research has demonstrated that ABA can be an effective therapeutic technique to teach children with ASD specific skills. Therapists utilize this technique in a variety of formats in order to help improve functional outcomes.

3.11. Social-emotional treatment approaches

Social-emotional treatment approaches are gaining in popularity with children with ASD as research reveals the impact of social/emotional development on all other functional areas.

Embodied cognition is created only when an individual can actively engage in his or her environment [83], which requires social interaction with objects and others. To encourage these interactions and relationships, the Developmental, Individual Difference, Relationship-Based Model (DIR®/Floortime™) was created. This treatment approach is used by both occupational and physical therapists to encourage participation in therapy for children with ASD.

3.12. Developmental, individual difference, relationship-based model (DIR®/Floortime™)

3.12.1. Purpose of the technique

DIR®/Floortime™ is a framework for assessment and intervention that focuses on building social, emotional, and intellectual abilities [84]. This framework seeks to assist children in creating an emotional foundation on which other skills can be encouraged to grow and develop. An important concept of this framework is that is does not seek to teach individual skills in isolation, but rather focuses on the child with ASD as a unique being that is capable of growth by establishing relationships and circles of communication within the environment [84].

3.12.2. Overview of the technique

According to Greenspan and Wieder [84], the DIR® Model was created by Dr. Stanley Greenspan in the 1980s. The model highlights the developmental, individual differences, and relationship-based components of emotional development in children. The developmental part of the model focuses specifically on the six identified developmental levels that are required for emotional health. These hierarchical levels include: (1) self-regulation and interest in the world, (2) engaging and relating, (3) purposeful two-way communication, (4) complex communication and problem-solving, (5) using symbols and creating emotional ideas, and (6) logical thinking and building bridges between ideas.

Individual differences in the DIR® Model refer to the child-specific ways that information can be taken in and processed [84]. It is commonly understood that children with ASD are unique; with each child demonstrating individualized ways of responding to sensory input. These individual differences need to be considered when attempting to factiliate in social–emotional development.

The relationship-based component of the DIR® model refers to the use of emotional connection to foster development. Clinicians utilizing a DIR® approach need to purposefully tailor their actions and communication to engage the child in an emotional relationship [84].

Clinical application of the DIR® model occurs in what is called Floortime™. Therapists engaging in Floortime™ techniques demonstrate skills in getting to the child's level and allowing the child's actions and communications to lead the emotional relationship [84]. By engaging in the child's world, this technique postulates that you can then bring the child into a "shared world" [85]. These techniques, when employed correctly, can help the child with ASD progress through the levels of emotional development.

3.12.3. Review of literature

Research regarding DIR®/Floortime™ appears to be somewhat limited in both scope and vigor, although the research base is expanding. A pilot randomized controlled trial was

completed in 2011 by Pajareya and Nopmaneejumruslers in Thailand [86]. This study utilized 32 participants that were 2–6 years old and were diagnosed with autistic disorder according to the DSM-IV. Participants were randomly assigned to the typical treatment group, or the DIR®/Floortime™—supplemented treatment group. Findings from the study revealed that DIR®/Floortime™ helped children with autism to better engage with caregivers. Additionally, the study found that engagement in DIR/Floortime™ helped parents to better play with their children with autism.

Liao and associates completed a study involving the use of DIR®/Floortime™ at home on preschool-aged children [87]. The study had a sample of 11 young boys and their mothers. Results of the study indicated that the use of DIR®/Floortime™ significantly improved two-way communication, relationship formation, problem solving, and behavioral organization, and adaptive skills. Additionally, mothers who utilized the intervention felt that their parent–child interactions improved.

A randomized controlled trial regarding ASD and DIR®/Floortime™ was conducted by Lal and Chhabria in 2013 [88]. This study utilized a sample of 26 children aged 3–6 who were diagnosed with ASD. These children were randomly assigned to treatment and control groups, with 13 participants in each group. The treatment group received 20 sessions of DIR®/Floortime™ that lasted 30 min each, while the control group received typical early intervention services. Results of this study indicated that all children who received DIR®/Floortime™ demonstrated improved social behavior from pre-test to post-test. Comparison between the control group and treatment group from pre to post-test indicated significant differences, with the DIR®/Floortime™ group showing greater improvement.

These positive results suggest that DIR®/Floortime™ does help in promoting social–emotional growth, which can improve functional outcomes. While the evidence is positive, scope is limited, which suggests caution in application until further studies regarding efficacy can be completed.

4. Conclusion

Occupational therapy is a rehabilitation specialty that facilitates the development of functional skills in children with ASD. Occupational therapists often work as part of an interdisciplinary treatment team. In this capacity, it is important for therapists to communicate across disciplines to be sure that treatment is carried over from one area to another.

There are many therapeutic approaches that occupational therapists can use to encourage growth and development in children with ASD. These treatment approaches have varying levels of evidence supporting their efficacy. Clinicians need to be mindful of the current evidence and use their knowledge of the child and the treatment, along with their clinical judgment, to create effective interventions.

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Chapter 2

Executive Functions and Neurology in Children and Adolescents

Gokcen Akyurek

Additional information is available at the end of the chapter

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Abstract

This chapter discusses the theoretical and methodological issues of creating a developmental perspective on executive function (EF) in childhood and adolescence. Focusing on school periods, this section outlines the development of the basic components of EF—inhibition, working memory, and attention. Cognitive and neurophysiological evaluations show that despite the emergence of EF in the first few years of life, it continues to grow significantly in childhood and adolescence. The components vary slightly according to their developmental sequence. The chapter links findings to long-standing developmental issues (i.e. developmental sequences and processes) and suggests the necessary research to establish a developmental framework covering early childhood throughout adolescence.

Keywords: executive function, executive control, prefrontal cortex, children, adolescent behavior

1. Introduction

Coordination of the executive functions (EFs) with the frontal lobe is seen in all mammalian species. Executive functions are not specific to people and their need of advanced information computing, but it is an integral part of the mammalian brain development that emerges over time to facilitate a more complex problem-solving and goal-oriented behavior [1]. The basic function of the developing nervous system is revealing the efforts that are necessary for effective learning and successful adaptation. Vertical and horizontal development processes of brain development and the accompanying age and experience make control and communication more automatic and effective [2, 3]. This is a demonstration of the skills and adaptation that we have developed over time while allowing us to understand what managing means in

childhood and adolescence. We acquire mastery of having and using cognitive controls with maturation. However, although the system is more effective at the beginning of maturation in parallel with increasing needs, it may provide less support afterward [4].

1.1. Basics of executive functions

The cognitive capacity of an individual increases with the executive functions being involved in many different aspects of information processing and behavior over time. The emergence of basic skills such as orientation and attention is followed by strategy determination, implementation, and then problem-solving. Executive functions change from a developmental perspective to multiple creative cognitive skills. Understanding what executive mean requires you to understand how each ability develops over time [5].

1.1.1. Attention

The attention system is a basic and supporting component of the execution system. It is a tool that guards learning for the developing individual and directs interaction with the environment, especially from birth [6, 7]. Throughout childhood, the child increasingly masters in creating schemas and representations by taking information about the environment. This supports the child's adaptation and learning of the demands and challenges of the community. For this reason, attention, regulation, and maintaining attention interact neurodevelopmentally with memory processes and constitute cognitive structures necessary for executive and behavioral control. As a result, attention during infancy and crawling period emerges as targeted behavior and serves to develop executive function skills over time [7, 8].

The infant begins to see the effects of his growing awareness with the events and experiences surrounding him over his perceived knowledge. This encourages cognitive and behavioral dialog through direct and indirect interactions with objects and people. The motor functions, senses, and cognitive functions interact to create the connection between the baby and the environment, which facilitates the infant's experience with the surroundings. This increases the infant's control over the interaction with the environment. This is initially a passive response to the environment but then it turns into an environment research process. Then, the quest for increased ties and interaction becomes an active process. As people, events, and experiences increase, babies carefully separate events and experiences that they find stimulating or uncomfortable and seek support through behavior or voice responses [9]. In the game period, the child begins to realize that they are influencing their environment and surroundings through mechanisms such as attention, reaching a target, and exploring. This awareness turns into realizing goals and desires and improves early problem-solving skills.

1.1.2. Behavioral and emotional regulation

Self-regulation develops throughout the age of infancy, walking, and primary education period. Guiding parenting initially directs this development capacity, but the baby and then the child develops his own reactions on how he behaves [7, 10]. In "real" experience, the child reacts to events through observation and imitation. By actively recalling these experiences, the child makes behavioral choices. The strategy begins to play a greater role in their behavior

so that during late infancy examples of purposeful actions or even "secret" behaviors (i.e. game hiding, early denial of responsibilities) are observed [11]. These efforts are examples of executive functions that arise such as problem-solving, self-monitoring, strategy definition and implementation, and even primitive flexibility. Memory is the basis for the development of many basic executive functions; the information processed and stored in the working memory governs attention, and constant impulse control arises and evolves. As a response to the child's efforts to guide and shape experience, orientation and engagement occur.

1.2. Executive functions in childhood

Middle childhood is one of the basic periods in which executive functions are necessary to support successful learning and the development of academic skills [8]. With executive functions in the first three grades, children can identify what's important and integrate new information with the existing information. However, from the fourth-grade onward, the learners who are expected to manage integrated academic requirements more competently and strategically have considerable demands on working memory, impulse control, self-monitoring, and intent to facilitate independent problem-solving and productivity [12]. For the typically developing middle school child while learning success proceeds in a forward line which indicates a growing capacity for independence, demands are met via variable engagement of EF skills. For example, impulse control develops completely between 10 and 12 years old [13, 14]. Similar speed in organizational skills with the speed of processing, verbal fluency, multidimensional transition, and planning usually occurs during middle childhood [14].

Middle childhood is a time period in which attention and motivation are necessary and a child should be under observation. For successful learning, behavioral regulation must increase [15]. Children who are 6 years old start to make tasks more successfully that require impulse control, and at age 9, most children can self-monitor and correct their behavior moderately [16]. Children who manage the tasks of increased attention and regulation effectively are more resistant to situations such as blocking, dissatisfaction, insistence, and self-control. Emotional regulation should be underlined with increasing daily demands and challenges, especially in terms of disappointment, anxiety, and anger. However, the difficulties associated with attention and behavior control, which are frequently seen with attention deficit and hyperactivity disorder (ADHD) and disruptive behavior disorders (DBD), emphasize that there is a major hurdle in the development of executive functions. As difficulties arise such as inefficiency, carelessness, and poor self-control, executive dysfunction manifests itself [17].

The enhanced self-control capacity in this period is necessary to meet additional demands, especially in social areas. Young people in this age start to establish stronger ties with their peers, and the opportunities in playing and learning reinforce belonging. This social inclusion increases opportunities by providing a wider range of participation and influence across all aspects of executive control. Especially, trying to solve problems together gives children the opportunity to accept and consider the opinions of others in situations where they can develop and change their ideas and goals [18].

Cooperation and reconciliation-related activities help the child struggle on his/her own and master on these skills. A child who is weak about understanding society and solving problems

in society also faces difficulties in social participation. A child who is not able to observe the wide range of perspectives, or a wide range of options offered during a group event, is usually incomplete in executive functions, and it is possible to observe that a child with faults on executive functions is affected by more than one area of socialization and academic skills [18, 19].

1.3. Executive functions in adolescents

Adolescence, in other words, upper cognitive access, is an important period in which an individual is able to make a strategic choice to increase learning capacity, evaluate options, and meet that demand. Ongoing development of the executive neural network (frontal lobe) explains the inconsistencies of high-level skills of adolescence [20]. Frontal functions, especially the dorsolateral prefrontal cortex and the orbitofrontal cortex areas, gradually begin to engage. In addition, there is a marked decrease in the gray matter of the cortex and an increase in white matter during this period [21]. While these important changes in brain structure change social awareness and expectations in this period, hormonal and physical changes improve the interaction between the individual and the environment [22]. For this reason, adolescents' capacities of awareness, decision-making, and problem-solving, which are highly affected by cognitive skills and emotional, social, and physical situations, also vary [23]. As a result, it is theorized that the development of executive functions in adolescence may be modulated in an emotional or social context. Luna and Sweeney also described adolescence as a "transition to an effective working relationship with the brain." During the adult period, executive networks become more consolidated and refined. Actions are more in sync with behaviors and interact more with others with better behavioral and emotional control [24].

Increasing independence and its capacity and managing multidimensional learning and behavioral demands develop during this period. This is a reflection of progress in the areas of attention control, flexibility and processing speed, capacity and working memory, planning, and problem-solving in conjunction with the increase in frontal cortex pruning and myelinization that occurs during adolescence [25].

While Anderson believes that cognitive flexibility and target-setting capacity mature up to the age of 12, some researchers later argue that executive functioning, memory, impulse control, and planning continue to evolve considerably in adolescence and early adulthood [26]. This theory was more widely accepted because of the proliferation of synapses at the beginning of adolescence. These developments turn into emotional decision-making and less responsive reactions to the will of the environment, and this is an appropriate response to the theory of self-control and social rules [27].

Disorder in the development of executive control during adolescence is present in psychopathology. The capacity to think before moving, to assess the appropriateness of one's answer, and to determine the most effective action that gives the desired result often varies in adolescence. However, in a typically developing young person, these skills become increasingly more effective over time [27]. Young people with impaired executive functions cannot make effective choices and cannot reach the result. In fact, while adolescents are more conscious at the beginning of pubertal maturation, they then enter into risky and sometimes reckless behavior and become more sensitive to others' views and assessments. This can make their relationships difficult with peers and adults [20].

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2. Executive functions and its neurology

2.1. Executive functions and prefrontal cortex

Executive functions are interdependent and progressively acquired; high-level cognitive skills that occur in conjunction with the expansion and integration of cerebellar, subcortical, and prefrontal nerve networks during early childhood and adolescence until early adulthood. Because the development of nervous systems that support executive functions lasts too long, they are vulnerable to changes that occur during development, which can lead to multiple executive dysfunctions [20].

The prefrontal cortex has an important role in the development of executive functions. The prefrontal cortex is located in the anterior part of the premotor cortex and constitutes approximately one-third of the cortex (**Figure 1**). The neural connections between the prefrontal cortex, motor and sensory cortices, and the brain's subcortical structures are carefully regulated and are responsible for controlling, influencing, and regulating behavioral goals and behaviors. As the individuals mature, large neural networks that are responsible for learning and behavior become increasingly integrated and coordinated with prefrontal cortex-related networks. As a result, the regulation of high skill levels that lead to many behaviors is related to the neurodevelopmental processes of the mature brain. This contributes to the enhancement of coordination of communication and behavioral regulation related to executive functions [21].

At the beginning of life, subcortically managed neural processing is the primary ability to interact and understand sensory input, to interact more extensively with the environment, and to reinforce and remember these experiences over time. These experiences reinforce the link between more integrated sources of knowledge that are better understood by the ongoing myelination of the more integrated and mature brain (**Figure 2**). As the connections between the subcortical structures and the prefrontal cortex increase, attention and memory control increases. In infants and children who begun to walk, growth episodes are associated with increases in attention control and working memory capacity. Subsequent brain growth episodes occur at 6–8, 10–12, and 14–16 years of age. Coordination between the prefrontal cortex and regulatory and executive networks improves the communication further [22].

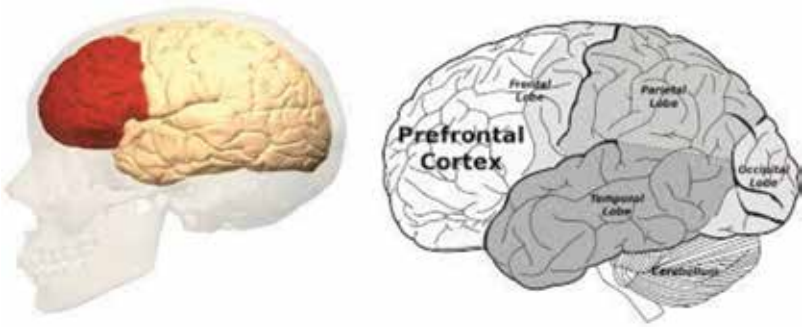

Figure 1. Prefrontal cortex.

Figure 2. Development of the dorsolateral prefrontal cortex.

In the first years of life, the prefrontal cortex grows with its expanding nets which leads to the development of facilitation and memory increase. As the child progresses toward middle childhood, connections related to prefrontal cortex and communication develop. The development of the prefrontal cortex accelerates the development of information processing and cognitive flexibility between the ages of 7 and 9 years. These developments in the frontal system and related networks encourage the analysis and integration of complex information and the communication needed for effective decision-making. The prefrontal cortex is especially involved in impulse control and the following strategy development and self-monitoring [23].

Given the central role of the prefrontal cortex in the successful development of executive functions, lesions of this critical region have been associated with memory weakness, impulsivity, attention problems, and disorganization. It is known that the damage of the left dominant prefrontal cortex causes particularly the impairment of the divided attention. Contrary to the lateral prefrontal cortex, regions associated with the ventral and medial prefrontal cortex show strong neural connections toward the limbic system and amygdala and are therefore responsible for the integration of mainly emotional and nonemotional information. Given the nature of this relationship, damage to the medial prefrontal cortex means impaired activity initiation, and individuals with lesions in this region are typically irrelevant, flat, and unmotivated [24–26].

It is difficult to determine the contribution of a particular cortical area over the executive functions. Although studies to this date have indicated that the main area control is related to the prefrontal cortex and the component structures, it is seen that the indefinite variability persists. Although some investigations suggest that some aspects of executive functions may be related to certain subregions of the prefrontal cortex, much of this work has been completed with adult and nonhuman specimens [28]. For this reason, the age in which brainstem connections of executive functions are established and whether these distinctions are appropriate for children or not are yet unknown. Preliminary studies, however, show that children have larger and less specific work in brain regions during executive functions. For

example, when children and adults were assessed for "Go/No-Go" tasks, while both groups showed functional magnetic resonance imaging (fMRI) activation in the anterior cingulate cortex, orbitofrontal cortex, and lower and middle frontal glands (**Figure 3**), children showed more activation on the anterior cingulate cortex and prefrontal cortex than adults [29]. These findings suggest that children work in wider areas of the prefrontal cortex during inhibitor tasks compared to adults. In a similar study, the increase in cortical activation on the left inferior frontal gyrus and orbitofrontal cortex due to the age is further emphasized; also it was shown that the activation of the left upper and middle frontal gyrus and anterior cingulate cortex decreased with age.

Another study that tackles the relationship between conflict resolution and cortical activation in children and adults, using event-related potentials, supports that executive functions become more productive as the brain signals become more mature [30].

Functions of the prefrontal cortex: *Inhibitory control* is described as the basis of the executive functions. Anterior prefrontal cortex is defined as the responsible area for impulse control in walking children and adolescence [31]. Impulse control processes are lateralized in the right hemisphere and are connected to the parietal lobes via ventral prefrontal cortex. At the same time, orbitofrontal cortex, anterior cingulate cortex, parietal and temporal cortex, and gyrus rectus are responsible for the impulse control [32]. A group of children with normal development, the ages between 4 years, 4 months, and 6 years, 8 months is the highest age for the cortex activation level with the working memory task [33]. This suggests that important morphological and structural changes affecting impulse control occur in the prefrontal cortex and the connected brain regions during childhood and adolescence.

Working memory depends on the prefrontal cortex activation, and tasks related to working memory development are age-related (especially during childhood) [32]. In the prefrontal cortex, in particular, the left middle frontal gyrus and the lower frontal gyrus are associated with working memory. The mid-frontal gyrus also plays a role in the control of automatic behaviors and competing answers and in responding to conflicting emotional intelligence. The right middle frontal gyrus is associated with judgmental response and the organization of the activity used to reach a goal [34].

The shifting, interaction with the prefrontal cortex, and its activation is a common finding with the adult period. The prefrontal cortex produces a strategy against the surrounding

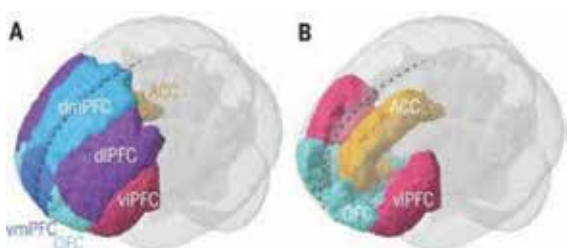

Figure 3. Dorsolateral prefrontal cortex, orbitofrontal cortex and anterior cingulate cortex.

information. This situation changes with regional activation differences, intelligence, and age. An event-related fMRI study investigated the performance of young adults and adults in the task of shifting attention using intelligence quotient (IQ) as a covariant and found that the average IQ individuals showed a higher activation of both prefrontal cortex and anterior cingulate cortex during the activation of response [35]. During the feedback, participants in the high IQ group showed a more complex relationship, including parietal, caudate, fusiform, and occipital regions. The authors reported that the feedback of high IQ people may be more strategic and they may experience less response overlap in the choice of responses for the task.

