BAYTEREK | Uluslararası Akademik Araştırmalar Dergisi
Bayterek International Journal of Academic Research (BIJAR)
e-ISSN: 2651-320X
DergiPark Akademik
http://dergipark.gov.tr/buaad
bayterekdergisi@gmail.com

Sense And Self-Regulation Checklist for Autistic Children: Adaptation to Turkish*

(Otizmli Çocuklar için Duyu ve Öz-düzenleme Kontrol Listesi: Türkçeye Uyarlanması)

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Article History

Received: 24/03/2023

Accepted: 07/09/2023

Article Type:
Research Article

Abstract

This study aims to adapt Sense and Self-Regulation Checklist (SSC) into Turkish which was developed for children with autism by Silva and Schalock. In this study 371 children aged 24-72 months with autism, typical development and other developmental disorders were included. Firstly, the linguistic equivalence was tested, followingly validity and reliability analyzes were made. Exploratory and Confirmatory Factor Analyzes were conducted within the scope of validity analysis. It was determined that each of the 12 sub-domains in the SSC measures a structure, the two-dimensional structure of the SSC was verified by performing CFA over these sub-domains` totals. Criterion validity examined according to opinions of the teachers. Within the scope of the reliability of the measurement tool; Cronbach's alpha, test-retest, and inter-rater reliability were assessed. Internal consistency coefficients were found to be 0.99, and test-retest reliability coefficients were found to be between 0.99 and 1.00. In addition, the consistency between the raters found to be 98%. Results shows that the scale was valid and reliable for the sample group which was applied.

Keywords:
adaptation; autism; self-regulation; sense; validity-reliability

Kaynak gösterme / To cite this article:

Çetin Sultanoğlu, S., & Aral, N. (2023). Sense and self-regulation checklist for autistic children: adaptation to Turkish. *Bayterek Uluslararası Akademik Araştırmalar Dergisi*, *6*(2), 316-338. doi: 10.48174/buaad.1270552

Öz

Bu araştırma otizmli çocukların duyu ve öz düzenleme becerilerini değerlendirmek amacıyla geliştirilmiş olan "Duyu ve Öz Düzenleme Kontrol Listesinin" (Sense and Self-Regulation Checklist) geçerlik ve güvenirliğini incelemek amacıyla gerçekleştirilmiş olan metodolojik ve tanımlayıcı bir araştırmadır.

Araştırmanın çalışma grubuna 2018-2019 eğitim öğretim yılında Ankara il merkezindeki Özel Eğitim ve Rehabilitasyon Merkezlerine devam eden, 24-72 ay aralığında bulunan otizm, genel gelişimsel yetersizlikleri olan çocuklar ile anaokuluna devam eden tipik gelişim gösteren, ailelerinden izin alınan 371 çocuk dahil edilmiştir. Çalışma grubu üç aşamada belirlenmiştir. İlk aşamada Ankara il merkezindeki ilçelerden iki merkez ilçe tesadüfi örnekleme ile seçilmiş ve bu ilçelerdeki özel eğitim merkezleriyle tek tek görüşülerek ilgili yaş grubundaki otizmli çocukların ve genel gelişimsel yetersizlikleri bulunan çocukların olduğu 19 özel eğitim merkezi ve üç uygulama anaokulu belirlenmiştir. İkinci aşamada belirlenen kurumların yöneticileri ile görüşülerek uygulama açısından uygun ortama ve koşullara sahip olan, yaş gruplarına göre yaklaşık olarak eşit dağılım gösteren, kurumlar seçkisiz olmayan

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*Bu araştırma birinci yazarın lisansüstü tezinden üretilmiştir.

yöntemlerden uygun yöntemle seçilmiştir. Üçüncü aşamada uygun yöntemle seçilen kurumlardaki çocukların aileleri ile görüşülerek çalışmanın amacı açıklanmış ve ailelerden onam alınmıştır.

Araştırma kapsamında çocuklar ve aileleri hakkındaki bilgileri elde etmek amacıyla araştırmacılar tarafından hazırlanan Genel Bilgi Formu ve otizmli ve gelişimsel yetersizliğe sahip çocukların duyu ve öz düzenleme becerilerini incelemek amacıyla Silva ve Schalock tarafından geliştirilen Duyu ve Öz Düzenleme Kontrol Listesi (Sense and Self-regulation Check List) kullanılmıştır. Duyu ve Öz Düzenleme Kontrol Listesi makalede ilk yazar olan araştırmacı tarafından araştırmaya katılmayı kabul eden çocukların annelerine bireysel olarak uygulanmıştır. Veri toplama sürecine başlamadan önce araştırma kapsamında geçerlik ve güvenirliği yapılacak olan Duyu ve Öz-düzenleme Kontrol Listesi için gerekli izinler alınmıştır. Kontrol listesinin araştırma kapsamında kullanılmasına izin verilmesi ve etik kurul onayının alınmasından sonra çalışmaya başlanmıştır.

