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Digital Assesment: Development of Emotional Regulation Measurement Tools in Children with Down Syndrome

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Abstract

Background: Down Syndrome is a genetic disorder that often affects emotional regulation in individuals. Children with down syndrome usually have difficulty understanding and expressing their emotions appropriately. **Objective:** The purpose of this study was to test the factor structure of the digital version of the ERQ for down syndrome children, which is called the DTbERQ (Digital Technology-based Emotion Regulation Questionnaire). **Method**: The subjects used in this study were 39 parents or guardians of a child with down syndrome in the city of Gresik-Surabaya. This study involved 2 translators and 2 expert judges. Then a readability test was carried out on 3 subjects before using the DTbERQ on a large scale. The analysis of this study used statistical procedures for validity and reliability tests. **Results**: The results of this study show that the DTbERQ measuring instrument has proven to be valid and reliable for measuring the emotional regulation of down syndrome children. **Conclusion**: The DTbERQ measuring instrument can be used well to measure the emotional regulation of children with down syndrome from the perspective of parents or those closest to them.

Keywords: Digital assesment; down syndrome; DTbERQ; emotion regulation.

Abstrak

Latar Belakang: *Down Syndrome* adalah kelainan genetik yang seringkali mempengaruhi regulasi emosi pada individu. anak-anak dengan *down syndrome* sering menghadapi kesulitan dalam memahami dan mengekspresikan emosi mereka secara tepat. **Tujuan:** Tujuan dari penelitian ini yaitu untuk menguji struktur faktor ERQ versi digital untuk *setting* anak *down syndrome* yang disebut dengan DTbERQ (*Digital Technology based Emotion Regulation Questionnaire*). **Metode**: Subjek yang digunakan dalam penelitian ini adalah sebanyak 39 orang tua atau wali dari anak *down syndrome* yang ada di kota Gresik-Surabaya. Penelitian ini melibatkan penerjemah 2 orang dan 2 *expert judgement*. Kemudian dilakukan uji keterbacaan kepada 3 subjek sebelum menggunakan DTbERQ dalam skala yang besar. Analisis penelitian ini menggunakan prosedur statistik uji validitas dan reliabilitas. **Hasil**: Hasil penelitian ini adalah bahwa alat ukur DTbERQ terbukti valid dan reliabel untuk mengukur regulasi emosi anak *down syndrome*. **Simpulan**: Alat ukur DTbERQ dapat digunakan dengan baik untuk mengukur regulasi emosi anak *down syndrome* melalui sudut pandang orang tua atau orang terdekat.

Kata Kunci: Asesmen digital; *down syndrome*; DTbERQ; regulasi emosi.

Introduction

Emotions are mental experiences or psychological phenomena expressed through individual behavior that affect physiological conditions, subjectivity, and how to respond to a situation (Fitri & Adelya, 2017). Emotions affect perceptions and social communication. Emotions can be caused by various pressures, such as the family environment, society, school, work, and others. Individuals with unstable emotions have several characteristics such as being unable to be productive, easily anxious, tense, frustrated, careless, dependent on others, lacking enthusiasm, and inefficient (Surya, 2016). This can be detrimental to oneself and others. For example, in girls, puberty is marked by menarche (menstruation) (Andani Lido et al., 2019). This is believed to be the cause of the emotional instability. Emotions often cause individuals to commit and experience violence. The dynamics of emotions are also felt by Children with Special Needs (ABK). One type or category of Children with Special Needs (ABK) is down syndrome. Apart from down syndrome, a study by Nurkhairulnisa et al. (2018) revealed that women with intellectual disabilities often consider menstruation as a burden for themselves and their caregivers.

As reported by Paudpedia (2023), data from the UN World Health Organization (WHO) in 2020 stated that every year around 3000 to 5000 children are born with down syndrome. Cognitively, it is necessary to be aware that individuals can manage their emotions, especially children with down syndrome. It is known through research conducted by Harjani (2020) that increased emotional instability in children with down syndrome can occur due to difficulty conveying messages verbally. This is also supported by several studies that state that children with down syndrome have emotional problems, especially in school (Channell et al., 2014; Martínez-Castilla et al., 2015; Pochon et al., 2017). Children with down syndrome tend to have flat emotional characteristics. To manage emotions, emotional regulation is needed.

