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Effect of Combined ST36 (Zusanli) and SP6 (Sanyinjiao) Acupoint Stimulation on Appetite in Preschool Children

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ABSTRACT

Background: Appetite problems in preschool children can negatively affect nutritional intake and growth and remain a public health concern. Conventional interventions are often insufficient, highlighting the need for alternative approaches. Acupressure is considered a safe, practical, and potentially effective method to improve appetite.

Objective: This study aimed to determine the effect of acupressure at ST36 (Zusanli) and SP6 (Sanyinjiao) on appetite in preschool children.

Methods: This quasi-experimental study with a pretest–posttest control group design involved 40 preschool children. The intervention group received daily acupressure for two weeks, while the control group received education. Appetite was measured using the Early Child Appetite and Satiety Questionnaire. Data were analyzed using the Wilcoxon Signed-Rank Test and Mann–Whitney U test with a significance level of $\alpha \leq 0.05$.

Results: Both groups showed significant improvements ($p < 0.001$), with greater improvement observed in the intervention group. The between-group analysis also showed a significant difference ($p = 0.037$), indicating that acupressure had a stronger effect compared to education alone.

Conclusion: Acupressure at ST36 and SP6 is effective in improving appetite in preschool children and can be considered a feasible non-pharmacological intervention.

Keywords : Acupressure, Appetite, Preschool Children

INTRODUCTION

Low appetite in young children is a significant nutritional concern, as it can lead to insufficient energy and nutrient intake, thereby affecting physical growth, cognitive development, and increasing the risk of stunting and wasting, particularly in low- and middle-income countries (Ssentongo *et al.*, 2021). Malnutrition during early life is also associated with impaired neurodevelopment, reduced cognitive capacity, and increased susceptibility to infectious diseases due to weakened immune function(Kirolos *et al.*, 2022) (Ssentongo *et al.*, 2021). According to the 2024 Indonesian Nutritional Status Survey (SSGI), the national prevalence of stunting reached 19.8%, highlighting that this issue remains a critical public health challenge

requiring immediate attention (Kemenkes RI, 2024). At the regional level, the prevalence of stunting in Mojokerto Regency has decreased significantly, from 27.4% in the 2021 SSGI survey to 9.6% in November 2025 (Pemerintah Kabupaten Mojokerto, 2025). However, preliminary findings from Blimbingsari Village, Sooko District, Mojokerto Regency, revealed that 4 out of 10 children (40%) experienced decreased appetite, indicating a persistent and relevant problem that may adversely affect nutritional status and increase the risk of stunting if left unaddressed.

Various nutritional interventions have been developed to address this issue. The use of fortified food supplements has been shown to improve amino acid levels and support child growth (Furuta *et al.*, 2021)(Rangkuti, 2022). In addition, appropriate and diverse complementary feeding practices are associated with reduced incidence of stunting and wasting (Id *et al.*, 2021). Community-based interventions have also been reported to improve appetite and food intake among children with stunting, emphasizing the importance of environmental and social support in improving nutritional outcomes (Nahar *et al.*, 2021). Despite these efforts, low appetite remains a key underlying factor contributing to inadequate nutritional intake, underscoring the need for effective and accessible interventions.

In this context, non-pharmacological approaches such as acupressure have gained attention as potential alternative interventions (Sari, Siti Haryani dan Ana Puji Astuti, 2024). Acupressure at ST36 (Zusanli) and SP6 (Sanyinjiao) acupoints, derived from traditional Chinese medicine, involves applying pressure to specific body points to stimulate physiological responses that support digestive function. Previous studies have demonstrated that stimulation of ST36 can modulate the central nervous system by influencing energy metabolism, neurotransmitter activity, and antioxidant responses, thereby regulating hunger and satiety signals (Huang *et al.*, 2022). Furthermore, stimulation of this acupoint has been shown to regulate gastrointestinal tissue metabolism, particularly in the stomach, contributing to improved digestive function and appetite regulation (Lee, Jiu dan Hsieh, 2022). These acupoints also play a role in the regulation of hormones such as insulin, leptin, and cholecystokinin, which contribute to enhanced nutrient absorption and the regulation of satiety in a more balanced manner (Landgraaf *et al.*, 2023). Clinical evidence also indicates that acupuncture at ST36 can enhance gastric mucosal integrity and function (Huang *et al.*, 2022), as well as protect the intestinal barrier, which is essential for optimal nutrient absorption (Liu *et al.*, 2023) (Oh dan Kim, 2022).

In addition, stimulation of SP6 is associated with hormonal regulation, including estrogen and progesterone balance, which may influence appetite and metabolic processes (Hu *et al.*, 2023)(Wang *et al.*, 2021). Acupressure has also been shown to alleviate stress and anxiety, factors that can negatively affect children's eating behavior (Sartika Dwi Yolanda Putri, 2025) (Huang *et al.*, 2022). Despite these promising findings, the effectiveness of acupressure may vary among individuals, and further scientific investigation is required to strengthen the evidence regarding its mechanisms and clinical benefits. Therefore, this study aims to explore the effect of combined ST36 (Zusanli) and SP6 (Sanyinjiao) acupoint stimulation on appetite in preschool children as a potential safe and practical intervention.