Çalışma sonucu elde edilen veriler değerlendirilerek her bir çocuğa ait bilgiler ve puanlar bilgisayar ortamına girilmiştir. Araştırma kapsamında literatürde geçerlik ve güvenirlik için yapılan analizler incelenmiş olup bu doğrultuda araştırmada geçerlik çalışmaları kapsamında öncelikle dil geçerliği ve dilsel eşdeğerlik geçerliğine bakılmış, sonrasında kapsam geçerliliğine ilişkin kanıtlar uzman görüşlerine dayalı olarak yapılmıştır. Yapı geçerliğine yönelik kanıtlar için öncelikle Duyu ve Öz Değerlendirme Kontrol Listesinde yer alan 12 alt boyuttan her birinin bir yapı oluşturduğunu göstermek için temel bileşenler analizine dayalı faktör analizi yapılmıştır. Faktör analizi yapılmadan veri girişindeki yanlış ve eksik veri girişleri kontrol edilmiş, veri dağılımındaki uç değerler silinmiş ve 12 alt boyutunun her birinin bir yapı ölçtüğü belirlendikten sonra bu alt boyut toplamları üzerinden açımlayıcı ve doğrulayıcı faktör analizi yapılarak Duyu ve Öz Değerlendirme Kontrol Listesinin iki boyutlu yapısı doğrulanmıştır. Yapı geçerliğine kanıt oluşturmak için çocukların tanılarına göre ölçme aracından aldıkları puan ortalamalarının farklılaşıp farklılaşmadığı kruskall-wallis testi ile incelenmiştir. Duyu ve Öz Değerlendirme Kontrol Listesi puanlarının güvenirliğinin belirlenmesinde test tekrar test güvenirliği, güvenirlik katsayısı ve değerlendirmeciler arası tutarlık analizleri için t testi Cronbach alfa ve MacDonald omega değeri hesaplanmıştır. Araştırma bulguları kapsamında Dil Geçerliği ve Dilsel eşdeğerlik çalışması gerçekleştirilmiştir. Bu bağlamda ölçme aracının Türkçeye çevirisi İngilizceye hâkim yedi uzman tarafından yapılmış, daha sonra ölçme aracı, Ölçme ve Değerlendirme, Duyu Bütünleme, Türk Dili, Ergoterapi, İşitsel Bütünleme Terapisi, Odyoloji, Özel Eğitim, Okul Öncesi Eğitim ve Çocuk Gelişimi alanlarındaki 11 uzmanın görüşüne sunulmuştur. Uzmanların önerileri doğrultusunda ölçek üzerinde bazı değişiklikler yapıldıktan sonra Türkçe metin, geri çevir yöntemiyle tekrar İngilizceye çevrilerek çeviriden kaynaklanabilecek anlam karmaşaları düzeltilmiştir. Bu süreçte beş bağımsız çevirmen tarafından geri çeviri işlemleri yapılmış ve İngilizce ile Türkçeden İngilizceye çevrilen maddeler arasında ifade birliği olduğu görülmüştür. Türkçeye çevrilen ölçme aracı iki Türk Dili Uzmanı tarafından ifadelerin anlaşılırlığı açısından incelenmiş ve gerekli düzeltmeler yapılarak ölçme aracına son şekli verilmiştir. Bu işlemlerin ardından ölçeğin orijinal haliyle Türkçeye çevrilmiş hali arasındaki tutarlığı incelemek üzere dilsel eşdeğerlik çalışması yapılmıştır. Dilsel eşdeğerlik çalışması kapsamında, İngilizce ve Türkçeye hakim olan 30 anneye, iki hafta arayla ilk olarak ölçeğin İngilizce olan orijinal hali, ardından Türkçeye çevrilmiş olan hali uygulanmış, elde edilen puanlar arasındaki tutarlık test edilmiştir. Her iki uygulamadan alınan puanlar arasındaki tutarlılığı test etmek üzere Pearson momentler çarpım korelasyon katsayısına bakılmıştır. İngilizce ve Türkçe ölçme araçları arasında yüksek düzeyde pozitif ve anlamlı bir ilişki olduğu saptanmıştır r=.99 Kapsam geçerliği doğrultusunda uzman görüşleri alınmış, uzmanlardan elde edilen görüşlere dayanarak kapsam geçerlik indeksi (KGİ) hesaplanmıştır. Yapılan değerlendirmeler sonucunda tüm maddelerin KGO oranının 1,00 olduğu ve maddelerin tümünün uzmanlar tarafından kabul edildiği belirlenmiştir. Bu değerlerin ortalamasının alınmasıyla hesaplanan KGİ değeri de 1,00 olarak saptanmıştır.

Verilerin toplanmasına başlamadan önce uygulamadaki aksaklıkları tespit etmek amacıyla uygulama kapsamındaki her yaş grubu ve cinsiyete eşit olarak dağılacak şekilde 18 (10 erkek, 8 kız) çocuğun annesine ön uygulama yapılmıştır. Ön uygulama sonunda maddelerin tamamının uygun olduğu, herhangi bir aksaklık olmadığı belirlenmiştir. Ölçme araçlarının faktör yapılarını ortaya çıkarmak için kullanılan açımlayıcı faktör analizi (AFA) (Büyüköztürk ve ark., 2012) sonucunda Duyu ve Öz Düzenleme Kontrol listesinde yeralan maddeler Duyu ve Öz düzenleme olmak üzere iki faktöre ayrılmıştır.

Duyu ve Öz düzenleme Kontrol Listesinin güvenirliğinin belirlenmesinde Test Tekrar Test güvenirliği ve Cronbach Alpha iç tutarlılık katsayısı ve Değerlendirmeciler arası tutarlılık hesaplanmıştır. Kontrol listesinin test-tekrar test güvenirliğine ilişkin elde edilen bulgular (0,99-1,00) ölçme aracının güvenirliğinin yüksek olduğunu göstermiştir. Cronbach alfa hesaplanmasi kapsaminda duygu boyutu ve öz düzenleme boyutu için hesaplanan tabakalanmış alfa değerleri her iki boyut içinde 0,99 olarak belirlenmiştir. Bu kapsamda 22 çocuğa ait ölçme aracı iki uzman tarafından bağımsız olarak değerlendirilmiştir. Puanlama tamamlandıktan sonra puanlayıcılar arasındaki tutarlılığa bakılmış ve tutarlılık oranının %98 olduğu saptanmıştır. Bu bulgular doğrultusunda değerlendirmeciler arası tutarlık oranın yüksek olduğu görülmektedir. Bu sonuçlara göre ölçeğin uygulandığı örneklem grubunda geçerli ve güvenilir olduğu belirlenmiştir.

Anahtar Kelimeler: duyu; geçerlik-güvenirlik; otizm, öz-düzenleme; uyarlama

Introduction

Autism was first defined as a neurodevelopmental disorder that occurs during the early years of life. It was first identified by American psychiatrist Leo Kanner in 1943. (Edwards et al., 2012; Fellowes, 2017; Folstain, 2006; Goldson, 2016; Tager-Flusberg and Joseph, 2003; Trachtman, 2008; Vivanti & Nuske, 2017). Symptoms of autism emerge before the age of three and manifests itself in the form of verbal and non-verbal communication and interaction problems, problems in play and social relations, and stereotypical movements (Aydın, 2010; Goldson, 2016; Korkmaz, 2015; Şener & Özkul, 2013; Verhoeff, 2014). Autism, defined as a developmental and communicative disability, that can affect self-regulation skills and development areas together with senses (Capal et al., 2017; Folstain, 2006; Şener & Özkul, 2013; Wing, 2015; Verdick & Reeve, 2012). It is important to identify these problems especially in children with autism in the early period in order to make necessary interventions. Children with autism often have difficulty regulating their emotions and senses. (Silva et al., 2009; Weitlauf et al., 2017).

