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# The Effectiveness of WHO Stress Management in Reducing Distress Among Parents as Caregivers of Children With Neurodevelopmental Disorders

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## ABSTRACT

**Background:** Caring for a child with neurodevelopmental disorders presents a significant challenge for caregivers, often resulting in stress, emotional pressure, and disruption in family and work life. To support the mental health and well-being of caregivers, effective interventions are needed to manage stress. This study was conducted to evaluate the effectiveness of stress management recommended by WHO in reducing stress levels among caregivers of children with neurodevelopmental disorders.
**Subjects and Method:** The research was conducted using an experimental research design, pre-test and post-test design without a control group. The study was conducted at the Disability Service and Inclusive Education Center of Surakarta City in April-May 2024. A total of 103 participants completed the questionnaire, with 74 meeting the inclusion criteria (PSS score > 14). The dependent variable was distress measured using the PSS questionnaire. The independent variable was WHO Stress Management. Data were analyzed using the Wilcoxon test and multivariate linear regression.
**Results:** The majority of caregivers were female (91.9%) with a mean age of 37.89 years (SD=6.2). The results showed that the mean PSS score decreased significantly from 19.14(SD=3.06) at pre-test to 17.51 (SD=3.23) at post-test (p <0.001). The level of moderate stress decreased from 97.3% to 90.5%, and the level of severe stress decreased to 0% (p=0.003). Family income (p=0.000), caregiving support (p=0.001), and compliance in listening to audio (p <0.001) variables significantly influenced the reduction in PSS scores.
**Conclusion:** The WHO stress management intervention is effective in reducing distress among parents caring for children with neurodevelopmental disorders.

**Keywords:** neurodevelopmental disorders, caregiver, stress management, perceived stress scale

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## BACKGROUND

Caring for children with neurodevelopmental disorders (NDD) can be challenging. Caregivers face significant demands in providing the extra care these children need (Hallberg and Klingberg, 2023) due to developmental deficits experienced by the children even from early stages of development (APA, 2022). They are also confronted with challenges related to the stigma from others towards children who differ in social behavior or appearance from their peers. The presence of an NDD child may also cause parents to feel insecure in their caregiving roles due to difficulties in interacting with their child (Hallberg and Klingberg, 2023). NDD caregivers often experience emotional and psychological strain, as well as disruptions in family life and work, due to the challenges of caring for their children (Chua et al., 2023).

The various difficulties faced by caregivers of children with NDD act as chronic stressors, creating a significant burden in their lives (George, 2022). Research shows that 53.9% of caregivers of children with Autism Spectrum Disorder (ASD) experience burden, with the majority reporting mild burden (Chua et al., 2023). Meanwhile, 46% of NDD caregivers report high levels of psychological distress (Maridal et al., 2021). The average stress score among ASD caregivers is 20.84 (SD 4.72), which is above average (Adib et al., 2019). This chronic stress can lead to fatigue, anxiety,s depression, emotional and cognitive problems, and an increased likelihood of physical health issues among NDD caregivers (Maridal et al., 2021). They also face loss of job opportunities, leisure time, social interactions, and are often confined to their homes. Most caregivers report that caring for a child with disabilities negatively impacts their financial condition (70%), physical health (65%), social life (64%), and dreams and hopes for the future (81%) (Maridal et al., 2021). Research also shows that parental stress is linked to more negative caregiving behaviors, which in turn lead to more behavioral problems in children (Damen et al., 2021).

The stressful situation experienced by caregivers of children with NDD and its resulting impact indicate that caregivers require support or interventions for stress management to improve their mental health and overall well-being (Bourke-Taylor et al., 2021). Research often focuses solely on the children, giving insufficient attention to their parents, even though parents experience significant burdens due to their children's behavior (Koly et al., 2021). There is a need for approaches to support parents in raising children with NDD, considering the high burden of these disorders (Bourke-Taylor et al., 2021). This can help reduce parental stress, improve effective caregiving skills, and enhance parents' understanding of their children (Koly et al., 2021). Addressing caregiver stress can have a positive impact on both the psychological well-being of the caregiver and the child (Yu et al., 2019).

Although several interventions have been implemented for caregivers, these studies face limitations in terms of accessibility, complexity of implementation, and lack of user-friendly guidelines (Frantz et al., 2018). Some interventions require specialized skills for implementation, necessitating additional training for parents or facilitators (Zygopoulou et al., 2021). Other studies do not provide sufficient detail to ensure replicability and ease of application (Frantz et al., 2018).

