

Treatments for Infantile Postural Asymmetry

Research Article

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Received: Jan 30, 2020; **Accepted:** Mar 10, 2020; **Published:** Mar 16, 2020

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Abstract

Approximately 10% of all infants in Germany suffer from infantile postural asymmetry, which is treated with a wide variety of treatments. Worldwide there are only few efficacy studies, mostly covering the disorders plagiocephaly and torticollis. Furthermore, there are also inadequate studies with large samples. Some of the treatments that are used have been barely evaluated. This is also why doctors still tend to wait for possible improvements without prescribing physical therapy. The purpose of this study, using the Delphi method, is to obtain agreement among international experts concerning the efficacy of different therapy treatments for infantile postural asymmetry. These outcomes can be used to promote additional, research and to justify treatment decisions. A consensus is achieved when more than 80% of all experts are either pro or contra a specific treatment. Using the Delphi method type 4 (Consensus Delphi), there will be four survey rounds aiming for a consensus. International experts were chosen by literature research. Those experts were exclusively physical therapists. In round 1, we collected treatments used by the experts; in round 2 we quantified these treatments using a Likert-type scale. Furthermore, in round 3, we collected arguments for and against each treatment from the experts and presented these to them in round 4. In this last round the experts again judged the efficacy of each treatment and evaluated their use for the future. We collected a total of 22 treatments. For three of them a positive consensus could be confirmed. Those treatments are prevention - parental training concerning day and night positioning (95% consensus), prevention - parental training concerning handling, (90% consensus) prevention - parental training concerning motoric development (86% consensus).

The evaluation of the international experts represents the lack of clarity on efficacy of therapies for infantile postural asymmetry. This could be the reason why preventive methods have been evaluated better than curative methods. Preventive treatments have been used by all experts and should be part of a comprehensive program in prenatal classes to prevent consequential disorders. Retrospectively one could evaluate whether the programs reduce the incidence of infantile postural asymmetry. According to stretching exercises, an RCT could be used to evaluate efficacy. Therefore, possible side effects must be observed. Even though all experts use stretching exercises, no consensus was reached.

Keywords

Congenital Muscular Torticollis, Infantile Postural Asymmetry, Physiotherapy, Delphi study, Non-operative treatment

Introduction

This study deals with the treatment of infantile postural asymmetry and has the aim to contribute to physiotherapeutic research in pediatrics. Beside

the problematic, that many studies only reflect the phenomenon of muscular torticollis and the vertebral column is only little evaluated, widely different therapeutic approaches become apparent in international comparisons.

In Germany alone physiotherapeutic -, osteopathic -and manual therapeutic techniques are used, however evidence for these techniques are currently missing [1]. Deitermann and Jung concluded that current studies have a huge range of method quality and heterogeneity of the used measurement instruments in their review [2].

Examples for two of the few studies with meaningful subject numbers come from Turkey and China. In these studies, a conservative distension program was conducted, in which in the case of the Turkish study 95% of the 311 subjects were then completely free of movement disorders. The conclusion of the study was, the earlier diagnosis and therapy take place the better the prospects of success [3]. In the Chinese study in 2000 n = 1086 children were examined and treated. Depending on the severity, it was selected between a home program, distension techniques and surgical intervention. Conclusion of the study was, the lower the dimension of the disease and the earlier the presentation, the less frequent surgery has to be performed [4]. Among some pediatricians however the opinion is also in mind, that this problem would also be solved by itself without therapeutic influence [5]. So, the difficulty is that the choice of a treatment method has resulted from a few studies and individual experience. To resolve this short coming, a Delphi survey is conducted with worldwide acquired experts for this problem. Objective is to lead the experts to a consensus and to judge the effectiveness or non-effectiveness of therapeutic techniques.

Theoretical Background

When trying to describe the infantile postural asymmetry, known aspects will be entered whose definitions are collected in the following.

Philippi defined the phenomenon in 2008 as follows: "Infantile posturale asymmetries are defined as hull convexity and/or constrained head rotation as a reactive movement pattern regarding an orientating head turn towards the left or right sidewhile in an abdominal or supine position."

More definitions, which include aspects of infantile postural asymmetry, can be found in the literature. Hefti defines the infantile scoliosis with the following words: "Infantile scoliosis is characterised by a long stretched, thoracolumbar C-shaped arc which mostly appears with a left convexity. For differentiation from a progressive infantile scoliosis the rib vertebral angle has to be considered" [6].

The deformed plagiocephaly is described by Rogers as a one sided flattening of the skull. Further he says that the cause of plagiocephaly in children must be questioned by a side preference.

This is mainly to be observed in children who suffer from a congenital muscular torticollis [7].