It is seen that children with autism, who have problems in sensory areas and self-regulation skills, are insufficient to cope with the problems they experience (Anlar et al., 2008; Kellerman et al., 2005; Korkmaz, 2015; McCarthy & Kartzinel, 2012; Silva et al., 2009). Sense, which is defined as perceiving changes such as electrical, physical, chemical and mental stimuli observed in the environment or in the inner world and regulating oneself depending on these perceptions, is also used as feeling (Martini, 2006; Moller, 2003). Sensory skills enable environmental adaptation of organisms by influencing their visual, auditory, physical, social and personal skills (Kronowitz, 2006; Miller & Lane, 2000). Self-regulation is defined as shaping one's behaviors, tendencies and desires in accordance with social rules, controlling emotions, showing appropriate behavior, and concentration and focusing (Aydın and Ulutaş 2017; Bauer & Baumeister, 2011; Blair & Raver, 2015; Ertürk Kara et al., 2018; Heatherton, 2011). In self-regulation, which is expressed as a concept in which the person realizes his/her mind, emotions, actions and takes into account the environment, in line with his/her goals (Heatherton, 2011; Zimmerman, 2008; Neal et al., 2017), it is important for individuals to set a goal, compare the purpose with the process, and correct the inconsistency by making adjustments if there are any between the goal and the process (Lord et al., 2010; Neal et al., 2017). Self-regulation is the ability to adjust one's behavior, emotions, and thoughts to the society in which one lives. Self-regulation skills, which are based on genetics and contribute to an individual's overall adaptation to the environment, are effective in almost all areas of life (Blair & Raver, 2015; Eisenberg et al., 2010; Heatherton, 2011).

It is especially emphasized that the senses and sensory systems are directly effective in the development of self-regulation skills (Goodwin et al., 2006; Kane, 2013). Problems in sense and self-regulation skills directly affect many systems that support children to fulfill many functions and regulate their relations with their environment (Kronowitz, 2006; Miller & Lane, 2000; Silva et al., 2009). When the studies about sense and self-regulation are evaluated, it has been seen that sense and self-regulation skills are effective on the development of children, and problems with these skills may cause some troubles (Kane 2013; Kronowitz, 2006). It is important to identify these problems especially in children with autism in the early period in order to make necessary interventions. In this context, measurement tools that can reveal the sense and self-regulation skills of children with autism is needed.

It has been determined that the number of measurement tools related to sense and self-regulation is insufficient in Turkey. In fact, the measurement tools that allow the measurement of sense and self-regulation skills together are limited (Bayındır, 2016; Bayındır & Ural 2016; Sezgin, 2016) and they are generally determined to be for children with typical development (Fırat, 2020; Erdoğan and Şengül, 2014; Ertürk, 2013; Ezmeci, 2019; Özer, 2016; Özdemir & Budak, 2019; Özkan, 2019; Şahin, 2019; Fındık Tanrıbuyurdu & Güler, 2014; Yılmaz 2019). In addition, it was determined that there is no measurement tool that measures the sense and self-regulation skills of children with autism, who are among the children with special needs. For this reason, it is necessary to adapt the measurement tools into Turkish, which are used to determine the sense and self-regulation skills in different age groups. From this point of view, it was intended to adopt the SSC, which was developed by Silva and Schalock (2012) to assess the sense and self-regulation skills of children, aged 24-72 months, with autism, into Turkish and perform reliability and validity analyzes.

METHOD

This is a methodological and descriptive study conducted to examine the validity and reliability of Sense and Self-Regulation Checklist which was developed to evaluate the sense and self-regulation skills of children with autism.

Study Group

The study group of the research included 371 children attending the Special Education and Rehabilitation Centers and Kindergartens in the Ankara in the 2018-2019 academic year. The children in the study group were between 24-72 months and were examined in three groups: autism, general developmental disabilities, and typically developing. The study group was determined in three stages. In the first stage, two central districts from the districts in the city center of Ankara were selected by

random sampling and 19 special education centers and three practice kindergartens for children with autism in the relevant age group and children with general developmental disabilities were determined by interviewing the special education centers in these districts one by one. In the second stage, the managers of the determined institutions were interviewed and institutions with suitable environment and conditions in terms of application, with approximately equal distribution according to age groups, were selected from non-random methods with the appropriate method. Although the unit selection process for the sample from the universe in the non-randomized method is a sampling method made in accordance with the principle of randomnessit is defined as selecting the sample from easily accessible and applicable units due to time, money and labor constraints (Büyüköztürk et al., 2012). In the third stage, the purpose of the study was explained by interviewing the families of the children in the institutions selected with the appropriate method and the consent of these families were obtained. Children, whose families gave consent and who accepted to participate, were included in this study. It has been determined that 38.3% of the children included in the study were female and 61.7% were male, and 8.9% were two years old, 20.5% were three years old, 25.6% were four years old, 27.5% were five years old, and 17.5% were six years old. It was determined that 32.3% of the children showed typical development, 34.2% had autism diagnosis, and 33.4% had a diagnosis of developmental disabilities other than autism. It has been determined that 41.2% of the children in the study had a sibling, 48.1% of children with special needs started special education at the age of three and 39.6% of children have been attending special education for one year.

Data Collection Tools

In order to obtain information about children and their families within the scope of the research, General Information Form prepared by researchers and Sense and Self-Regulation Check List prepared by Silva and Schalock (2012) in order to examine the sense and self-regulation skills of children with autism, were used. The mother of each child who consented to participate in the study received an individual application of the SSC from the researcher.

General Information Form: The form prepared to determine the demographic information of the children participating in the research, consists of questions containing information such as the age, gender, diagnosis, number of siblings, the age of starting special education and the time spent in special education.

Sense and Self-Regulation Checklist: SSC is a checklist developed by Silva and Schalock in 2012 to identify the sense and self-regulation symptoms accompanying autism. The sensory domain of the SSC consists of six subdomains as *touch–pain, auditory, visual, taste-smell, hypersensitivity and hyposensitivity*. On the other hand, self-regulatory domain consists of *Sleep, Digestion, Self-soothing,*

Orientation / attention, Aggressive behavior, and Self-injurious behavior subdomains. The SSC is used to determine the sense and self-regulation levels of children between 24-72 months, especially those with autism and developmental problems. The checklist consists of two domains as sense and self-regulation, and 12 sub-domains. The SSC is in a four-point Likert type (often, sometimes, rarely, never) and consists of a total of 56 items belonging to the sense and self-regulation domains. The measurement tool was planned as 65 items in the first stage, but since the 9 items in the measurement tool did not fit into any domain, it was finalized as 56 items, as in the original version of the measurement tool. The total scores of the Sensory and Self-Regulation domains are obtained by summing the scores obtained from the sub-domains of the SSC. The Cronbach alpha coefficient of the checklist was determined as .87. The items in the Sense and Self-Regulation Checklist are directed to parents or caregivers, and they are asked to evaluate their children. A high score from the Checklist indicates a problem in sense and self-regulation skills, while a low score indicates that there is no problem in sense and self-regulation skills. Scoring of the four-likert-type checklist was "Often (3)", "Sometimes (2)", "Rarely (1)", "Never (0)". The highest score that can be obtained from the checklist was 168, and the lowest score was 0.