METHODS

According to Sugiyono (2022), quantitative research is a method that relies on measurable and objectively testable data while rejecting speculation that cannot be empirically verified. Therefore, this study employed a quantitative approach using a quasi-experimental design with a two-group pretest–posttest design, which aims to measure the effect of an intervention by comparing outcomes before and after treatment in both intervention and control groups (Notoatmodjo, 2018). This design allows researchers to evaluate the effectiveness of acupressure stimulation in improving appetite among preschool children.

This study was conducted in Blimbingsari Village, Sooko District, Mojokerto Regency, Indonesia. The population consisted of all preschool children in the area. The sample was selected using purposive sampling, as this technique provides samples that are appropriate to the research objectives and are considered representative (Sugiyono, 2022). The sample was divided into two groups: an intervention group and a control group. This study adhered to ethical research guidelines and was reviewed by the Health Research Ethics Committee of Kadiri University, receiving ethical approval under Ethical Clearance Number No. 093/27/III/EC/KEP/UNIK/2026.

The inclusion criteria were: (1) willingness to participate as respondents, (2) not experiencing illness during the intervention period, and (3) absence of congenital abnormalities such as cleft lip. The exclusion criterion was children who became ill during the intervention period. The control group received education regarding appetite improvement, while the intervention group received acupressure treatment in accordance with the standard operating procedures (SOP).

The independent variable in this study was acupressure at ST36 (Zusanli) and SP6 (Sanyinjiao) acupoints, while the dependent variable was appetite in preschool children. The acupressure intervention was administered by applying pressure to each acupoint for 1 minute with four repetitions per session, conducted daily for two weeks. Stimulation of ST36 and SP6 has been reported to influence digestive function, energy regulation, and hormonal balance related to appetite (Centis dan Dewi, 2023)(Maria Conchita Leyla Centis, Yuni Kusmiyati, 2022)(Liana *et al.*, 2024).

Appetite was measured using the Early Child Appetite and Satiety Questionnaire, a standardized instrument designed to assess appetite and satiety in early childhood. This instrument has demonstrated good validity and reliability in evaluating children's eating behavior (Nahar *et al.*, 2021).

The study was conducted through several stages: (1) preparation, including obtaining permissions and coordinating with relevant stakeholders; (2) pretest, involving baseline measurement of appetite using the questionnaire; (3) intervention, where the intervention group received daily acupressure for two weeks while the control group received education; (4) posttest, involving reassessment of appetite using the same instrument; and (5) data processing and analysis.

Data collection was conducted using questionnaires as primary data, supported by secondary data from relevant documents and literature. Data processing included editing, coding, scoring, tabulating, and cleaning prior to statistical analysis using statistical software.

Data analysis was performed using univariate and bivariate methods. Univariate analysis was used to describe respondent characteristics, while bivariate analysis employed the Wilcoxon signed-rank test to assess differences before and after intervention within groups, and the Mann–Whitney U test to compare differences between the intervention and control groups. These tests were selected due to the ordinal nature of the data and non-normal distribution (Dahlan, 2019). A significance level of $\alpha \leq 0.05$ was applied.

RESULTS AND DISCUSSION

Table 1. Respondent Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Child Age (Years)	3	17	42.5
	4	23	57.5
Gender	Male	19	47.5
	Female	21	52.5
Nutritional Status	Underweigh	5	12.5
	Normal	33	82.5
	Overweight	2	5.0
Maternal Age (Years)	<20	1	2.5
	20-35	25	62.5
	>35	14	35.0
Maternal Education	Secondary Education	24	60.0
	Higher Education	16	40.0
Maternal Occupation	Housewife	17	42.5
	Prevate Employed	9	22.5
	Self Employed	12	30.0
	Civil Servant	2	5.0
Pendapatan Keluarga	<Regional Minimum Wage	24	60.0
	Equal to Minimum Wage	7	17.5
	> Regional Minimum Wage	9	22.5
Family Size	Small	24	60.0
	Medium	15	37.5
	Large	1	2.5

Based on the results presented in Table 1, the majority of children were aged 4 years, accounting for 23 respondents (57.5%). Most children were female, with 21 respondents (52.5%). The majority of children had normal nutritional status, totaling 33 respondents (82.5%).

Most mothers were aged 20–35 years, with 25 respondents (62.5%), and had secondary education, with 24 respondents (60.0%). The majority of mothers were housewives, accounting for 17 respondents (42.5%).

In terms of family income, most respondents had income below the regional minimum wage, totaling 24 respondents (60.0%). Additionally, the majority of respondents belonged to small families, with 24 respondents (60.0%).

