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Effectiveness of Traditional Remedies *Pucuk Jarak* and *Bedak Langeh* in Melongas Massage on the Growth and Development of Stunted Toddlers

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Abstract

Stunting is a serious health problem among toddlers, characterized by delayed physical growth due to inadequate nutrition, a history of infectious diseases, low maternal education, and suboptimal parenting. In North Lombok Regency, the prevalence of stunting remained high at 19.3% in 2023. Efforts to address this issue have not only focused on nutritional interventions but also included complementary non-pharmacological therapies, such as *melongas* massage, which has been traditionally practiced using pucuk jarak and bedak langeh remedies. This study aimed to examine the effectiveness of these two remedies on the growth and development of stunted toddlers. A quasi-experimental nonequivalent control group design was applied, involving 72 stunted toddlers divided into three groups: pucuk jarak, bedak langeh, and control. The intervention was carried out for four weeks with melongas massage administered twice weekly. The measured parameters included body weight, height, appetite, sleep quality, and immune function. The results showed that the pucuk jarak group experienced more significant improvements across all parameters compared to the bedak langeh and control groups. Phytochemical tests supported these findings, showing total flavonoid levels of 53.32 mgQE/g in pucuk jarak compared to 3.58 mgQE/g in bedak langeh. The high flavonoid content is believed to play an important role in improving metabolism, appetite, growth, and immunity in toddlers. Thus, melongas massage using pucuk jarak has the potential to serve as a complementary strategy rooted in local wisdom for accelerating stunting reduction programs in North Lombok.

Keywords: Herbal Massage Formulation; Stunting; Toddler Massage; Pucuk Jarak; Traditional.

INTRODUCTION

Stunting is a growth disorder in children under five years old, marked by a shorter height compared to their age (Schneider, 2025). It can be caused by low energy intake, long-term illness, low birth weight, low maternal education, low family income, insufficient protein intake, and lack of exclusive breastfeeding (Isasih, Fajriani, et al., 2024). In 2023, there were 149.2 million stunted children worldwide (22%); in Indonesia, 21.5%; in West Nusa Tenggara, 24.6%; and in North Lombok Regency, 19.3% (Astuti et al., 2025). The government has addressed stunting through food supplements, iron tablets, sanitation improvements, deworming, and non-pharmacological complementary therapy (Isasih, Inayati, et al., 2024). One such therapy is toddler massage (Widianti, 2025). Regular massage can increase catecholamine hormones (*epinephrine and norepinephrine*), stimulating growth and development by improving appetite, weight gain, and brain development (Fifit & Luvi Dian Afriyani, 2023). Previous studies showed that toddler massage accelerates gastric emptying, induces hunger, relaxes the body, improves sleep quality, and enhances nutrient absorption for optimal growth (Dessie et al., 2024; Sofiana et al., 2025).

In Indonesia, toddler massage is widely practiced, including in North Lombok, where it is called *melongas*. This traditional practice, passed down through generations, involves traditional massage therapists using herbal remedies such as *jarak* mixture (young *jarak* leaves and candlenut) and *bedak langeh* (a mixture of grated coconut, rice flour, and turmeric) (Isasih et al., 2025). These herbs, sourced locally, are believed to aid children with illnesses or developmental delays such as late sitting, crawling, walking, or standing. Their effectiveness is closely associated with the ability of flavonoids to induce relaxation in smooth muscle fibers, a process that also involves modulation of muscarinic receptor activity, thereby contributing to improved physiological regulation of muscle tone and overall organ function (Adibah et al., 2025; Makkayu et al., 2025; Rahayu et al., 2024; Tridesianti et al., 2025).

Stunting remains a serious health problem in North Lombok (19.3%). Thus, comprehensive efforts are needed, including non-pharmacological complementary therapies. *Melongas* massage, using *pucuk jarak* and

bedak langeh, is widely believed to be beneficial, but no scientific evidence yet confirms its effectiveness. This research aims to evaluate the impact of traditional herbal remedies used in *melongas* massage on the growth of stunted children. The study not only measures clinical outcomes but also examines total flavonoid levels, ensuring safety, acceptability, and bioactive content. Its novelty lies in being the first of its kind, providing a scientific foundation for traditional practices and offering a locally based alternative for accelerating stunting reduction.