Data Collection Method

Before starting the data collection process, necessary permissions were obtained for the SSC, whose validity and reliability will be made within the scope of the research (01.08.2017). After the checklist was allowed to be used within the scope of the research, the ethics committee approval for the research was obtained (02.04.2018).

After the permissions were obtained, the validity and reliability data for the SSC were collected at the Special Education and Rehabilitation Centers and Ankara University Practice Kindergartens located in the central districts of Ankara city center. Children aged between 24-72 months whose families gave consent to participate in the study were included in the study. Adaptation studies within the scope of the research were carried out in the 2018-2019 academic year.

Data Analysis

The data obtained as a result of the study were evaluated and the information and scores of each child were submitted to the computer system. Analyzes related to validity and reliability in the literature were examined within the scope of the research and in this direction linguistic validity and linguistic equivalence validity were examined within the scope of validity studies in the research. Then evidence for content validity was made based on expert opinions.

For the evidence for structural validity, factor analysis based on principal component analysis was performed first to show that each of the 12 sub-domains in the SSC constitutes a construct. Before

performing the factor analysis, incorrect and incomplete data entries in the data entry were checked, extreme values in the data distribution were deleted, and it was determined that each of the 12 sub-domains measured a construct. Then the two-domain structure of the SSC was verified by performing exploratory and confirmatory factor analysis on these sub-domain totals. In order to provide evidence for construct validity, whether the mean scores obtained from the measurement tool differ according to the diagnoses of the children was examined with the Kruskall-Wallis test.

Children were grouped as poor or good in terms of Sense and Self-Regulation after taking the opinion of the teachers. The differentiation of the Sensory and Self-Assessment Checklist scores was examined according to this grouping and proof of criterion validity was obtained. Since the scores do not show normal distribution and children have two levels of Sense and Self-Regulation as poor-good, Mann Whitney U test was used in the examination of the differentiation of Sensory and Self-Assessment Checklist scores according to the state of being poor or good. In order to determine the reliability of the SSC scores test-retest reliability, reliability coefficient and inter-rater consistency analyzes calculated, also T-test, Cronbach's alpha and MacDonald omega values were calculated.

RESULTS AND DISCUSSION

Linguistic validity and linguistic equivalence, content validity, exploratory and confirmatory factor analysis, criterion validity and test-retest reliability, cronbach's alpha coefficient and inter-rater reliability of the measurement tool were examined within the scope of the validity and reliability of the Sense and Self-Regulation Checklist. The results obtained are presented and discussed below.

Validity Results and Discussion

In the validity studies of measurement tools, three different types of evidence are generally obtained: content validity, criterion validity and structural validity (Özgüven, 2011). First, the results of the study of linguistic validity and linguistic equivalence are given within the scope of validity study of the SSC. Then, the analysis results and discussion regarding content, construct and criterion validity are given.

Linguistic Validity and Linguistic Equivalence study, is carried out in order to make the measurement tool, whose original name is “Sense and Self-Regulation Checklist”, suitable for data collection in Turkish population. In this context, the translation of the measurement tool into Turkish was made by seven experts who are fluent in English, and then the measurement tool was presented to 11 experts in the fields of Measurement and Evaluation, Sensory Integration, Turkish Language, Occupational Therapy, Auditory Integration Therapy, Audiology, Special Education, Preschool

Education and Child Development. After making certain changes on the checklist in line with the suggestions of the experts, the Turkish text was translated back into English using the back translation method and any ambiguities that could arise from the translation were corrected. During this process, back translations were made by five independent translators, and it was seen that the expressions were the same between the items translated from English and Turkish to English.

The measurement tool translated into Turkish was examined by two Turkish Language Experts in terms of the clarity of the expressions and the measurement tool was finalized by making the necessary corrections. After these procedures, linguistic equivalence study was conducted to examine the consistency between the original version of the measurement tool and its translation into Turkish. Within the scope of linguistic equivalence study, first, the original version of the scale in English and then the translated version of the scale was applied to 30 mothers who are fluent in English and Turkish at two-week intervals and the consistency between the obtained scores was tested. The consistency of the scores from both applications was examined using the Pearson Product Moment correlation coefficient. It was found that the association between English and Turkish measurement instruments was quite positive and substantial. (r=.99).

Since the correlation coefficient between .70-.99 indicates a high level of relationship (Büyüköztürk, 2015), it is thought that the linguistic equivalence of the Checklist is provided due to the high correlation between the Turkish version and the original one.

Content validity: Content validity can be used to examine whether the items in the measurement tool represent the behavior or area to be measured, and it can also be used to make some adjustments to these items if necessary. One of the most preferred methods in ensuring content validity is to consult experts in the field of the study. expert opinions were taken within the scope of this study and the content validity index (CVI) was calculated based on these opinions. The CVI is used in determining whether experts consider each item necessary (Yurdagül, 2005). The CVI shows the suitability level of the items. The content validity index (CVI) is obtained by averaging the total content validity ratio (CVR) of the items that are significant at the 0.05 level and that will be included in the scope of the measurement tool. CVR is calculated as an item statistic based on content validity for whether the items are on a scale (Aktürk and Acemoğlu, 2012; Özgüven, 2011; Yurdagül, 2005).

After collecting expert opinions, these opinions for each item were combined and evaluated in a single form and The Content Validity Ratio (CVR) was calculated according to the following formula (Lawshe, 1975). In this formula,“Ne” indicates the number of experts who answered “Applicable” to the item, and “N” indicates the total number of experts who expressed their views on the item.

$$CVR = \frac{N_e - (\frac{N}{2})}{N/2}$$

It is known that the Content Validity Ratio (CVR) has a value between -1 (absolute rejection) and +1 (absolute acceptance). If all the participants rate an item in the scale as “Appropriate”, the CVR value of that item will be 1. When more than half of the participants rate any item in the scale as “Appropriate”, the CVR will be between 0 and 0.99. In the presence of CVR equation, CVR will be equal to 0 when half of the experts express their opinion on the item in the scale as “Appropriate”, CVR>0 when more than half of the experts express their opinion as “Appropriate”, and CVR<0 when less than half of the experts express their opinion as “Appropriate”. When the CVR ratio is zero or less than zero, this item has no scope validity. For this reason, such items in the scale should be removed from the measurement tool (Ayre & Scally 2014; Lawshe, 1975).

