



## Innovation Article

## Innovative therapeutic pants for children with genu varum and genu valgum

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### ABSTRACT

**Background:** This research is motivated by the absence of therapeutic pants in patients with genu deformity, so innovations to create latest medical products are needed to prevent the disease. One of the innovations is development of therapeutic pants for genu varum and genu valgum.

**Objective:** It aims to research and develop therapeutic pants to improve comfort of children with genu varum and genu valgum.

**Methods:** This study used Research and Development (R&D) approach. It consisted of 3 phases, namely phase I, II, and III or product trials.

**Result:** From the literary study in phase I, it was obtained that materials used to make the therapeutic pants were cotton cloth fabric and foam. In the second phase of the research, it was also discovered that designs and shapes of the pants were as needed. The results of product trials or phase III of this study involved 5 respondents; it showed that the use of therapeutic pants in toddlers resulted comfort and satisfaction for them.

**Conclusion:** The therapeutic pants are proven to increase comfort in toddlers with genu varum and genu valgum.

### INTRODUCTION

Epidemiology of *genu deformity* (*genu varum* and *genu valgum*) in the United States was 0.7%<sup>1</sup>. Nationally, the cases of *genu deformity* in Indonesia (especially Makassar) have been reported at 19.48%, which consisted of 41.13% types of *genu valgum* while *genu varum* was 58.86%<sup>2</sup>. The diseases cases in Banyumas Regency have not been reported. The effects of experiencing *genu varum* and *genu valgum* in children are pain in the middle of the knee and arthritis during their adult growth, increased pressure in the muscle compartment, growth disorders and deformities.<sup>3,4</sup>

Therapeutic management of *genu deformity*<sup>5</sup> can be implemented with both non-surgical and surgical therapy<sup>6-8</sup>. The success rate of the therapeutic management depends on the patient's age, and the degree of joint damage<sup>6</sup>. Non-surgical therapy is usually applied for degree I and II in patients who are less than 3 years old, while degrees III - VI is for patients who are older than 3 years old and or

for those who are failed in non-surgical therapy. Deformity of genu therapy degree III-VI usually requires surgery; it also usually results permanent sequelae<sup>9,10</sup>.

Previous studies in stage I and II of *genu deformity* with the use of braces (*brace/splint*)<sup>11</sup> is the right way to improve the angle of the proximal tibia varus<sup>5,15</sup>. One method of brace installations that is often used is Knee ankle foot orthosis (KAFO)<sup>9,12</sup>. This method fixes the knee in the extension position and gives the medial space to become valgus. This brace is used 23 hours a day, for 2 years or depending on the degree of varus angulation<sup>9,10,13,14</sup>.

The therapy is still limited in patients with *genu deformity*, so it needs the latest product innovations to prevent the disease. One of them is the development of *genu varum* and *genu valgum* therapy pants that provides comfort and has an anchoring device to keep the foot position looks normal when the child is moving and walking. The objec-

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tive of this study is to prevent *genu varum* and *genu valgum* in toddlers' feet by providing them comfortable feeling when they are mobilizing.

## METHOD

The researchers used *Research and Development* (R&D) approach in this study<sup>15,16</sup>. It consisted of 3 phases, namely phase I, II, and III or product trials<sup>17-19</sup>.

Phase I of this research was a literature study that aimed to find a comparison of cloth materials suitable for the pants and interviews about the comfort of wearing pants. The results of interviews with 10 respondents resulted the data that they need tools that are useful to prevent and provide comfort to toddlers who experience disorder of *genu varum* and *genu valgum*. Researchers figured out comparisons between existing products with the pants that will be produced in terms of fabric materials and its shape. The fabric used as the basic material for producing these therapeutic pants was cotton cloth and the material used for cushioning was foam and self-adhesive hook and loop (velcro).

Phase II of this research was the stage of product development with reference to the results of Phase I. Researchers designed therapeutic pants in accordance with the size according to anthropometry (national data). This innovative pants were made with cotton cloth that is equipped with foam on the sides to increase comfort in the use. The zipper on the side of the pants functions to make it easier to get self-adhesive hook and loop inside the pants. While the fabric adhesive to tighten the pants according to the shape of a toddler's feet. In addition, the rubber on the waist pants for easy adjustment of waist size.

Phase III of this research was the trial phase. The type of study is experimental<sup>20</sup>. The population were children (toddlers) having *genu varum* and *genu valgum* foot disorder with a total sample of 5 people<sup>21</sup>. The assessed variables were the level of comfort and satisfaction in the use of this innovative pants. The instrument was a questionnaire including structured statements about comfort and satisfaction. Data analysis which used by researchers was simple descriptive analysis.