In response to the need for more accessible guidelines, in 2020, the World Health Organization (WHO) released an

electronic illustrated guide titled "Doing What Matters in Times of Stress: An Illustrated Guide". This module provides guidance for managing stress by incurporating several modalities of stress management therapy, primarily mindfulness and relaxation therapy. Designed with numerous illustrations, the guide is intended to be user-friendly and has been translated into Indonesian (Octaviani et al., 2023). This guide is expected to serve as an effective and accessible tool for caregivers, helping them manage stress more effectively without requiring specialized training.

Based on the above, the author intends to conduct a study to provide stress management interventions using the WHO stress management module for caregivers of children with neurodevelopmental disorders. This study aims to evaluate the effectiveness of stress management recommended by WHO in reducing stress levels among caregivers of children with neurodevelopmental disorders. By implementing the stress management approach recommended by WHO, this study is expected to provide practical guidance for caregivers in managing their daily stress and contribute to the development of better support strategies for caregivers of children with neurodevelopmental disorders.

## SUBJECTS AND METHOD

### 1. Study Design

This study is a preliminary study conducted using an experimental research design with a pre-test and post-test design without a control group. The aim of this study is to provide an initial overview of the effectiveness of the WHO stress management intervention in reducing distress among parent caregivers of children with neurodevelopmental disorders and to serve as a basis for future research. The study was conducted at the Disability Services and Inclusive Education Center in Surakarta City from April to May 2024.

### 2. Population and Sample

The target population of this study is parent caregivers of children with neurodevelopmental disorders. The accessible population of this study includes parent caregivers of children with neurodevelopmental disorders who undergo therapy at the Disability Services and Inclusive Education Center in Surakarta City during April-May 2024 and meet the study's inclusion criteria.

The subjects taken met the following inclusion criteria: a. Biological father or mother of a child with neurodevelopmental disorders who lives in the same household with the child, b. Aged ≥18 years. c. Able to read and write, d. Able to understand and communicate in Indonesian, e. Willing to participate in the study and sign the informed consent form, and f. PSS score ≥ 14. Meanwhile, the exclusion criteria are: a. Has a history of or is currently undergoing treatment for mental disorders, b. Has a severe or life-threatening medical condition.

The sampling method used is total sampling, a technique where all members of the population meeting the inclusion criteria are included as study participants. This approach is applied when the study population is relatively small or easily accessible, allowing for the inclusion of all eligible individuals in the study. The sample size is increased to 22 subjects per group. Thus, the minimum total sample size for the study is 2 × 22 = 44 subjects.

### 3. Study Variables

The dependent variable of this research is distress measured using the PSS questionnaire, and the independent variable is WHO Stress Management. The confounding variables are caregiver's gender, education, income, caregiving support, number of

children with disabilities, child's age, child's gender, child's diagnosis, and adherence to listening to audio.

**4. Operational Definition of Variables**

**WHO Stress Management** is a module published by WHO as a coping guide for managing stress, consists of five core chapters: grounding, unhooking, acting on your values, being kind, and making room, accompanied by audio recordings. The intervention will be delivered in two sessions, each lasting 20–30 minutes. The first session will cover grounding and unhooking. The second session will cover making room, acting on your values, and being kind. After each session, participants will be provided with audio recordings to practice independently at home at least once a day. Compliance with listening to the audio recordings will be categorized as: having listened at least once, or not having listened.

**Distress in NDD caregivers** is characterized by a lack of individual control over themselves, problems, or their environment, that assessed using the PSS (Perceived Stress Scale) questionnaire.

**5. Study Instruments**

Distress in NDD caregivers is assessed using the PSS (Perceived Stress Scale) questionnaire. The questionnaire is self-reported by the subjects and aims to measure the individual's tendency to perceive stress as a result of stressful situations in daily life. Perceived stress in this measurement tool is characterized by a lack of individual control over themselves, problems, or their environment. The questionnaire consists of 10 items, with response options on a scale (0, 1, 2, 3, 4: Never, Almost Never, Sometimes, Fairly Often, Very Often). The PSS is interpreted as mild stress (0–13), moderate stress (14–26), and severe stress (27–40).

**6. Data analysis**

The analysis will begin by presenting data in tables with numerical scales to compare pre-test and post-test scores on the PSS. The Wilcoxon test will be used since the data is not normally distributed. Normality tests to determine the data distribution will utilize the Kolmogorov-Smirnov test. For categorical scale tables, the Wilcoxon test will also be applied to compare stress levels before and after the intervention. Multivariate linear regression analysis will examine the effect of all variables on changes in stress scores within the sample after the intervention. A significant difference is indicated by $p<0.05$. All statistical analyses will be conducted using SPSS 21.0.