In the content validity of the SSC developed by Silva and Schalock (2012); the content validity ratios of each item of the 65-item checklist were calculated in order to evaluate expert opinions and the content validity index (CVI) was determined by averaging the content validity rates. As a result of the evaluations, it was determined that the CVR of all the items was 1.00 and all the items were accepted by the experts. CVI value, which was calculated by averaging these values, was detected as 1,00. The SSC has been drafted with 65 items. As a result of the analyzes, all the items in the measurement tool were accepted with the approval of all experts. These values show that the content validity is provided. Since the items in the measurement tool are in the form of short and clear statements, it is possible to say that the experts found all the items in the checklist appropriate. There was no evidence that expert opinion was sought for content validity in the original form of the SSC (Silva & Schalock, 2012).

Preliminary Study (Pilot Study): Preliminary application was made to the mothers of 18 (10 boys, 8 girls) children, evenly distributed to each age group and gender within the scope of the application in order to detect the malfunctions in the application before starting the collection of data. It was determined that all the items were appropriate and there were no problems at the end of the pilot study. The study was started with the study group after preliminary application and evaluation.

Structural validity: In order to determine whether the results obtained from the measurement tool are valid or not, the procedures in the original version of the scale were carried out. There are 56 items in the SSC developed by Silva and Schalock (2012). The measurement tool consists of two domains, sense and self-regulation, and there are a total of 12 sub-domains, six of which are in each domain. Items in the sub-domains of hyposensitivity and hypersensitivity in the sensory domain were selected from the items in the other four domains, no different items were created for these two domains. In

this context, 23 of the 26 items in the sensory domain of the measurement tool are used twice. The scores obtained from the sub-domains of the SSC are summed to obtain a total score for each domain and the total score of the sense and self-regulation checklist is obtained by summing the scores obtained from each domain. Scoring of the four-likert-type checklist was “Often (3)”, “Sometimes (2)”, “Rarely (1)”, “Never (0)”. The highest score that can be obtained from the checklist was 168, and the lowest score was 0.

The sense and self-regulation domains of the SSC and the number of items in the sub-domains are presented in Table 1.

Table 1. Number of items in domain and sub-domains of Sense and Self-Regulation Checklist (Silva & Schalock, 2012).

Items	Total number of items
Sensory Domain	26
Touch-pain	16
Auditory	4
Visual	2
Taste-smell	4
Hyposensitivity,	5
Hypersensitivity	18
Self-Regulation domain	30
Sleep	4
Digestion	10
Self-soothing	4
Orienting-attending	5
Aggressive behavior	4
Self-injurious behavior	3

Factor analysis was performed for each of the sub-domains given in Table 1 and it was examined whether each sub-domain showed a one-dimensional structure. For this, KMO and Barlett tests were used to determine the appropriate sample size and factor loading values were also reviewed in detail during the analysis. The results of the factor analysis for the Sensory domain and each sub-domain of the Sense and Self-Regulation Checklist are presented in Table 2.

Table 2. The results of the factor analysis for the Sensory domain and each sub-domain of the Sense and Self-Regulation Checklist

Items	Touch/ Pain	Auditory	Visual	Taste/smell	Hypo-sensitivity	Hyper-sensitivity
1.Does not cry tears when hurt	0,46				0,52	
2.Doesn't notice if the diaper is wet or dirty	0,43				0,62	
3.Face washing is difficult	0,74					0,73
4.Haircuts are difficult	0,69					0,69
5. Refuses to wear a hat	0,62					0,62
6. Prefers to wear a hat	0,30					0,34
7. Cutting fingernails is difficult	0,70					0,67
8. Prefers to wear one or two gloves.	0,43					0,40
9. Avoids wearing gloves	0,54					0,53
10. Cutting toenails is difficult	0,77					0,72
11. Will only wear certain footwear	0,65					0,60
12. Prefers to wear the same clothes day after day	0,60					0,54
13. Wears only certain clothes	0,58					0,55
14. Cries tears when falls, scrapes skin, or gets hurt	0,01				-0,07	
15. Head-bangs on a hard surface	0,50				0,84	
16. Head-bangs on a soft surface	0,60				0,88	
43. Reacts poorly to certain everyday noises		0,71				0,60
44. Covers ears with certain sounds		0,79				0,68
45. Reacts strongly when others cry loudly or scream		0,88				0,70
46. Is startled by sudden noises		0,85				0,72
31. Looks at objects out of sides of eyes			0,90			
32. Is bothered by certain lights			0,90			0,57
51. Gags with certain smells				0,60		0,52
52. Avoids foods with certain textures				0,71		0,62
53. Tooth brushing is difficult				0,52		
54. Mouths or chews objects				0,34		
Explained variance value	32%	66%	81%	54%	43%	37%

When Table 2 is examined; it has been determined during the factor analysis that the factor loading value of all items except item 14 (0.01-0.07) in Touch/pain (0.01 to 0.77), Auditory (0.71 to 0.88), Visual (0.90), Taste/smell (0.34 to 0.71) Hyposensitivity (-0.07 to 0.88), and Hyper-sensitivity (0.34 to 0.73) sub-domains varied between 0.30 – 0.90. It can be said that the items in the sub-domains with factor loading values above 0.30 serve the purpose. In order not to spoil the original structure of the measurement tool, the analyzes were continued without removing the 14th item. In addition, the explained variance values obtained as a result of the factor analysis for the sub-domains were 32% for Touch/Pain, 66% for Auditory, 81% for Visual, 54% for Taste/Smell, 43% for Hyposensitivity, 37% for Hyper-sensitivity. According to these values, it can be said that the the items in the Touch/Pain sub-domain account for 32% of this structure, the items in the Auditory sub-domain account for 66% of this structure, the items in the Visual sub-domain account for 81% of this

structure, and the items in the Taste/Smell sub-domain account for 54% of this structure, the items in the Hypo-sensitivity sub-domain account for 43% of this structure, and the items in the Hyper-sensitivity sub-domain account 37% of this structure. The results of the factor analysis for the Self-Regulation domain of the SSC and for each sub-domain are presented in Table 3.