The prefrontal cortex is also associated with multitasking ability. The prefrontal cortex plays a role in the ability to hold knowledge as well. This feature is unique, prefrontal cortex neurons do not interrupt firing against a new stimulus [36]. This response pattern is useful in terms of showing maturity when individuals are forced to interfere independently with an increasingly complex and changing environment. Blakemore and Choudhury suggest that adult's multitasking skills are better than children or adolescents. Adolescents (aged 11–14) and children (aged 6–10) completed a number of tasks related to prospective memory with an adult group (mean age 25); results showed that adults use more effective strategies than adolescents or children. Thus, the prefrontal cortex also allows us to recall our daily life and the necessary information to achieve its mission despite disturbing stimuli [37].

2.2. Executive functions and limbic system

Regarding executive functions, the limbic system and prefrontal cortex, especially the anterior cingulate cortex are related to emotional regulation and processing, impulse control, and directing attention (**Figure 4**). An error monitoring task study on early adolescence, late adolescence, and adult performance revealed that the error rates were 11% in young adolescents, 7% in late adolescence, and in adulthood, it was even lower [38]. Potential related to the events during the mission localized on the anterior cingulate cortex or on its surroundings, which suggests that the difference in age-related task performance may be due to the maturation of the anterior cingulate cortex. Adults with good performance in an impulse control task were found to have larger anterior cingulate cortexes on magnetic resonance imaging (MRI) [39].

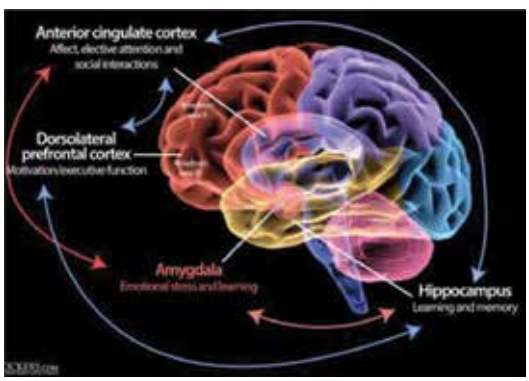

Figure 4. ACC with limbic system.

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In addition, the relationship between anterior cingulate cortex and attention maintenance control is supported. According to Rueda and colleagues, the anterior cingulate cortex is a kind of "control rod" that allows the attention system to be arbitrary [40]. A group to define the relationship between anterior cingulate cortex and lateral prefrontal cortex during direct attention tasks showed that the anterior cingulate cortex takes place during tasks requiring continuous attention control and performance monitoring [41]. Another study examined the reciprocal relationship between emotional control and effort; hence, the anterior cingulate cortex has a proximity to emotional processing regions. Accordingly, the anterior cingulate cortex is associated with the cognitive evaluation of distressing photographs, thereby reducing the negative effect [42].

2.3. Parietal and temporal cortexes

Temporal and parietal cortexes are also important components of the executive net at the same time. Both temporal cortex and parietal cortex are associated with inhibitory control, set shifting, initiation, goal-directed behavior, and working memory (**Figure 5**). The upper parietal cortex plays a primary role in task change, regardless of whether the task involves verbal, visual, or spatial knowledge or not. Other areas of the parietal cortex are primarily responsible for initiating and completing targeted activities. It appears that the parietal cortex regions are also involved in updating the working memory. Especially, the upper left parietal region is linked to the current tasks of ongoing activity [43].

2.4. Executive functions and cerebellum

The cerebellum is a major but often a less well-understood component of the executive functions system. Cerebellum reaches its size at about 11 years for girls and 15 years for boys and is as important as regions that control executive function in early childhood [44]. Cerebellum gains maturity during motor control, emotional processing, and adolescence period and plays a central role in high cognitive functions. The cortico-ponto-cerebellar network works intensively in the timing and ordering of requests such as verbal working memory and executive aspects of visual and verbal analysis (**Figure 6**) [45]. In addition, it is also known

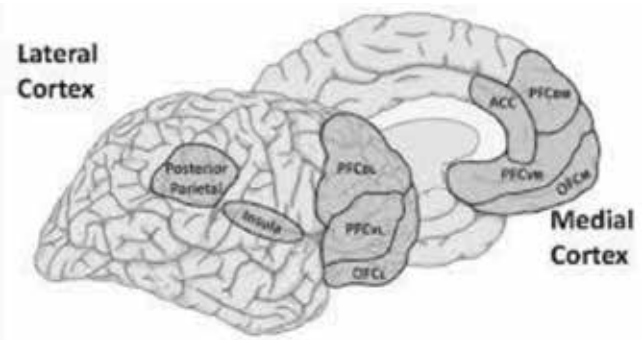

Figure 5. Prefrontal cortex and parietal cortex.

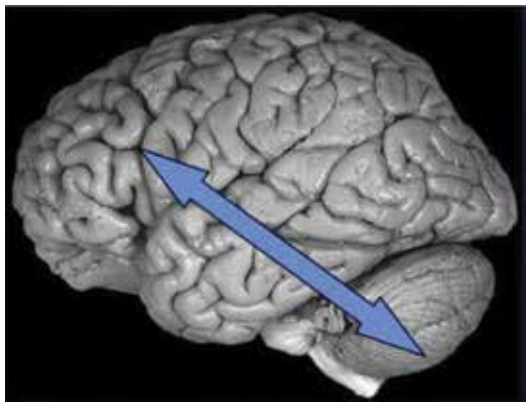

Figure 6. Prefrontal cortex and cerebellum.

that cerebellum has a modulating effect on emotional, cognitive, and regulatory capacities. However, cerebellar lesions do not appear to explain the impairment executive functions alone. It is thought that when executive dysfunctions are accompanied by cerebellar dysfunction, executive functions are impacted [46].

3. Dyslexia and executive functions

Evidence supports that executive functions are accompanied by learning difficulties (commonly known as learning disorder [LD]). In general, the first indicator of learning difficulty is the low rate of academic achievement in reading, mathematics, or writing [47–50].

Students with learning disabilities who have difficulty in planning, initiating activity, organizing thoughts and materials, self-monitoring and progression, impulse control, or attention shifting cannot learn as effectively as those who master these executive function skills [49]. While executive dysfunctions and learning disabilities often coexist, the relationship between executive dysfunctions and learning disability is still not fully established. A fundamental question is whether the specific characteristics of a particular academic field challenge are executive function difficulties or not. Even if there are no academic weaknesses, it is a bigger question to consider the difficulties of executive functioning as a learning disadvantage.

Phonological difficulties are seen as the greatest cause of reading difficulty, but the difficulty of executive functioning presents an additional difficulty in reading. A recent study has shown that children with dyslexia produce fewer words and complete fewer categorical tasks than typical readers in the semantic fluency task. In addition, in learning disorders, the meta-analyses of executive functions show that children with learning disabilities typically cannot achieve their peers' performance in executive function tests [51]. For example, a meta-analysis involving 48 studies, typically comparing the difficulties of executive functions on developing children with learning disability, attributed moderate (0.56) effect dimension on executive functions [52]. Wechsler intelligence scale for children- fourth edition (WISC-IV) Coding has

distinguished and identified the participants with learning disability the most accurately from their typically developing peers. Similarly, the meta-analysis of 13 researchers comparing children with learning disorder and children with typical development has shown that the overall impact dimension which was measured by planning, organizing, strategy development, attention to detail, and recall tests for executive functions is moderate. Although verbal and visual working memory seems to be effective, verbal working memory has been shown to be more effective than visual working memory [53–56]. It is seen that the difference between the subjects with reading difficulty and typical readers increases with age. Overall, findings suggest a strong association between learning disability and executive functions [49, 57, 58].

Some studies have investigated the difficulties of executive functioning in subtypes of reading disorders. In particular, researchers compared the difficulty of reading a word with the difficulty of understanding reading. For example, in one study, adolescents were categorized as difficulty in reading a word, difficulty in isolated understanding, or typical reading achievement. Working memory and planning (when controlling attention, coding, fluency, and vocabulary) make a meaningful contribution to understanding what is being read but not word recognition. Findings of difficulty in planning have continued in adolescents who had difficulty understanding the reading even after controlling the accompanying ADHD and phonological processing ability. Although reading disorders are often accompanied by ADHD, these studies show that executive functioning difficulties may also occur in individuals without ADHD but reading-comprehension difficulties, and that the difficulties of strategic planning are closely related to the difficulties of understanding [58–60].

4. Evaluation of executive functions

During the individual assessment, a child's approach to a mission can reveal the strengths and weaknesses of executive functions. While some tests are designed to evaluate executive functions, each component of the evaluation process may provide different information about executive functions and disorders.

4.1. Key issues in evaluating executive functions

1. Almost every test contains executive functions. The executive function is related to many things, and it is impossible to draw conclusions from an evaluation alone. For example, even completing the most standard scales requires some planning, strategy, or impulse control. The opposite is also true; most of the tests described as primary "executive functioning evaluation tool" include other cognitive processes. This is called "task impurity" [61]. As a result, other tests (including intellectual work and academic achievement) and behavioral observations also provide information about executive functions. It is important to be aware of these elements and their role in evaluation and definition.

2. Standardization can remove features of executive functions. The structure of an ironically standardized test may reduce the requirements of some of the aspects of executive functions [62, 63]. Most of the standardized tests contain clear instructions and scoring. This

reduces the chances of the person who applies the test to observe executive dysfunctions that are more likely to appear in uncertain situations. Some uncommonly used tests due to difficulties in standardization include open-ended scenarios. A person can gather enough cognitive resources to perform executive functions tasks for a short period of time [64].

3. It is difficult to isolate the skills of a single executive function. Each aspect of the executive functions is intertwined, which makes it difficult to assess a single executive skill. For example, self-monitoring is part of impulse control or vice versa. These skills are different from each other, but it is difficult to distinguish them because they usually occur at the same time and affect each other. A low score on a test aiming to measure the performance of an executive function may reflect the difficulty in a different execution process.

4. The executive functions may vary depending on the environment. Unfortunately, when evaluating executive functions, a child can perform differently in different environments. This can be clearly seen even when comparing home and school, different classes or everyday challenges. In such cases, it is important to examine the people, circumstances, and all sources of information that would lead to confusion regarding the child's functions.

   For a child with executive dysfunction, some environments may have their own advantages (such as getting immediate, specific, explicit feedback from the teacher and learning in a highly structured classroom). The support and coherence of some people according to the nature of the child can intuitively increase this advantage. During interactive games, the success of the activity can be improved by providing clear, consistent, and clear results or awards for the child's actions. In such cases, it is important to include environmental factors in the developed treatment plan for the person and the activity success. It is important to gather information not only about the most challenging environment of the child's executive function but also in the environments that the child is successful at the same time. These exceptions may provide the data needed to describe the executive functioning difficulties and possible remediation strategies. It is important to assess the performance of the child in different environments (home/school and daily/laboratory).

5. Some factors can worsen (or heal) executive functions. These include self-care factors such as fatigue [65, 66], hunger [65], pain [67], stress [68], mood (positive or negative) [69], or lack of exercise [70]. Excessive stimulation with multiple sensory inputs (e.g. auditory, visual, and tactile) and multiple cognitive demands are also significant exacerbations [71, 72]. The sudden change of the surrounding and people around, a new teacher, new classroom, or new school may cause the difficulties in temporary executive functions occurrence. However, a child who is already struggling with compensation for executive function difficulties typically has less cognitive reserves [73]. The child is more vulnerable to the occurrence of any of these factors, and as soon as the effect of these factors accumulates, they become choked. For this reason, it is important to keep them under control. Teachers or their families can be informed of this by creating a checklist for various skills, such as self-care in children.

6. It is difficult to define appropriate peer comparison. It is important to identify the appropriate peer group when evaluating the executive functions. This allows you to make a

direct comparison. Given the "typical" expectations and differences, it provides an important contrast point. However, it is not easy to determine the best comparison group, as the appropriate comparison group can be chosen by age, gender, intellectual ability, school grade, or other factors.

7. A statistically significant inconsistency between average executive functions and a high IQ is not necessarily a clinical deficit [74, 75]. Compared to IQ scores, there are a number of factors that can lead to lower executive function scores. A person's low motor performance can cause average executive functions.

8. Disability is an important aspect of executive dysfunction. As in any circumstance, assessing the existence and degree of disability is also a necessary condition for examining executive functions. In cases where the child interferes with daily life, it will be difficult to provide parental, teacher, or student care. It is important to remember that even when there is an inconsistency between skill and executive function scores, there may be also a difficulty in obtaining or expecting developmentally expected benefits.

Executive function causes challenges in a range of areas including academic [76–79], emotional [16], behavioral [16], social [16, 79, 80], and adaptive functions [81]. When we think about many aspects of functioning, such as social interactions, family relationships, family responsibilities, and community involvement, and employment for adolescents and young adults, the success of the individual is greatly influenced by adaptation via limiting the actual independence of executive dysfunction [81].

It is also important to assess the effect of executive dysfunction on the functional and emotional well-being of the person. For example, a teenage girl in class may have difficulty in integrating and expressing emotional and social life-related feelings and thoughts. In addition, the struggle with the school can increase her anxiety by reducing its prosperity and self-confidence. These issues can further aggravate her executive functioning difficulty.

4.2. Rating scales

In its simplest form, the assessment scale is a list of items that are evaluated to identify the presence, frequency, and/or severity of a behavior, emotion, or thought. A number of evaluation scales have been developed over the past decade to help to define executive functions. In general, such assessment scales are thought to be more predictive of executive dysfunctions than laboratory tests [82]. This difference can be attributed to the contextual factors (clinic/home, school, community). This difficulty in assessing highlights the fact that it is important to understand the story of the assessed child.

When evaluating children, it is important to have age-based normative data. Smaller age groups allow the child's symptoms to be assessed more accurately in terms of appropriate development or consistent with a psychopathology. Many studies have shown a change in executive function performance during childhood and adolescence. Most of the statistical analyses for the assessment scales also show significant gender effects, against men in executive function ratings [83, 84].

Behavioral Rating Inventory of Executive Function, which is available for parents and teachers to complete developed to evaluate executive functions—for preschoolers (2–5 years old, BRIEF-P) and for school age children (aged 6–18 years). There is a self-report form for completion by youth 11– 18 years old (BRIEF-SR), as well as a group of forms for adults 18–90 years old (BRIEF-A). BRIEF was developed by a group of pediatric neuropsychologists who are collecting data on real-life executive function in the home and school environment. For this reason, expectations of daily adaptive needs and academic achievement provide reasonable information to parents and teachers. Normative data for BRIEF is somewhat restrictive because it is collected from a limited geographical area, and therefore may not represent the general population. EFBAI scores provide summaries of various aspects of executive functions (e.g. impulse, working memory, self-monitoring, etc.), and a clinician tells where and why a student struggles. It has been found that executive functions of BRIEF have a greater correlation with the descriptions of parents and teachers than the performance on laboratory tests and therefore considered to be a good standard tool for executive functions of the person.

Clearly, although executive functions are a tool for assessment. The Brown Attention Deficit Disorder Scales for Children and Adolescents (Brown ADD Scales) are based on the theory that attention deficit represents a developmental disorder of executive functioning. These assessment scales include organizing, prioritizing/activating, focusing/sustaining/recording attention, and executive functioning.

Conners 3 is another attention deficit and hyperactivity disorder (ADHD)-based assessment scale that includes executive functional aspects of the assessed areas. "Executive Functionality" includes the scale, initiation, time management, planning, prioritization, and organization concepts. Other scales in Conners 3 can also reflect executive functions such as attention/focus and self-control. The information obtained with Conners 3, such as the Brown ADD scale and BRIEF, can help identify the areas that require more focus and evaluation which leads to intervention initiatives [85].

Assessment scales such as the Behavior Assessment System for Children, Second Edition (BACS-2), the Conners Comprehensive Behavior Rating Scales (Conners CBRS), and the Achenbach System of Empirically Based Assessment (ASEBA) do not explicitly refer to executive functions, but they can provide information about executive functions. Comprehensive assessment scales such as these can help gathering relevant information in a broader context of issues beyond executive functions.

5. Conclusions

Unlike previous exams focusing on pre-school EF, this focus on EF focuses on a much larger age range. This view allows the study of the developmental form of EF, the gains in EF development, to be examined in the light of developments in behavioral and neural levels. Based on the developmental problems, the following research bases can be established: (1) to compare developmental progress of each EF component with a sample of a wide range of age and (2) to evaluate the developmental sequence of the EF component. Thus, cognitive neuroscience can provide a developmental theoretical focus on EFs for children with/without dyslexia.

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Conflict of interest

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Chapter 3

Occupational Therapy in Forensic Settings

Esma Ozkan, Sümeyye Belhan, Mahmut Yaran and Meral Zarif

Additional information is available at the end of the chapter

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Abstract

It is necessary for a person to comply with the expectations of society and the rules of law to which these expectations are secured. Offenders turn back to the community after the penalty was executed by isolating from society and some occupations. An occupational imbalance is seen in the individuals, during this penalty period and afterward, because of limited occupational participation. As an occupational being, this affects their physical, mental and psychological well-being. Imprisonment is an important practice in criminal law to punish criminals. This may be necessary for the protection of society from criminals, but successful integration into a community after exiting the prison is the most important factor in preventing recidivism. Occupational therapy focuses on health and well-being by using meaningful and purposeful occupations. Occupation involves any activity that people perform or participate in, such as giving care to themselves or others, working, learning, playing games, and interacting with others. From this perspective, the role of occupational therapists in forensic settings is to determine the abilities of these individuals to congregate their deprived freedoms and use them to train them for an independent and autonomous life; to provide a professional orientation, career counseling, and self-esteem; to gain some habits for physical, spiritual and moral life and to reinforce.

Keywords: forensic setting, occupational therapy, recidivism, offender, intervention

1. Introduction

Human is a social being, which occupies in different ways to survive. Occupations are all of the daily activities in one's life that make him who he is. Occupations are formed by cultural backgrounds and include all the tasks performed to fulfill the time and give life meaning. Occupational therapy is a treatment option for individuals with physical, mental

or developmental conditions that focus on health and well-being by using meaningful and purposeful occupations for individuals for the development, improvement or maintenance of the essential skills needed to be successful in their environment [1].

Forensic occupational therapy refers the occupational therapy service that assesses and makes interventions to the individuals with occupational problems in the criminal justice system [2]. The forensic settings can be variable and be challenging, but the main point here to pay attention is the holistic and humanistic view of occupational therapy which says that occupation is vital for human and is essential for health and well-being. From this view, forensic occupational therapy is the same as the mental health occupational therapy practice in some ways [3]. The main difference is the legal context and the restrictive correctional environment. The legal context is usually built upon deprivation of some occupations, and this alienates the individual to the occupation. Also, labeling and stigma affect reintegration to the community [4].

In terms of the individual, occupational therapy is an important necessity for occupational participation and occupational balance. With these, occupational therapy prepares the person for community life and protects the individual from recidivism [5]. This is not the sole benefit of occupational therapy. Also, there are benefits for the community; reducing crime provides social well-being and also increases social welfare by contributing to the individual's productivity activities, so that, forensic occupational therapy has dual aim both for the individual and the community.

The forensic population is growing all over the world and brings challenges with this growing population [5–8]. These challenges can depend on the person, environment and/or activity. The thing that should never be ignored is the legal context, and the therapists must consider the needs of individuals in the legal context [9].

Offenders' rehabilitation is a multidisciplinary teamwork, and occupational therapy is a key part of the treatment and rehabilitation. The methods are similar to other mental health settings. The key focuses for the occupational therapists working in forensic settings are assessment, prevention of occupational deprivation, development of occupations to prevent recidivism, preparation for discharge and activities of daily living (ADLs), preparation to community and the vocational rehabilitation.

This chapter describes the occupational therapy in forensic settings such as prisons, secure hospitals and community reintegration services. The chapter also discusses the assessments, models that can be used in forensic settings, interventions and challenges in forensic settings.

2. Forensic settings

Correctional administration is the reinstatement and retraining of a person's antisocial behavior and feelings through confinement for treatment purposes. Correctional settings regulate the individual's psychosocial status and provide health care service for the prisoners [10].

Correctional settings are a way to facilitate the mental health recovery of the inmates. Since, many of the inmates have serious mental disorders, the forensic unit, of the correctional

facility, plays an important part in their recovery. The unit reduces the risk associated with the inmates and facilitates their transition into the community or less restricted settings. However, the same results could be achieved with occupational therapists. The two main methods that are adopted by occupational therapists (OTs) are the reduction of occupation deprivation and increasing skills by occupational participation. Hence, the inmates are provided with an opportunity to play a purposeful and meaningful occupation in society [3].

Patients, who are admitted to the forensic units and get in contact with the criminal justice system as a consequence of their committed crimes, are detained in accordance with the country-specific mental health legislation. However, some patients are admitted due to severe behavioral issues.

There are several types of correctional settings where charged offenders are held. The main institutions are forensic mental health settings, jails and prisons. Forensic mental health settings include the following: high secure units, medium secure units, low secure units, psychiatric/acute mental health units, community, forensic hostel, special hospital, acute unit of a forensic hospital, high-security section of a forensic hospital, sub-acute unit of a forensic hospital, consultation/liaison position in the community sector, tertiary mental health facility, extended forensic/psychiatric safe care and medium to high secure unit [11].

Jails and prisons are the main correctional facilities since they are able to hold the greatest number of people. There are approximately 12 million jail admissions, which is approximately 19 times that of state and federal prisons [12].

Jails and prisons served for different purposes; have restricted opportunities for rehabilitation; offer a similar grade of occupational deprivation, inadequate access to health services and poorly planned methods; are temporary in nature and lack systematic regulation and resources [13].