MATERIALS AND METHODS

Study area

This study employed a quantitative research method with a quasi-experimental approach using a nonequivalent control group design (Norman & Roggman, 2025). The research was conducted in Kroya Hamlet, Tanjung Village, Tanjung Subdistrict, North Lombok Regency, from July to August 2025. It consisted of an experimental group treated with *melongas* using pucuk jarak and bedak langeh formulations, and a control group receiving *melongas* without formulations, selected without randomization. The study population included all stunted toddlers in Tanjung Subdistrict, North Lombok Regency, totaling 72 children. Sampling was conducted using the total population method, resulting in 24 children receiving *pucuk jarak*, 24 children receiving *bedak langeh*, and 24 stunted children assigned to the control group.

Procedures

Data collection began with testing the total flavonoid content using the UV-Vis spectrophotometer method on all formulations applied in *melongas* massage (Suryanis et al., 2022). The target was to compare the total flavonoid content. A pretest was then conducted for both experimental and control groups, measuring growth and development through body weight and height (anthropometric questionnaire), appetite (Food Frequency Questionnaire/FFQ), sleep quality (Pittsburgh Sleep Quality Index/PSQI), and immunity. The goal of the pretest was to obtain a baseline profile of stunted children before treatment. The treatment phase involved melongas massage with *pucuk jarak* and *bedak langeh* formulations for the experimental group, while the control group received melongas massage without formulations. Massages were given twice a week for 10–15 minutes over four weeks, using gentle strokes with light pressure on the head, back of the neck, chest, back, arms, thighs, calves, and feet in one direction, as well as circular motions on the abdomen, palms, and soles to enhance circulation and provide relaxation (Aryani et al., 2022). The massage was performed by experienced traditional therapists trusted by the community.

The *pucuk jarak* formulation consisted of ground castor shoot leaves and candlenut, while the *bedak langeh* formulation was made from ground coconut, turmeric, and rice. Both formulations were freshly prepared before each treatment. Prior to treatment, therapists were briefed to ensure consistency in timing, technique, and massage areas. The treatment target was the successful application of *melongas* massage using traditional formulations in all experimental groups. Posttests of growth and development were conducted every two sessions after the massage. The goal of the posttest was to identify which traditional formulation was most effective in improving the growth and development of stunted children.

Data analysis

The study results were subsequently subjected to statistical analysis employing the Two-Way Analysis of Variance (Two-Way ANOVA).

RESULTS AND DISCUSSION

Result

This study was conducted on 24 children treated with *pucuk jarak* formulation, 24 children treated with *bedak langeh*, and 24 stunted children in the control group. The findings revealed the frequency distribution of the characteristics of stunted children, as presented in the following table:

Table 1. Frequency distribution of characteristics of stunted children receiving *melongas* treatment in the intervention and control groups.

Characteristics Of Stunted Children	Intervention Group				Control Groups	
	Pucuk Jarak Group		Bedak Langeh Group			
	F	%	F	%	F	%
Age (months)						
≥ 24–35	7	29.2	3	12.5	12	50.0
36–46	8	33.3	13	54.2	6	25.0
47–59	9	37.5	8	33.3	6	25.0
Total	24	100.0	24	100.0	24	100.0
Gender						
Male	15	62.5	18	75.0	9	37.5
Female	9	37.5	6	25.0	15	62.5
Total	24	100.0	24	100.0	24	100.0
Breast Milk						
Exclusive Breastfeeding	20	83.3	23	95.8	19	79.2
Non-Exclusive Breastfeeding	4	16.7	1	4.2	5	20.8
Total	24	100.0	24	100.0	24	100.0

Based on Table 1, it can be seen that the frequency distribution of stunted toddlers given the *Melongas* massage treatment shows that most were aged 47–59 months (37.5%) in the traditional remedies pucuk jarak group, 36–46 months (54.2%) in the *bedak langeh* group, and ≥24–35 months (50.0%) in the control group. The study also revealed that most stunted toddlers who received the *Melongas* massage in the intervention groups were male: 62.5% in the traditional remedies pucuk jarak group, 75.0% in the *bedak langeh* group, while in the control group, the majority were female (62.5%). The results further showed that most stunted toddlers who received *Melongas* massage had exclusive breastfeeding: 83.3% in the traditional remedies *pucuk jarak* group, 95.8% in the bedak langeh group, and 79.2% in the control group.