Table 3. Factor analysis results for the Self-Regulation domain and each sub-domains of the Sense and Self-Regulation Checklist

Items	Sleep	Digestion	Self-soothing	Orienting-attending	Aggressive behavior	Self-injurious behavior
26. Has difficulty falling a sleep at bedtime	0,89					
27. Has difficulty falling back asleep when awakens during the night	0,90					
28. Awakens very early and stays awake	0,79					
29. Has difficulty awakening in the morning	0,79					
55. Will only eat familiar foods		0,75				
56. Does not seem to be interested in food		0,61				
57. Eats very few foods (five to ten kinds)		0,76				
58. Bowels are loose		0,60				
59. Bowel movements (BM) are frequent (more than three times a day)		0,58				
60. Requires regular use of laxative to avoid constipation.		0,24				
61. BM is hard and dry		0,55				
62. Bowel movement is every other day		0,32				
63. Bowel movement is twice a week		0,49				
64. Bowel movement is once a week		0,44				
24. Has difficulty calming him- or herself when upset			0,86			
25. Gets upset or tantrums when asked to make a transition			0,85			
33. Tantrums or meltdowns.			0,82			
34. Cries easily when frustrated			0,73			
17. Has to be prompted to make eye contact when spoken to				0,89		
18. Seems not to notice when spoken to in a normal voice.				0,87		
19. Does not respond to his or her name				0,87		
20. Does not notice or react when tapped on the back				0,86		
22. Stares off into space				0,84		
35. Hits or kicks others					0,88	
36. Scratches or pulls others' hair					0,77	
37. Bites others					0,65	
38. Throws things at others					0,79	
39. Pulls own hair						0,82
40. Bites self						0,82
41. Hits self						0,46
Explained variance value	72%	31%	66%	75%	60%	52%

When Table 3 is examined, it has been determined during the factor analysis that the factor loading value of all items except item 60 (0.24) in Sleep (0.79 to 0.90), Digestion (0.24 to 0.76), Self-soothing

(0.73 to 0.86), Orienting-attending (0.84 to 0.90), Aggressive behavior (0.65 to 0.88), and Self-injurious behavior (0.46 to 0.82) sub-domains varied between 0.32 – 0.90.

In addition, the explained variance values obtained as a result of the factor analysis for the sub-domains were 72% for Sleep, 31% for Digestion, 66% for Self-soothing, 75% for Orienting-attending, 60% for Aggressive behavior, 52% for Self-injurious behavior. According to these values, it can be said that the the items in the Sleep sub-domain account for 72% of this structure, the items in the Digestion sub-domain account for 31% of this structure, the items in the Self-soothing sub-domain account for 66% of this structure, and the items in the Orienting-attending sub-domain account for 75% of this structure, the items in the Aggressive behavior sub-domain account for 60% of this structure, and the items in the Self-injurious behavior sub-domain account 52% of this structure.

As a result of the exploratory factor analysis (EFA) (Büyüköztürk et al., 2012), which is used to reveal the factor structures of the measurement tools, the items in the SSC were divided into two factors as Sensory and Self-regulation. It was observed that the rate of variance explained by the items in total was over 30%. It is considered adequate if the explained variance is above 30% for test development studies in the field of behavioral sciences (Karasar, 2006). In this context, it was determined as a result of factor analyzes that each sub-domain in both the sensory and the self-regulation domains of the SSC constitutes a structure by itself.

In order to demonstrate the two-dimensional structure of the SSC, confirmatory factor analysis was performed with the total scores obtained from each sub-domains of Sensory and Self-Regulation domains. Goodness-of-fit index values, which enable us to evaluate model data fit in confirmatory factor analysis, are presented in Table 4. The Confirmatory Factor Analysis measurement model of the two-dimensional structure of the Sense and Self-Regulation Checklist is presented in Figure 1.

Table 4. Confirmatory factor analysis results

	χ^2	χ^2/sd	p	CFI	GFI	NFI	RMSEA	Factor Load Values		Error Variances	
								max	min	max	min
Scale	119,33	2,25	0,000	0,97	1,00	0,94	0,105	1,00	0,39	0,85	0,00
Recommended Value		χ2/df ≤ 3		≥0,90	≥0,90	≥0,90	≤0,080	≥0,30		≤0,90	

When Table 4 is examined, it has been observed that the χ^2/sd value was lower than 2. Accordingly, it can be said that the model fits the data very well. The CFI, GFI and NFI values were determined as 0.97, 1.00 and 0.94, respectively. If these values are above 0.90, it means that the model fits the data

very well. When the Confirmatory Factor Analysis is evaluated in terms of RMSEA index, this was found to be 0.098 for the model and this value showed that the model had a low level of fit with the data compared to the index. When the fit indices are evaluated in general, it is seen that the two-dimensional model fits the data. Factor loading values of all items in the scale are higher than 0.30. Accordingly, it can be said that all items serve their purpose.