**7. Research Ethics**

The study was conducted after obtaining ethical clearance, approval from the Head of the Psychiatry Department at FK UNS, and Ethical Clearance from the Ethics Committee of FK-UNS/RSUD Dr. Moewardi Surakarta (No. 931/IV/HREC/2024). Approval was also secured from the Head of the Surakarta City Education Office and the Head of the Regional Research and Innovation Agency of Surakarta City. Prior to the study, the research subjects were given an explanation of the study's objectives and procedures. The subjects provided their consent through a written informed consent form. The research adhered to the principles of respect for autonomy, justice, beneficence, and non-maleficence.

## RESULTS

**1. Sample Characteristics**

Based on research data involving 74 samples, the average age of caregivers who are parents of children with neurodevelopmental disorders is Mean= 37.89; SD= 6.2 years (Table 1). The majority of caregivers are female, accounting for 68 individuals (91.9%), predominantly mothers of children

with neurodevelopmental disorders, while 6 individuals (8.1%) are male or fathers. Most respondents are married, totaling 71 individuals (95.9%), with a small proportion being divorced (2 individuals, 2.7%) or widowed (1 individual, 1.4%).

The highest level of education among caregivers is high school or its equivalent (45 individuals, 60.8%), followed by higher education (14 individuals, 18.9%), junior high school or its equivalent (12 individuals, 16.2%), and elementary school or its equivalent (3 individuals, 4.1%).

Most respondents are unemployed (49 individuals, 66.2%), while 25 individuals (33.8%) are employed. Regarding family income, the majority earn less than IDR 2,000,000 (50 individuals, 67.6%), while 20 individuals (27.0%) earn between IDR 2,000,000 and IDR 3,000,000, and 4 individuals (5.4%) earn more than IDR 3,000,000.

Most research subjects have one child with disabilities (71 individuals, 95.9%), while 3 individuals (4.1%) have two children with disabilities. A significant proportion of respondents lack caregiving support (52 individuals, 70.3%), while 22 individuals (29.7%) receive caregiving support. Additionally, 46 respondents (62.2%) are compliant in listening to audio recordings, while 28 respondents (37.8%) are non-compliant.

The characteristics of the children show that the majority are aged 7-12 years, accounting for 42 children (56.8%), followed by 1-6 years with 27 children (36.5%), and 12-18 years with 5 children (6.8%). Most of the children are male, totaling 58 (78.4%), while females account for 16 (21.6%). The diagnoses include ADHD in 23 children (31.1%), intellectual disability in 20 children (27.0%), autism in 19 children (25.7%), speech and language disorders in 9 children (12.2%), and other diagnoses in 3 children (4.1%).

**Table 1. Sample characteristics**

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Caregiver Age | | |
| Caregiver Age | 74 | 100 |
| Gender | | |
| Male | 6 | 8.1 |
| Female | 68 | 91.9 |
| Marital Status | | |
| Married | 71 | 95.9 |
| Divorced | 2 | 2.7 |
| Widowed | 1 | 1.4 |
| Relationship with Child | | |
| Biological Father | 6 | 8.1 |
| Biological Mother | 68 | 91.9 |
| Education | | |
| Primary School (or equivalent) | 3 | 4.1 |
| Junior High School (or equivalent) | 12 | 16.2 |
| Senior High School (or equivalent) | 45 | 60.8 |
| Higher Education | 14 | 18.9 |
| Occupation | | |
| Unemployed | 49 | 66.2 |
| Employed | 25 | 33.8 |

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Family Income | | |
| Below 2.000.000 | 50 | 67.6 |
| 2.000.000 - 3.000.000 | 20 | 27.0 |
| More than 3.000.000 | 4 | 5.4 |
| Number of Disabled Children | | |
| One Child | 71 | 95.9 |
| Two Children | 3 | 4.1 |
| Caregiving Support | | |
| Available | 22 | 29.7 |
| Not Available | 52 | 70.3 |
| Compliance with Audio | | |
| Compliant | 46 | 62.2 |
| Non-compliant | 28 | 37.8 |
| Child Data | | |
| Child Age | | |
| 1-6 years | 27 | 36.5 |
| 7-12 years | 42 | 56.8 |
| 12-18 years | 5 | 6.8 |
| Child Gender | | |
| Male | 58 | 78.4 |
| Female | 16 | 21.6 |
| Child Diagnosis | | |
| Intellectual Disability | 20 | 27.0 |
| Autism | 19 | 25.7 |
| ADHD | 23 | 31.1 |
| Speech and Language Disorder | 9 | 12.2 |
| Others | 3 | 4.1 |

