



Case Report / Vaka Sunumu

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The effects of dark room therapy and sensory integration therapy in an individual diagnosed with autism spectrum disorder who had prolonged toe walking

Uzun süreli parmak ucu yürümesi olan otizm tanılı bir bireyde duyu bütünleme terapisi ve karanlık oda terapisinin etkisi

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ABSTRACT

The aim of this study was to observe the effect of Sensory Integration and Darkroom Therapy on a 3-year-old child with autism and toe walking independent of any syndrome. In footprint measurement, the distance between certain points was measured. In this study, it was found that heel contact was gained in walking phases at the end of 75 sessions made with footprint. For this reason, it was concluded that it would be beneficial to add Sensory Integration and Dark Room Therapy to the treatment protocol for these individuals.

Keywords: Autism, Dark room therapy, Sensory integration, Toe walking, Foot print

ÖZET

Bu çalışmadaki amaç, Duyu Bütünleme ve Karanlık Oda Terapisi'nin, otizmli ve herhangi bir sendromdan bağımsız olarak parmak ucu yürümesi olan 3 yaşındaki bir çocuğa olan etkisini gözlemlemektir. Bu çalışmada ayak izi ölçen aparat ile yapılan ölçümlerde 75 seans sonunda yürüyüş fazlarına topuk teması kazandırıldığı tespit edildi. Bu nedenle de Duyu Bütünleme ve Karanlık Oda Terapisinin bu bireylerin tedavi protokolüne eklenmesinin faydalı olacağı sonucuna varıldı.

Anahtar Kelimeler: Otizm, Karanlık oda terapisi, Duyu bütünleme, Parmak ucu yürüme, Ayak izi

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INTRODUCTION

Autism Spectrum Disorder (ASD) was first named “infantile autism” in 1943 (American Psychiatric Association, 2013). It is defined as the developmental disorders affecting three areas of the brain, the areas related to sociability and empathy; communication, language, imagination; mental flexibility and limited interests (Rapin, 2002). Although the etiology of ASD is not known for sure, the prevailing view is that genetic factors are effective (Kim, 2015).

There isn't any standardized clinical method that has been published yet to “quantify” toe walking while standing, walking, or running in children with ASD (Valagussa, 2018). It is recommended to see an orthopaedist as soon as toe walking is noticed (Wilder, 2019).

Ayres defines sensory integration as a neurological process in which sensory stimuli from the body and the environment are organized. One of the hypotheses in this regard is that disturbance in sensory processing causes abnormal behavior (Ayres, 1972). The Improved nervous system can result in decreased problematic behaviors and more efficient learning (Lang, 2012).

In Dark Room Therapy, the room is mostly used to improve interaction and self-regulation in individuals with moderate, or severe cognitive disorders (diffused developmental disorders, autism spectrum disorder or dementia) (Chalmers, 2012). It has been stated that visual, auditory, olfactory, tactile, vestibular, and proprioceptive stimuli are used in Snoezelen rooms (Kaplan, 2006).

CASE REPORT

Our study was conducted with a 3-year-old patient diagnosed with typical autism who had prolonged toe walking symptoms. The patient was not affiliated with any institution and was treated with private home sessions. Before the therapy, the parents of the patient who was included in the study signed a written informed consent form. The patient received a total of 75 sessions of therapy for 5 months, 15 times a month, with each session lasting 40 minutes. All of the measurements made before therapy were repeated after every 25 sessions. A total of 4 measurements were made and recorded at the end of 75 sessions. Direct goniometric measurement was used to measure the ankle joint range of motion (Otman, 1998). In the measurement of footprint, a sufficient amount of ink was poured onto a plate, A4 paper was placed on the plate and the patient was made to step on the plate during normal stepping (Senol, 2020). After this procedure was applied on both feet, the footprint on the paper was measured in

cm. In the measurements taken from the footprints obtained, the points taken as reference were as follows (Figure1);