Since the recommendation to store the children in the first months of life on the back, to prevent sudden infant death syndrome, the phenomenon of infantile postural asymmetries respectively torticollis has significantly increased [8]. In 2006 already, torticollis was the third most orthopedic indication in children in the USA [9]. Philippi describes the pathophysiological mechanism as follows: The process of preferred positioning, deformation, habituation of preferred positioning, and further deformation and alignment of motor activities regarding the preferred side and therefore again further habituation result in a vicious circle.

Most of the studies consider only aspects of the infantile postural asymmetry like the torticollis. This makes a statement about the incidence difficult. The incidence of torticollis varies from approx. 0,5% of all newborns to 8,2%, measured on Dutch children up to 16% of the American population [10,11].

As already mentioned, there is a lack of evidence of the efficacy of physiotherapeutic provisions in Germany. For example, a few describe the efficacy of osteopathy in combination with handling or osteopathy in combination with Vojta [12]. In addition, Jung could indicate, that Vojta showed better results than the control group "no treatments" and "handling and osteopathy" [13]. As described before, evidence of efficacy is also provided for stretching techniques. Globally considered there are many other therapeutic approaches but only rarely qualitatively and especially quantitatively high-quality evidence of efficacy.

Objective

This work deals with the question if there are effective therapies methods for the treatment of infantile postural asymmetries according to experts. Hypotheses are:

1. Content of neurophysiological treatments are effective treatments for infantile postural asymmetry.
2. Content of manual therapeutic treatments are effective treatments for infantile postural asymmetry.

3. Content of osteopathic treatments are effective treatments for infantile postural asymmetry.
4. Content of physical treatments are effective treatments for infantile postural asymmetry.
5. Content of other treatments, not covered by the above-mentioned categories are effective treatments for infantile postural asymmetry.

Since there is not enough evidence for the existing treatment forms of infantile postural asymmetry the type

the literature as a minimum while theoretically there is no upper limit [15]. Starting from this selection, 16 experts could be contacted. In one case two physiotherapists who worked on the same study were contacted. Nine authors gave answers. Thereof seven physiotherapists agreed to take part in the survey. They are spread over three continents and five countries (Figure 2). Thus, the predetermined minimum number has been reached and the survey could be started.



Figure 1: Course of the study

four is chosen for this work. Through feedback discussions should be generated without group dynamic effects and thus a consensus will be found.

Method

It was attempted with a mixed method design by using qualitative and quantitative methods to find a consensus among the experts. For that purpose, open and closed questionnaires were used. At the beginning of the first phase there was a systematic literature review. Based on this the experts for the Delphi-round were acquired. Studies from medical databases were sought dealing with infantile postural asymmetries. Postural asymmetries due to neuromuscular or musculoskeletal disorders or such studies dealing exclusively with helmet- surgical- or drug therapy, were excluded.

Following this, the authors were contacted and asked to participate in the Delphi-round (Figure 1). The cover letter was worded in English and German. The questionnaires were also designed in English and German. In the second survey round a Likert like scale was included. That represents a commonly used scale technique where it is typical to enable the interviewed person the approval or rejection in graduation [14]. At least a minimum of seven participants were searched for. This number is regarded in

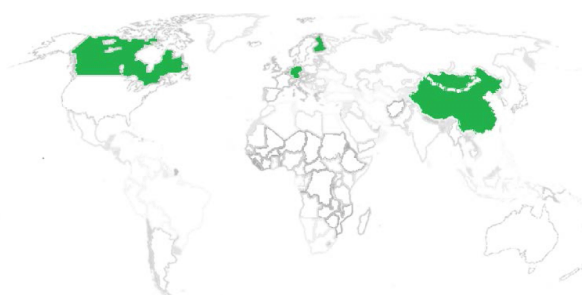


Figure 2: Global distribution of experts

Results

The aim of the first Delphi-round was to determine which therapy methods are used to treat infantile postural asymmetries by the experts. They have been asked to name every single method they used in their treatments. In total 22 different therapy methods have been collected (Table 1).

The second round consisted of two work assignments. For each form of therapy, the experts should specify a) if they use this in their work with infantile postural asymmetries or not and b) for how effective they think this is. To assess this, there was the graduation effective, rather effective, neutral, and not effective. This was verified by a scale related to a Likert scale. A point value has been assigned to the individual response options. To classify a therapy form to be effective or ineffective, a

Table 1: Treatment possibilities.