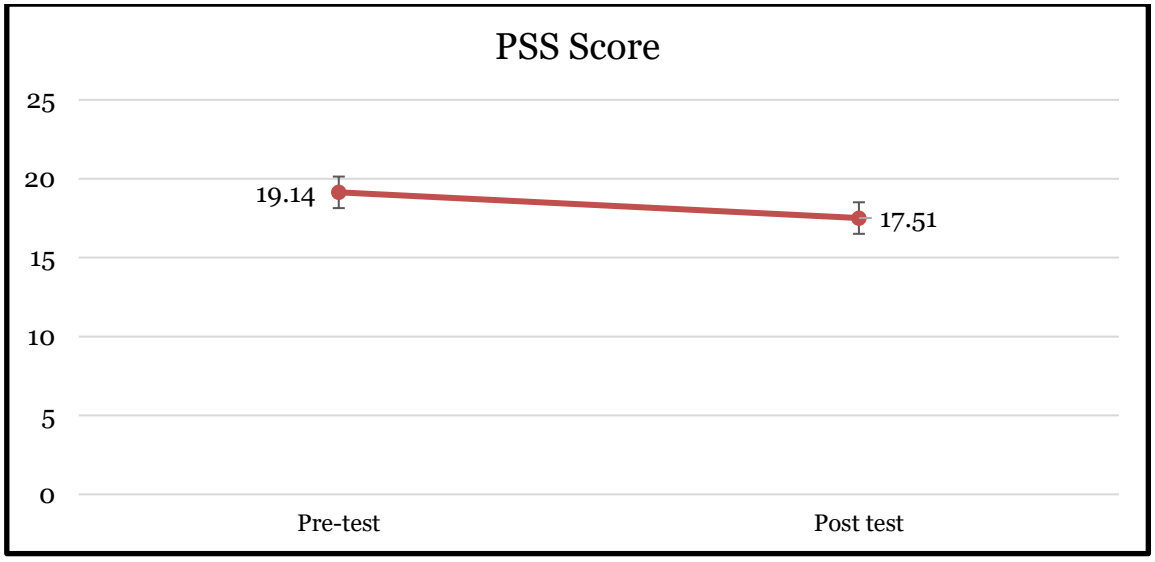


**Figure 1. Differences in PSS pre-test and post-test scores**

**2. Differences in PSS Pre-test and Post-test Scores**

The Wilcoxon test was used to assess differences in PSS scores before and after

treatment. The results are illustrated in the Figure 1. The mean PSS score in the pre-test was 19.14 ± 3.06. while the mean post-test score decreased to 17.51 ± 3.23. with a p-value of 0.000 < 0.005. This indicates a significant difference between pre-test and post-test scores in caregivers of children with neurodevelopmental disorders.

### 3. Comparison of Stress Levels in Pre-test and Post-test

Stress levels in the pre-test and post-test were tabulated using a cross-tabulation table and analyzed using the Wilcoxon test. Most participants (97.3) experienced moderate stress during the pre-test. while 2.7 had severe stress. After the intervention. moderate stress levels decreased to 90.5. severe stress was eliminated. and mild stress appeared at 9.5. The p-value of 0.003 < 0.005 indicates a significant difference in stress levels between pre-test and post-test in caregivers of children with neurodevelopmental disorders (Table 2).

**Table 2. Comparison of stress levels in pre-test and post-test**

| Stress Level | Pre-test | Post-test | Z | p | 95% CI | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Mild | 0 (0.0) | 7 (9.5) | -3.000 | 0.003 | 0.045 | 0.198 |
| Moderate | 72(97.3) | 67 (90.5) | | | | |
| Severe | 2 (2.7) | 0 (0.0) | | | | |

The evaluation of stress levels in the pre-test and post-test shows a reduction in stress levels among those with moderate and severe stress. Among 72 respondents with moderate stress. 9.7 improved to mild stress. while 90.3 remained at moderate stress. For the 2 respondents with severe stress. all (100) improved to moderate stress (see Table 3. Percentage Reduction in Post-test Stress Levels).

**Table 3. Percentage reduction in post-test stress levels**

| Pre-test | Post-test | Frequency (N) | Percentage (%) |
|---|---|---|---|
| | Mild stress | 7 | 9.7 |
| Moderate | Moderate stress | 65 | 90.3 |
| | Total | 72 | 100 |
| | Mild stress | 0 | 0 |
| Severe | Moderate stress | 2 | 100 |
| | Total | 2 | 100 |

### 4. Influence of Confounding Variables and Compliance with Listening to Audio on PSS Scores

Confounding variables in this study, including all demographic characteristics and compliance with listening to the audio intervention, were analyzed using a multiple linear regression to assess their association with changes in stress scores post-intervention. The pre-test PSS score was included as a baseline covariate to identify factors influencing post-intervention PSS scores.