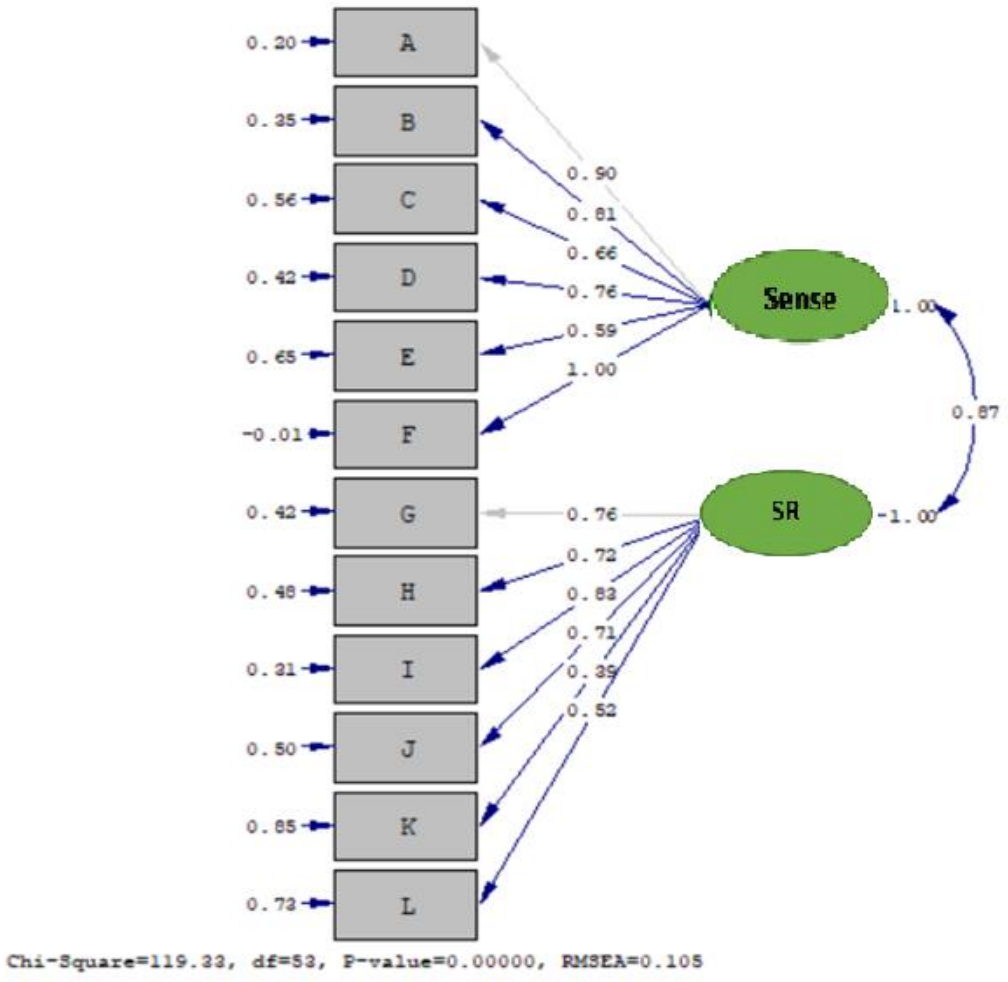

Figure 1. Sense and Self-Regulation Checklist measurement model

The factor structure was revealed and confirmed by the exploratory and confirmatory factor analyzes of the SSC. Factor analysis is the process of determining the construct validity of a scale and is the same as the scientific theory development process. Factor analysis summarizes data sets by meaningfully grouping them based on the relationship between various variables (Büyüköztürk, 2002; Karagöz & Kösterilioğlu, 2008).

It was determined that the checklist showed a two-dimensional structure, namely the Sensory domain and the Self-regulation domain, in accordance with the structure in its original form, and consisted of

56 items as a result of the exploratory and confirmatory factor analyzes made in the Sense and Self-Regulation Checklist (Silva & Schalock, 2012).

In order to provide evidence for construct validity, groups with known characteristics are compared and the relationship between these groups is examined (Ercan & Kan, 2004). In this context, the differentiation of the mean scores obtained from the measurement tool according to the diagnoses of the children was analyzed. The differentiation of the scores that children will get from the measurement tool according to their diagnosis status, especially the high mean scores of children with autism, will constitute important evidence for construct validity. It was examined whether the scores obtained from the domains of the SSC differ according to the diagnosis in order to evaluate whether the SSC can reveal developmental differences according to the diagnosis (autism, other, typical) of the children participating in the study. In this sense, Kruskall-Wallis test, which is a non-parametric analysis method, was used, to test whether the children included in the study differed according to their diagnoses, since the distribution of the sensory and self-regulation domains do not show a normal distribution. Results of this analysis is given in Table 5.

Table 5. Kruskall-Wallis test results for the domains of the Sense and Self-Regulation Checklist according to the diagnoses of the children

Kruskall-Wallis	Group	n	Rank Avg.	Sd	Chi-square	p	Difference
Sensory total	Typical	120	84,48	2	228,64	0,00*	Autism >D.dis> Typical
	Autism	127	290,27				
	Developmental disability	124	177,46				
Self-Regulation total	Typical	120	90,93	2	241,37	0,00*	Autism > D.dis > Typical
	Autism	127	298,94				
	Developmental disability	124	162,33				
General	Typical	120	83,75	2	252,93	0,00*	Autism > D.dis > Typical
	Autism	127	298,91				
	Developmental disability	124	169,31				

When the results of the Kruskall Wallis test applied for the scores obtained from the domains of the Sense and Self-Regulation Checklist in Table 5 are examined, it has been determined that the scores of the children from the domains of the SSC show a statistically significant difference according to their diagnosis (Sensory: 228,64, p<.001Self-Regulation 241,37, p<.001; Total: 252,93, p<.001). It has been determined that scores of children with autism in the sensory and self-regulation domains were higher than that of children with typical development and developmental disabilities, and the scores of children with developmental disability were higher than that of children with typical development. As a result of post hoc tests applied to determine the source of the difference, it was determined that the source of the difference was due to the scores of children with autism. The fact

that the mean score of children with autism from the measurement tool is higher than their peers with developmental disabilities and typical development indicates that the construct validity of the measurement tool is high. The method of comparing known groups was used to determine the construct validity of the original measurement tool and changing scores from the checklist due to the diagnosis were examined. Accordingly, it was determined that the scores of the checklist varied between children with typical development and children with autism. It was concluded that this situation is important in determining the construct validity, and the construct validity of the original checklist is found to be high. As a result of the analysis, it was determined that the differences between the scores according to the diagnosis were significant (p<.01) (Silva and Schalock, 2012).

Criterion validity: Criterion validity is one of the main components of validity and reliability studies and has an important place in ensuring validity. Within the scope of criterion validity, the effectiveness of measurement tools is determined and the relationship between the scores obtained from the measurement tool and the criteria determined in the future or now is examined (Büyüköztürk et al., 2012; Gürsakal, 2001). The criterion validity was tested with a similar measurement tool within the scope of the validity studies of the SSC developed by Silva and Schalock (2012). Pervasive Developmental Disorders Behavior Inventory (PDDBI) was used within the scope of criterion validity. Scale validity for the similar age group in which the research was conducted could not be controlled in this study due to the lack of an equivalent measurement tool in Turkey, but criterion validity was checked. In order to determine the criterion validity of the SSC, 105 children were asked by their teachers to evaluate them as poor and good in terms of sense and self-regulation. It was examined whether the sub-domains of the children's SSC differed according to the opinions of teachers. Mann Whitney U test was used in this study since sub-domain scores do not show normal distribution at teacher opinion levels. The results were presented in Table 6.

Table 6. Mann Whitney U test results of Sense and Self-Regulation Checklist domains according to teachers' opinions

	Teacher evaluation	n	$\bar{X}$	ss	Rank Avg.	Z	P
Sensory domain	Good	53	6,15	5,34	27,87	8,555	0,000
	Poor	52	72,37	18,60	78,62		
Self-Regulation domain	Good	53	4,74	3,63	27,92	8,530	0,000
	Poor	52	43,46	9,86	78,56		

When Table 6 is examined, it is found that the total scores of the Sense and Self-Regulation Checklist domains show a statistically significant difference according to the opinions of the teachers (Sensory domain: Z= 8.555; P<.001; Self-Regulation domain: Z= 8.30; P<.001). When the average values are examined, the scores of the children with good sensory and self-regulation skills are lower than the

students with poor sensory and self-regulation skills (Sensory-good 27.87; poor 78.62; Self-regulation-good 27.92; poor 78 ,56) according to the teacher's opinions. Considering that the decrease in Sense and Self-Regulation Checklist scores indicates better sensory and self-regulation skills, the results obtained show that the criterion validity of the measurement tool is at a high level.