Table 2. Appetite Before and After Intervantion

Group	Before			After			*P-Value*
	Poor	Moderate	Good	Poor	Moderate	Good	
Control	7 (35%)	11 (55%)	2 (10%)	1 (5%)	8 (40%)	11 (55%)	0.000
Intervention	1 (5 %)	8 (40%)	11 (55%)	0 (0)	3 (15%)	17 (85%)	0.000

Based on the results, in the control group before the intervention, the majority of children had moderate appetite, totaling 11 respondents (55%), followed by poor appetite in 7 respondents (35%) and good appetite in 2 respondents (10%). After the observation, most children in the control group had good appetite, accounting for 11 respondents (55%), followed by moderate appetite in 8 respondents (40%) and poor appetite in 1 respondent (5%).

In the intervention group before the intervention, the majority of children already had good appetite, with 11 respondents (55%), followed by moderate appetite in 8 respondents (40%) and poor appetite in 1 respondent (5%). After the intervention, most children showed good appetite, increasing to 17 respondents (85%), followed by moderate appetite in 3 respondents (15%), with no children categorized as having poor appetite.

The statistical analysis showed a p-value of 0.000 in both groups, indicating that there were significant differences in appetite before and after the intervention.

Table 3. Comparison of Appetite Between Control and Intervention Groups

Group	*Mean* Rank	*P-Value*
Control	17.43	0.037
Intervention	23.58	

Based on the analysis, the mean rank in the intervention group (23.58) was higher than that in the control group (17.43). The statistical test showed a p-value of 0.037 ($p < 0.05$), indicating a significant difference between the control and intervention groups. This finding suggests that appetite in the intervention group was better than in the control group.

This study demonstrated that appetite improved in both the control and intervention groups, with a greater magnitude of improvement observed in the intervention group. In the control group, the proportion of children with good appetite increased from 10% to 55%, while in the intervention group, it increased more markedly from 55% to 85%, with no children remaining in the poor appetite category. These findings suggest that although general improvements may occur over time, the intervention contributed to a more substantial enhancement in appetite.

The within group analysis using the Wilcoxon Signed-Rank Test showed significant differences before and after intervention in both groups ($p < 0.000$). This may indicate the influence of external factors such as caregiver education, environmental adaptation, or increased parental attention during the study period (Naila *et al*., 2021). However, the between-group comparison using the Mann-Whitney U test revealed a statistically significant difference ($p = 0.037$), with a higher mean rank in the intervention group, confirming the effectiveness of the intervention.

The observed effect can be explained by the physiological mechanisms of acupressure. As a form of tactile therapy, acupressure administered routinely in toddlers can induce relaxation, enhance blood circulation, and ultimately optimize organ function, including the digestive system. Mechanical stimulation through massage may increase intestinal motility, improve nutrient absorption, and enhance appetite (Ramdaniati, 2025). The ST36 (Zusanli) acupoint is widely recognized in traditional Chinese medicine as a primary point for strengthening the functions of the stomach and spleen (Landgraaf *et al*., 2023). Stimulation of the ST36 (Zusanli) acupoint has been reported to enhance gastrointestinal motility, regulate energy metabolism, and modulate central nervous system activity related to hunger and satiety (Huang *et al*., 2022)(Lee, Jiu dan Hsieh, 2022). In addition, stimulation of SP6 (Sanyinjiao) is associated with hormonal regulation and stress reduction, which may positively influence appetite and eating behavior (Hu *et al*., 2023). These combined mechanisms likely contributed to the greater improvement observed in the intervention group.

These findings are consistent with previous studies demonstrating that non-pharmacological interventions, including acupressure, can effectively improve appetite and nutritional intake in children(Naila *et al*., 2021). Given its non-invasive nature, safety, and ease of application, acupressure may serve as a practical alternative intervention in community and primary healthcare settings.

Overall, the improvement in appetite observed in the intervention group can be explained by the physiological mechanisms of acupressure, which contribute to enhanced gastrointestinal function, regulation of energy metabolism, and modulation of central nervous system activity related to hunger and satiety. In addition, stimulation of specific acupoints is associated with hormonal regulation and stress reduction, thereby positively influencing children's eating behavior. These findings are consistent with previous studies indicating that non-pharmacological interventions, such as acupressure, are effective in improving appetite and nutritional intake in children. Given its non-invasive nature, safety, and ease of application, acupressure may serve as a practical and feasible alternative intervention to improve appetite in children, particularly in community and primary healthcare settings.

CONCLUSION

In conclusion, although both groups showed improvement, the intervention group demonstrated a significantly greater increase in appetite, indicating that acupressure at ST36 and SP6 is an effective and feasible non-pharmacological approach to enhance appetite in preschool children. Future research should incorporate larger sample sizes and adopt randomized controlled trial (RCT) designs to enhance the internal validity and generalizability of the findings. Extended intervention duration and longer follow-up periods are also warranted to evaluate the long-term sustainability of acupressure effects on appetite. Moreover, future investigations should elucidate the underlying physiological and molecular mechanisms, particularly those related to gastrointestinal function and neuroendocrine regulation. Further exploration of variations in acupoint selection, intervention frequency, and duration is essential to optimize and standardize the most effective acupressure protocol for improving appetite in children

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