P value of <0.001 indicates that the variables included in the test simultaneously influence the post-test PSS score. The coefficient of determination (R square) is 0.953. meaning that these variables account for 95.3 of the variation in the post-test PSS score. while the remaining 4.7 is influenced by other variables not included in the regression test.

This study showed that caregiver age, marital status, relationship with the child, education, occupation, number of children with disabilities, child's age, child's gender, and child's diagnosis were not significantly associated with caregiver's stress after the intervention. Meanwhile, family income, caregiving support, and compliance with listening to the audio have a significant influence on stress scores after the intervention (p <0.001) (Table 4).

**Table 4. The results of multiple linear regression**

| Independent Variables | b | 95% CI | | p |
|---|---|---|---|---|
| | | Lower limit | Upper limit | |
| Pre-test Score | 0.64 | 0.55 | 0.72 | <0.001 |
| Caregiver Age | <0.01 | -0.03 | 0.03 | 0.990 |
| Marital Status | -0.03 | -0.73 | 0.66 | 0.922 |
| Relationship with Child | 0.24 | -0.60 | 1.07 | 0.574 |
| Education | -0.09 | -0.37 | 0.19 | 0.518 |
| Occupation | 0.09 | -0.36 | 0.54 | 0.683 |
| Family Income | -1.23 | -1.60 | -0.86 | <0.001 |
| Number of Disabled Children | -0.73 | -0.22 | 1.68 | 0.128 |
| Caregiving Support | -0.95 | -1.48 | -0.43 | 0.001 |
| Child Age | -0.20 | -0.16 | 0.55 | 0.267 |
| Child Gender | -0.14 | -0.60 | 0.32 | 0.542 |
| Child Diagnosis | 0.03 | -0.18 | 0.22 | 0.737 |
| Compliance with Audio | -1.58 | -2.0 | -1.07 | <0.001 |

**5. Analysis of depression score difference of pre and post test**

This analysis aims to identify the variables that contribute to the effectiveness of the intervention in reducing respondents' stress levels, specifically caregiving support, income, and compliance. Figure 2 presents the changes in mean PSS scores from pre-test to post-test based on caregiving support. Figure 3 shows the changes based on income, while Figure 4 illustrates the overall changes in mean PSS scores from pre-test to post-test.