Total flavonoid content in traditional remedies *pucuk jarak* and *bedak langeh* used in *Melongas* massage for stunted toddlers

Table 2. Total flavonoid content in traditional remedies pucuk jarak and bedak langeh used in Melongas massage for stunted toddlers.

Herbal Mixture	Concentration Of Total Flavonoids (Mgqe/G)
Remedies Pucuk Jarak	53,32
Bedak Langeh	3,58

The phytochemical test results showed that the remedies *pucuk jarak* herbal mixture contained a much higher total flavonoid level compared to the *bedak langeh* mixture. The total flavonoid content in the remedies *pucuk jarak* mixture was recorded at 53.32 mgQE/g, while the *bedak langeh* mixture contained only 3.58 mgQE/g.

The frequency distribution of body weight, height, appetite, sleep quality, and immune resilience among stunted toddlers who received the *Melongas* massage in the traditional remedies *pucuk jarak* group, the *bedak langeh* group, and the control group is presented in the following table:

Table 3. Frequency Distribution of Body Weight, Height, Appetite, Sleep Quality, and Immunity of Stunted Toddlers Treated with Melongas Massage In Intervention and Control Groups.

Category	Intervention Group				Control Groups	
	Pucuk Jarak Group		Bedak Langeh Group			
	F	%	F	%	F	%
Body Weight						
Increased	20	83.3	15	62.5	10	41.7
Decreased	1	4.2	2	8.3	1	4.2
Remained The Same	3	12.5	7	29.2	13	54.2
Total	24	100.0	24	100.0	24	100.0
Height						
Increased	18	75.0	13	54.2	4	16.7
Decreased	6	25.0	11	45.8	20	83.3
Total	24	100.0	24	100.0	24	100.0
Appetite						
Increased	20	83.3	11	45.8	8	33.3
Decreased	1	4.2	6	25.0	3	12.5
Remained The Same	3	12.5	7	29.2	13	54.2
Total	24	100	24	100	24	100
Sleep Quality						
Increased	19	79.2	18	75.0	13	54.2
Decreased	3	12.5	2	8.3	6	25.0
Remained The Same	2	8.3	4	16.7	5	20.8
Total	24	100	24	100	24	100
Immunity						
Increased	19	79.2	18	75.0	13	54.2
Decreased	3	12.5	2	8.3	6	25.0
Remained The Same	2	8.3	4	16.7	5	20.8
Total	24	100	24	100	24	100

Based on Table 3, it can be observed that there was an increase in body weight among stunted toddlers in the intervention groups, namely 83.3% in the traditional remedies *pucuk jarak* group and 62.5% in the *bedak langeh* group. Meanwhile, in the control group, most children had stable body weight, accounting for 54.2%. The results also showed an increase in height among stunted toddlers in the intervention groups, with 75% in the traditional remedies *pucuk jarak* group and 54.2% in the *bedak langeh* group. In contrast, the majority of the control group maintained the same height (83.3%). Furthermore, an increase in appetite was observed in the intervention groups, with 83.3% in the traditional remedies *pucuk jarak* group and 45.8% in the *bedak*

langeh group. Meanwhile, in the control group, most toddlers maintained the same appetite (54.2%). The findings also revealed improvements in sleep quality and immunity among stunted toddlers across both intervention and control groups, recorded at 79.2% in the traditional remedies *pucuk jarak* group, 75% in the *bedak langeh* group, and 54.2% in the control group.

The results of the normality test for the variables of body weight, height, appetite, sleep quality, and immunity of stunted toddlers who received *Melongas* massage in the traditional remedies *pucuk jarak* group, the *bedak langeh* group, and the control group are presented in the following table:

Table 4. Results of the normality test of body weight, height, appetite, sleep quality, and immunity variables in stunted toddlers in the intervention and control groups.