Emotional regulation is defined as an individual's ability to manage emotions. Gratz and Roemer (2004) define emotional regulation as awareness and understanding of emotions, emotional acceptance, the ability to restrain impulsive behavior and vice versa so that individuals can achieve desired goals when experiencing negative emotions adaptively can use emotional regulation strategies to control emotional responses to meet personal goals and situational demands. Gross and John (2003) stated that emotional regulation includes all conscious and unconscious strategies to increase, maintain, and reduce one or more components of emotional responses.

Individuals with poor emotion regulation skills are susceptible to stress. In children with down syndrome, emotional regulation is very important for the development of their social competence or skills (Khalid et al., 2023). Emotional regulation can protect individuals with down syndrome from the negative effects that can arise due to stress, which ultimately affects the type of leeway in individual emotional regulation strategies (Giyati & Whibowo, 2023). Several previous studies have proven that emotional regulation is negatively related to stress (Saedpanah et al., 2016; Schall & Schütz, 2019; Zahniser & Conley, 2018).

The Emotion Regulation Questionnaire (ERQ) is an emotion regulation measurement tool developed and compiled by Gross and John (2003) and developed in various countries (Anuar et al., 2016; Molina et al., 2015; Popianti, 2020). There are two processes for assessing individual emotion regulation strategies: reappraisal and suppression. Reappraisal is a form of cognitive change that involves and describes situations that have the potential to arouse internal emotions that change their emotional impact (Lazarus & Folkman, 1984). Suppression is a strategy that focuses on behavioral aspects that appear relatively late in the emotion-generative process and change the tendency of emotional responses. Gross (2007) noted that repeated efforts can increase cognitive resources that function optimally in the social context in which emotions arise. Suppression has negative effects, one of which is suppression within the individual related to feelings of incongruence or differences between inner experience and external expression. Reappraisal is considered more effective than suppression because it can reduce experiences and behaviors that express emotions that do not affect memory. Suppression reduces emotional experiences, affects memory, and increases physiological responses among individuals concerning the social environment.

In this study, the researchers developed a digital ERQ measuring instrument. To date, no digital-based ERQ-measuring instrument has been developed. In terms of culture, children with down syndrome are not yet widely known in Indonesia and the importance of emotional regulation for them. Therefore, broader research needs to be conducted to examine the validity and reliability of digital-based ERQ in Indonesia and to validate and understand the construct of emotional regulation in students or children with down syndrome, which is then named DTbERQ (Digital Technology Emotional Regulation Questionnaire). Cebulla et al. in Pochon et al. (2017) showed that there is still a lack of experimental evidence to conclude the recognition and regulation of emotions that characterize children with down syndrome. Previous research by Bettis et al. (2022) showed

that there is a great opportunity for emotional regulation to be measured digitally or by utilizing technology. Bettis also said that there are still few researchers who have conducted research on the development of emotional regulation measuring instruments using technology. In Indonesia, there are still no studies that discuss and report satisfactory internal consistency for the ERQ scale or measuring instrument in children or students with down syndrome based on digital. Thus, this study aimed to adapt the ERQ related to cultural and language aspects to produce an Indonesian version of the DTbERQ that has good validity and reliability values (to measure the emotional regulation of children with down syndrome children). With the adaptation of the DTbERQ measuring instrument, it will be easier for parents or guardians who have children with down syndrome to see how good their child's emotional regulation is, what actions can be taken to overcome it if the results obtained are negative, and actions that can be developed by parents towards their children if the results obtained are that they already have good emotional regulation.

Method

This study used a quantitative research method, an adaptation approach to measuring instruments using a survey. Emotional regulation variables were used in this study. In this design, at the beginning of the study, researchers obtained permission to adapt the measuring instrument from previous research, Gross and John, and a translation of the measuring instrument was carried out before finally being tested and distributed to the subjects, namely, children with down syndrome.

Sample or Population

This study was conducted in the Gresik-Surabaya area, with a fairly limited category of children with down syndrome, and only 39 guardians or parents of children with down syndrome were willing to participate. The translation was done by 2 people and 2 expert judges. The Indonesian version of the DTbERQ was tested on four down syndrome subjects before being used to determine the participants' understanding.