Jails and prisons provide care for mentally disturbed offenders in ill-equipped correctional institutions. In particular, jails are used for temporary confinement and are usually lacking in mental health screenings and treatment received by inmates in jails is more limited. Prisons, however, might offer inmates the opportunity to access consulting service for substance abuse treatment even though the service delivery is generally insufficient [14].

2.1. Jails

Jails serve as an introduction to the incarceration system. They are local correctional facilities operated by a city or country instead of the federal or state government. The main purpose of jails and prisoner distribution centers is to confine a person before and after court judgments and to filter prisoners to and from courts and other correctional facilities. Some people in jails have been sentenced, while others might be waiting to be convicted. Many individuals receive an imprisonment of less than 2 years [3].

Judgment is mostly a complex process of sentencing. In this respect, inmates in forensic settings might either be arraigned or experiencing the trial process.

2.2. Prisons

Prisons are classified as high, medium and low security institutions that are typically used for convicted criminals who have been sentenced to at least a year of imprisonment in U.S. Federal Bureau of Prisons. In addition, depending on the severity of the crime, some individuals are sentenced to either state or federal prisons. However, compared to jails, prisons offer a far more stable environment for the inmates and restrict their interaction with society for longer periods of time [3].

The primary purpose of prisons is to ensure public safety and the security of inmates. In addition to incarcerating criminals, prisons offer them programs to address their criminogenic needs related to education, substance abuse, employment and transition to the community.

Basic services in prisons involve intake and screening of psychotropic medicines and to provide occupational therapy services. Those services are substantially provided for prisoners to decrease their social isolation and increase their problem solving and adaptation skills, self-efficacy and self-esteem. The occupational therapy services also promote emotional regulation abilities and social and emotional skills in order for the inmate to deal with prison life and take this opportunity to improve on self-efficacy and occupational engagement [15].

1. High-security units: Individuals classified as high risk to public safety have been sentenced to life imprisonment and are receiving long term treatment, are housed in high-security prisons. The physical environment in these facilities consists of a number of physical and structural barriers between the facilities and the external environment of the institution.

   In high-security prisons with highest number of staff, and both multiple and single cells, criminals remain in their cells or in an outer cage in the facilities' yard. Each cell is equipped with a toilet, screwed to its floor, and prisoners are permitted up to three 10-min showers per week. Movement is firmly restricted and activity within the cellblock does not occur without other constraints, such as handcuffs, leg irons and corrective officer escorts [3]. Orientation can be considered as essential because it gives the staff the chance to be acquainted with the prisoners. The ward program focus areas, such as improving awareness of self, others and the environment; orientation to time, place and situation; probing cognitive abilities and teaching of new skills to improve leisure time use and psychomotor activation, should be maintained after discharge [16].

2. Medium-security prisons: Those institutions house individuals with a criminal background and requiring 2–5 years of treatment [17]. Medium-security prisons, where prisoners' accessibility to prison gardens and exercise areas, libraries, showers and health services are high, offer far more opportunities in terms of interaction, movement and activity in-between prisoners [3]. Medium-security prisons usually have a wide diversity of work-oriented and treatment programs. Parole is more frequently granted in medium-security prisons and may be classified as supervised (always less than 1 h), limited (sent to wards for only 1 or 2 h), occupational therapy parole (join structured activities or subcontract work) and unlimited parole (mostly on weekends and during the week when they do not join specific rehabilitation activities).

Patients included in the rehabilitation process are integrated into community life by developing intellectual and emotional insight, self-care and self-expression skills and general work abilities. Furthermore, providing stress and anger management, psychoeducation and prevention programs for substance abuse in psychoeducation groups facilitates the patients/inmates return to society [16].

3. Low-security prisons: These facilities have windows and open spaces that allow the prisoners to move and interact freely within the environment. Even though low-security prisons are surrounded by double-rings, they have no prison fences or other secured perimeter and are often unpatrolled by armed guards. Since the inmates might work on agriculture, transport or conservation projects, they can provide training to the prison's staff; in addition to meeting the labor force needs of other institutions [3].

   In open wards (low or minimum-security prisons), during the therapeutic leave and discharge periods, greater priority is given to preparation of patient participation. Patients are expected to adhere to hospital rules and regulations, but are allowed to freely leave their wards and take the opportunity to practice skills acquired in the medium secure wards and joining educational training programs outside the health services [3].

The intensive life skills training program is comprised of communication, conflict management and criticism handling, problem-solving, money handling (budgeting, current price trends) and work-related skills (job seeking, application for a job, writing of curriculum vitae, work interviews through the use of role play). In addition, recreational activity program, and specific work skills-related programs are implemented to enhance psychosocial interactions [15, 16].

2.3. Forensic hospitals

Forensic psychiatric settings are generally located in secure units that rehabilitate individuals deemed unfit to stand trial or not criminally responsible. Those inmates pose a serious threat to either themselves or others because of severe mental illness. A forensic psychiatric setting provides treatment-based approaches with a view to rehabilitating patients while keeping the public safe. Patients, temporarily transferred from correctional facilities or incarcerated environment, are assessed and treated for mental illness in the facility that consists of secure, closed and open common units [17].

Forensic psychiatric hospitals reintegrate patients systematically into the community with well-equipped and specialized clinical services, as well as an exhaustive range of vocational and rehabilitative programs. Treatment is typically long-term, in order to improve and safely stabilize patients' mental well-being.

2.4. Community reentry centers

Reentry centers are facilities that help inmates by offering structured and supervised residential settings just before or after their release. In addition to providing a permanent residence to the individuals, assistance in financial management and facilitating, their return to the society

is also arranged. These centers might be especially useful, because the psychological adaptation required for offenders, with expansive criminal histories, returning to the community after a long period of imprisonment, can be particularly demanding.

A crucial component of community reentry centers is substance abuse management and mental health treatment and counseling. Growing prison populations are largely due to drug-related crime and drug abuse, but relatively few prisoners receive the appropriate treatment. In this respect, community-based correctional settings have launched out prison-based drug treatment programs during the past few years [3].

2.5. Psychological models in forensic rehabilitation

There are two main models of psychology about correctional treatment. The risk, need and responsivity model (RNR model) was built up by Andrews and Bonta, and they describe the criminal risk variables named 'central eight' (**Tables 1**) [18]. Good lives model (GLM) is the other model which claims, that rather than addressing criminogenic needs, the focus of treatment should be on the enhancement offenders' abilities to obtain primary human goods [19]. Purvis describes 11 primary human goods (**Tables 2**) [20].

If it is examined the models, both are similar, but RNR Model is based on cognitive-behavioral and the GLM is based on humanistic philosophy. The GLM identifies 11 'primary human goods' and RNR identifies 'central eight' which are inverse overlap. It can be said that GLM 'primary human goods' are inverse restatements of the 'central eight' risk factors, viewed from the lens of humanistic psychology [19]. Depending on these criminal risk factors, it is argued that the criminal procedure of the individual can be predicted and therefore the criminal procedure can be prevented by taking the necessary precautions. However, the RNR model is not compatible with occupational therapy outlook in the view of the possibility of irreversible risk factors and bias holding against the individual.

1. History of antisocial behavior: If there is an early involvement in antisocial acts and if they are still continuing, it is a big risk variable.
2. Antisocial personality: Adventurous, pleasure-seeking, poor self-control personality pattern are other risk factors.
3. Antisocial cognition: Attitudes, values and beliefs supporting crime cause a personal identity favorable to crime.
4. Antisocial associates: Quality of relationship affects the behavior. So that, having close association with criminal peers and relative isolation from prosocial others because of either the individual or the community affects the criminal behavior.
5. Family/marital: Problematic circumstances of home, lack of nurturing relationship and/or poor monitoring behavior.
6. School/work: Circumstances such as low levels of performance and satisfaction in school or work
7. Leisure/recreation: Low levels of involvement and satisfaction in prosocial activities such as leisure time activities
8. Substance abuse: Abuse of alcohol or drugs affects the criminal behaviors.

Table 1. The 'central eight' criminal risk variables.

1. Life (including healthy living and optimal physical functioning, sexual satisfaction)
2. Knowledge(how well informed one feels about things that are important to them)
3. Excellence in work (including mastery experiences)
4. Excellence in play (hobbies and recreational pursuits)
5. Excellence in agency (autonomy and self-directedness)
6. Inner peace (freedom from emotional turmoil and stress)
7. Relatedness (including intimate, romantic and family relationships)
8. Community (connection to wider social groups)
9. Spirituality (in the broad sense of finding meaning and purpose in life)
10. Pleasure (feeling good in the here and now)
11. Creativity (expressing oneself through alternative forms)

Table 2. The 'primary human goods'.

3. Occupational therapy models in forensic rehabilitation

The use of occupational therapy models in forensic rehabilitation focus on client-centered, holistic and occupation-focused practice with the approach of clinical reasoning based on individual preferences and needs. Normally, individuals engage in occupations which they prefer or want throughout their life; however, in secure environment situations, this ability of the individual can be limited or can be restricted by the individual's mental health/disorder/learning disability, their perceived and their actual risks to themselves or others and institutional regulations, policies or legal restrictions. Individuals who need forensic rehabilitation face some participation limitations to all or a combination of activities and this can cause occupational deprivation additionally to the sense of hopelessness and poor mental health [6, 11, 15]. Moreover, community life skills and performing daily living activities and interaction with the environment of the individual can be limited. Therefore, group or individual occupational therapy programs often target basic living skills, self-care, vocational skills, adaptive coping strategies, creative arts and anger or stress management. The general aim of occupational therapy is to enable individual to experience occupational enrichment and achieve optimal occupational functioning. Occupational enrichment in forensic settings can be considered as both the goal and process of occupational therapy interventions, so evidence-based practice is very important [15].

Occupational therapy guideline recommendations show that Model of Human Occupation (MOHO) and its associated assessments are the most used occupational therapy model in forensic occupational therapy. The model was developed in the 1980s by Professor Gary Kielhofner and has had some revisions and collaborations until now. MOHO supports that human occupation is motivated, patterned and performed. Humans are conceptualized as three interrelated components: volition, habituation and performance capacity [16]. Also,

environmental considerations are very important to increase the occupational participation of the individual having forensic occupational therapy and rehabilitation [15].

Volition presents the individual's motivation for occupation and relates to individual's motivation to participate to occupations combined with their self-belief and capacity to succeed which means personal causation. Motivation and personal causation can be affected by the individual's mental health (such as depression, schizophrenia, personality disorder) or their perception of the reason and need for their admission. Therefore, the literature supports that it is important to establish the individual's own goals to ensure treatment readiness. Some individuals can have complex occupational histories, which are situated within social tensions related to their antisocial or criminal occupations present lack of motivation to engage and participate activities they want and these individuals can view the environment as a barrier to participation in usual activities which can impact the individual's mental health and well-being negatively. It is supported that volitional problems are likely to be highly relevant in the secure setting which can cause decrease in personal causation, difficulty in identifying or having unrealistic goals and an inability to and meaning or interest in activities [15, 16].

Occupational therapists have the skills and expertise to assess and engage people in those occupations which are meaningful and motivating. This requires a careful understanding and appreciation of what underlies the motivation and creating occupational opportunities like self-care, productivity and recreational activities. Occupational therapists also help people to identify and achieve their own hopes and aspirations such as vocational rehabilitation and work skills [15, 16].

Habituation refers the individual's roles and behavior patterns consistent with his/her lifestyle. It presents automatically and effectively doing routine tasks related to their environment. Roles of the individual are responsibilities of the individual associated with personal identity, occupations and activities of daily life and extraordinary occupations. Individual with criminal lifestyles can have problems on participating prosocial roles with their daily routines and occupations [15, 16].

Occupational therapy interventions in secure environments help individual to participate in prosocial roles and occupations in an effort to live within society without resorting to previous criminal or new antisocial behaviors. The imposed legal and security restrictions in secure environments can mean that patients are unable to participate in their habitual or chosen occupations; this may be because such occupations are antisocial, or due to lack of resources, facilities or particular environments being available in secure settings. Often patients benefit from the structure, stability and consistency of admission [19].

For occupational therapy interventions age, ethnicity and culture, finding the 'right' occupations that are culturally relevant, risk-managed and appropriate to the 'typical' forensic population can be challenging. The literature supports that not only redesigning lifestyle but also technological advances have an impact on the range of occupations that occupational therapist is able to offer to extend the inclusion level of the individual such as contemporary videogames and Nintendo® WiiTM additionally to participating actual sports and recreation activities [16].

According to the Model of Human Occupation, performance capacity is related to an individual's adaptive interaction with the environment, and the ability to do activities provided by physical and mental components and the associated subjective experience. Occupationally restricted individuals have problems with occupational performance skills for independence in daily living. Moreover, performance skills may not be acquired or learned during transition from child to adult. Occupational therapists in secure environments have a major role to play in helping patients to develop, maintain or acquire new skills for successful community reintegration or transition to less secure settings, for example in the area of vocational rehabilitation. Occupational therapists can guide individuals to identify possible vocational areas such as study/education, voluntary or paid employment [16, 20, 21].

Occupational therapy interventions should help the individual to identify prevocational needs and sometimes individuals have not been or will not have a productive activity like working again and therefore the therapists need to help them to establish different prosocial, productive and meaningful occupations to increase health, wellbeing, occupational performance and general quality of life. For these reasons, it is important for occupational therapists to measure and follow the progress of the individual with outcome measures during daily living activities [17, 18, 21].

Social and physical isolation of the individuals can cause problems to access their own complex occupational and environmental worlds. Being cut from own life can cause limitations over occupational choices and experience, so environmental changes and supports during activity performance can provide opportunities, constraints and demands to the individual. The literature supports that individuals in secure environments spend much of their time in passive leisure, personal care and rest occupations and occupational therapists are one of the core elements in increasing activity participation of the individual and develop occupations of their choice [15, 16]. Also, occupational therapists can facilitate the exploration of new or unknown occupations to increase positive life experiences of the individual.

As it is given earlier, there is a great model need to understand the volition, habituation, performance skills, physical and social environments in which an individual's occupation takes place. MOHO assists the understanding of occupation(s) and problems of occupation that occur in terms of volition, habituation, performance capacity and environmental context. This system-based model includes well-designed assessments, observational, self-report and interview schedules. One of the advantages of this model is that because of its extensive use in mental health settings; a forensic version of an assessment tool 'Occupational Circumstances Assessment and Interview and Rating Scale' was designed. But, the literature also supports that this tool is not the only one for the use of occupational therapists, and occupational therapists may find any particular model, or standardized assessment/outcome measures to support their interventions [4, 15, 16, 21, 22].The literature supports that the use of occupational therapy models in forensic mental health may increase evidence-based practice and help the professionals to show the effect of occupational therapy. As Model of Human Occupation is seen to be the most used occupational therapy model, models including environmental and individual issues such as psychological issues, desires, wants, activity performance and satisfaction from the activity performance can help the occupational therapist to plan more

effective assessments and interventions. Although the literature is still limited; different occupational models such as KAWA model, creative ability model, PEOP (Person, environment, occupation, performance), the Canadian model of occupational performance and engagement and the individual placement and support model with can be effectively used with standardized assessments and outcome measures in various individuals, situations, cultures and environments in provision of occupational therapy services in a cost-effective way [6, 15, 16].

4. Assessment in forensic occupational therapy services

Occupational therapy process commences with contiguity between the offender and occupational therapy service. Collecting information about the person and making special evaluations is the first step in this process. Gathering information about the individual and special assessments helps to determine the problems and needs, as well as the reason for the intervention. It also allows for the setting of intervention targets and the determination of the intervention plan. In the process of occupational therapy, the intervention plan is followed by the implementation of the intervention. The intermediate evaluation may be needed to determine the effectiveness of the intervention or to reveal new intervention goals and plans. After intervention plans that have been modified or reorganized after the interim evaluation are applied, the intervention is assessed. As seen in the abovementioned occupational therapies process, information gathering and evaluation also play an important role in the intervention for forensic occupational therapy applications. In summary, an occupational therapist working with prisoners should use a three-stage assessment of initial assessment, interim evaluation and outcome measurement during the occupational therapy intervention process [15, 21].

Occupational therapy sees people as active and social entities and treats the person, his occupations and the environment holistically in order for the individual to achieve or regain well-being. It is also important to assess the individual as a whole in the information gathering and evaluation process for the creation of a suitable intervention plan [15] . According to the occupational therapy reference frame written by AOTA [15], personal factors include the individual's values, interests, and spirituality as well as body structure and functions. Having knowledge about the boundaries and areas of internal energy in prisoners' participation in occupations can be useful to guide activity preferences and motivation processes. The things that constitute the meaning of prisoners' lives are values and beliefs they believe to be worth trying and taking the time. The occupational therapist in forensic setting desires recreates occupational identification of offenders who lose their roles by being isolated from the social environment. For this reason, it is very important to understand the value, relevance, strengths and limitations of the individual [4, 16, 22].

It is also necessary to assess the sensory, motor and cognitive skills involved in the body structure and functions of the person in need to meet the occupation requirements they wish to perform. These skills can make or break an individual's daily life. One point that should not be overlooked here is that during the process of occupational therapy collecting and evaluating information, the prisoner does not play a passive role, so the occupational therapist does not seem to be running a process alone. The occupational therapist and the prisoner are

in the business association during the presentation of information, evaluation and outcome measures, and the prisoner is actively involved in this process.

Occupational therapists are aware that the occupational performance of an individual is influenced by factors related to the individual as well as by the performance patterns and the environment. Roles, routines, rituals, and habits constitute performance patterns [15]. Routines and habits allow the individual to perform his/her daily activities without thinking about how to move, without trying to remember. Occupational therapists working in forensic health services care about whether the prisoner has useful habits and routines for him. It is necessary to know how individuals spend their days and which routines they create from day to guide to get new routines and habits to use the time and energy more efficiently when the living conditions change [11]. Roles are the whole of the behaviors that an individual imposes on his/her responsibility, which is imposed by the environment and culture. Rituals are symbolic behaviors that are understood by social, cultural and spiritual values that shape the occupational identity of the individual. During the evaluations, the roles of the prisoner and the importance of these roles and the determination of meaningful rituals in the individual's life provide significant benefits for the therapist's intervention plan. Changes in location and time can also cause changes in the roles and rituals of individuals. The change in the role and ritual of the individual after conviction can cause occupational alienation in the individual. In the context of a forensic health service, acquisition of the prisoner's new skills and habits, and the new roles and rituals that are well integrated with the environment make an important contribution to the occupational balance of the individual [3, 16, 23].

Understanding the environments in which occupational performance takes place, it is important for occupational therapists to understand the underlying effects of occupational participation. The environment includes dimensions related to physical, social (including individuals in the individual's life) and policies, and at the same time creates a supportive or restrictive effect for the occupational adaptation of the individual. Situations such as an absence of freedom for the individual, individual secrecy, and the meaningful and socially acceptable occupations constitute a barrier to prisoners' participation in their environment and occupation [15, 24]. Occupational therapists should also be thoroughly evaluating the environment of individuals who are establishing an intervention plan with prisoners applying to the occupational therapy service.

We have already mentioned the preferred models for forensic occupational therapy applications. MOHO, one of these theories, includes structured and unstructured assessment and information gathering tools [3, 4, 11] for collecting and evaluating information about offenders. Some of those:

- Occupational performance history interview (OPHI II)—A semi-structured measure of self-care and information about the individual's life history;
- Assessment of communication and interaction skills (ACIS)—evaluates three subdomain individuals, including the physical dimension of communication, information exchange, and relationships, in an occupational pattern or in a social group [25];

- The Model of Human Occupation Screening Tool (MOHOST)—gives the client a holistic view of his or her motivation to achieve occupation, communication and interaction skills, occupation patterns and the individual's process and motor skills as well as the environment. MOHOST also allows a highly effective assessment of the effectiveness of occupational therapy interventions [26];
- Occupational Self-Assessment (OSA)—a method of assessment that reveals how the individual focuses on the occupational competence of the individual about his/her occupational adaptation, helping to shape the needs and values of the individual. OSA is a highly recommended assessment tool for evaluating forensic occupational therapy. Individuals are given a very wide list of daily occupations, individualists are asked to evaluate the occupations in their own eyes and the level of their own performance [26];
- Occupational circumstances assessment interview and rating scale (OCAIRS-Forensic Mental Health Version)—the therapist has extensive content to get detailed information about the offender. It gives the individual an accurate and holistic view of occupational functionality. If the more fully involved the offender is in the evaluation process, the higher the participation in intervention practices [27, 28].

Evaluations such as Canadian occupational performance measurement, assessment of motor and process skill, independent living scale, and the role checklist are other measures preferred by occupational therapists [3, 24].

Another assessment heading in the forensic occupational therapy process is risk assessment. When considering the evaluation processes mentioned earlier, a prisoner who has forensic settings should be considered as a means of risk assessment to determine the potential for another crime or previous crime. Occupational therapists take into account the risk assessment and management of risks posed by each client and to increase the occupational involvement of individuals by taking environmental precautions and managing them to manage risks in environments such as high-risk kitchens and workshops to improve individual skills as well as providing positive risk-taking opportunities to enhance the capabilities of both individuals.