Neurophysiologic treatments
Neurodevelopmental Treatment NDT / Bobath
Vojta's method
Vestibular rehabilitation
Oculomotor training
Manual therapy treatments
Atlas therapy
Soft tissue techniques
Myofascial techniques
Massage
Osteopathic treatments
Balanced ligamentous tension technique (BLT) / Balanced membranous tension technique (BMT)
Visceral technique
Biodynamic treatment
Physical treatments
Kinesiotape / Tape
Heat / Hotpack
Ultrasonic therapy
Other treatments
Metamorphosis (Robert St. John)
Foot reflexology
Baby and infant massage (Leboyer)
Strengthening exercises
Stretching exercises
Prevention through parental advising for day and night positioning
Prevention through parental advising for handling
Prevention through parental advising for motor development

majority of 80% based on the point values had to be found. For this 17 out of 21 possible points had to be achieved. This value could be positive or negative. For the case of a neutral rating 0 points were awarded. Overall 38 neutral assessments were made in this round. All seven experts used more techniques than those mentioned by them. Prevention through parent training relating to day- and night bedding was solely mentioned by the experts already in round one. Thus, it is not surprising that prevention through parent training relating to day- and night bedding reached the highest value of this survey round with 20 out of 21 possible points. Prevention through parents training relating to handling was at least mentioned by five experts in round one and scored 19 out of 21 points. Prevention through parent training relating to motoric development was mentioned four times in round one and has been also rated effective with 18 out of 21 points. The three techniques were applied by all experts and there were no neutral votes. This was the case with no other technique.

- Prevention through parent training relating to day- and night bedding with 95% consensus
- Prevention through parent training relating to handling with 90% consensus
- Prevention through parent training relating to motoric development with 86% consensus

The question what therapy was used or not, aimed to the one hand on the practical use of the mentioned methods by the experts and on the other hand on the design of their practical working. It showed that a therapy method which was mentioned by an expert was also used by him. On the other hand, the three consensus techniques were stated by all experts as being used. Also stretching was used by all experts. The remaining techniques were distributed to used and unused. Some techniques were already known by literature research. The survey of

Table 2: Pro and contra strengthening exercises.

Arguments for strengthening	Arguments against strengthening
To reduce head posture due to muscle imbalance	May induce strong discomfort and fear of the child
Often effective, as infants with plagiocephaly often have asymmetry in the active neck range of motion. However, standard "repositioning therapy" is usually enough to correct mild asymmetry in the ROM, as it usually is a result of from asymmetrical positioning	Potential cause of snapping the sternocleidomastoid muscle in cases with sternomastoid tumour
Effect of Pediatric Physical Therapy on Deformational Plagiocephaly in Children with Positional Preference, A Randomized Controlled Trial. Arch Pediatr Adolesc Med. 2008;162(8):712-718	Requires parental cooperation for intensity
Nonsurgical Treatment of Deformational Plagiocephaly, A Systematic Review. Arch Pediatr Adolesc Med. 2008;162(8):719-727	It can be hard to understand for parents' which site they must practice
To strengthen opposite side to ensure good head position	
Kinesiological approach to a musculoskeletal problem	
Most of the time there is a difference in strength on the 2 SCM, so if you are strengthening the other, not affected, SCM, you can get a better balance and a better posture, it is fun to do with the child	
It will lead to better head balance and head/motor control	

Table 3: Pro and contra stretching exercises.

Arguments for stretching	Arguments against stretching
Gentle stretch only that serve more like warm up to prepare the child for active and positioning exercises	Painful
Through positioning which is a form of long intensity and prolong stretch	Evidence / facts against stretching
Effective, if the passive neck range of motion is restricted. <i>Adolesc Med.</i> 2008;162(8):712-718.	It can be hard to understand for parents' which direction they must stretch
Effect of Pediatric Physical Therapy on Deformational Plagiocephaly in Children with Positional Preference, A Randomized Controlled Trial. <i>Arch Pediatr Adolesc Med.</i> 2008;162(8):712-718 (participant 03)	Requires parental cooperation for intensity
Nonsurgical Treatment of Deformational Plagiocephaly, A Systematic Review. <i>Arch Pediatr Adolesc Med.</i> 2008;162(8):719-727 (participant 03)	It can be painful for the child, so the child will only counteract, and the opposite will happen
To align muscle fibers	
To stretch shortened tissues	
To obtain full range of motion	
Kinesiological approach to a musculoskeletal problem	
As preparation and parental training	
It should be told to parents to do, not only the therapist. Parents have the time to give a long period of stretch to the affected muscle	
It can help to lengthening the muscle, so better posture of the head will be possible	

experts delivered additional new details of the applied techniques of infantile postural asymmetry. Preliminarily not identified techniques through scientific literature were: Vestibular rehabilitation, ocular motor training, Atlas therapy, myofascial techniques, Balanced Ligamentous-Tension, resp. Membranous-Tension Techniques, Visceral techniques, Biodynamic treatment, Metamorphosis acc. to Robert St. John, Foot reflexology and the baby massage acc. to Leboyer. Of these techniques the ocular motor training is most used, with four out of seven nominations. Six out of seven therapists indicated therapies used by their own in the second round of consultation, which they did not mention in the first round. To win majorities for the undecided therapy forms, the experts were asked in the

third round to submit pros and cons for the respective therapies. This was limited to each three pros and cons to simplify the evaluation. As an example, the following (Table 2 and Table 3) should represent this for strengthening exercises and stretching.