The subjects of this study were children with Special Needs (ABK) in the down syndrome category in Gresik and Surabaya. Those who filled out the questionnaire on the measuring instrument were parents or guardians who were previously willing to sign an informed consent form before conducting research. The participants in this study were selected using a non-probability sampling technique. Saturated sampling was used in this study.

Data Measurement

The data collection technique used in this study was adapted from Gross and John's (2003) ERQ. There are 2 ERQ indicators, namely reappraisal consisting of 6 items, and suppression consisting of 4 items. The ERQ is used to assess the habits of individuals using two emotional regulation strategies. Responses to the ERQ use the Likert Scale starting from points 1 (disagree), 2 (neutral), and 3 (agree). The ERQ assessment is carried out by adding the total value of the subject's response to each item in the indicator. The ERQ interpretation was carried out by looking at the total value to identify individual emotional regulation. The higher the total value of an individual's emotion regulation, the higher the individual's emotion regulation.

The researchers distributed informed consent to the parents or guardians of the subjects before conducting the research. The process of adapting ERQ to DTbERQ was carried out using the measuring instrument adaptation procedure according to Beaton et al. (2000), namely the first stage the researcher gave the measuring instrument to two translators to translate into Indonesian. Second, the translation results were translated back into the original language, namely English, by two translators. Third, the translation results were given to experts to assess and analyze the equivalence of items between the original text and Indonesian. Fourth, the DTbERQ is given to four children with down syndrome for a readability test by participants, followed by a discussion with a psychometric expert. Finally, DTbERQ was tested in other children with down syndrome.

Data Analysis

Statistical analysis was used for data analysis. Researchers are interested in developing the DTbERQ measuring instrument as a tool to determine emotional regulation in children with down syndrome through the confirmatory factor analysis (CFA) model test method, namely the validity and reliability of the coefficient. All analyses in this study were assisted by the JASP for Windows computer applications.

Result

The DTbERQ adaptation process was conducted in accordance with the cross-cultural measurement tool adaptation procedure of Beaton et al. (2000). The following are the results of the ERQ adaptation to DTbERQ:

Table 1. DTbERQ Item

No	Item
Reapprisial item	
1	*Ketika anak saya ingin merasakan semua emosi yang lebih positif (seperti kebahagiaan atau hiburan), anak saya mengubah apa yang sedang dipikirkannya.*
3	*Ketika anak saya ingin mengurangi emosi negatif (seperti kesedihan atau kemarahan), anak saya mengubah apa yang sedang dipikirkannya.*
5	*Ketika anak saya dihadapkan pada situasi yang penuh tekanan, anak saya membuat dirinya memikirkannya dengan cara yang membantu tetap tenang.*
7	*Ketika anak saya ingin merasakan emosi yang lebih positif, anak saya mengubah cara berpikir tentang situasi tersebut.*
8	*Anak saya mengendalikan emosi dengan mengubah cara berpikirnya tentang situasi yang dihadapi.*
10	*Ketika anak saya ingin mengurangi emosi negatif, anak saya mengubah cara berpikir tentang situasi tersebut.*
Suppression items	
2	*Anak saya menyimpan emosinya untuk diri sendiri.*
4	*Ketika anak saya merasakan emosi positif, anak saya berhati-hati untuk tidak mengekspresikannya.*
6	*Anak saya mengendalikan emosi dengan tidak mengekspresikannya.*
9	*Ketika anak saya merasakan emosi negatif, anak saya memastikan untuk tidak mengekspresikannya.*

The results of the ERQ adaptation into DTbERQ were inputted into the DTbERQ application. The application is designed such that each question item is inputted one by one with the input of a score that has been designed and calculated to be filled in by the parents of the subject or participant, namely the parents of children with down syndrome. The application also contained the results of each subject's answer scores. Each score indicates whether a child with down syndrome has a high, medium, or low emotional regulation score. An explanation of each range is provided.