Current risk factors such as age and gender, substance use status, criminal history and potential risk factors such as marital status, occupational participation level in the forensic setting, family support should be considered in the risk assessment. Occupational therapists pay attention to the influence of the person-environment-occupation interaction on the occupational adaptation of the individual. Occupational therapists can estimate the effects of individual's personality and sociodemographic characteristics (physical, cognitive and psychological), their level of skill and the environmental risk factors, including interpersonal interaction, social support network, hospice environment, social security status on the possible risk factors. For this reason, they may play an active role in providing counseling to minimize the risks faced by prisoners and these risks' adverse effects on occupational adaptation [3, 21].

5. Interventions in offenders rehabilitation

As already mentioned, offender rehabilitation in forensic settings is not different from other mental services. Intervention methods used by occupational therapists must include life skills

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development (such as ADLs, IADLs, and health management), occupational development, awareness (such as self-awareness and social awareness), self-management, skill-building (such as social, relationship, vocational skills), education etc.

The GLM is a model that overlaps the humanistic point of view of occupational therapy. Although the GLM is a psychology-based model, it supports occupational therapies' application models such as PEO, MOHO, CMOP and role acquisition model. Occupational therapists may develop interventions taking into account the GLM's the primary human goods components. Some intervention recommendations based on the 'primary human goods' are given in **Table 3**.

The 'primary human goods'	Intervention recommendations
1. Life (including healthy living and optimal physical functioning, sexual satisfaction)	**Aim:** Understand themselves, reach personal satisfaction, live life better and achieve their goals
	Occupational strategies:
	Functional life skills
	Role development
	Independent living skills
	Literacy and education
	ADLs
	IADLs
	Health management
	Gender-specific issues
	Money management
2. Knowledge (how well informed one feels about things that are important to them)	**Aim:** Identify one's emotions, thoughts, interests, and values; understand how internal characteristics influence actions; maintain a sense of self-confidence and self-efficacy
	Occupational strategies:
	Self-awareness
	Drug and alcohol awareness
3. Excellence in work (including mastery experiences)	**Aim:** To keep the physical, psychological and social needs of the individual together, to increase the independence of the individual and to work with a holistic and customer-centric approach in the role of the worker.
	Occupational strategies:
	Prevocational training
	Job search skills
	Work-related practice
	Vocational rehabilitation: work preparation, voluntary and paid work
	Work hardening
4. Excellence in play (hobbies and recreational pursuits)	**Aim:** To build up hobbies, recreational pursuits
	Occupational strategies:
	Recreational skills
	Time management

The 'primary human goods'	Intervention recommendations
5. Excellence in agency (autonomy and self-directedness)	**Aim:** To organize and adapt a behavior to achieve individually selected goals and values
	Occupational strategies:
	Anger management
	Stress management
	Problem solving skills
	Motivation
6. Inner peace (freedom from emotional turmoil and stress)	**Aim:** Regulate emotions, thoughts and behaviors across contexts; cope with stress and manage impulses; set goals
	Occupational strategies:
	Self-management
	Increase self-esteem and confidence by promoting personal responsibility
7. Relatedness (including intimate, romantic and family relationships)	**Aim:** Establishing and maintaining relationships with others; resisting inappropriate social pressure; working in cooperation; preventing and resolving interpersonal conflict; asking for help when necessary [29].
	Occupational strategies:
	Relationship skills
	Complex relationship building
	Facilitating development of supportive relationships
	Social skills
8. Community (connection to wider social groups)	**Aim:** Being active in social groups
	Occupational strategies:
	Social skills
	Social awareness
	Responsible decision-making
	Graded community engagement and one-to-one goal planning
	Empathy
9. Spirituality (in the broad sense of finding meaning and purpose in life)	**Aim:** To find meaning and purpose of life
	Occupational strategies:
	Motivation
10. Pleasure (feeling good in the here and now)	**Aim:** Feeling good, loving life
	Occupational strategies:
	Motivation
	Increase self-esteem and confidence
11. Creativity (expressing oneself through alternative forms).	**Aim:** Knowing himself about what he can do
	Occupational strategies:
	Skills development
	Vocational activities include such as woodwork, crafts, graphics, horticulture

Table 3. Intervention recommendations in offender's rehabilitation from the view of occupational therapy.

1. Life: Life skills training is a commonly used occupational therapy intervention in mental health [30]. Offenders are at a higher risk for poverty, unemployment and difficulties in relationships. The life skills training interventions can focus on self-care, self-maintenance, intrinsic gratification, social contribution and interpersonal relatedness skills. The interventions must be client centered and the context must be well evaluated. While working with an offender, the balance of daily occupations should be kept in mind for a healthy lifestyle.
2. Knowledge: The development of interventions for improving self-awareness is very important in offenders' rehabilitation. Self-awareness is the ability to recognize him/herself as an individual who is different from other individuals. Self-awareness is having a clear perception of personality, including strengths, weaknesses, thoughts, beliefs, motivation and emotions. The aim of the interventions is to gain a sense of self-worth. Facilitatory interventions, such as education, feedback, behavior therapy and psychotherapy have been recommended to a greater extent than compensatory interventions.
3. Excellence in work: The main problem of ex-offenders is employment to maintain their lives [31]. Unemployment concerns begin to increase still they are in prison. They face substantial barriers to many types of legal employment [32]. These barriers are poor basic skills, low self-esteem, a lack of recent work experience, employer discrimination, behavioral and health problems. Interventions must include prevocational training, job search skills, work-related practice and also work hardening.
4. Excellence in play: Recreational activities and hobbies are the enjoyable, activities that are restorative in which the clients' choice and control often associated with leisure time. Recreational pursuits and hobbies are the power of life. The main aim of the therapeutic recreation is to enhance the patient's quality of life and ability to participate in leisure and/or play. Also, it can improve social participation and social skills which is very important for the offenders.
5. Excellence in agency: Self-directedness is the ability to organize and adapt a behavior to achieve individual selected goals and values. Self-directedness includes the concept of an autonomous individual and concepts of personal integrity, self-respect, dignity, efficacy and feelings about one's life [33].
6. Inner peace: Anger management problems affect all parts of a persons' life. The goals of treatment are to increase the client's resources for coping with stress and try to decrease the demands made on the client. Treatment is first achieved by increasing awareness of the client about the relationship between anger and stress and then increasing the effective use of the stress management techniques that the client is able to cope with [11, 34]. Anger management interventions begin with recognizing the triggers of anger. The client must take responsibility for his/her own change so that the problem can be solved. The second stage of the intervention is the awareness of the behaviors when the client is angry, such as, shouting, swearing, treating verbal, postural or gestures, abusive behaviors such as phone calls, messaging or other communication ways, harassments, emotional abuses or violent. Also in this stage, the therapist must help the client to identify times when his/her thoughts do not lead to logical or rational conclusions. The third stage is teaching specific skills to help the client to manage triggers for anger effectively, such as relaxation techniques, mindfulness and assertiveness.

7. Relatedness: Group interventions in which the family members and friends are engaged are suitable for relatedness [35]. The aim of the interventions must be establishing and maintaining relationships with others, resisting inappropriate social pressure, working in cooperation, preventing and resolving interpersonal conflict, asking for help when necessary [29].

8. Community: Deficits in social skills are often seen in forensic groups. Social skills training is the main intervention method for being active in a group [36]. For being in a group, it is also important to make responsible decision to identify and evaluate the problems correctly, making decisions based on ethical and social norms, to evaluate decisions in context, contribute to the welfare of society, accurately identify and evaluate problems, make decisions based on ethical and social norms, consider context in decisions, contribute to well-being of community [29]. Social skills training consists of learning activities that use behavioral techniques that enable individuals to acquire independent life skills for better functioning in their communities. Direct teaching, modeling, role playing, behavior rehearsal, and social reinforcement can be used during the interventions.

9. Spirituality: The spirituality is the 'meaning and purpose in life, the life force or integrating aspect of the person and transcendence or connectedness unrelated to belief in a higher being' in occupational therapy perspective [37] . The meaning of spirituality is different for everyone, can be participating a religion, visiting religious places (such as churches, mosques, synagogues etc.) regularly and can be different for some praying alone, yoga, meditation, being in the nature, walking and so on. There can be challenges about talking about the beliefs and spirituality with the client and that much of spiritual experience can be culturally influenced [37]. Motivation techniques can be used to find meaning and purpose in life.

10. Pleasure: Pleasure is one of the subjective experiences of the human need-based experiences to engage in occupations [38]. It influences productivity, restoration and being active to engage occupations [39]. Motivational and increasing self-esteem and confidence interventions can be used to improve pleasure.

11. Creativity: It is stated that 'creativity is part of everyday practice; the use of creativity as a conscious approach; creativity involves risk-taking; creativity needs a supportive environment; and creativity is the use of expressive arts in therapy' [40]. Especially creative arts increase the capacities of offenders, help to explore their own resources, assist them to locate hope and motivation, recognize their interconnectedness with others without external pressure to comply [41].

6. Challenges in forensic occupational therapy

The main challenge is the context because of the complexity of the rules affecting the freedom of the offender and the occupational opportunities [7]. The heterogeneous client population is another challenging condition with in the context. Restricted daily living activities cause the loss of control and autonomy. Time use is another challenging factor, the lack of structured time use

besides the loss of control and autonomy affects the client's volitions, habits, and routines. Also, lack of opportunities for meaningful, individualized career choices for patients affects the client.

Also, change, itself is a challenging condition. There are many factors that affect the daily living activities that are the volitions, habits of the individual and the environment. Therefore, it is not possible to catch the change in every environment. Even in a prison or in a secure hospital or a probation service, the offender has always an obligation and mostly a restricted occupational choice. Motivation or perceived lack of choice is an important challenge. Another challenge is the obligations dictate some occupations and this is not the individual's choice. Occupational therapy is client-centered, but freedom deprivation is a challenge to make interventions. Occupational therapy is client-centered but freedom deprivation is a challenge to make interventions. Labeling and stigma are other challenging parts of the offenders' participation in the occupations and the community.

Keeping the three justices—criminal justice, occupational justice and social justice—in a balance is the main aim of the offender's rehabilitation and the most challenging part of the rehabilitation.

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Chapter 4

Employment of People with Disabilities and Ergonomic Risk Factors at Workplace

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Additional information is available at the end of the chapter

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Abstract

The importance of employment to people with disabilities has been increasing in recent years. Participation in working life as active producers has been the main factor in community integration of people with disabilities. It has been proven that if people with disabilities are given the opportunity to develop and use their working capacity, they can be as successful as those who do not have any disabilities, and nowadays the most rational way of helping people with disabilities is to provide them with profession and work. Vocational rehabilitation is a process that helps someone to overcome the barriers when beginning to work, continuing to work, or returning to work after any accident, illness, or disorder. Although the employee is selected according to his/her ability according to the work to be done, it is very important that the place to work matches the physical and psychological characteristics of the employee. Ergonomics is important at working life as it affects productivity. Many different ergonomic risk factors are available to affect the quality of life of a person at workplace. This chapter focuses on the employment of people with disabilities, the risk factors they may face at workplace and assessment of risk factors.

Keywords: employment, disability, workplace, ergonomics, risk factors

1. Introduction

Participation of people with disabilities in business life has been increasing in many countries in recent years [1–3]. The use of rehabilitation services and the participation in working life as active producers have been the main factors in community integration of people with disabilities [2–4]. Developed countries make legal arrangements in this area to enable people with disabilities to gain profession. The Americans with Disabilities Act (ADA)

emphasizes that work for people with disabilities is a right, not just a social participation. The United Nations has also taken a major step in recent years, placing 'work' in the basic rights of people with disabilities and obliging employer to prepare accommodation that is compatible with the employee's needs [5].

The International Labour Organization (ILO) states that all persons with disabilities are entitled to vocational rehabilitation, employment and progress at work, regardless of the type of disability and the level of disability [6, 7]. It has been scientifically proven that if people with disabilities are given the opportunity to develop and use their working capacity, they can be as successful as those who do not have any disabilities, and nowadays the most rational way of helping people with disabilities is to provide them with profession and work [1, 4, 6, 8, 9]. Thus, instead of being dependent on others, they will be able to earn an income and perceive themselves as persons who are productive, efficient and economic contributors [2, 3, 6].

The chance of a permanent or temporary physical or psychological discomfort during the life of an employee is 20% [9]. This disturbance can change the functional capacity of the person [9]. An acquired physical disability may cause a person to change jobs or to continue existing work with assistive devices and adaptations [10]. However, it may not always be enough to find a suitable workplace and to adapt the individual to work independently [1]. It is necessary to evaluate the person's ability to continue to work over a long period of time [1]. Some jobs can cause a person's physical condition to deteriorate, which leads to an increase the level of disability both at work and during daily life [1].

People who are permanently or temporarily disappeared from work after a disease or accident can receive financial support for a period of time [9]. Social security institutions, health councils and insurers evaluate the person's functional capacity to determine the person's ability to return to work [9–11]. Job losses due to the loss of working capacity of individuals cause social and economic consequences for both the person and the society [1, 6, 11]. Especially, long-term job losses are costly for countries [1]. Therefore, efforts are being made to minimize the loss of work that can occur through the provision of work security and the measurement of risks [1]. Many countries work on the vocational rehabilitation programs for workers who have lost their working capacity irreversibly, making them to enter the economic arena again [11].

The criteria for returning to work for an employee established by a rehabilitation team in the case of an accident or illness are as follows [9]:

1. Comparison of physical/cognitive requirements of work with function
2. Possible requirements for job modification and settlement
3. Adaptive device or assistive technology requirement
4. Permission for body mechanic training or treatment
5. The need to return to part-time or gradually work within a limited time

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The above factors are agreed with the employer and the employee to form the action plan. This is a dynamic planner that can be changed according to the progress. The plan can continue until he or she returns to work [9].

2. Employment of people with disabilities

2.1. Barriers to employment of people with disabilities

There are personal and programmed facilitators and barriers in the participation of people with disabilities in their working life [12, 13]. The interaction between these facilitators and barriers constitutes the personal economy of energy and resource [12, 13]. As the barriers increase, the resources within the personal economy decrease [12]. The person should either give decreasing personal source to work or transfer the source into family and social life [12, 13].

The personal factors that are barriers to the working life of people with disabilities are secondary conditions such as pain, fatigue, mobility change, depression, change in perception [12, 14], change in vision, change in bowel and bladder control [12]. Personal factors which are related to disability or not, such as education level, social support status and self-esteem, may also be barriers [6, 13, 14]. People with disabilities who return home without working have stated that secondary conditions have worsened; that no energy is left to participate in the family and social life; that they are stuck between work, financial income and health status; and that they lose from non-work-related quality of life [13, 15, 16]. As a result, the interaction of these secondary conditions with social and environmental barriers negatively affects the economy.

Social and environmental factors alone can also be barriers to the working lives of people with disabilities [6, 12]. Factors such as the lack of a general healthcare coverage and the inability to transfer one's health coverage when going into another work are social barriers [12]. As environmental factors, we can count the barriers when reaching the workplace and all the barriers that prevent mobility at workplace [13]. Inaccessible toilets, pavements and unreachable computer tables are among the environmental barriers [6, 12–14].

It is very important that a person with a disability is able to continue to work or to arrange a suitable place for a new job. In each country, compulsory laws must be enforced to plan and implement a suitable settlement for the employee's needs. Thus, the barriers that may arise in the working life should be tried to be reduced to a minimum. Such problems in the employment of people with disabilities are accompanied by the risk of social exclusion and poverty [6]. Resolving the problems in employment helps participation of disabled people and their families in productive life, as well as it is the only way to increase independence and quality of life [6].

2.2. The importance of vocational rehabilitation in people with disabilities

Vocational rehabilitation is a process that helps someone to overcome the barriers when beginning to work, continuing to work, or returning to work after any accident, illness, or disorder [6, 11]. This process consists of a flexible set of applications that takes shape from

one step to the next according to the needs of the individual [12]. These practices are a very important step for participation in social life again for people with disabilities who have not been able to enter the education system for various reasons; who are disconnected from this system at any stage, disabled while working; or who want to change their occupation [6]. Vocational rehabilitation practices involving individuals who lose their jobs, employers, family members and related persons cover procedures that can help them to easily reach and continue these programs.

In vocational rehabilitation, the person's disability, cause, nature and age do not matter [6]. What is important is whether the disability situation creates a barrier from a professional point of view [6]. If the present obstacle situation is a real problem for the present or future work, it indicates the need for vocational rehabilitation [6].

2.3. The scope of vocational rehabilitation

Like all other rehabilitation services, vocational rehabilitation will continue to be a developing field based on the evidence gained through research. Described by H. Kayıhan in 2009 [17], vocational rehabilitation includes steps of assessment, guidance, training, placement, protection and monitoring. In the assessment, an analysis of the physical, mental and vocational abilities of a person who is injured or remains after the disease is made. During this analysis, it is very important for the evaluator to evaluate the findings effectively and efficiently and to know that the findings can vary according to personality traits during this process [11]. Proposals are made in the field of guidance for vocational education and employment opportunities. In the training section, the person is trained and prepared for the job. The next step is to help the person find a suitable job. Special arrangements make it easier for the recruited person to work. In the last step, the person is followed until the full adaptation to the job is secured [17].

In vocational rehabilitation, the cause of disability, the nature of disability and the age of the disabled person do not matter. The important thing is whether there is an obstacle to work. If the physical and/or mental disability of the person is an obstacle to the current or future work, then professional rehabilitation is needed [18, 19]. People with disabilities should be assessed on the basis of their capacities, competencies, potential and relevance before starting vocational training. Akel et al. [19] reported that even adolescents with chronic diseases should be educated about possible future occupations. Functional and work capacity of the people is investigated. Parallel to the results obtained, training is provided to increase the work potential of the person and to prepare him to the activities. Vocational rehabilitation team includes people from professional groups such as doctors, physiotherapists, occupational therapists/ergotherapists, psychiatrists, psychologists, course teachers, social workers, professional advisers and some other professionals as architects or engineers [17].

The 'International Classification of Functioning, Disability and Health' (ICF), created by the World Health Organization in 2002, classifies health and health-related areas by defining body functions and structure, activities and participation [11, 20]. These areas are categorized by physical, personal and social aspects. Since the function and disability of the subject are in the same context, ICF also includes environmental factors [11]. The social model and ICF are the models that professional rehabilitation practitioners can use. Even if the content of the

models is not fully used, general order and principles can be used, while vocational rehabilitation programs are being created [11, 21]. In a study published in 2011 by Escorpizo et al., relevant results were found between assessment methods used in vocational rehabilitation and some ICF categories and pointed out the importance of using this model in vocational rehabilitation [21]. In another study in the United States, it was argued that the ICF model is a new turning point in understanding and addressing health and health problems [22]. It has been determined that this method may assist in occupational rehabilitation team, determine the necessary treatments, develop effective placement strategies and evaluate outcomes [22]. The ICF's core set for vocational rehabilitation has been formed to serve as an international standard and to measure and/or report concerning functioning of individuals at vocational rehabilitation programs [23].

2.4. Importance of functional capacity evaluations in vocational rehabilitation

Functional capacity evaluations are an objective measurement method that evaluates the activity status, activity limitations, physical requirements of the work and the general work situation of people with disabilities and those who have experienced work injury and gives suggestions for ultimately taking part in the job-related and participatory role [24–27]. These assessment methods have been used in North America since the early 1980s [13]. This term coincides with the time when ergotherapy is developing rapidly. The desire to find valid data in order to increase the return of persons to safe work has increased the importance of functional capacity evaluations. For the last 40 years, with the development of technology, more objective and computerized measures began to be used, resulting in healthier work choices and successful job placements [27–29]. Functional capacity evaluations are implemented by physiotherapists, occupational therapists, physicians, occupational rehabilitation consultants and many other professional occupations [9]. It is stated that the person who made the measurement should be trained in this subject [9, 11].

For people with physical disabilities to be employed, functional capacity needs to be evaluated first and then placed in appropriate jobs [8, 9, 30, 31]. Functional capacity evaluations can be made from medical, functional, psychological, physical and occupational aspects. Following the determination of the functional capacity, it is stated that the work analysis should be carried out at a later stage to assess the requirements of the work and the functional capacity should be adjusted to meet the needs of the job [4]. The decision should be made to place the person with disabilities in the work course or job [4]. As a result of the functional capacity evaluations, it is aimed to determine the capacity of the person to meet the demands of the job and the appropriate jobs [8–10]. If there is a problem to continue to work, an action plan should be made [10]. This plan should be to place the person in a modified job, to train the person about job demands, to direct the person to a treatment center when there is a medical problem, or to prepare the person for a new job with vocational rehabilitation if it is not possible to return to the previous job [10].

The purpose is very important when choosing a functional capacity evaluation method [24, 31]. If it is the intention to return to the old job, job requirements should be determined by job analysis [24]. Functional capacity evaluation results should be compared with the physical

requirements of the job [24]. A more general and comprehensive assessment should be done if the person is to be placed in a new job [24]. The physical condition is investigated from many directions and the most appropriate ones are identified from the various types of job opportunities available [24]. If the objective assessment of the functional capacity is to determine the disability status, then an evaluation method should be chosen where the evaluator can collect the desired information [24].