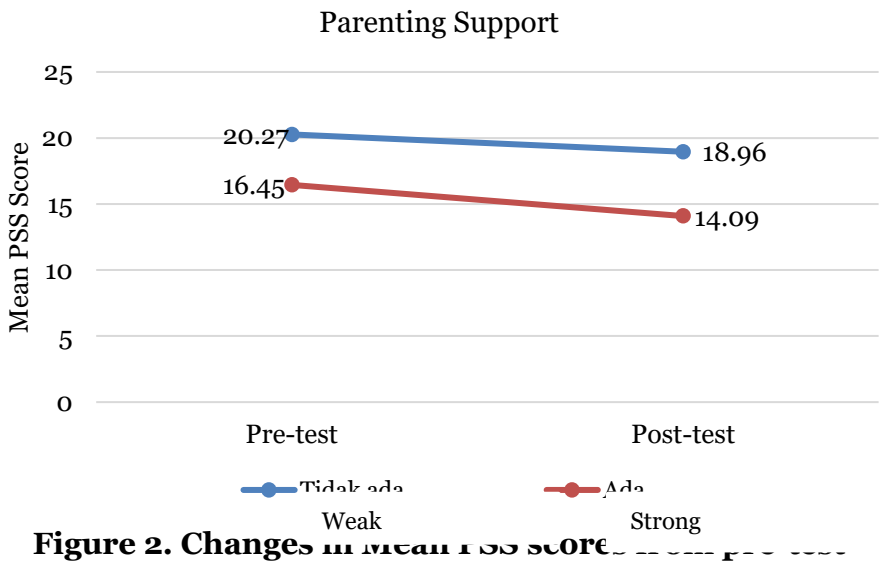


**Figure 2. Changes in Mean PSS score from pre-test to post-test based on caregiving support**

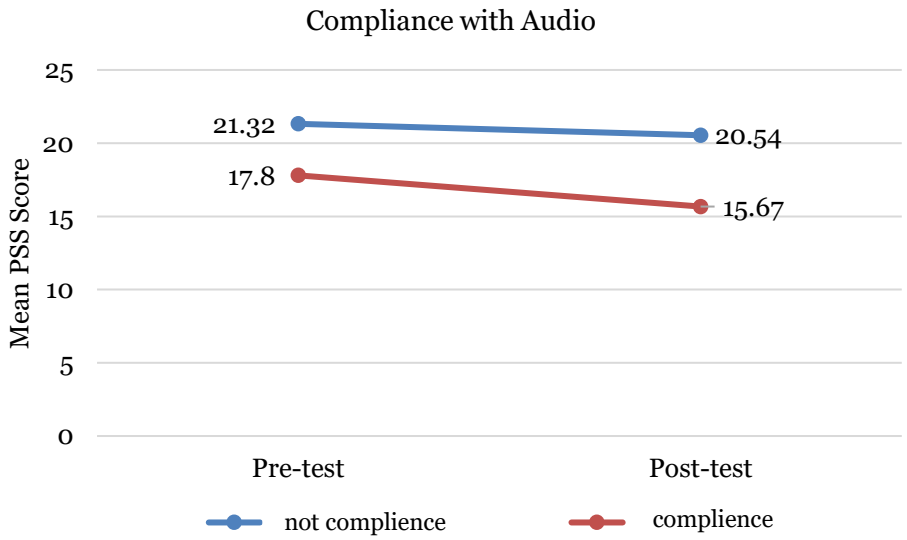


**Figure 4. Changes in Mean PSS scores from pre-test to post-test**

Based on caregiving support, the changes in mean PSS scores from pre-test to post-test are as follows. In the group with caregiving support, the mean pre-test PSS score was 16.45, which decreased to 14.09 after the intervention. In contrast, the group without caregiving support had a higher mean pre-test score of 20.27, which decreased to 18.96 post-intervention. Although both groups experienced a reduction in stress levels, the group with caregiving support showed a greater decrease (Δ= 2.36) compared to the group without support (Δ= 1.31). These results suggest that the intervention was effective in reducing stress, with a more significant reduction observed among respondents who had caregiving support.

Figure 3 illustrates the change in mean PSS scores from pre-test to post-test based on income levels. In the group with an income below two million, the mean PSS score decreased from 19.74 to 18.74. For those with an income between two and three million, the score dropped from 18.25 to 15.45. Meanwhile, in the group with an income above three million, the mean score declined from 16.00 to 12.50.

These results indicate that the intervention effectively reduced stress levels across all income groups. However, the reduction was more pronounced in higher-income groups. Specifically, the group earning below two million experienced a decrease of Δ= 1.00, the two-to-three million group showed a larger decrease of Δ= 2.80, and the highest income group exhibited the greatest reduction, at Δ= 3.50.

Figure 4 illustrates the change in mean PSS scores from pre-test to post-test based on compliance with listening to the audio intervention. In the compliant group, the mean pre-test PSS score was 17.80, which decreased to 15.67 post-intervention. In contrast, the non-compliant group had a higher mean pre-test score of 21.32, which only slightly decreased to 20.54 after the intervention. These findings suggest that participants who complied with the audio intervention experienced a greater reduction in stress levels compared to those who did not comply.

The reduction in mean PSS scores suggests that the audio-based intervention had a positive effect on stress reduction, with a more substantial impact observed

among participants who complied with the listening protocol. The compliant group experienced a mean PSS score reduction of Δ= 2.13, whereas the non-compliant group showed a smaller reduction of Δ = 0.78.