This study conducted a validity test using total item correlation adjusted to the minimum criterion limit of up to 0.2 (Azwar, 2016). From the results of the validity test that has been carried out as a whole, the researcher showed a range of values of 0.068–0.533. Based on the results of the validity test of the DTbERQ items, there was one item with a value below 0.2, which means it was not valid. This can happen because of cultural and environmental differences, while the other nine items show values above 0.2, so that they can be measured accurately.

Table 2. Reliability Test Results

Cronbach's Alpha	N of items
0.700	10

Based on the results of the reliability test conducted by researchers using Cronbach's Alpha calculations. The results of the DTbERQ reliability analysis show that Cronbach's Alpha reliability value is 0.700, which is above 0.60, therefore it can be concluded that DTbERQ can be said to be reliable (Sugiyono, 2016: Jannah, 2018). This indicated a good level of reliability. This study makes a substantial contribution to the psychology literature, especially in the context of measuring emotional regulation.

Table 3. Validity Test Results

No	Item	Total Item correlation
Reappraisal Items		
1	When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about. *Ketika anak saya ingin merasakan semua emosi yang lebih positif (seperti kebahagiaan atau hiburan), anak saya mengubah apa yang sedang dipikirkannya.*	0.068

No	Item	Total Item correlation
3	When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about *Ketika anak saya ingin mengurangi emosi negatif (seperti kesedihan atau kemarahan), anak saya mengubah apa yang sedang dipikirkannya.*	0.529
5	When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm *Ketika anak saya dihadapkan pada situasi yang penuh tekanan, anak saya membuat dirinya memikirkannya dengan cara yang membantu tetap tenang.*	0.276
7	When I want to feel more positive emotion, I change the way I'm thinking about the situation *Ketika anak saya ingin merasakan emosi yang lebih positif, anak saya mengubah cara berpikir tentang situasi tersebut.*	0.250
8	I control my emotions by changing the way I think about the situation I'm in *Anak saya mengendalikan emosi dengan mengubah cara berpikirnya tentang situasi yang dihadapi.*	0.459
10	When I want to feel less negative emotion, I change the way I'm thinking about the situation *Ketika anak saya ingin mengurangi emosi negatif, anak saya mengubah cara berpikir tentang situasi tersebut.*	0.415
Suppression items		
2	I keep my emotions to myself *Anak saya menyimpan emosinya untuk diri sendiri.*	0.267
4	When I an feeling positive emotions, I am careful not to express them *Ketika anak saya merasakan emosi positif, anak saya berhati-hati untuk tidak mengekspresikannya.*	0.441
6	I control my emotions by not expressing them *Anak saya mengendalikan emosi dengan tidak mengekspresikannya.*	0.533
9	When I am feeling negative emotions, I make sure not to express them *Ketika anak saya merasakan emosi negatif, anak saya memastikan untuk tidak mengekspresikannya.*	0.374

Notes: N The purpose of this study was to adapt the ERQ related to cultural and language aspects

Discussion

The purpose of this study was to adapt the ERQ to cultural and language aspects. Based on the results of the adaptation of the ERQ for children with down syndrome, the name DTbERQ was given. The DTbERQ has good category reliability with a score of > 0.6. The results of the reliability test in the study of the development of an emotional regulation measuring instrument for children with down syndrome showed a value of 0.700, while for the validity value of each item, there was one invalid item because it was less than 0.2, and nine items were declared valid in testing the DTbERQ in a sufficient sample of 39 down syndrome children in Gresik and Surabaya.

One item was declared invalid, which could be due to the factor of filling out the instrument or measuring instrument, which was seen from the perspective of the parents. Not all parents can understand and pay attention to their children in terms of regulating emotions. Dealing with and caring for special children or children with special needs is difficult for parents.

Overall, this study provides evidence that the DTbERQ is a reliable measuring instrument because the reliability and validity of DTbERQ items can be used to evaluate emotional regulation in children with DS in Indonesia. However, the sample size in this study was only on a scale that was not broad in scope. Therefore, for further studies, it is necessary to evaluate the DTbERQ measuring instrument on a wider scale. Furthermore, we conducted a research study using the DTbERQ by increasing the measurement power of the scale.