Functional capacity evaluations, such as all other tests performed in the field of rehabilitation, are generally planned according to the test and measurement standards established by the American Physical Therapy Association [32]. Functional capacity assessments are crucial to ensure reliable and valid results and to be safe and practical in practice [24, 30]. Reliability is stated as the most important factor that evaluations are standardized [24, 30]. Reliability studies of functional capacities for many different purposes have been accelerated after 1990, and clinicians have drawn attention to the importance of reliable assessment methods [33]. Reliability studies of newly produced evaluation methods continue at a rapid pace [33].

Lechner et al. [34] and Brouwer et al. [35] found that functional capacity evaluation protocols were reliable for people with low back pain and other musculoskeletal disorders. Lechner et al. evaluated 50 persons aged between 18 and 65 who had musculoskeletal discomfort and who spent at least 20 hours per week with the so-called Physical Work Performance Evaluation [34]. The reliability of interpersonal reliability when using the evaluation method of 11 physical therapists was found to be very high [34]. Gross and Battie [36] found that test–retest reliability of the results of functional capacity evaluation during lifting was high in people with low back pain. An evaluation system called 'Isernhagen Work System' was used in this study [36]. The authors state that when evaluating the operational definition, the safe and maximum performance detection is reliable when well explained to the evaluators [36].

Many types of validity were tested in the field of functional capacity assessments [30, 33]. Less validity studies were conducted compared to reliability studies [37]. The first study to question the validity of functional capacity assessment studies was conducted by Smith et al. [38]. In this study, 125 prisoners in prison were evaluated by 'Smith Functional Capacity Assessment Method', medical history was taken, and 'Patient Activity Questionnaire' was applied. According to these test results, the chances of returning to work were determined. One year after being released from prison, a questionnaire was sent to these persons, and their employment status was questioned. From the responses, it was determined that the results of the tests in the prison estimated the work situation to be 86%. Matheson et al. [39], who tested the predictive validity of functional capacity assessments, attempted to determine the return to work after 6 months without evaluating the individuals with chronic musculoskeletal system. In this study, a low lift was tested, and a 2% chance of returning to work for each added pound weight was found to increase by 2%. Lechner et al. [40] also tested the predictive validity of the 'Physical Business Performance Assessment', a functional capacity evaluation method, on 30 people with musculoskeletal dysfunction. As a result of this study, the results of functional capacity assessment were well validated in determining the chances of returning to work after vocational rehabilitation [40].

Compared to other assessments, functional capacity evaluations take longer [24, 30]. This can vary from a few hours to a few days, depending on the measurement protocol used [24, 30].

It is also stated that these evaluations are more suitable to be applied in the clinical environment instead of the business environment because they include equipment such as lifting units, weights and power measuring unit [30]. Because of these equipment, it is stated that the establishment of functional capacity evaluation units is almost as costly as the imaging methods at diagnostic centers [30].

The main components of functional capacity assessments can be summarized as data collection, physical assessment, physiological assessment and functional performance measures [24]. In the data collection section, file scans, interviews with people, or surveys are conducted [24]. Physical evaluations are performed to determine clinical findings related to the disease [24]. As a result of these findings, it is determined if there is inconvenience for physiological and functional evaluations to be done properly or if the person should be followed during evaluations [24, 30]. Physiological evaluations include sections such as assessment of muscle strength or cardiovascular endurance [24].

The business factors specified in the 'Job Titles Dictionary' (DOT) indicate both the physical requirements of the job and the capacity of the employee to fulfill those requirements [24]. These 20 physical requirements are used by rehabilitation specialists and business consultants to classify jobs [24, 26]. Functional performance assessments measure the physical requirements of this work [24, 26]. The lift capacity test is the most commonly used functional work measurement in the DOT [24]. However, it is stated that the measurement of lift capacity in different situations and in different positions is very important in terms of reliability of the test [24].

3. Ergonomic regulations at workplace

The study of ergonomics and work posture in workplaces has gained importance in recent years. Ergonomics is an interdisciplinary scientific discipline that scientifically examines and relates the relationship between people, the equipment and working environment they use to the field of application [41]. In order to harmonize the person, machine and work with each other in the best way, it examines the physiological, biological, anatomical and other specialties of the human being and enables the machine and work to be designed according to these characteristics [41]. This science helps to understand how human abilities and limitations are understood and how it can bring about performance in a safe, effective, comfortable and healthy way in relation to the environment [42, 43]. If a building is anthropologically, physiologically, sociologically and psychologically compatible, it must be able to perform daily activities [42, 44]. Effective and successful 'harmonization' guarantees high productivity, avoidance of disease and injury risk and increased satisfaction in the work [44]. In order to achieve these, technical and health teams must be in a successful cooperation [44].

Ergonomists should consider the special requests of the persons who will use the building during the construction, arrangement, or repair of a building, so that the space is useful, safe and effective [42]. Factors such as lighting, heat, noise, ventilation, cleanliness, humidity, as well as working hours and break times are examined in the field of ergonomics [11]. While arranging the environment of a disabled or elderly person, ergonomists find solutions by

evaluating every field and activity [42]. Ergonomic problems that occur during the working life of people with physical disabilities should be solved with the participation of many disciplines. Ergonomics is a multidisciplinary approach which addresses many disciplines as engineers, physicians, psychologists, physiotherapists, ergotherapists, architects, home economists and other disciples who have knowledge about anatomy, biomechanics, psychology, physiology, engineering principles, anthropometry, and kinesiology and the ones who solve stress factors at home, school, and workplace [17, 45].

The main physical problems that may arise as a result of interaction between human, environment, and equipment are musculoskeletal diseases [41]. Work-related musculoskeletal disorders refer to musculoskeletal disorders that affect work environment and work performance significantly. Workplace risk factors are thought to develop work-related musculoskeletal disorders with personal characteristics and social factors [46]. Jobs with multiple risk factors or increased working at high-risk conditions will increase the likelihood of having a musculoskeletal system disorder [44]. Repeated hand tasks with heavy work, heavy lifting, pushing heavy objects, pulling or carrying, long sitting in poor posture, monotonous work, inadequate intermittent rests, vibration, or cooling are the main risk factors [41]. The level of risk generated is determined by the severity of exposure to the risks, frequency, duration, and strength capacity of the person to meet other job requirements [44].

Inadequate working postures in jobs that require intense labour force cause inefficiency as well as musculoskeletal discomfort [41, 44, 47]. One of the aims of the ergonomics is to improve worker postures and balance worker capabilities and work requirements, resulting in improved worker safety, health, and overall productivity of the system [41, 44, 47]. Workplace injuries cause a decrease in one's work capacity and production [41, 44, 47]. While these injuries cause discomfort, reduced work capacity, and production affect economics negatively [44]. Therefore, the role of preventive rehabilitation becomes increasingly important in preventing these injuries and having a healthy musculoskeletal system [44]. One of the mechanisms of injury that is resulted from many risk factors is muscle loading [43, 48]. In poor working posture, degenerative changes occur in the affected joints and in the connective tissue [43, 48]. Repetitive movements and inadequate rest periods cause discomfort caused by muscular loads together with degenerative changes resulting from poor and bad posture [43, 48]. Another mechanism of injury that occurs during exercise is muscle fatigue. Static and dynamic loading resulting in muscular work with maximum capacity leads to muscle fatigue [43, 48].

Points to consider when designing a workplace to avoid work injuries are listed below [49]:

1. When the person is working, he should provide a straight and face-to-face posture.
2. If the vision is required during a job, the required work points should be visible when the head and neck are upright or only when the head is tilted slightly forward.
3. All business activities should allow one to work with many different but equally healthy, safe postures without diminishing the capacity.
4. Work should be arranged in such a way that the person must be standing or sitting in position according to his wishes. While sitting, both feet should have equal load, and the foot supports must be adjusted accordingly.

5. When standing, both feet should be loaded equally, and the foot supports should be adjusted accordingly.
6. Work activities should be arranged such that the joint movements are in the middle of the range of motion. This is especially true for the head, neck, and upper limbs.
7. When muscle force is required for the work, the force applied should be along the relevant limb and should be performed by the contraction of the most suitable large muscles.
8. Work should not be performed at the heart level or above the heart level, especially when using force above the heart level. Even at the light work, the upper extremities need to be rested when work has to be done above the heart level.
9. If there is a continuous force application, arms or legs should be used without having to organize on the equipment.
10. Rest periods should be provided at all workloads including environmental load, information load, and length of work.

3.1. Ergonomics for persons with disabilities

Ergonomic arrangement of a workplace is done by making the work suitable for the person to be worked on. Although the employee is selected according to his/her ability according to the work to be done, it is very important that the place to work matches the physical and psychological characteristics of the employee [44, 45]. 'Appropriate Settlement' was first used in 1990 to prevent discrimination against the people with disabilities and to remove the barriers to employment [14]. This term includes [1] provision of assistive equipment necessary for the job to be done, [2] modification to make the business environment fully accessible, [3] arrangement of the workflow, and [4] provision of personal assistance when needed. Unreachable workstations constitute a physical barrier, and if the workspace is not modified, it will prevent the desired work [7, 14]. Some workplaces are affecting the physical condition negatively due to the work they have installed on the person, which can reduce the person's independence both at home and in daily life [1, 14]. The person may not be able to keep the job any longer and then may be forced to another job or not to work at all.

Providing the necessary tools to do the job is a step in removing the barriers at the workplace [14]. Easy access to computer technology, software that understands speech, ergonomic keyboards, and mouth-controlled mice are frequently used in many disability groups [14]. In fields where computer technology is not used, envelope folding machines, electrical staplers, telephone headsets, and similar equipment can be useful for productivity [14]. Another step in lifting the barriers is to organize the physical work environment both personally and in general [14]. Business areas should be well illuminated, crossing areas should be expanded, maneuvering areas should be separated, and entrances without stairs should be provided [14, 44]. The regulation of the workflow is also important in ensuring accessibility [14, 44]. It should be ensured that the energy of the person is activated by arranging activities that are not necessary for the business [14, 44]. For example, placing frequently used equipment in close proximity, or lowering shelves where heavy items are placed, prevents the occurrence of fatigue and walking

difficulty [14]. In addition, to find the appropriate time to take a break without interruption and to change among employees in monotonous work are the steps that can be taken in order to streamline the workflow [14]. Some employees may need physical help despite all the arrangements [14]. Office design should be done in such a way that employees can help each other when needed or a place where an assistant can work if required [14].

Different studies done by Belgen et al. [50] and Çalık et al. [51] reported that the majority of people with disabilities work with high-risk posture and this creates risk of musculoskeletal problems [50, 51]. An employer who will hire a person with physical disabilities should follow a conscious attitude to what positions he or she will be employed and the places in which the person concerned will be interested. It is aimed to create the work to be done with the ergonomic arrangement to ensure the employee's harmony with the work environment [42, 44, 45, 50, 51]. This is only possible when anthropometric point of view, physiological point of view, psychological point of view, information point of view, and safety point of view are all considered [42, 44, 45]. Only when all these conditions are met, the person can perform all the necessary activities appropriately [42]. Conditions that are often neglected for people with disabilities are anthropometric, physiological, and psychological conditions [45].

3.2. Accessibility at work for people with disabilities

Accessibility means that a person with a disability can move around as he or she wants without any intermediary. Accessibility is the most important point that should be given importance in workplaces where people with disabilities are. Accessibility of the workplace is the independent completion of all phases between the door of the house and the start of work at the workplace. The barrier most frequently shown as an obstacle to work is a workstation that is inaccessible [7, 14].

The accessibility feature should also be considered parallel to the vertical area, also called the comfort zone. This area is the vertical field from the lowest level that a person can reach to the highest level that one can reach while standing. The limits set for the Turks in this regard are the upper reach limit of 115.6 mm (the small woman with the wheelchair) and the lowest reach limit of 665 mm (the long male using the seat handle) [44]. This area marks the location of many control buttons, such as power switches, door handles, sockets, and so on, which must be present at the workplace. Changes in this area in the business environment also prevent the disabled employee from being dependent to others [43, 45].

Optimum placement will not make anyone happy because the various places in the workplace can be used by people with many different characteristics. As a result, both horizontal and level of adjustability are always the best solutions. The height of the seat to be seated, the height of the counter, the height of the sinks, and the height of the cabinets to which the items of interest are to be placed must always be adjustable [14, 44, 52]. Özyörük and Kütük [52] reported that redesigning of working environment to increase work efficiency made positive changes and achievements were gained.

3.3. Ergonomic risk factors

Work-related factors that cause musculoskeletal disorders and accelerate discomfort are called ergonomic risk factors. These factors directly or indirectly affect the occurrence of discomfort. Ergonomic risk factors are examined under three main headings [41]. These are:

1. Physical factors
2. Environmental factors
3. Psychological factors

3.3.1. Physical factors

Repetition of the same movements during work, improper postures, static posture, excessive use of force, and squeeze are the physical dimensions of the ergonomic risks. Repetitions of the same or similar movements during work can cause pain and discomfort in the musculoskeletal system because the muscles are not given enough time to rest [41]. Natural postures are the safest and most convenient way to work. Non-natural postures force the physical limits of the body by putting pressure on the muscles and joints. The long standing of the worker in the same position limits the blood flow and makes the muscles tired and injured. The excessive force applied to the muscles causes the muscles to contract more than normal, causing the joints to overload and cause injuries. Compression of the soft tissue between a bone and a hard or sharp object reduces blood flow and nerve conduction, damaging tendon and tendon sheath [41].

3.3.2. Environmental factors

Noise, temperature, humidity and airflow, lighting, vibration, and chemicals are among the ergonomic risks. The organizer of the workplace should also pay attention to environmental factors. The obligation of the human body's limits, job requirements, and the characteristics of the equipment means to ignore the role of the environment.

The body of a working person may be exposed to certain environmental factors. Environmental interactions above the limits can cause different body parts, leading to cumulative trauma. The use of vibration absorbing equipment, the use of extreme cold or hot barriers or insulation clothing, the construction of barriers where there is airflow, and the introduction of a crusher on the computer screen for reflected light can reduce the environmental impacts of the body through simple, non-costly measures [41].

3.3.3. Psychological factors

Psychological risk factors include mental overload, psychosocial effects, social communication in the workplace, and organizational influences. It has been determined that these factors, which include all employees and employers, increase ergonomic risk and should therefore be considered [41, 44].

Many musculoskeletal system diseases that involve the abdomen, neck, upper extremity, and lower limbs in our country are accepted as occupational diseases in the law [41]. However, data on the frequency of these diseases, risk factors, workday loss, insurance indemnity, and cost are not available [41]. Work-related musculoskeletal diseases, which are among the most important problems of employees and which reduce work efficiency, and prevention of adverse effects of these diseases are possible with ergonomic education and initiatives [41, 53].

Employees, employers, and professionals and organizations dealing with occupational health should be informed about work-related musculoskeletal disorders and prevention, and community awareness should be established [41, 53–55]. Studies done with different groups of employees emphasize the importance of workplace assessment and health evaluations to be done actively, and continuous training should be provided for all workers [53–55].

3.4. Evaluation of ergonomic risk factors at workplace

It is important to assess risk in terms of health and safety, including the situation of employees who are likely to be affected by the risks present at the workplace [41]. Following these assessments, the protective measures to be taken and the protective equipment to be used can be determined [41]. Ergonomic analysis methods are used to evaluate the ergonomic risk factors in the study area. Ergonomic analysis is a mechanism used to facilitate the identification of existing problems in the field of work [12, 41, 56]. The work is carried out by systematically recording the effects of work on the person or the specific views of the work [56]. With these analyses, ergonomic defects and possible health hazards can be identified and subsequently eliminated. During the analysis, all factors considered for each individual situation, technical and personal factors, should be evaluated [56].

When choosing which of the many analysis methods available today is to be used, the objectives should be [43, 56]:

- Working environment, working place, working style, design of equipment.
- Prevention of work injuries, work-related disorders and diseases.
- Continuing and enhancing the ability of the disabled and elderly to work.
- Obtaining information for the prevention of occupational injury or illness.
- Evaluation of work and characteristics of the work related to health care and planning of research programs.

Assessment methods include checklists, workplace analysis observations of work postures and movements, and self-filled surveys [43, 56]. Checklists are an evaluation method that consists of many questions and examines various factors. The most commonly used checklist is the 'General Ergonomic Risk Analysis Checklist' prepared by the International Ergonomics Association [56, 57]. Workplace analysis determines workplace characteristics such as workplace, general physical activity, lifting, work postures and movements, accident risk, occupational satisfaction, difficulty in decision-making, work repetition, attention, air temperature, and noise. Work postures and movement analysis are needed to be done at work to make a more precise analysis of the problems caused by work postures and movements. Today, there are many observation methods. The most commonly used pole is the pencil-paper method based on visual observation. In recent years, photography, videotape, and computer systems have also been used frequently.

The Ovako Working Posture Analysis System (OWAS) and Rapid Upper Limb Assessment (RULA) are commonly used methods for evaluation of easy and practical posture movements requiring direct observation. OWAS examines the upper extremity/shoulders, lower extremity, head, and load-lifting postures [56, 57], while RULA examines upper extremity working posture.

Conflict of interest

No conflict of interest.

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Section 2

Therapeutic Use of Activity in Occupational Therapy

Chapter 5

Animal-Assisted Therapy in Occupational Therapy

Sedef Şahin, Barkın Kose and Meral Zarif

Additional information is available at the end of the chapter

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Abstract

Developing technology, rehabilitation services, and health definitions have brought about the use of different treatments as well as traditional treatments. Some of these methods are virtual reality, animal-assisted practices, and aqua therapy. Animal-assisted approaches are the therapeutic methods of eliminating and using the problems that an individual experiences in the physical, emotional, psychological, social, sensory, and environmental development areas by taking advantage of human and animal interaction. These methods consist of two basic chapters: animal-assisted activities (AAAs) and animal-assisted therapies (AATs). An interdisciplinary team is needed to implement the methods. This team is composed of personnel, such as occupational therapist (OT), physiotherapist, speech therapist, special education specialist, and a psychologist, who have been trained in this area. In recent years, these methods have been used to increase social interaction with physical structure and functions in neurodevelopmental disorders such as autism spectrum disorder and cerebral palsy. In addition, it is actively used in mental disorders such as depression and anxiety because an improvement is observed by providing the individual to feel safe. When participation is considered in the context of independence in daily life activities are very important, the use of animal-assisted in occupational therapy.

Keywords: animal-assisted, occupational therapy, rehabilitation

1. Introduction

Developing technology, rehabilitation services, and change in health definitions have brought about the use of different treatment methods as well as traditional treatments. Some of these methods are virtual reality, animal-assisted practices, and aqua therapy. Animal-assisted approaches are defined as using human and animal interaction in therapeutic methods to eliminate or decrease the problems that an individual experiences in the physical,

psychological, and social environments. These methods consist of two basic topics, namely animal-assisted activities (AAA) and animal-assisted therapies (AAT). Both AAA and AAT can be implemented in an interdisciplinary team approach. Occupational therapists (OTs), physiotherapists, speech therapists, special education specialists, and psychologists are core elements of these approaches. In recent years, these methods have also been used to increase social interaction with physical structure and functions in neurodevelopmental disorders such as autism spectrum disorder and cerebral palsy in addition to mental health disorders such as depression and anxiety to increase the independence in daily life activities and social participation.

2. Overview of animal-assisted therapy

The American Veterinary Medical Association has been involved in human and animal interaction as psychological and physical functions between human beings and animals. In this interaction, they define individual's quality of life as a structure that contributes positively to their improvement [1]. Animal-assisted rehabilitation, the inclusion of animals that can interact with humans such as cats, dogs, and horses, has an active role in the rehabilitation process with the aim of achieving rehabilitation goals [2, 3]. When such approaches are incorporated into rehabilitation programs, the general condition of the individual and the treatment principle that the rehabilitation team has followed are taken into account [4, 5]. Animal-assisted rehabilitation approaches, rather than a stand-alone approach, are a strategic concept where multiple professionals work together to achieve interdisciplinary goals within a single goal [5]. This framework consists of three basic questions. The first question is "what are the benefits of the individual animal and therapeutic activities including animals?" The second question is "how to include the animal to the rehabilitation process?" The third question is "what are the most appropriate activities for the individual?" [1] Based on the answers of these questions, animal-supported approaches are grouped under two main headings: animal-assisted activities (AAA) and animal-assisted therapies (AAT). When therapeutic properties of AAA are investigated, it has been found that it helps to reduce the level of stress and anxiety and indirectly increasing the self-confidence and socializing. It is stated that AATs were predominantly used to support neurodevelopmental substructures of individuals and make a positive contribution to their well-being [6].