Category	Shapiro-Wilk		
	Statistic	Df	Sig.
Body Weight			
Pre- pucuk jarak	0.997	10	0.899
Post- pucuk jarak	0.993	10	0.911
Pre- bedak langeh	0.987	10	0.888
Post- bedak langeh	0.981	10	0.892
Pre control	0.978	10	0.974
Post control	0.954	10	0.87
Height			
Pre- pucuk jarak	0.987	10	0.976
Post- pucuk jarak	0.973	10	0.856
Pre- bedak langeh	0.966	10	0.879
Post- bedak langeh	0.971	10	0.882
Pre control	0.958	10	0.874
Post control	0.964	10	0.864
Appetite			
Pre- pucuk jarak	0.987	10	0.735
Post- pucuk jarak	0.985	10	0.921
Pre- bedak langeh	0.978	10	0.888
Post- bedak langeh	0.954	10	0.892
Pre control	0.968	10	0.974
Post control	0.984	10	0.87
Sleep Quality			
Pre- pucuk jarak	0.997	10	0.899
Post- pucuk jarak	0.993	10	0.911
Pre- bedak langeh	0.987	10	0.888
Post- bedak langeh	0.981	10	0.892
Pre control	0.978	10	0.974
Post control	0.954	10	0.87
Immunity			
Pre- pucuk jarak	0.955	10	0.735
Post- pucuk jarak	0.968	10	0.812
Pre- bedak langeh	0.973	10	0.891
Post- bedak langeh	0.984	10	0.921
Pre control	0.954	10	0.888
Post control	0.987	10	0.892

Based on Table 4, it can be observed that the variables of body weight, height, appetite, sleep quality, and immunity among stunted toddlers who received the *Melongas* massage treatment in both the intervention and control groups were normally distributed, as indicated by a significance value of >0.05 using the Shapiro–Wilk test.

The effectiveness of traditional traditional remedies *pucuk jarak* and *bedak langeh* in the *Melongas* massage for supporting the growth and development of stunted toddlers can be seen in the following table:

Table 5. Effectiveness Of Traditional Traditional Remedies Pucuk Jarak and Bedak Langeh In the Melongas Massage on The Growth And Development of Stunted Toddlers.

Category	Intervention Group								Control Group				P Value
	Pucuk Jarak Group				Kelompok Bedak Langeh								
	N	Min	Max	Mean	N	Min	Max	Mean	N	Min	Max	Mean	
Body Weight													0,021
Pretest	24	5000 (Gram)	11000 (Gram)	10860 (Gram)	24	4300 (Gram)	10000 (Gram)	90100 (Gram)	24	4800 (Gram)	10400 (Gram)	8200 (Gram)	
Posttest	24	6500 (Gram)	15000 (Gram)	13840 (Gram)	24	4970 (Gram)	12000 (Gram)	10900 (Gram)	24	4350 (Gram)	10900 (Gram)	8800 (Gram)	
Height													0,011
Pretest	24	58 Cm	83 Cm	88 Cm	24	56 Cm	86 Cm	78 Cm	24	58 Cm	85 Cm	74 Cm	
Posttest	24	73 Cm	100 Cm	97 Cm	24	62 Cm	92 Cm	82 Cm	24	59 Cm	87 Cm	74,8 Cm	
Appetite													0,028
Pretest	24	13	17,2	15	24	14	16	14,3	24	13	17	15	
Posttest	24	17	24	22	24	15,8	18	16	24	13	18	15,7	
Sleep Quality													0,035
Pretest	24	18,3	23	22	24	17	22	21	24	17	22	21	
Posttest	24	24,8	28	27	24	19	23	22	24	17,8	22,4	21,6	
Immunity													0,033
Pretest	24	13,2	18	16	24	14	16	14,3	24	13	17	15	
Posttest	24	17,6	26	24	24	15	18	16	24	13	18	15,7	

Based on Table 4, it can be seen that in the initial measurement (pretest), the average body weight of respondents in the traditional remedies *pucuk jarak* group was 10,860 grams, in the *bedak langeh* group 9,100 grams, and in the control group 8,200 grams. After the intervention, body weight increased significantly, especially in the traditional remedies *pucuk jarak* group, reaching an average of 13,840 grams. Meanwhile, the *bedak langeh* group increased to 10,900 grams, and the control group only rose slightly to 8,800 grams. Statistical tests showed a p-value of 0.021, indicating significant differences between groups. The height measurement results showed that, at pretest, the average height in the traditional remedies *pucuk jarak* group was 68 cm, in the *bedak langeh* group 78 cm, and in the control group 74 cm. After the intervention, the average height in the traditional remedies pucuk jarak group increased to 97 cm, in the *bedak langeh* group to 82 cm, while the control group only reached 74.8 cm. The statistical test results yielded a p-value of 0.011, indicating significant differences between groups.