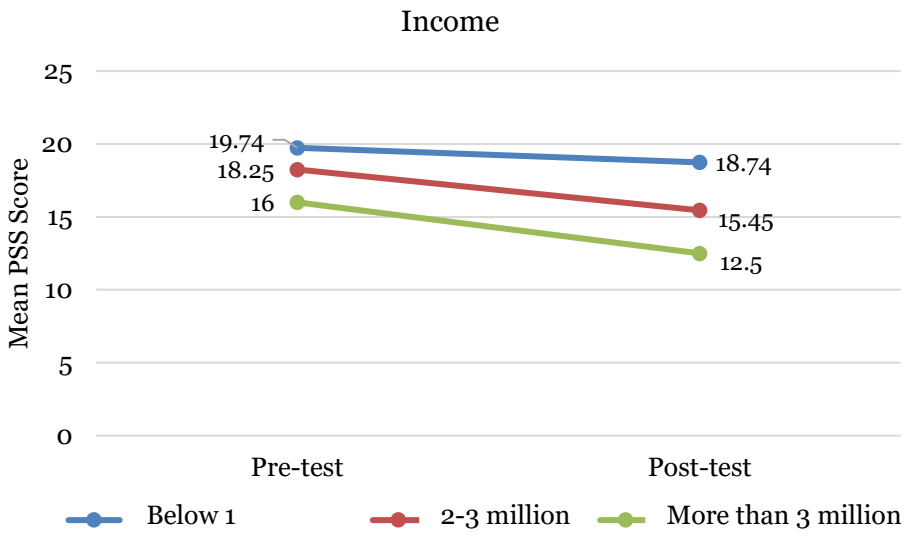


**Figure 3. Changes in Mean PSS scores from pre-test to post-test based on income**

## DISCUSSION

The demographic characteristics of parent caregivers of children with neurodevelopmental disorders in this study revealed that the majority of respondents were biological mothers (91.9%), most had at least a high school education (79.7%), were unemployed (66.2%), had a family income below 2,000,000 IDR (67.6%), and lacked caregiving support (70.3%). These findings are consistent with those of Maridal et al. (2021), who reported that 95% of caregivers were biological mothers, highlighting the predominant caregiving role of mothers in families with children with neurodevelopmental disorders. Similarly, the caregivers' education level aligns with the findings of Herrero et al. (2024), which showed that 85.2% of caregivers for children with autism spectrum disorder (ASD) had completed secondary or higher education. Higher education levels are often associated with increased knowledge about neurodevelopmental disorders and the use of more effective caregiving strategies. However, a higher level of education does not necessarily correspond to greater workforce participation. Many mothers face reduced leisure time, lack of social support, social isolation, and limited opportunities to work outside the home (Herrero et al., 2024).

The characteristics of the children in this study showed that the majority were aged 7–12 years (56.8%) and male (78.4%). The most common diagnoses were Attention Deficit Hyperactivity Disorder (ADHD) (31.1%), Intellectual Disability (27.0%), and Autism Spectrum Disorder (25.7%). These findings are consistent with previous studies that have reported similar demographic patterns among children with neurodevelopmental disorders. For example, ADHD is more commonly diagnosed in school-aged children (Salari et al., 2023). Additionally, research has consistently shown that neurodevelopmental disorders are diagnosed more frequently in boys than in girls (Francés et al., 2022).

This study found a mean reduction in PSS scores of 3.63 (Mean= 3.63; SD= 0.17) at post-test compared to pre-test scores, with a p-value of <0.001, indicating a statistically significant difference. This suggests that the WHO stress management intervention effectively reduced perceived stress among parent caregivers of children with neurodevelopmental disorders. Further statistical analysis comparing stress levels before and after the intervention confirmed a significant difference (p = 0.003). Among the 72 respondents who initially reported moderate stress levels, 9.7% improved to mild stress, while 90.3% remained at the moderate level. Notably, both respondents (100%) who initially had severe stress experienced a reduction to moderate stress following the intervention. These findings support the effectiveness of the WHO intervention in helping parent caregivers manage and reduce their stress levels.

These findings are consistent with previous research on the effectiveness of stress management interventions, such as mindfulness training and relaxation techniques. For instance, Hartley et al. (2019) found that mindfulness training supports emotional regulation and can significantly reduce stress in caregivers of children with autism spectrum disorder (ASD). Similarly, Behbahani et al. (2018) demonstrated that Mindful Parenting interventions effectively decreased stress and reduced negative parent-child interactions among caregivers of children with ADHD. In addition, Catalano et al. (2018) reported a significant 37.1% reduction in perceived stress scores following relaxation therapy and progressive muscle relaxation interventions among mothers of children with ASD. Likewise, Bray et al. (2017) found that relaxation and guided imagery interventions were effective in lowering anxiety, depression, and stress levels in parents of children with developmental disabilities.

These research findings are supported by several theoretical frameworks. Mindfulness practices have been shown to increase parasympathetic nervous system activity and reduce peripheral stress responses by lowering hypothalamic-pituitary-adrenal (HPA) axis activation (Jaiswal et al., 2019). Chronic stress can negatively impact the immune system and trigger the release of stress hormones such as cortisol. Mindfulness trains individuals to recognize and respond to stress with a non-judgmental and accepting attitude, rather than reacting with anxiety or resistance. This adaptive response can reduce the likelihood of stress inducing inflammatory processes in the body (Willekens et al., 2018). Similarly, relaxation techniques induce physiological effects that are opposite to those of stress and anxiety, including reduced heart rate, improved peripheral blood flow, and neuromuscular stability. These changes help counteract adrenergic stress responses, thereby contributing to stress reduction. The WHO stress management module used in this study incorporates both mindfulness and relaxation-based techniques (Octaviani et al., 2023), enabling participants to manage stress more effectively.