3. History of animal-assisted therapy

3.1. Animal souls and spiritual healing

Animals play an important role in the history of the disease with different ideas about disease and its treatments. However, the precise characteristics of these roles depend not only on the prevailing views of animals but also on supernatural or "scientific" belief systems in which they are buried. Probably, the oldest of these belief systems, often called "animism," includes the concept that all natural beings, as well as other natural objects and phenomena,

are circulated by an invisible soul, spirit, or "essence," but with conscious bodybuilding, the carrier can act independently of the body when it dreams or is unconscious. In a typical animist worldview, all statements of illness or misfortune are the direct result of attacks by the other angry or evil spirits encountered during these periods of unconsciousness toward the spirit of the person or the "truth." In some cases, these spiritual attacks are thought to be reprisals. It is the result of moral accusation that the person intentionally or mistakenly does. On the other hand, a person can be the innocent victim of a malicious shaman or the attack of souls acting in the name of witches. Tips about the root of spiritual attacks are provided by the contents of dreams or images just before certain illnesses, injuries, or misfortunes [7–9]. Animist belief systems carry the characteristics of all communities that engage in hunting, and disturbing animal spirits among these communities are often seen as the most common source of malicious mental influences. Many hunters believe that the souls of hunted animals in the tribe have the ability to seek revenge as the ghosts of killed people. To avoid this accretion, all animals, whether dead or alive, are treated with great respect [10]. In other hunting and feeding cultures, there were more specific moral associations between people and the animals they hunted for food. For example, many Native American and Eurasian peoples believe in the concept of personal "protective spirits" [7, 11]. Between Ojibwa (Chippewa) and the Algonian neighbors, these spirits were known as *manito* and were often represented as spiritual representations of wild animals or figures of their ancestors. Live animals were regarded as "honorable servants" of their own *manitos*, and this kind of spirit apparently presided over and represented all the worldly members of their species. For this reason, the hunters made contradictory ceremonies after killing an animal, so that the "essence" would return to *manito* with a convenient explanation of how it was processed. According to Ojibwa worldview, *manito's* activities explained almost all conditions of everyday life. Every living thing, whether alive or dead, was equipped with spiritual powers and associated with any unfortunate *manito*, such as illness, injury, death, or hunting that resulted in failure or the lack of personalized intention of someone else [12]. It was believed that the protective spirits of the animals differed in power. The majority of insects and small animals, such as mice, rats, or squirrels, were referred to as not important species because there was the belief that these animals lacked the protective qualities. On the other hand, it was believed that animals such as the bear and eagle had good protective spirits and so they were considered valuable [7, 12].

3.2. Animals as socialization agents

The end of the seventeenth century which was called "Age of Enlightenment" brought some changes in the public perception of animals that are well documented by historians of the modern age [13, 14]. Among these changes, contrary to the pre-medieval and renaissance periods, sympathetic thoughts began to dominate attitudes toward animals and nature [15]. While perceptions of wildlife and threats to wildlife have diminished from prevalence, pet-feeding habits have expanded to aristocratic and middle-class communities living in newly founded cities. This change in animal-related attitudes and behaviors could at least partly reflect Europeans' migration from rural areas to the towns and cities, and the rapid spread of the human population. This rural migration made it possible for the population to be adapted to systems designed for growth [8, 14]. The reformers of the eighteenth century, deriving their authority from the works of John Calvin and Thomas Hobbes, thought that they could

indirectly learns from the innate, unfavorable characteristics of children by using children's behavior to take care and control real animals [16]. Compassion and anxiety for the health of animals became one of the didactic themes of children's literature that lived in the eighteenth and nineteenth centuries; the main aim was to inspire the morality of the good and sex, respectively, especially in boys [17–19]. In the late eighteenth century, theories about the social effects on animal care were initiated in the treatment of mental illnesses. The best-documented studies took place in The York Retreat in England. The York Retreat used more innovative methods than the mental treatment methods used at that time. In this study, prisoners were encouraged to do handwriting, writing and reading books, and they were also allowed walking freely around the courtyards and gardens of the Retreat, where small pets were also part of the Retreat and prisoners could interact with them. In his description of the Retreat (1813, p. 96), Samuel Tuke, the founder's grandson, described how the internal courtyards of the Retreat were supplied "with a number of animals; such as rabbits, sea-gulls, hawks, and poultry. These creatures are generally very familiar with the patients: and it is believed they are not only the means of innocent pleasure; but that the interaction with the sometimes tends to awaken the social and benevolent feelings." In the nineteenth century, pets became an increasingly popular feature in the psychiatric departments of hospitals in the UK. For example, in a highly critical report on terrible conditions for patients in Bethlem Hospital in the 1830s, British Charity Commissioners proposed that the shelter of people with a mental problem is provided support for treatment of sheep, rabbits, apes or other domestic pets, they have also been described as social animals. Such recommendations are clearly taken seriously. According to a paper published in Illustrated London News of 1860, the regulations at Bethlem Hospital have been redesigned according to the stimulus [20]. It has been observed that animal companions have beneficial and therapeutic effects in the treatment of physical disorders. Florence Nightingale, for example, observed and wrote in Notes on Nursing (1880) that "a small pet is a particularly good friend, especially for the patient, long chronic cases" [21].

3.3. Psychotherapy and animals

Despite the success of animal-supported institutional care in scientific studies during the nineteenth century, with the development of evidence-based medicine in the early twentieth century, the use of animals in hospitals has declined dramatically [20]. For the next 50 years, animals were used in the context of zootomic illnesses, public health concerns, or psychoanalytic theories of the origin of mental illnesses. Sigmund Freud's ideas concerning the origins of neurosis tended to reiterate the Hobbesian idea of mankind's inherently beast-like nature [16]. According to Freud, infants and young children are in fact similar to animals, as long as they are governed by instinctual desires or could be influenced by organized basic biological functions such as nutrition, defecation, sexuality, and self-protection. Freud describes this basic and animal-like instinct of human nature as "identity." As children mature, their parents' behaviors will either cause too much impulsive behavior by reacting to the child's inner aggression or induce their sense of fear, guilt, and socialization. The suppression of these children under the consciousness of children ensures that their behavior in their daily lives is healthy. But they are like animals in their 30s. Freud refers to this as a bottled animal chart. It results in explosive situations where the individual cannot go out on regular outings [22]. Freud interpreted the

recurrent animal images of his patients' dreams and "freethinking" as metaphorical means that hid the unacceptable thoughts and feelings of humans. "The Wild Beast" he argued, "It makes him happy that other dreams come true while the passionate spirits of the dreamer are afraid of himself" [23]. These crude thoughts and impulsions threaten the "ego" so deeply that they can be ignored in the dark corners of the consciousness in proportion to the capacity of the subconscious within the hours when at least one person is awake. According to Freud and his followers, the aim of psychoanalysis is to reveal these scary residents of the subconscious, to reveal them as they are in their true nature, and thus to neutralize them [24]. The notion of "id," Freud defines as the basic "animal" essence of human nature, contains more than a superficial resemblance to animistic and shamanic ideas about animal spirits and protective spirits, including bad thoughts/"evil self" or spiritual origins [24]. In the study on Carl Jung, especially his discussions of mythological archetypes in dreams and visions, and his concept of the "Collective Unconscious," this resemblance becomes more or less explicit [25]. It is also echoed in the writings of Boris Levinson, the founder of "pet-facilitated therapy." In his book *Pets and Human Development*, Levinson states that:

> *One of the chief reasons for man's present difficulties is his inability to come to terms with his inner self and to harmonize his culture with his membership in the world of nature. The rational man has become alienated from himself by refusing to face his irrational self, his own past as personified by animals* [26].

According to Levinson, the solution to this growing sense of alienation is through positive relationships with the animals, as if dogs, pets, and other domestic animals are within themselves. It is emphasized that this relationship has increased the quality of life by positively contributing to the solution of the problems experienced by the individual in the spiritual sense [27]. Levinson went one step further to the idea that Freud propagated and suggested symbolic patterning system of things where we fear to confront animals; in order to argue that their relationship with animals is an important part of human evolution and that it is now an integral part of our present psychological well-being [26].

3.4. Animals, social support, and relaxation

There has been considerable development in the theoretical substructure of animal-assisted approaches during the last 20 years and, at least in part, in response to the skepticism shown toward blood-based medicine. This substructure offers the basis for demonstration as a psycho-mental mediator by providing relief from relatively metaphysical-based thoughts about animals [24]. The primary catalyst for this change of emphasis was a single, groundbreaking study of 92 outpatients from a cardiac care unit who, statistically speaking, were found to live longer if they were pet owners [28]. This finding prompted a whole series of other health-related studies as well as stimulating a lot of discussion concerning the possible mechanism(s) responsible for the apparent salutary effects of pet ownership. Of these, at least two have stood the test of time. According to the first, animals are able to induce an immediate, physiologically de-arousing state of relaxation simply by attracting and holding our attention. According to the second, companion animals are capable of providing people with a form of stress-reducing or stress-buffering social support [29, 30]. Although the de-arousing effects of animal contact have been demonstrated by a considerable number of recent studies, little evidence exists at present that these effects are responsible for more than transient or short-term

improvements in physiological parameters, such as heart rate and blood pressure. On the other hand, pets serving as a source of social support seem to provide a relatively high level of evidence for the longer-term benefits of animal companionship [31].Cobb has defined social support as "relationships that direct, to emphasize and give importance to, to describe that it is the pattern of mutual obligations." However, the newer authors have expressed it as "perceived social support" and "social networking" characteristics. The first represents a qualitative definition of the degree of satisfaction from the support that one receives from certain social relations; the second is a more quantitative measure involving the number, frequency, and propensity of the person's general social interactions [32]. However, the importance of social support to human well-being, which we wanted to describe, has been regarded as one of the top-down issues throughout history. Loneliness—lack of social support—has always been seen as a painful and distasteful phenomenon; since ancient times, societies have used single-cell imprisonment, exile, and social mobilization as methods of punishment. This, in fact, shows that loneliness is actually the basic punishment method. In addition, religious themes explain in detail the psychological effects of autobiographical, social isolation that homeland traitors and prisoners of war wrote. Many of them describe physical torture in a way that will emotionally, often sharply, up to the apex of gradual descent. This decrease in pain is associated with the onset of a serious indifference and hopelessness, which usually requires catatonic deprivation [29]. In the last 10–15 years, a comprehensive medical literature has emerged confirming that there is a strong and positive link between social support and improved human health and survival [33–35]. There is a great deal of social support in reducing the adverse effects of stress, which chronic life has brought. With the controversy still underestimating these effects, many authorities now accept the judgment that the main benefits arise from the buffering or healing capacities of long-term effects of supporting social relations [36]. Theoretically, this beneficial effect of social support should be applied to any positive social association. It has been observed that positive behaviors are exhibited within the two parties in relation to which one is loved or respected. Despite the increasing evidence for anthro-zoological research in the recent past, the idea that animal attendants contribute socially to human health, however, received very limited medical attention [8].

4. Animal-assisted therapy in occupational therapy

4.1. The role of animal-assisted approaches in rehabilitation

AAT is used as a therapeutic approach in rehabilitation. AAT approaches are being used all over the world in order to improve not only the emotional and psychosocial states but also the physical, sensory, and cognitive skills positively for individuals with various diseases or of different ages [37, 38]. Rehabilitation practices include holistic approaches, with divergence toward children, adolescents, adults, and elderly people.

It is known that there are many neurological, physiological, and genetic diseases seen in children, and the rehabilitation practices are widely used in these children [39]. In literature, AAT is commonly used in children with cerebral palsy, developmental neurological disorders,

autism spectrum disorders, sensory processing disorders, degenerative neurological and muscle disorders that mainly focus on control of muscle tonus, mobility, and balance [40]. When the elderly and adult population rehabilitation applications are examined, it is seen that animal-assisted approaches are preferred in the treatment of diseases such as multiple sclerosis, head trauma, post-traumatic neurological conditions, Alzheimer Disease, dementia, anxiety, and depression [41–43]. These diseases can cause a reduction in postural symmetry and control, and deterioration in cognitive skills like attention, memory, and executive functions [37].

All of these patients with diseases, whether young or old, were psychologically affected, and their motivation decreased during rehabilitation. It is known that sensory, emotional, and physical characteristics of animals can be utilized to increase the level of motivation in rehabilitation. In fact, in most developed countries today, health-care providers employ animal-assisted therapy in a wide range of settings, including rehabilitation centers, acute care, psychiatric centers, and outpatient clinics. For example, doctors' consulting rooms have fish tanks in their waiting rooms to promote a sense of calm [44]. It is now well known that the presence of animals can induce relaxation, increase positive emotions, reduce resistance to treatment, and put patients' minds at ease.

Awareness of the advantages and disadvantages of the animals and species used by the professional practitioner team in rehabilitation practices involving many health disciplines involved in this area positively affect the effectiveness of rehabilitation [6]. At the same time, it also emphasizes the importance of knowing the animal's unique structure and instincts in these studies [6, 37]. Most studies and programs in AAT utilize animals such as livestocks, dolphins, dogs, cats, birds, hamsters, or horses [45]. All animals have certain advantages and disadvantages within themselves, so that the practitioner can make arrangements according to the individual and individual's needs.

4.1.1. Therapy with livestock

It is mentioned in the literature that all farm animals can be easily included in treatment approaches as long as they are checked by the veterinarian for good health and reliability. The benefits and difficulties of incorporating livestock into therapy approaches may vary according to the therapist's rehabilitation goal. These animals are preferred by the occupational therapists (OTs) in rehabilitation applications, in particular for those individuals who have difficulty in independent daily living skills, in terms of a large living space, and special need for care. There are also studies showing that AAT with livestock affects individuals' motor and cognitive functions positively [46, 47]. They are preferred by OTs because they can help improve their equilibrium, hand-eye coordination, executive function, and hand skills of individual.

4.1.2. Therapy with dolphin

AAT in individuals with both physical and cognitive impairment is a useful method for facilitating human interaction, stress reduction, relieving depression, and increasing

motor and cognitive functions in therapeutic purposes. The dolphin is one of the most important animal species that provide them. There are two main reasons for choosing the dolphin in therapy session when compared to other species: the first is the dolphin's intelligence and learning style and the second is water as stress reduction [45]. On the other hand, there are also some difficulties or disadvantages to working with dolphins. Researchers suggest that the dolphin has some risks due to the fact that it is not a domestic animal, the results of evidence-based studies are very low, and treatment conditions come with very high costs [48].

Dolphin-assisted therapy is commonly used in people with head injuries, schizophrenia, cancer, or other chronic diseases for improving both gross and fine motor skills, developing sensory integration, and increasing communication skills. Nathanson et al. indicated that measurable improvement was observed in the functioning in children with autism spectrum disabilities when dolphin therapy was conducted 5 days per week for at least two weeks [49]. It is suggested that the dolphin should be used as a supportive therapy in the healing and motivational aspects as well as the positive aspects in human beings.

4.1.3. Therapy with dogs

One of the animals frequently used in therapy by professionals working in various fields is the dog to improve the physical, cognitive, functional, and social skills of individuals. The most important areas of use are autism spectrum disabilities in children and visually impaired individuals [50]. Many studies mentioned that the degree of independence in daily living activities improved when using dogs as a therapy companion [50, 51]. It is observed that dogs, one of the most important parts of AAT, interact better with people than other animals [6]. Dogs are highly preferred by experts because they are both AAA and AAT suitable for use in therapeutic approaches.

Dogs are often preferred for both children and adults in therapy because they are friendly, sympathetic, obedient, and playful. They are also used as a guide for the blind, as walking aids for physically challenged, and a hearing assistance for the deaf. Many studies have shown that dogs offer vital benefits in terms of reducing functional disability and facilitation of communication and interaction in humans [38, 52]. Therefore, it is important to remember that dogs can be used for animal-assisted approaches toward therapy, primarily for all ages and patients with diagnosis.

4.1.4. Therapy with cats

Cats can often help in both AAA and AAT like the dogs [53]. They are free spirited and can interact with humans and provide sensory and emotional support to individuals. Due to these characteristics, cats have shown that they especially affect individuals' well-being and quality of life positively [6]. It is known that they can be easily used in supplied everywhere as well as in the living space of the individual. However, it can be said that the most common disadvantage of using cats in therapy is their allergic furs [54]. It is therefore necessary that the therapist who applies the animal-assisted approach to patients has to understanding and know the patient's allergic conditions and chronic diseases.

Interest in AAT is increasing day by day in the literature. While it is generally believed that cats are widely used in AAT, we found no qualified studies that used a cat [37]. So, there is a need for OTs to investigate the disadvantages of utilizing a cat in the therapeutic approaches on patients with having a disability in daily life skills.

4.1.5. Therapy with small animals

Pets that are described as small pocket animals, feathers and furs of varying lengths, color, and characteristics that vary in appearance are categorized in this section. Small animals consist of fish, birds, hamsters, turtles, and rabbits, which can be found easily in the classrooms, offices, or schools rather than other large animals. OTs can benefit from the use of these animals in the development of activities in areas requiring community participation.

These animals often carry on with their lives as an ordinary part of the circle. But at this time, it is especially used in therapeutic approaches for both children and psychiatric patients in terms of learning to take responsibility for animals [43, 55]. These animals have a disadvantage in terms of the limited span of life (2–5 years) which can hamper rehabilitation process [56]. Although these animals are preferred in performing small tasks in AAA, the number of studies in the literature is inadequate.

4.1.6. Therapy with horse

Among animal-assisted approaches, horses are the most commonly used animals in therapeutic approaches toward patients [6]. When examining thousands of years of history, no matter how much the environmental conditions change, there has always been an intense relationship between societies and horses [57]. In the literature review on the therapeutic use of horses, the concept of AAT is under two headings: therapeutic riding and hippo-therapy. These concepts are named differently as both methods are different but basically with the same goal [58].

Although there is a belief that horses were tamed and ridden and used in the treatment of the human beings in B.C., there is no definite evidence on this subject [59]. Looking at history and the use of horses as therapeutic agents, horse riding was considered as a physically during exercise in the sixteenth and seventeenth centuries. This aspect was also observed during the 29 rehabilitation of war veterans after the World War II [58]. The use of horses for disabled people has been intensified since the middle of the twentieth century. The best example regarding this was the treatment process, which resulted in Lis Hartel, professional horse-rider, participating in the Olympics and winning a medal while losing lower extremity functions due to polio. After this excellent success, equestrian federations have been established in many developed countries, mainly in England, and AATs are being covered under universal health insurance [60].

Hippo-therapy, one of the commonly used methods of therapeutic intervention, is derived from the ancient Greek word "Hyppos." With this method, horses can be used to develop or rehabilitate the individual's physical, sensory, cognitive, and social functions through the use of horseback movements. Since 2010, American Hippo-therapy Association has created a conceptual framework that includes sensory integration, including dynamic systems theory and

motor learning. This conceptual framework takes into account the natural rhythm or movement of the horse that can affect the participants' neurological, motor, vestibular, sensory, and functional considerations to achieve the intended goals or outcomes [61].

Choosing the appropriate horse for the therapy session helps the individual to meet the rehabilitation needs with the individual and the horse feeling more comfortable. The features of an ideal therapy horse are an average age of 10–12 years, an average height of 150–160 cm to help control horses and riders and side holders to about 45° tilt (the stepping stones will get harder as the angle of the bog is lowered), and being calm and gentile [6, 60]. The sessions with hippo therapy, which consist of meeting, warming, working, relaxation, and farewell, are planned by interdisciplinary professionals. Hippo-therapist, occupational therapist, physiotherapist, special education specialist, private horse instructors, and volunteers who have been educated about hippo therapy may be included in the rehabilitation sessions in menaj [61].

As a treatment strategy, hippo therapy may primarily be dependent on the theory of sensory integration because the movement of the horse provides a sensory experience for the rider. The role of therapists is to determine the amount of sensory stimulation and the input [61]. For example, walking slowly cannot be enough incentive to allow the rider to join a relative. On the other hand, brisk walking or jogging can increase the attention span. In addition, riding bareback can help the rider get the maximum possible proprioceptive input. As an alternative approach, stirrups (used with a saddle or backpack) can help proprioceptive input by gravity on the hard surface. Sans, Fortney, and Willenbring [71] argue about this approach of sensory integration as a rider. In addition, this internal drive can be further improved through the connection between the rider and the horse.

At a hippo-therapy session, the horse changes motion by an average of 2000 steps, which means that the rider is also taking 2000 strokes—about 2000 muscle contractions. It has been proved that the increased number of repetitions support motor learning. Therefore, the increase in the number of repetitions due to hippo therapy is the most important parameter supporting the development of static-dynamic balance, weight transfer, motor planning, and motor skill in the direction of the individual's motor learning principles [62]. During hippotherapy intervention, following the provision of a suitable position for the rider, the three planes are prepared in accordance with the principles of movement, rhythm, motor learning, and motivation. It has a positive effect on coordination, reaction time, sensory processing, respiratory control, motor planning, and postural control [6, 62]. This multifunctional approach helps to increase the positive effect of the therapy and success of the therapy.

4.1.7. Animal-assisted therapy and occupational therapy

Occupational therapy is a client-centered approach to these individuals in rehabilitation practices. The assessment and intervention of occupational therapy are aimed to improve the participation in their daily living activities more meaning and oriented [63]. Occupational therapists use a lot of approaches in their practice to improve quality of life and well-being in their patients. A range of target areas that can be addressed with the help of therapy animals are listed in the book for AAT interventions for OT: motor skills (gross and fine motor), neuro-musculoskeletal skills (range of motion, strength, balance), sensory functioning (tactile,

visual, auditory), cognitive skills (orientation, attention, executive functions), weight bearing, communication skills (expression and acculturation language, cooperation), psychosocial skills (well-being, motivation), perception processing skills (body perception, depth perception, spatial relationships), and respiratory function (diaphragm force, positioning) [6, 64].