The average appetite score in the traditional remedies *pucuk jarak* group rose sharply from 15 in the pretest to 22 in the posttest. In the *bedak langeh* group, the score increased from 14.3 to 16, while in the control group it only rose slightly from 15 to 15.7. A p-value of 0.028 indicated significant differences between the intervention groups and the control group.The quality of sleep also showed greater improvement in the traditional remedies *pucuk jarak* group, with the average score increasing from 22 in the pretest to 27 in the posttest. In the *bedak langeh* group, the score only rose from 21 to 22, while in the control group it remained relatively stable, from 21 to 21.6. Statistical tests showed a p-value of 0.035, indicating significant differences between groups. The average immune system score in the traditional remedies *pucuk jarak* group increased from 16 to 24 after the intervention. In the *bedak langeh* group, the score rose only from 14.3 to 16, while in the control group it increased slightly from 15 to 15.7. Statistical tests showed a p-value of 0.033, indicating significant differences between groups.

Overall, these findings indicate that the traditional remedies *pucuk jarak* intervention had a stronger effect on body weight, height, appetite, sleep quality, and immune function compared with the *bedak langeh* and control groups.

Discussion

Variations in age may influence the body's response to the Melongas massage intervention, as older children present more complex growth patterns and nutritional requirements. Previous studies have noted that children aged 24–59 months are particularly vulnerable to stunting, given that they remain in a period of rapid growth and thus require adequate nutritional intake (Isasih & Inayati, 2024). This finding is consistent with earlier research indicating that boys are at greater risk of stunting than girls, a disparity attributed to their higher energy and macronutrient needs as well as increased susceptibility to infectious diseases (Habibah et al., 2021). Such gender, based differences in nutritional status and immune response may, in turn, influence the outcomes of interventions. Furthermore, these observations align with prior evidence highlighting the importance of exclusive breastfeeding in mitigating the risk of stunting, as breast milk provides complete nutrition alongside immunological protection against disease (Indah et al., 2024). Nevertheless, cases of stunting persist even among exclusively breastfed

children. This suggests that breastfeeding alone is insufficient; it must be complemented by balanced complementary feeding, effective parenting practices, and adequate stimulation for growth and development, as corroborated by other studies (Dartiwen & Aryanti, 2024).

Taken together, factors such as age, gender, and breastfeeding history illustrate the baseline conditions of stunted toddlers prior to intervention. Existing literature supports the conclusion that children under five particularly boys are more susceptible to stunting, while exclusive breastfeeding remains critical in prevention, though it is not a singular determining factor (Indah et al., 2024). Importantly, the Melongas massage, when integrated with pucuk jarak and bedak langeh, demonstrates continued effectiveness in enhancing growth status and overall health outcomes in stunted toddlers.

The large difference in flavonoid levels shows that pucuk jarak has greater potential to provide health benefits, especially in terms of antioxidant activity and improving the immune system. Flavonoids are bioactive compounds that can fight free radicals, strengthen the body's defenses, and support growth and tissue repair (Windi Habsari, Dita Ayu Lestari, 2025). The high flavonoid content in pucuk jarak is consistent with the intervention results, where the group that received this remedy showed improvements in body weight, height, appetite, sleep quality, and immunity. Other studies also support this. For instance, a 96% ethanol extract of *Vernonia cinerea L.* was found to contain 82.96 mgQE/g of flavonoids (Hasyim et al., 2025), a result similar though higher than that of pucuk jarak. On the other hand, pumpkin flesh (*Cucurbita maxima D.*) only had 8.8 mgQE/g, even lower than bedak langeh (Abdunisa & Hardini, 2024). This comparison shows that pucuk jarak has much higher flavonoid levels than several other plants, which may explain the significant improvements in growth and health observed in this study. The high flavonoid content is therefore considered one of the key factors behind the effectiveness of the intervention (Sumarni & Injiyahi, 2024).