The adaptation of the ERQ into the DTbERQ, which was specifically designed for children with down syndrome, is in line with existing theories on emotion regulation and measurement adaptation. According to Ford and Gross (2018), emotion regulation consists of two aspect strategies: reappraisal and suppression. Reappraisal involves cognitively reframing an emotional situation to change its emotional impact, whereas

suppression involves inhibiting emotional expression (Gross, 2015). The DTbERQ measurement instrument retains both constructs, making it theoretically consistent with the original ERQ framework. The results showed that the DTbERQ had a good level of reliability (Cronbach's alpha = 0.700), which met the acceptable reliability threshold (Hayes & Coutts, 2020). This supports the consistency of the instrument in measuring emotion regulation in children with down, as measured by parents. However, one item in the reappraisal dimension was invalid (correlation <0.2). This could be related to cultural and contextual differences, as suggested by Çapik et al. (2018), who emphasized that linguistic and cultural factors significantly influence measurement adaptation.

Furthermore, the role of parents in assessing emotion regulation is crucial, yet challenging. According to Reaume and Thomassin (2024), parents' perceptions of their children's emotion regulation are influenced by their emotional intelligence, awareness, and biases. In the case of down syndrome, parents may have difficulty accurately observing and reporting their children's emotion regulation due to communication barriers and cognitive limitations (Faught et al., 2022). This may explain the differences in item validity and highlight the need for item refinement to ensure clarity and understanding among parents.

Furthermore, the reliability of the DTbERQ suggests that the instrument effectively captures emotion regulation tendencies in children with down syndrome, albeit in a limited sample. Future research should aim to validate the instrument in larger and more diverse populations to increase its generalizability (DeVellis, 2017). Additionally, integrating multi-informant approaches, such as teacher or therapist assessments, may provide a more accurate assessment of emotion regulation in down syndrome emotion regulation (García-Villamisar et al., 2019).

The findings from this study contribute to the field of psychology by providing a culturally adapted and psychometrically sound instrument to assess emotion regulation in children with down syndrome. The results are consistent with existing theories of emotion regulation, while highlighting the importance of cultural adaptation in psychological measurement. Future research should focus on refining the DTbERQ, expanding sample sizes, and incorporating qualitative methods to better understand the nuances of emotion regulation in children with down syndrome.

A limitation of this study was the small number of subjects. Thus, it affects each item that is tested for validity and reliability, as well as affecting one invalid item. The DTbERQ can be used and filled in from the perspective of parents because of the limitations in down syndrome children.

Conclusion

This study successfully adapted the Emotion Regulation Questionnaire (ERQ) into the DTbERQ for children with down syndrome in Indonesia. The results showed that the DTbERQ is a consistent, valid, and reliable measurement tool with a reliability value of 0.700. Of the ten items tested, nine were declared valid with a value above 0.2, while one item had a value below 0.2. However, invalid items were retained due to cultural, language, and subject-characteristic considerations. By involving 39 children with down syndrome, this study proves that the DTbERQ can be used to assess emotion regulation in this population. The adaptation process was carried out in accordance with standard cross-cultural adaptation procedures to ensure conceptual and linguistic equivalence. The cultural differences and challenges faced by parents in observing and reporting their children's emotions may have influenced the results of this study.

This study provides important insights into emotion regulation in children with Down syndrome and contributes to the development of psychological assessments in this field. The DTbERQ has the potential to be a useful tool for researchers and practitioners to evaluate emotion regulation in children with special needs. However, the limited number of samples in this study limits the generalizability of the results. Therefore, further research with a larger and more diverse sample is needed. In addition, alternative approaches, such as direct observation and assessment from various sources (multi-informants), can be explored to improve the accuracy of measuring emotion regulation in children with down syndrome.

Based on the findings of this study, further development of the DTbERQ should focus on improving the clarity of the questions so that they are easier for parents to understand. Expanding the sample coverage to other regions in Indonesia is also needed to improve the validity and generalizability of this measurement tool. In practice, professionals who work with children with special needs are advised to use the DTbERQ as part of their psychological assessment, while still combining it with other observation methods. Furthermore, theoretical research on emotion regulation can continue to be developed by examining the influence of cultural and environmental factors on the ability of children with DS to regulate emotions. Further research in this area is expected to provide a more comprehensive understanding and support the development of more effective intervention strategies for children with down syndrome.

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