According to OTs' views and perceptions of evidence-based practice, AAT is one of the methods used in rehabilitation. Some researchers have investigated the impact of AAT on elderly participants who were diagnosed with psychiatric, physical, and developmental disabilities in long-term care settings [65]. Van Fleet and his colleagues describe an animal-supported occupational therapy as a learning process in which a professional therapist carries out a therapy session, using a dog, to facilitate the development of the skills needed by the child to have an independent function in self-help, playgrounds. A therapy dog may become part of the learning process when learning everyday tasks related to the animal [66]. OTs may add a wrist weight to gain strength from the weak arm or use a customized brush with a special handle to help the child hold the brush. Thus, the child becomes more motivated and excited to participate in the treatment. Thus, this method helps OTs, and the child can to reach the child's treatment goals more quickly and easily [67]. In another study, AAT was also applied on patients with post-traumatic stress disorder generally seen in personnel during military service; AAT was found to provide positive benefits. It was also observed that new gained in combat veterans learned new skills using trained dogs [68].

Dogs are a popular choice for many occupational therapists. OTs showed that treatment with dogs, which are often preferred for treatment, has improved social skills, motivation, having an interest in the environment, and self-awareness of children with autism spectrum who had behavioral problems [6]. A study performed on OTs found that senior citizens in a walking program at an assisted living facility walked further when with a dog than when they walked alone, indicating the potential value of pets in physical conditioning [69]. Due to the earlier studies mentioned, the OTs believed AAT impacted individuals through internal responses to the animal and thorough responses to the external environment. On the other hand, horses proved to be effective in treatment programs, especially for physically disabled people. Among the reasons for preferring the horse in these types of patients include; it can be said that walking on the horse can feel like as the walking accent, walking distance can be adjusted by the therapist or rider if necessary, and positive feeling can increase the motivation of the person [6, 70].

In almost all studies on AAT, animal interaction increased motivation of individuals:

- Those who refuse therapy may come to therapy sessions more often and easily when they know that animals are present.
- Interaction with animals raises morale of long-term care residents.
- People feel better socially people feel better about themselves the idea of ownership of animals and the responsibility for care given to them increases the daily devotion
- Sense, motor, perception, cognitive, and social skills improve.
- Participation in functioning and daily living activities are facilitated.

OT should focus on the use and participation of meaningful activities to improve the quality of life of an individual in AAT intervention. For these purposes, it is aimed to develop correct posture and walking pattern, mobility of the pelvis and hip region, head and trunk control, muscle tone and strength, sense regulation, social communication, self-confidence and empathy, motor and cognitive skills. It is thought that the ability of individuals to improve their skills, function, and quality of life can be improved by pet ownership, care of animals, and regular interaction during therapy.

The frequency of use of the AAT and AAA in the field of rehabilitation for the last 10 years has been rapidly increasing. Animal-supported approaches from different countries and disciplines showed positive effects on sensory, emotional, and cognitive functions, especially the physical structure and functions of individuals at different ages and diagnoses. OTs emphasize the effectiveness of this method in studies conducted in the field of occupational therapy. At the same time, we believe more qualitative and quantitative research and more detailed studies are still needed and OT's and OT intervention programs focusing on therapeutic use of animals in rehabilitation must continue.

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Chapter 6

New Flower Bed Design and Verification Supporting Horticultural Therapy Classes Based on Behavioral Observation

Meng-Cong Zheng

Additional information is available at the end of the chapter

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Abstract

Horticultural therapy improves the elderly's emotional and cognitive functions and also leads to their social participation and better overall health. We want to know about the problems of implementing horticultural therapy and how to improve it with the flower bed design. "House of Love" is a private nursing home in Taipei and had been the research base in this study. It was found that current horticultural classes heavily rely on teacher-centric and volunteer staff-assisted curricula, often not considering the specific physical and psychological needs the elderly usually face in classes. "Elderly Green" is a new design taking the requirements of horticultural classes in to consideration, providing for a maximum of flexibility under varying conditions by modulizing the flower bed. It allowed the elderly to do their gardening in a comfortable and less strenuous manner. "Elderly Green" is a centripetal flower bed design improved equally distributed care for each participant during class time and increased interaction among the elderly that reduces manpower needs.

Keywords: flower bed design, horticultural therapy, behavioral observation

1. Introduction

Taiwan has become an aging society. Even though many assisted living facilities are providing care services for the elderly, most of them do not want to move into nursing homes because the perceived lifestyle at these facilities is foreign to them. "Aging in place" is a concept that first originated from Northern Europe during the 1960s. The goal at the time was to care for the elderly with resources that are native to them so they could age in an environment that is familiar to their culture, which would give them the holistic care and independence that they

deserve. On the contrary, some nursing homes limit the elderly's lifestyle choices and social functions, which may damage their mental health and self-respect resulting in deterioration of their body and mind [1]. The goal of "Aging in place" was to fulfill the native's needs with domestic goods and services, which would require community-like facilities to build a long-term care system. Most of the assisted living facilities today in Taiwan are based on community activities to promote interaction among the elderly. Healthcare-oriented facilities should be considered more when daily activities and movements become less convenient for the elders. Japanese welfare economist [2] proposed five basic measures to ensure that the elderly live a normal life: avoid taking quarantine measures; allow them to live in an environment with which they are familiar as much as possible; facilitate their social exchanges and mutual assistance; provide facilities and services to maintain quality of life when institutionalized care becomes necessary; and integrate social welfare, medical and health, and environmental maintenance policies to create a suitable living environment.

Sandberg indicated that 95% of the elderly in Hong Kong have one or more chronic diseases; however, only 5.5% require institutionalized care [3]. Although nursing homes can help the elderly who cannot live independently [1], institutionalized care entails a change in living environment, and consequently, disconnection from family and society as well as a reduction in physical activities and enhanced loneliness [4]. Another study found that the physical activity level of the nursing home-dwelling elderly is considerably lower than that of the community-dwelling elderly [5]. In addition to facing changes to their environment and mobility, the elderly who move into nursing homes must deal with changes in daily life routine, social network, and social support [6]. Moving into a nursing home means the discontinuation of a person's traditional lifestyle with which they are familiar. In addition, the elderly can sustain an enormous sense of loss caused by separation from families, neighbors, and friends [1, 7]. When the elderly face gradual decline in physical and mental status, what can be done to ensure they age stably is a question that requires an answer. The American Horticultural Therapy Association (AHTA) maintained that horticultural therapy can be applied to people of various ages, backgrounds, and abilities. It defined horticultural therapy as "engaging in gardening-related activities through the assistance of a trained therapist to complete a specific therapeutic goal." Horticultural therapy has four major types of benefits: intellectual, social, emotional, and physical [8–11].

Intellectual benefits: Through horticultural therapy, participants can acquire new skills and knowledge, increase their vocabulary and communication skills, have their curiosity aroused, improve observation, receive occupational and pre-occupational training, receive stimulation to their sensory organs [11–14], and obtain new learning opportunities [15].

Social benefits: A successful treatment should involve three types of interaction: between the therapist and the client, between clients, and between the client and nonclient [16]. Generally, these interactions mainly are aimed at socializing and collaborating; specifically, sharing gardening experiences facilitates creating meaningful interactions. Because group members have a common goal, interactions among them can be increased on the basis of mutual respect and support, as well as duty sharing. During the process of gardening, patients have the opportunity to connect with people other than their group members and share their own gardening results with external parties, thereby gaining the benefit of an enlarged interpersonal network [4, 11, 17].

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Emotional benefits: Lewis and Mattson maintained that through gardening activities, people can experience serene satisfaction in the world of plants where no threats or discriminations exist, thereby alleviating their mental stress and fear [2]. Furthermore, when patients discern that they can work independently and have their own gardens, a sense of identification and belonging to the gardens emerge in them, and their self-respect is enhanced. When patients' confidence is elevated, their belligerent tendencies can be tempered and adjusted to socially acceptable behavioral models; in addition, their interests and passion for future life are triggered to satisfy their creative instinct [11]. Moreover, gardening activities can help patients develop an ideal self-image and continually develop work skills [12]. Because numerous factors in the living environment can affect people's emotions, a designed and selected environment can indeed quicken patients' emotional recovery [18–21]. For example, a successful therapeutic garden can reduce people's stress, even generating a sense of encouragement [22].

Physical benefits: In addition to mental benefits, gardening activities help wounded or physically disabled individuals to improve their coordination and effectively control their motor neurons through tasks such as carrying plants, sowing seeds, applying fertilizer, and watering plants [11].

For the elderly, gardening enables them to improve physical and mental health through a leisure activity. Therefore, an increasing number of the retired elderly have devoted themselves to gardening activities, and numerous elderly nursing and home care centers have introduced horticultural therapy. Research has shown that horticultural therapy can improve the elderly's arthritis symptoms, and it exerts positive effects on blood pressure and diet control [2]. Furthermore, gardening activities can increase regular physical activities that require physical and mental stability as well as high-level functional activities [23]. Gardening practices have the clear effects of enhancing muscle strength, fine motor skills, and balance; in particular, transplanting requires grasping and releasing with the thumb and index finger as well as muscle flexibility [23, 24]. Gardening activities boost enthusiasm and senses of responsibility and achievement. From selecting plants to their growth and eventual flowering, plants continually create hope for people. Furthermore, learning gardening skills enhances the elderly's curiosity. Therapeutic use of activity can help the geriatric individuals to improve their independence in daily life, and cognitive and motor skills [13, 21, 23]. The activity that will be used as a therapeutic agent can be determined according to the interests, activity preference, and the skills of the geriatrics [19, 25, 26]. Gardening can expand people's social networks by providing opportunities to socialize [27]; thus, gardening activities have positive effects on the community-dwelling elderly.

Brown administered a 5-week horticultural therapy course to 66 older residents in nursing homes [28], and found that compared with the control group, residents in the test group exhibited significantly greater improvements before and after receiving the horticultural therapy in several items on the activities of daily living (ADL) scale, namely physical ambulation, feeding, and toilet. Austin applied a 5-week horticultural therapy course to eight elderly people who lived by themselves, the results of which revealed that their fitness, ADL scores, and 6-min walk test results all improved significantly after the intervention [29]. In addition, Son administered a 5-week horticultural therapy to five community-dwelling elderly people, and found that during vegetable-planting activities, they could use adapted tools and aids to teach the elderly to adjust to appropriate joint movement angles, balance using suitable postures, and train gross

and fine motor skills, eventually improving their physical activity and self-maintenance abilities [30]. Thelander introduced a 6-week outdoor gardening intervention to eight older residents with dementia at a frequency of three times a week, for 40–70 minutes per session [31]. The results indicated that landscape maintenance tasks such as watering, weeding, and fallen leaf picking significantly improved the residents' balance. Gigliotti and Jarrott compared the elderly participating in gardening activities with counterparts receiving conventional treatment, and found that those in the horticultural therapy group exhibited significantly higher levels of activity involvement and positive emotions [32]. Lee and Kim implemented a 4-week gardening intervention comprising selecting bean cultivars, sowing seeds, watering plants, touching the plants they had planted, cleaning and maintaining the planting environment, and harvesting, cutting, and washing the plants; their results indicated that these indoor gardening activities significantly reduced anxiety [33]. Austin determined that after receiving horticultural therapy, the elderly exhibited significantly lower levels of anxiety [29]. By touching the plants they had planted, cleaning and maintaining the planting environment, and harvesting, cutting, and cleaning the plants, the elderly were engaged in higher levels of physical activity, which in turn improved their cognitive functions [33]. In addition, Sempik, Aldridge, and Becker noted that gardening activities strengthened the elderly's sense of responsibility and increased the opportunities for decision-making, through which their degradation could be slowed and the group became consolidated because of sharpened social skills [34]. However, gardening activities remain inadequate in the elderly's nursing homes. Although lawns and gardens are common in nursing institutions, they are rarely designed according to user needs. SCUs in France conducted a survey from 1992 to 2007, determining that less than 82% of medical institutions had freely accessible outdoor space, and only 43% provided patients with access to this outdoor space; thus, gardens were not regarded as a part of health management. Nevertheless, compared with conventional treatments that require hospitalization, horticultural therapy is generally more accessible to patients and easier to adapt to; furthermore, the costs are cheaper than other types of therapy. Despite gardening activities being widely recognized as a positive therapy, substantial efforts are still required to popularize this therapy in public care systems. Engaging in gardening activities typically requires the elderly to bend or squat. When planting is conducted in a standing posture, people in a wheelchair have difficulty participating because square tables have limited availability. Therefore, defining design conditions that support the elderly's participation in gardening activities is paramount. Research has shown that the first condition to be considered in horticultural equipment design is to lower the participants' physical burden. When the elderly are allowed to engage in the activities by themselves, their opportunities for mutual communication increased; however, their exchanges and communications reduced when a facilitator joined [35]. Circle theory in the field of environmental psychology maintains that using a round table enables people to see each other. However, results of one experiment revealed that simple concentric tables could not satisfy the requirements of wheelchair users and others with diversified physical conditions [36]. Even so, designers may still experiment with other shapes that have the effect of a circle to determine which table shape facilitates the interaction of people with varying physical conditions in a variety of venues. Horticultural therapy courses stimulate emotions, boost activity levels, reduce stress and fear through human-to-plant interactions, increase muscle relaxation, and promote confidence and knowledge. These courses promote user's sense of responsibility and self-fulfillment through

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plant care, which also enhances cognitive capabilities. Group activities in planting and sharing experiences create community opportunities and respect among each other. There is a connection between social participation and environment recognition of the elderly [37, 38]. Besides, there is also a strong correlation between the elderly's ability to successfully interact with society and the quality of their facilities and surroundings. Their comfort with the surrounding environment and perception of the social interactions significantly aid their social ability [39]. Horticulture courses are crucial in planning regarding retirement and assisted-living facilities. Many studies showed mind-body health improvements among the elderly who partake in horticulture classes. However, implementing horticulture courses through assisted care and planning in these facilities are not enough. We need to consider an elder's activity level, physical ability, and health condition in gardening classes to implement communication and activity in their curriculum.

This study investigates facilities that have implemented horticulture classes in their treatment. Through interviews and behavioral observation to find out the problems and conditions associated with horticulture classes, also understand the different types of gardening, facility deployment, and gardening treatment details and execution. This study also focuses on the duration of these classes to understand the effectiveness of horticulture classes that will be helpful for future class design and planning.

2. Method

"House of Love" is a private nursing home and a research base established in 1923, for the elderly, people with no assistance, the sick, and the homeless. "House of Love" is also awarded for excellence by the Ministry of Home Affairs and Taipei City Hall. "House of Love" is the best long-term care center in Taipei that focuses on treatment of the body and mind (**Figure 1**). This study implemented records of long-term behavioral observation in "House of Love" with a focus on cases who participated in these horticulture classes, the

Figure 1. Private nursing home "House of Love".

Figure 2. Observation one, class one (control group).

interaction between them, their problems in grading, and studies of these classes. Behavioral observation and post-occupancy evaluation were used in this study. Behavioral observation is referred to as sequential action marking; this method is a type of continuous observation-recording, and its objective is to record the relationship between time and actions. This study adopted behavioral observation to record the process of the elderly's engagement in gardening activities. Post-occupancy evaluation was adopted to evaluate user evaluations after experiencing the design. Weaknesses in the proposed design could be determined from users' behaviors and reactions, and corresponding design strategies could be developed.

This study was carried out in three sections. The first section focuses on observation of elders who participated in horticulture classes. We implemented behavioral observations in the three classes as below:

1. Observation of class one (control group) (**Figure 2**)

   Class location: flower beds with sitting areas.

   Elder group: the elderly with dementia and ambulatory.

   Class participation: nine elders, one teacher, one social worker, and three volunteers

2. Observation one, class two (control group) (**Figure 3**)

   Class location: operating area.

   Elder group: the elderly in wheelchair and ambulatory.

   Class participation: total of 13 elders. Nine in wheelchair and four ambulatory, one teacher, one social worker, and seven volunteers

3. Observation one, class three (control group) (**Figure 4**)

   Class location: low floral display area in the back of the garden.

   Elder group: the elderly on lower treatment.

   Class participation: total of eight elders, one teacher, one social worker, and 10 volunteers.

The investigation was conducted using behavioral observation. The gardening course was implemented in the Garden of Fragrance in the House of Love. Classes for the control group were documented faithfully in their entirety with videos and photographs. The collected files

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Figure 3. Observation one, class two (control group).

Figure 4. Observation one, class three (control group).

were coded and divided into four categories: class-related objects, classroom interactions, the elderly's upper extremity activities, and the elderly's lower extremity activities.

Section 2 focuses on how we make a design proposal of gardening tools and then new design proposal will put into section three which uses behavioral observation again in another horticultural therapy class to see its effect.

4. Observation of new class (test group)

Class location: side exit of the main building in the plaza.

Elder group: currently in wheelchair.

Class participation: five elders, one teacher, no social workers, and no volunteer.

This study is based on behavioral observation and post-occupancy evaluation. We hope the result would combine gardening therapy and class design in an amicable environment for elders.

3. Results

The observation results indicated that classes two and three involved longer durations of activities conducted in a sitting posture. Compared with a standing posture, engaging the elderly during the classes in a sitting posture led to more satisfactory evaluations from the teacher in the postclass interviews. Both the teacher and social workers expressed that adopting a sitting posture effectively prevented the elderly from developing exhaustion or muscle pain, whereas

Figure 5. Behavior of tool use.

adopting a standing posture could result in these symptoms. In addition, **Figure 5** reveals considerable difference between the dominant and nondominant hand in the rate of tool use, indicating that the elderly did not use their two hands in turn for equal lengths of time. Even when engaged in bare hand operations, the elderly spent significantly longer on average operating with their dominant hand than with their nondominant hand or both hands.

There are more elders staring into space and resting behavior in class two. Even though class two has a longer duration, there is no increase in time between the interaction of plants and elders. Furthermore, elders in class two have at the highest, a 39.47% increase in time duration to observe others (**Figure 6**). The observation reveals that the unequal attention from instructors causes the unattended elders to look around at other elders in boredom.

The instructor in three horticulture classes pointed out that sedentary positions are more suitable for elders in gardening activities that prevent fatigue from stooping or repetitive movements. Only class two has three gardening platforms, providing more assistance during gardening. The operating platforms make it easier for elders to reach, which makes it a more suitable platform for elders to use. On the contrary, there is a high discrepancy between dominant and nondominant hand users in gardening work in class two. Moreover, observations of the three classes reveal that elders who use tools use their dominant hand 32.62% of the time more than their nondominant hand. Elders who use their bare hands use their dominant hand 17.31% of the time more than their nondominant hand. It is one point where the platform design can improve. We also know that elders more frequently use tools than bare hands to work with soil

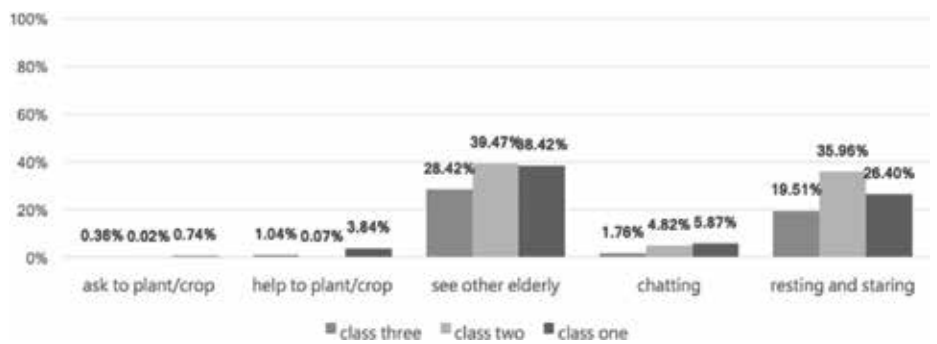

Figure 6. Intensity of elder interaction in horticulture class.

and plants based on observation. This study also focuses on the design proposals of how users place gardening tools, to give an effect of horticulture activities.

Moreover, staring into space and resting behavior are the highest in class two. When instructors are unavailable to attend to an elder, this elder ends up staring into space because he/she is confused about next steps. Observations in class two also reveal that instructors, volunteers, and social workers on average spend the most time assisting elders. The purpose of these horticulture classes is for elders to achieve therapeutic effect through finishing class experiments on their own. Over-guidance from instructors or volunteers could decrease the opportunity for elders to work on their own. One of the 13 elders in class two had less attendance. Finally, the flower platform from class two with nine elders in the wheelchair, compared to the fixed flower beds at the center of the plaza, is associated with higher mobility which can easily accompany with other classes. Therefore, we should consider the different physical condition of elders and use the mobile floral platform as a base, as a template for future gardening design.

3.1. Horticultural flower bed design concerns and conditions

Three most common problems occurred in gardening work among the elders during the first observation:

1. Bad posture: inadequate tools encourage poor posture in elders, which offsets the therapeutic benefits of the classes. The tools they used affected many postures in classes.
2. Lack of interaction of classes: horticulture classes stimulate interactions between the elderly and also reduce the aging of body function. Staring-into-space and resting behaviors take up a large percentage of class interaction based on our observations. Sharing and helping interactions among elders should be a critical design criterion for a flower bed.
3. Uneven care among elders: many staff, other than the instructor, need to focus on the situation of all elders also, which increases the burden on them. Therefore, most of these horticultural classes arrange volunteers to help. However, an oversupply of volunteers will cause uneven care among the elders, and reduce their independence to work in gardening activities. A goal of flower bed design should be taken into account the volunteer-to-elder ratio and save manpower.