## RESULTS

From the literary study in phase I, it was obtained that materials used to make the therapeutic pants were cotton cloth fabric and foam. In the second phase of the research, it was also obtained that designs and shapes of the pants were as needed as shown in the Figure 1.

Figure 1 shows the product design of therapeutic pants that is equipped with fabric self-adhesive hook and loop. Therapeutic pants made of cotton and equipped with foam. The use of this therapeutic pants can make the respondent's feet look like normal in general. While figures 2 and 3 show the use of therapeutic pants in children with *genu varum* and *genu valgum*.

The results of product trials or phase III of this study involved 5 respondents and it obtained the results as follow, the use of therapeutic pants in children (toddlers) provides comfort and satisfaction. Therapeutic pants were tested on 5 respondents with various gender. Before the respondent wore the therapeutic pants, the respondent's family first filled out a questionnaire including a questionnaire of safety and comfort level. The results of the comfort level questionnaire showed that respondents felt comfortable and satisfied in wearing the therapeutic pants; their toddlers did not cry while wearing the pants

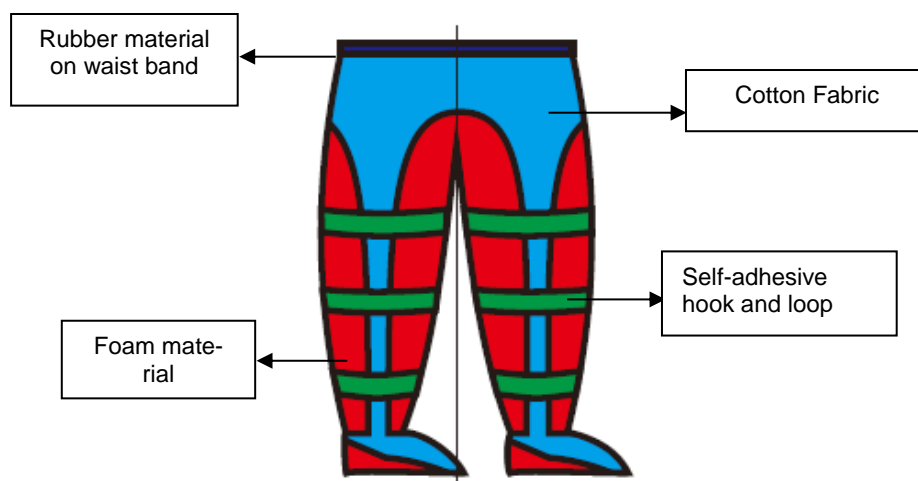


Figure 1. Design of innovative pants



**Figure 2.** The use of therapeutic pants in a child with *genu varum*



**Figure 3.** Use of therapeutic pants in a child with *genu valgum*

## DISCUSSION

From the trial results on five respondents, all of them stated that they felt safe and comfortable. That was because of its fabric material; the therapeutic pants were made of cotton fabric and foam that is soft and comfortable to wear. Cotton cloth is a fabric that is 100% natural plant fiber, contains no chemicals, and has hypo allergenic material. In addition, this fabric is more comfortable to wear because the fibers are hollow like air ventilation so the skin can 'breathe'. The variable confidence and comfort obtained from the five respondents indicated that the therapeutic pants are comfortable when used and they become easy to move outside their homes.

For that reason, the researchers produce this therapeutic pants which is made of soft materials and attractive designs for the users. In a previous study conducted in the United States, iron Therapy Pants were used to test ankle performance and the presence of a disc that was positioned in the knees of children to slow growth temporarily, but the outside part of the knee would keep growing<sup>22</sup>. Therefore, the researcher did a modification<sup>23</sup> by giving priority to the respondents' comfort as well as the materials used; it is also designed to prevent the occurrence of leg disorders of both *genu varum* and *genu valgum* in children. To prove the pants are able to prevent the disorders of the foot, it requires a long time. In addition, the researchers selected the materials because they are affordable by the respondents.

## CONCLUSIONS AND RECOMMENDATION

The results of this therapeutic pants product development are proven to provide comfort when children with *genu varum* and *genu valgum* are mobilizing daily. For mothers who have children with the feet disorders, they are expected to use this product for their children as a medical

therapy. The product development does not stop here, it needs development and measurement of other variables, so that the researchers can produce more perfect therapeutic pants product.

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