Reliability Results and Discussion

The test-retest method, which is important in ensuring its reliability, how the answers will be continuous at different times and the clear definition of the features, in other words, the stability coefficients are examined. In this context, a value of 0.80 (Crocker & Algina, 1986; Ercan & Kan 2004) and a Cronbach alpha value of 0.70 or higher (Nunnally & Bernstein, 1994) are effective.

Consistency between raters is expressed as the examination of the reliability of the scores given to the same items by two or more raters (Büyüköztürk et al., 2012). Test-Retest reliability and Cronbach Alpha internal consistency coefficient and inter-rater reliability were calculated in determining the reliability of the SSC.

Test-Retest Analysis; The test-retest method is the application of a measurement tool to the same group twice under the same conditions, not in a long- or short-time interval (Büyüköztürk et al., 2012; Özçelik, 1981). Within the scope of the reliability of the measurement tool, test-retest was performed five weeks after the first application. For the test-retest method, the measurement tool was re-applied to 45 children with equivalent age and gender distribution. The results are given in Table 7.

Table 7. Test-Retest Coefficients of Sense and Self-Regulation Checklist Domains

Domain	Typical	Autism	Devep.disability	Number of items
Sensory total	0,99	1,00	0,99	26
Self-Regulation total	1,00	1,00	1,00	30
Total	1,00	1,00	1,00	56

When the results of the correlation coefficients obtained in Table 7 are examined, it is seen that the test-retest reliability coefficient is above 0.70 for both the total score and the domains, and the lowest is 0.99. Findings about the test-retest reliability of the checklist (0.99-1.00) showed that the reliability of the measurement tool was high. The test-retest method was also applied within the scope of the reliability studies of the SSC developed by Silva and Schalock (2012), and the test was re-administered to 38 children four months after the first administration. Since the test-retest reliability and mean scores were determined as .677, 84.0 and 82.50, respectively. It was concluded that test-retest reliability was achieved.

Findings on the Cronbach Alpha reliability coefficient; In order to determine the reliability of the scores obtained from the Sense and Self-Regulation Checklist, the Cronbach's alpha coefficient for each sub-domain was calculated. The results are presented in Table 8.

Table 8. Cronbach alpha and MacDonald Omega values of the Sense and Self-Regulation Checklist

	Total number of items	Cronbach Alfa	MacDonald Omega
Sensory domain	26	0,90	0,91
Touch-pain	16	0,82	0,85
Auditory	4	0,82	0,83
Visual	2	0,77	0,77
Taste-smell	4	0,70	0,72
Hypo-sensitivity,	5	0,41	0,64
Hyper-sensitivity	18	0,89	0,90
Self-Regulation domain	30	0,91	0,92
Sleep	4	0,86	0,87
Digestion	10	0,73	0,74
Self-soothing	4	0,82	0,83
Orienting-attending	5	0,91	0,92
Aggressive behavior	4	0,76	0,79
Self-injurious behavior	3	0,43	0,56

When Table 8 is examined, Cronbach's alpha values for the sub-domains of the sensory domain vary between 0.41 and 0.89, and MacDonald Omega values vary between 0.72 and 0.90. On the other hand, Cronbach's alpha values for the sub-domains of the self-regulation domain vary between 0.43 and 0.91, and MacDonald Omega values vary between 0.56 and 0.92.

When factor loading values are equal in a scale, it is recommended to use the omega coefficient when the alpha and omega results give equal results but the factor loading values are not equal. (Yurdugül, 2006). In this case, the use of omega value can be considered more accurate when the factor load values differFor reliability measurements, values between 0.50 and 0.80 are regarded as moderately trustworthy, values above 0.80 are regarded as highly reliable, and values below 0.50 are regarded as low reliable (Salvucci et al., 1997). Accordingly, it can be said that the sub-domain scores under the senory and self-regulation domains are moderate - high reliable. In addition, using the stratified alpha value in calculating the total reliability value in scales consisting of sub-domains gives more accurate information. For this purpose, the stratified alpha values calculated for the sense and self-regulation dimensions was determined as 0.99 for each. The Cronbach alpha coefficient expresses the consistency of the scores of the items in the measurement tool with the total scores. Measurement tools with a Cronbach alpha coefficient above .70 are considered as reliable (Büyüköztürk et al., 2012). Accordingly, it can be said that the sensory and self-regulation domain scores are highly reliable.

Findings on inter-rater consistency; Another method used in reliability studies is to ensure consistency between raters. In order to ensure consistency between the raters, the data were analyzed by calculating the percentage of consistency-aggrement. Percent aggregation (index of aggrement) is expressed as the ratio of the total number of items matched by the raters to the number of evaluations or observations. It is used as a simple percent of the agreement of the scores given by the two raters (Güler & Taşdelen Teker, 2015; Nurjannah & Siwi, 2017). In this context, the measurement tool belonging to 22 children was evaluated independently by two experts. After the scoring was completed, the consistency between the raters was checked and the consistency rate was found to be 98%. In line with these findings, it is seen that the rate of consistency is high between raters. Inter-rater consistency method was not used in the reliability studies conducted for the Sense and Self-Regulation Checklist developed by Silva and Schalock (2012).

Conclusion

According to the results of the validity and reliability study conducted with 371 children aged between 24-72 months in Ankara, it has been accepted that the Sense and Self-Regulation Checklist is a valid and reliable measurement tool consisting of 56 items. The SSC consists of two domains, namely sensory and self-regulation, and 12 sub-domains. The sensory domain of the Sense and Self-Regulation Checklist consists of six subdomains as *touch–pain, auditory, visual, taste-smell, hypersensitivity and hyposensitivity*. On the other hand, self-regulatory domain consists of *Sleep, Digestion, Self-soothing, Orientation / attention, Aggressive behavior, and Self-injurious behavior* subdomains. Scoring of the four-likert-type checklist was “Often (3)”, “Sometimes (2)”, “Rarely (1)”, “Never (0)”. The highest score that can be obtained from the checklist is 168, and the lowest score is 0. It has been determined that the SSC is a valid and reliable measurement tool to evaluate the sensory and self-regulation skills of children aged between 24-72 months.

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