3.2. Concept drafts

Horticultural therapy courses were conducted in groups. Most flower beds available on the market could be used by multiple users. However, this study aimed to develop a flower bed featuring sufficient personal space and the ability to support multiple users, thereby enhancing a sense of exclusiveness in the users. From the starting point of user space, modularized separable designs were developed to meet the aforementioned requirements (**Figure 7**).

Eventually, a hexagonal design was adopted. A set of flower beds comprising six pieces was created and modularized. The advantage of hexagon-based modularization was that the comprising pieces could be assembled into various shapes in response to varying class requirements. During the design process, the researchers considered the possibility of future production and designed the flower beds to be self-assembly pieces for the convenience of those purchasing and using the products. Hence, all components were made from planks and

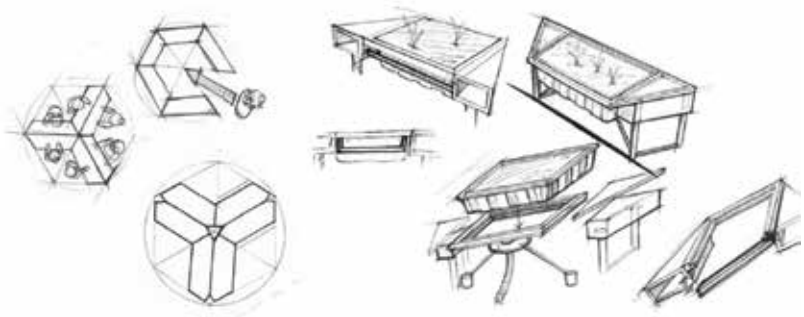

Figure 7. Development of design concepts.

Figure 8. Flower bed dimensions.

tubes. To meet the requirements of various older users, the use of height of an ordinary elderly in the sitting and standing postures as well as that of the elderly in wheelchairs were considered. A 1:1 model was produced by measuring available wheelchairs on the market to obtain the most appropriate dimensions (**Figure 8**): 104 cm (l) × 45 cm (w) × 81 cm (h). Furthermore, the height under the table was set to 62 cm, to be compatible with the knee height of most the elderly in a sitting posture, and to allow wheelchairs to enter and exit easily.

In a satisfactory drainage system, flower bed design should be considered. The drainage system was first placed at the center of the table; however, experimental results indicated that the drainage effect was poor. Subsequently, a pipeless drainage system was designed, in which table beams were used as water channels to guide water to be discharged through table legs. With a pipeless design, water pipes or water pot damage caused by prolonged use could be prevented, and the space under the table could be effectively minimized to allow the elderly to enter and exit more easily. The soil pot that was readily available was Model-600 sealed pot, which could be used once it was pierced along the directions of the water channels, and furthermore, it could be replaced conveniently. Previous observations have suggested that approximately 15 items should be used in each gardening course session, including hoes, shovels, potted plants, and the elderly's personal belongings. Considering users' need for storage, operating platforms and drawers were added to both sides of the newly designed flower bed. The operating platforms were designed to be inclined surfaces with water drainage holes to facilitate water discharge. In

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addition, a round hole was designed on the top to place 5–7″ potted plants or hoes and shovels. Moreover, most of the elderly would hold on to the chair or the flower bed when standing or sitting. Therefore, iron bars were installed to surround the operating platform with raised edges for the elderly to hold on to. Multiple methods of flower bed arrangement were simulated to ensure the design was compatible with multiple course requirements. In addition to facilitating teaching, the operating platform served as a display platform after class to enhance the elderly's sense of connection with the plants they had planted. We have designed a new wooden flower bed based on all of the conditions and concerns on the sizing and interaction design factors. The flower bed is a trapezoidal desk, which allows everyone to gather around in a circle. We hope it is more convenient for the instructor to communicate with the elderly than before.

In addition, top pulleys were adopted for the casters, which featured a stamp-and-press switch to stop slippage, enable the flower beds to be arranged in class, and prevent flower bed movement when the elderly hold them for support. Because horticultural therapy classes are often implemented outdoors, all flower beds were finished with wood oils that were extracted from plants and exhibited UV-resistant and water-proof features. Subsequently, simple loading and drainage tests were conducted. A sealed pot containing approximately 30 liters of water was used in the loading test, and the results indicated that the flower bed remains stable both under normal use conditions and violent shaking. Furthermore, the drainage system was proved to be effective in leading the water to drain through the framework-turned-channels under the sealed pot to the sides of table legs to be discharged.

4. Discussions

This discussion takes the new design of the flower desk into the curriculum. The test group has a total of five participants, including four women, one man, where three of them are in wheelchairs. They sit equidistant from the teacher in a circle. The five new flower desks are arranged radially, with an opening for the instructor to freely walk in and out of it.

In the test group during the horticulture class, the elderly used the dominant hand 26.30% of the time, nondominant hand 17.58% and both hands 12.32% of the time (**Figure 9**). The test group has a much higher usage of hands in all three categories compared to the control group, especially in the nondominant hand category. The test group uses bare hands 56.21% of the class, which is much higher than the control group of 25.28%. Previous observations revealed that inappropriate flower bed dimensions can lead to a forward-leaning sitting posture. When the table top was too low, or when the elderly could not approach the flower bed with ease from their chair, they could not make effective use of the work table. However, the newly designed flower bed "Elder Green" may effectively prevent bad posture in its users. As a result, this new flower bed design stimulates both hand usage and balance in the elderly. From flipping soil to digging a hole to placing a seed to burying soil, all elders fulfilled the hand movement goals. It could be the design of "Elder Green" that allow elders to feel more intimate toward the product.

The total time that the test group spent using their dominant hands was 26.32% for tool use and 26.30% for bare hand operations. In contrast, time spent in the control group was 34.60%

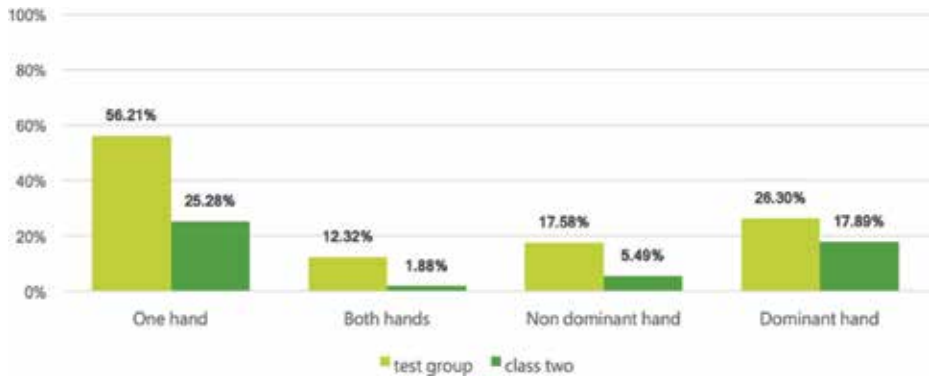

Figure 9. Average percentage of time working with bare hands.

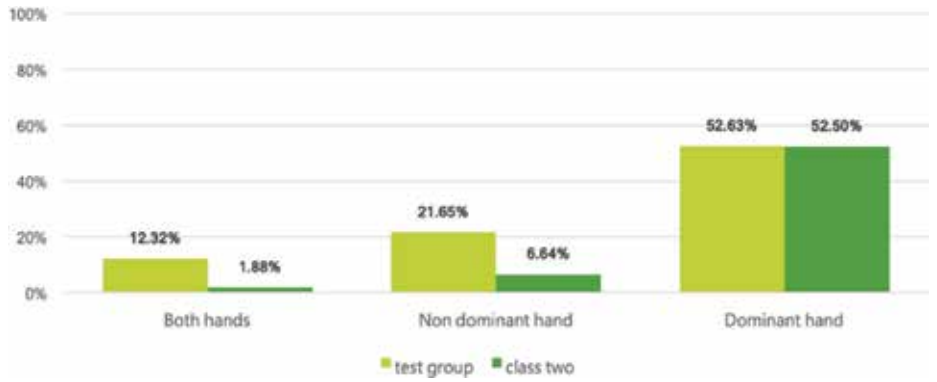

Figure 10. Average percentage of time working with tool-assisted and bare hands.

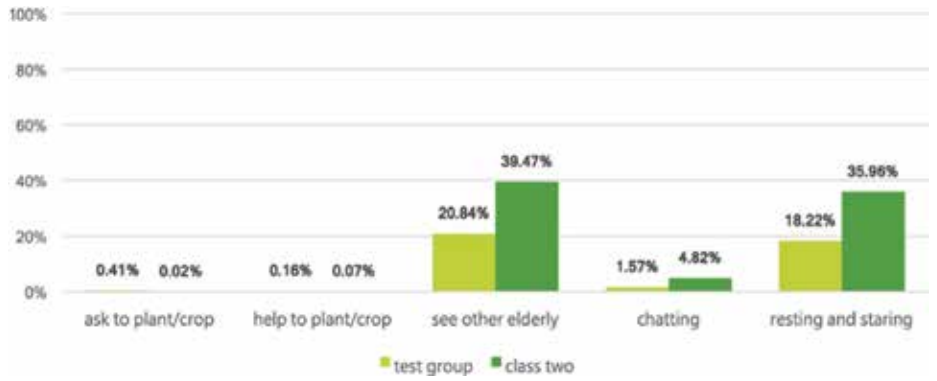

Figure 11. Interaction of the elders in class in percentage.

for tool use and 17.89% for bare hand operations (**Figure 10**). The results indicated that the elderly in the test group were involved in tool-assisted and bare hand operations more evenly. In addition, compared with the control group, the elderly in the test group had considerably higher percentages of dominant hand use and both hand use in terms of total time. Therefore, the newly designed flower bed was proved effective at enhancing the elderly's willingness to

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use the nondominant hand and both hands, thereby encouraging balanced exercise in both hands and enhancing the positive effects of horticultural therapy.

The percentage of time in the test group where the elderly spent staring into space or resting is 18.22%. It is significantly lower than that of the control group at 35.96% (**Figure 11**). The elders in the test group spent a lot more time on planting activities and less time being idle. We also observed that the elderly immersed in their tasks that were under only one instructor's supervision. This means that "Elder Green" causes participants to be more interested in the whole class.

4.1. A comparison between pre- and post-design behavior, factoring in the number of elders

The control group of class two has a total of 13 participants, accompanied by nine volunteers and one teacher (**Figure 12**). Based on the new and unique design function of the flower bed with professional garden therapist advisory, the user base of "Elder Green" is set at five, accompanied by one instructor.

4.2. A comparison of caregiving to elders between the pre- and post-design

The percentage of time where an elder gets verbal instruction in class is 7.19%, physical instruction is 6.46%, and the average time where instructor demonstrates for an elder is 57.4 s, 1.97% of class time (**Figure 13**). Compared to class two, volunteer demonstrations have decreased.

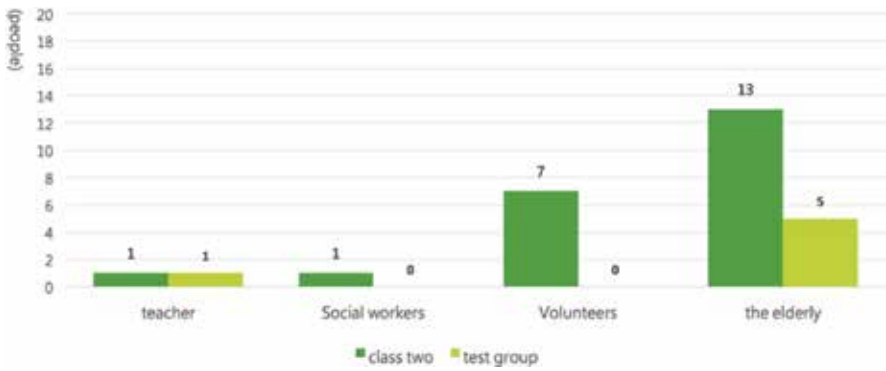

Figure 12. The relationship between the number of instructors and elders.

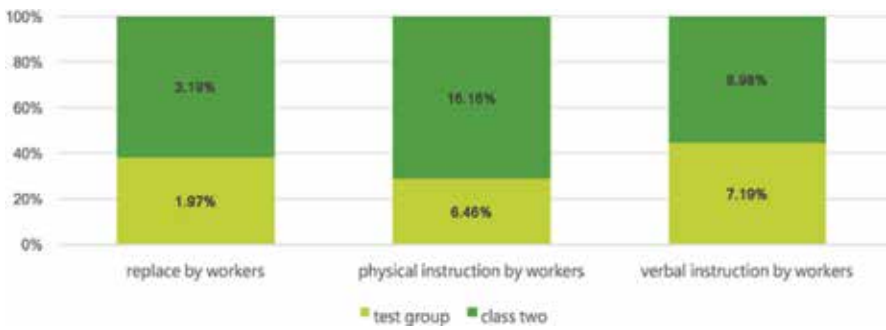

Figure 13. The percentage of time when an elder receives care.

Also, the elderly in the test group are much more enthusiastic about the curriculum, which reduces any distraction from other volunteers. The new design makes the elderly to get the therapeutic effect when working independently as same as the goal of horticultural classes. Implementation of "Elder Green" in the new curriculum will have positive effect on horticultural activities.

4.3. Comparison of pre- and post-design, factoring workers to elder interaction

The attention on all the elderly residents was unequal even though there were 13 elders and 9 volunteers in the control group of class two (**Figure 14**). On the contrary, there is only one instructor for every five elders, the elders of test group have more even guidance and care from one instructor (**Figure 15**). The test group had a much better experience than the control group in increased mental stimulation and physical exercise. This reveals how the instructor-centric class mode of "Elder Green" works. "Elder Green" helps the elders with fewer instructors and volunteers, conducting a quality fulfilling class more than creating a balance of instruction to each student.

In the test group, the elderly achieved higher amounts of exercise in a more balanced manner. The percentage of time involved in bare hand operations was higher than that spent on tool use. During the classes, the horticultural therapist encouraged the elderly to touch the soil often with their hands, and even smell the soil to increase tactile and olfactory sensory stimulation. Because

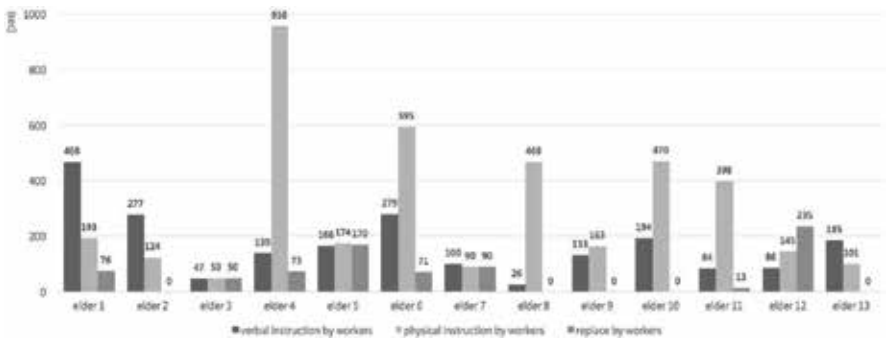

Figure 14. Relationship of class two (control group) between workers and elders.

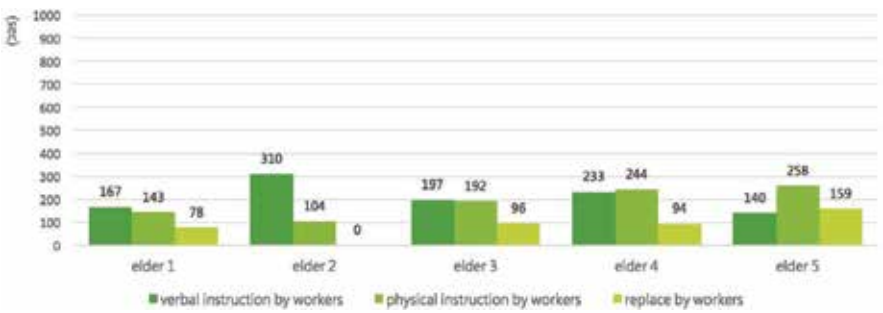

Figure 15. Relationship of the test group between workers and elders.

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the dimensions of Elder Green were more suitable for the elderly, and because it featured individual operating platforms, the elderly could engage in planting more easily, which enhanced their willingness to use bare hands. In addition to encouraging the elderly to use both hands evenly, Elder Green enabled the horticultural therapist to provide equal attention to each older adult because of its radial arrangement when in teaching mode. Moreover, the arrangement elevated the elderly's perceived respect from others during the activities. The results indicated that idle time for the elderly in the test group decreased and mutual assistance increased. Again, this showed that higher enthusiasm in the elderly promotes the effects of horticultural therapy. Overall, this teaching style can enable institutions to provide quality gardening courses with less manpower.

5. Conclusions

The horticultural therapist can stand at the center of the radial flower beds to interact with the elderly during gardening courses. This study adopted universal design; both the elderly who were wheelchair users and nonwheelchair users could sit by the side of the flower bed. The flower bed was primarily made of wood, the pattern and color of which conveyed comfort and warmth to the elderly. After completing the gardening course, the flower bed naturally became a display shelf showcasing the planting results (**Figure 16**). The Elder Green flower bed helped every older adult focus on the course contents. It mitigated the problem of forward-leaning sitting postures commonly observed in users of existing products by improving flower bed dimensions; moreover, even the elderly in wheelchairs could approach the flower bed at a proper distance to effectively use the work table and reach the depth of the flower bed at ease, rendering gardening activities easier. In previous observations, marked differences were observed between the percentage of time the elderly spent using their dominant hand and using their nondominant hand. However, with the Elder Green flower bed, the elderly' physical activity conducted with both hands holding objects was substantially elevated, and they used their nondominant hand more frequently to accomplish the movements required in the class instead of simply using the same hand repetitively. Therefore, the Elder Green flower bed created more opportunities for physical activity among the elderly by effectively guiding them in spreading their strength to both hands (**Figure 17**).

Figure 16. Different type of "Elder Green" arrangements.

Figure 17. Actual situations of the elderly holding objects, using tools, and interactions between them and the teacher.

Observations on the bare hand operations of the elderly using Elder Green revealed notable increases in the average time of dominant hand, nondominant hand, and both hand usage compared with those observed with conventional methods. This finding indicated that the elderly became more active in bare hand operations, which enabled them to receive more comprehensive hand motor training. The individual seat attached to each Elder Green flower bed provided each participating older adult with an exclusive operating platform, enhancing their subsequent willingness to care for the plant and generating a sense of connection with the plant. In addition, this study noted that after Elder Green was introduced, the elderly were more enthusiastically involved in the tasks assigned by the teacher in class, which reduced distraction caused by boredom. Overall, the combination of a tight class tempo and concentrated movements rendered the gardening course fruitful; moreover, after Elder Green was adopted, the elderly spent more time helping each other. This indicated that the new teaching method inspired by Elder Green encourages mutual assistance and collaboration in a group of the elderly, and can adequately achieve the effects that horticultural therapy is expected to exert on the elderly. Using this method, the elderly have greater opportunities to complete gardening operations independently during horticultural therapy. Although the five elderly participants in the test group were only cared for by a horticulture teacher, the course proceeded successfully and they received relatively equal attention. This method allows organizing a quality horticultural therapy course with less manpower, and is likely to promote the willingness of related institutions to organize such courses. The flower bed of "Elder Green" allows soil depth of at least 15 cm. The height of the space under the desk is set at 62 cm which is a one-size-fits-all for elders of different heights and wheelchair users. The specification for the different basin choices are available in the market which makes future replacements easier (**Figure 13**). Users can arrange "Elder Green" in different forms according to the number of participants and the purpose of the horticulture class. Users also arrange flower beds in different shapes as the number of desks increase. "Elder Green" desks are mostly made out of wood. The protective wooden oil creates a warm and moist feeling when touching the wooden desk. Users can place the tools such as a hoe, shovel, plant, etc. on top of the desk or in the built-in drawer, which allows an elder to work seamlessly. Besides, an elder can use the desk of "Elder Green" as a hand-holder when sitting down or standing up for class. The installed wheel can make moving arrangements easier on the desk, and wheel lock also prevents the flower basin from shifting around.

The "Elder Green" flower beds have the potential to improve in many aspects. Studies support that individuals with cancer and chronic disease also benefit from therapeutic use of activities such as gardening, which helps the individual in terms of strengthening his/her bonds with life [19, 21]. Thus, different types of wooden patterns and the color of the flower basin are examples of customization which can meet the different requirements by design. Also, how different horticultural class curriculums combined with different medical aids are worthy of investigation for the future.

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Occupational therapy is a health care specialty with a deep focus on client-centered and holistic rehabilitation to improve the individual's occupational performance, quality of life and well-being through participation in meaningful and purposeful activities. This new book presents the importance of the therapeutic and creative use of activity in different populations, which is one of the core components of occupational therapy. Rehabilitation, rehabilitation delivery and outcomes are affected by recent changes in the meaning of health and social values. This resulted in an increasing necessity for therapeutic therapy, as well as creative use of activity in occupational therapy. This book focuses on recent advances in occupational therapy and reviews current practical guidelines. It introduces updated knowledge and skills for children, adults and the communities, including physical, mental, social, sensory, behavioral, environmental and community-based interventions to prevent, promote and improve activity use.

The book will be relevant to occupational therapists, speech and language therapists, physical therapists, psychiatrists, psychologists, social workers and all the members of interdisciplinary rehabilitation team care workers.

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