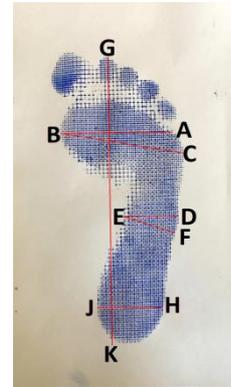


Figure 1. Footprint measurement of a healthy individual

(A-B): The distance between the head of the 5th metatarsal bone and the 1st metatarsal bone, mean metatarsal width

(B-C): The distance between the head of the 1st metatarsal bone and the outermost point of the 5th metatarsal bone, maximum metatarsal width

(D-E): The distance between the midpoints of the foot, which is the thinnest part of the foot, length of the arc

(E-F): The narrowest distance between the midpoints of the foot

(H-J): Heel width

(G-K): Foot length

Before the treatment, the patient was evaluated with Dunn Sensory Profile Caregiver Questionnaire. Dunn Sensory Profile Caregiver Questionnaire has been designed to evaluate the sensory processing skills of children and it is administered to children between the ages of 3 and 10. The Sensory profile consists of 125 items and it is filled in by the caregiver. The items are scored with the 5-Likert system according to the frequency of behaviors. Turkish validity and reliability of the Questionnaire were conducted by Kayıhan H. et al. (Kayıhan, 2015)

As a result of the Dunn Sensory Profile, caregiver Questionnaire applied in our study, it was concluded that the child had a modulation problem in addition to vestibular, proprioceptive, and tactile processing disorders. Based on this result, the activities performed as 10 repetitions in 45-minute sessions under the guidance of a physiotherapist with sensory integration training are as follows:

To improve vestibular processing;

1. Jumping on a spiky Pilates ball with a diameter of 75 cm
2. Rotational oscillations on a single suspension swing by targeting the stimulation of semi-circular canals

3. Activities involving interaction in the upside-down position
4. Trampoline

To improve the plantar contact;

1. Activities to develop the pressure on the sole of the foot in standing and sitting positions on a spiky balance disc
2. Pressure under the sole with materials of different textures
3. Walking on the floor with different textures such as cotton, felt and velvet, etc.
4. Stimulation of the receptors on the sole of the foot with small spiky balls
5. Manual massage to gastrocnemius muscle specifically (Halperin, 2014).

To improve proprioceptive functioning;

1. Regular use of weighted blankets during sessions
2. Use of weighted vest weighing 10% of the individual's body weight at regular intervals
3. Activities including deep pressure
4. Weight transfer to hands and feet
5. Awareness exercises in front of the mirror
6. Compressing with pillows.

These exercises were done with 15 repetitions of each movement. It was observed that the patient's toe walking increased in direct proportion to stress level and in order to provide self-regulation, classical music, calming scents, bubble column, colored lights, double suspension swing, and linear and slow oscillations were used in a multisensory environment in Dark Room Therapy (Lang, 2012).

RESULTS

As a result of the therapy, the ankle of the patient approached the neutral position, and pre-treatment and post-treatment ankle joint range of motion values are as follows (Table 1).

Table 1: Direct goniometric measurement of ankle joint range of motion.

Measurement	Right ankle	Left ankle
Pre-treatment measurement	130°	115°
After 25 sessions	125°	115°
After 50 sessions	110°	105°
After 75 sessions	85°	90°

Right foot footprint values are as follows (Figure 2).

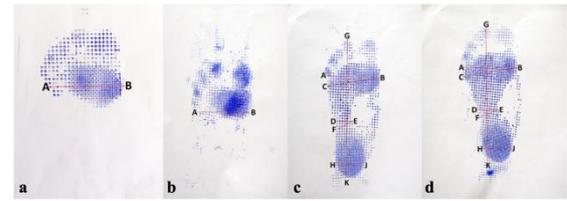


Figure 2.a: Right foot pre-treatment measurement, **b:** Measurement of the right foot after 25 sessions, **c:** Measurement of the right foot after 50 sessions, **d:** Measurement of the right foot after 75 sessions. **A-B:** Mean metatarsal width; **B-C:** Maximum metatarsal width; **D-E:** Arc length; **E-F:** The narrowest distance between the midpoints of the foot; **G-K:** Foot length; **H-J:** Heel width.

Left foot footprint values are as follows (Figure 3).