The results show that the *pucuk jarak* remedy was more effective than the other groups. Its high flavonoid and bioactive compound content helps improve metabolism and appetite, which in turn supports weight gain. This agrees with earlier studies showing that herbal interventions can improve children's nutrition by enhancing digestion and nutrient absorption (Windi Habsari, Dita Ayu Lestari, 2025). The study also confirms that Melongas massage combined with *pucuk jarak* and *bedak langeh* supports child growth. Previous research found that traditional massage can stimulate growth hormone secretion, which aids linear growth in toddlers (Hanifa, 2022). This effect may be linked to the much higher flavonoid level in *pucuk jarak* (53.32 mgQE/g) compared to *bedak langeh* (3.58 mgQE/g), which helps stimulate digestion and increase appetite. Similar findings were reported in studies showing that flavonoid-rich herbs improve digestive enzyme activity and appetite in children (Rahayu et al., 2024)

Better sleep quality also plays an important role in recovery, growth hormone balance, and immune strength. Relaxation-based therapies such as massage have been shown to improve sleep and reduce children's risk of infection, a major factor in stunting(Arieska et al., 2025). Overall, this study highlights that Melongas massage with *pucuk jarak* provides stronger benefits for nutrition and health in stunted toddlers compared to *bedak langeh* or control groups. Its superiority is linked to higher levels of bioactive compounds, especially flavonoids, which are known to support metabolism, growth, and immunity.

This result matches earlier studies showing that child growth data often follow a normal distribution after nutrition and physical stimulation interventions. This makes it possible to use parametric tests such as the t-test or ANOVA to analyze group differences (Norman & Roggman, 2025). Normal data distribution is important because it increases the accuracy of the analysis and reduces bias. The findings also show that differences in body weight, height, appetite, sleep quality, and immunity were relatively even and without extreme variations. This suggests that the group differences are more likely caused by the *Melongas* massage with traditional remedies, not by irregular data distribution. A good normality test result is therefore a sign of strong data quality, making the interpretation of the intervention more reliable.

These results are in line with Mulyana and Herlina's research, which found that traditional massage as a complementary therapy can increase body weight and appetite in stunted toddlers by stimulating the vagus nerve that regulates digestion (Mulyana & Herlina, 2025). Putri's study also showed that local wisdom-based herbal remedies containing flavonoids improve toddlers' nutritional status by enhancing nutrient absorption and strengthening immunity (Putri et al., 2025). The improvement in sleep quality observed in the traditional remedies *pucuk jarak* group supports earlier findings that infant massage boosts melatonin secretion, improving sleep patterns and growth (Dianita Zahra et al., 2022). Likewise, the enhanced immune function corresponds with studies showing that flavonoid-rich herbal remedies increase lymphocyte activity, thereby strengthening immunity (Tridesianti et al., 2025).This study not only confirms past findings but also offers novelty by testing locally rooted practices *pucuk jarak* and *bedak langeh* combined with *Melongas* massage. It highlights that integrating local wisdom with science can be a promising complementary strategy to reduce stunting, especially in high-prevalence areas like North Lombok Regency.

CONCLUSIONS

Based on the results and discussion of this study, it can be concluded that the intervention with the traditional remedies pucuk jarak mixture significantly improved body weight, height, appetite, sleep quality, and immunity of respondents compared to the bedak langeh group and the control group. These positive effects are supported by the high total flavonoid content of the traditional remedies pucuk jarak mixture, recorded at 53.32 mgQE/g, which is much higher than that of the bedak langeh mixture at only 3.58 mgQE/g. This finding is consistent with previous studies while also providing novelty in the use of traditional remedies in Melongas massage practice. Therefore, the traditional remedies pucuk jarak mixture has the potential to be developed as a complementary strategy in addressing stunting, particularly in regions with high prevalence such as North Lombok Regency.

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Authors' Contributions: Widani darma isasih. specializing in public health, the chairperson acts as the initiator of the research topic, participates in collecting data on sleep quality and immunity of stunted toddlers, coordinates the total flavonoid content analysis, and ensures consistency in Melongas massage techniques with the therapist. They also take part in data management and analysis, as well as in preparing the research proposal, report, and outputs.
Junendri Ardian, specializing in nutrition, the member is responsible for collecting weight and height data using anthropometric measurements, assessing appetite through 24-hour recall and FFQ, as well as conducting sensory and pact tests on stunted toddlers. They also contribute to preparing the research report and outputs

Competing Interests: There are no competing interests in this study. The authors affirm that all stages of the research, from design and implementation to reporting, were carried out independently without any intervention or influence from external parties that could create a conflict of interest

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