While the statistically significant reduction in PSS scores and stress levels observed at post-test suggests the effectiveness of the intervention, further evaluation is needed to determine its clinical relevance and long-term impact. This is particularly important given the chronic nature of stress experienced by caregivers of children with neurodevelopmental disorders (George, 2022). Chronic stress has been shown to cause morphological changes in brain regions sensitive to stress and can impair

behavior, autonomic regulation, and neuroendocrine responses, often requiring a prolonged recovery period (McEwen & Akil, 2020; Godoy et al., 2018). In this study, the WHO stress management intervention was delivered over only two sessions (one session per week), which is considerably shorter than other established interventions. For example, Siebelink et al. (2022) implemented an eight-week mindfulness-based intervention (MBI) for parents of children with ADHD, while Bray et al. (2017) conducted a six-week guided imagery program for parents of children with developmental disabilities. Additionally, the frequency of engagement with the intervention materials was lower in the present study, with participants instructed to listen to audio recordings at least once per session, in contrast to other studies where relaxation techniques were practiced twice daily (Catalano et al., 2018) or guided imagery was used once daily (Bray et al., 2017). These differences highlight the need for future research to explore the optimal duration and frequency of intervention to achieve more sustained benefits for caregivers.

The assessment of confounding variables using multivariate linear regression analysis revealed that certain factors significantly influenced the reduction in post-test PSS scores, namely family income, caregiving support, and compliance with listening to the audio recordings. These findings align with previous studies indicating that economic conditions, availability of caregiving support, and adherence to interventions are key determinants of the effectiveness of stress management programs.

Economic factors, including family income, contribute substantially to parental stress. Families with higher income levels generally have greater access to healthcare, education, and support services, which can alleviate stress (Prata et al., 2019). Caregiving support—defined as the presence of assistance from individuals other than the parents in caring for children with neurodevelopmental disorders—has also been shown to significantly reduce parental stress. A supportive caregiving environment helps mitigate the psychological burden and emotional exhaustion experienced by parents (Craig et al., 2016; Silva et al., 2019). Parents who receive such support are more likely to experience lower levels of distress and demonstrate more effective coping strategies (Lindsey & Barry, 2018).

Furthermore, compliance with the intervention, particularly the consistent use of guided audio recordings, was associated with greater reductions in stress. While the intervention did not entirely eliminate stress, respondents who adhered to the listening schedule at least once per session exhibited greater improvements in PSS scores compared to non-compliant participants. This supports existing evidence that adherence is a critical factor in maximizing the benefits of mindfulness-based interventions for stress reduction (Forbes et al., 2018).

The regression analysis indicated that the variables included in the model explained 95.3% of the variance in post-test PSS scores, while the remaining 4.7% was attributed to factors not captured by the model. This finding aligns with the biopsychosocial model of stress, which posits that stress is influenced by an interplay of biological, psychological, and social factors. In the context of parents caring for children with neurodevelopmental disorders (NDD), relevant stress-related factors include parental and child characteristics, social and family support, socioeconomic status, and access to professional support (Prata et al.,

2019). These components interact dynamically to shape the stress levels experienced by caregivers (Craig et al., 2016).

As a preliminary study, this research offers a foundational understanding that can inform future investigations. Further studies with larger sample sizes and extended intervention periods are necessary to validate and expand upon these findings, thereby enhancing the design and effectiveness of caregiver-focused stress management strategies. Additionally, this study provides valuable insights into respondent adherence to the intervention, contributing to the broader understanding of how implementation fidelity may impact the effectiveness of the WHO stress management module in reducing caregiver stress..

However, this study has several limitations that should be acknowledged. First, the absence of a control group limits the ability to definitively attribute the observed reductions in stress to the WHO stress management intervention, as improvements may have been influenced by other external or internal factors. Second, while the reduction in Perceived Stress Scale (PSS) scores was statistically significant, its clinical relevance remains uncertain. Further research is needed to determine whether more intensive or prolonged interventions can produce greater reductions in stress and whether such changes translate into meaningful clinical outcomes.

Additionally, due to resource constraints, the researchers were unable to closely monitor participants' adherence to practicing the WHO stress management techniques in their daily lives. This lack of monitoring may have affected the consistency and fidelity of intervention implementation. To mitigate this issue in future studies, it may be beneficial to deliver the entire module in a single, comprehensive session accompanied by guided practice. This approach could enhance participant understanding and improve the integration of stress management strategies into daily routines.

## AUTHORS CONTRIBUTION

Alifiani Nurrohmah conceptualized the research topic, developed the study proposal, conducted data collection and analysis, and drafted the initial version of the manuscript. Gusti Ayu Maharatih supervised the overall research process, provided critical input on the study design and analytical approach, and revised the manuscript for important intellectual content. Vitri Widyaningsih contributed to refining the research questions and provided guidance in interpreting the results.

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## CONFLICT OF INTEREST

There was no conflict of interest in this study.

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