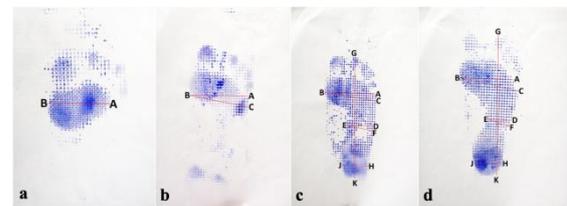


Figure 3.a: Left foot pre-treatment measurement, **b:** Measurement of the left foot after 25 sessions, **c:** Measurement of the left foot after 50 sessions, **d:** Measurement of the left foot after 75 sessions. **A-B:** Mean metatarsal width; **B-C:** Maximum metatarsal width; **D-E:** Arc length; **E-F:** The narrowest distance between the midpoints of the foot; **G-K:** Foot length; **H-J:** Heel width.

The patient did not have plantar contact before therapy. There was a gradual increase in plantar contact from the beginning to the end of the therapy. The patient was able to make full plantar contact at the end of the therapy. All of the data obtained as a result of our study were tabulated and recorded (Table 2, Table 3).

Table 2: Right foot footprint values (cm).

Measurement	A-B	B-C	D-E	E-F	G-K	H-J
Pre-treatment	5.5	-	-	-	-	-
After 25 sessions	5.5	-	-	-	-	-
After 50 sessions	6	6	1.5	1.5	16	3.5
After 75 sessions	6.5	6.5	2.5	3	16	4

A-B: Mean metatarsal width; **B-C:** Maximum metatarsal width; **D-E:** Arc length; **E-F:** The narrowest distance between the midpoints of the foot; **G-K:** Foot length; **H-J:** Heel width.

Table 3: Left foot footprint values (cm).

Measurement	A-B	B-C	D-E	E-F	G-K	H-J
Pre-treatment	5	-	-	-	-	-
After 25 sessions	6.2	6.3	-	-	-	-
After 50 sessions	6.4	6.5	1.5	1.5	16	3.5
After 75 sessions	6.5	6.5	3	3	16	4

A-B: Mean metatarsal width; **B-C:** Maximum metatarsal width; **D-E:** Arc length; **E-F:** The narrowest distance between the midpoints of the foot; **G-K:** Foot length; **H-J:** Heel width.

This study researched the effect of sensory integration and dark room therapy on a 3-year-old patient with prolonged toe walking. No studies were found in the literature in which ankle joint range of motion was measured in an individual with ASD. In this study, it was found that heel contact was gained in walking phases at the end of 75 sessions made with footprint. Thus, it was concluded that sensory integration and dark room therapy were effective in prolonged toe walking. Improvement has been reported in sensory modulation in individuals with autism with sensory integration therapy (Spitzer, 1996). Studies including proprioceptive sense have also been carried out recently. It has also been reported that there is a need for studies including all these problems in individuals with autism. This study is a standardized clinical method that quantifies the toe walking of children with autism while standing, walking, or running. This study is a first in the literature in its field for having these qualities. In addition to these, it was found that sensory integration and dark room therapy that we applied to autistic individuals with sensory processing disorder had a significant effect on toe walking. Our study will both inspire future studies and contribute significantly to the sessions of physiotherapists and/or ergo therapists who apply/will apply sensory integration and dark room therapy.

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Ethics Committee Approval: No need for case report.

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Conflict of Interest: The authors declare that they have no competing interest.

Author Contributions:

Idea/Concept: Cansel ÖZBEK, Sıdıka KARAKETİR; **Design:** Cansel ÖZBEK, Deniz ŞENOL; **Supervision/Consulting:** Deniz ŞENOL; **Data Collection and/or Processing:** Cansel ÖZBEK; **Analysis and/or Interpretation:** Deniz ŞENOL; **Literature Review:** Cansel ÖZBEK, Sıdıka KARAKETİR; **Writing of the Article:** Cansel ÖZBEK, Sıdıka KARAKETİR; **Critical Review:** Cansel ÖZBEK, Sıdıka KARAKETİR, Deniz ŞENOL.

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