In the fourth and final round the experts were asked to peruse the summarized pros and cons. Subsequently they should choose from the nuances of effectiveness as already performed in round two. Furthermore, they should indicate if they will use or will not use the respective form of treatment in the future.

Comparing the votes given in the second round there were some changes. Regardless of the tendency of change a consensus could not be reached for any further technique. In any case no expert changed his mind in this round. This was very nearly missed for stretching (76% consensus). The following figure 3 shows exemplarily the results of survey round four, describing other treatment possibilities.

Discussion

The possibility of error (bias) will be enumerated. The strengths and the weaknesses of the method of collecting data will be addressed. The author will deal critically with the implementation and the results. An important bias in this work is the foreign-language-bias. The author and most experts are not native speakers in English. Up to the questionnaires of the German participants it was asked in English. This may lead to translation mistakes and thus to misunderstandings. Therefore, the author paid particularly attention to the summary of pros and cons into a literal translation in the case of interpretation possibilities. However, it cannot be ruled out that there has been distortion anyway.

In the translation of the names of the therapy methods, scientific literature was used. Since a translation into the German language was necessary for the evaluation and writing of this work anyway, it was possible for the German participants to respond in their mother tongue. Problems could also have arisen from the software used. Excel and Word 2013 were used in this study at which compatibility issues arose. Since these problems became obvious all files were sent in compatibility mode (Office 97-2003) and sent as PDF if necessary. However, it did not come to defective information. Although the questionnaires were previously examined, these difficulties were not known before. Therefore a larger group of test persons would have been necessary. This better form of assessment was

not feasible in consideration of the time frame conditions and moreover this would not have guaranteed complete secureness.

For example, despite the multiple identification of pro - and contra columns the incorrect column was selected. Another problem was that not every expert knew all therapeutic methods. Although this was not explicitly queried, it can be concluded from formulations within the third round. For example, an expert wrote, "I am not familiar with it, but...". Nevertheless, a judgment was requested. His was then rendered with unknown background. However, the small number of experts must be taken into consideration again. Such fragmentation, in which only those experts can give their opinions, who know the form of therapy, would have made the results unusable in many cases. At the same time, the question would have been how this knowledge could be verified, which makes such a survey simply impossible. The results also show that this possible lack of knowledge does not inevitably lead to negative evaluations. Thus, none of the techniques used by only one expert was led to a consensus.

Especially in the osteopathic techniques it is, however, well conceivable that these are unknown in detail. Another possibility would have been to provide a short description for each method. At least this would have limited the problem in the run-up to the judgment. Here the obvious disadvantage is the much higher effort for the experts, which could have had an adverse effect on the response rate.

Conclusion

The number of treatment techniques mentioned reflects the picture that was created by the literature research. In addition, techniques were added which, in this context, have not yet been mentioned in the literature. The fact that not all experts had knowledge of any technique, shows how little common the knowledge of the treatment of infantile postural asymmetry still is. At the beginning of the investigation, the following hypotheses were established:

- I. Content from neurophysiological treatment methods are effective treatment methods for infantile postural asymmetry.
- II. Content from manual therapeutic methods are effective treatment methods for infantile postural asymmetry.
- III. Content from osteopathic treatment methods are effective treatment methods for infantile postural asymmetry.

IV. Content from physical treatment methods are effective treatment methods for infantile postural asymmetry.

V. Content from other, not covered by the categories mentioned above, treatment methods are effective treatment methods for infantile postural asymmetry.

The hypotheses I to IV cannot conclusively be verified or falsified after this Delphi-study, as no consensus could be achieved for one of these techniques. Hypothesis V. however can be verified, as for the techniques prevention by parent training related to night and day positioning, handling and motor development, a consensus was found. However, actual efficacy must be quantified. These results also do not implicate that the remaining procedures and techniques are not effective. They merely mean that a common opinion has not been found.

The most important result of this survey is the significance of prevention. From the beginning the experts agreed upon that prevention through parent training related on day and night positioning, handling and motor development are indispensable building blocks of the therapy of infantile postural asymmetry. This shows that physiotherapy must provide even more advice for prevention. Comprehensive and systematic prevention of infantile postural asymmetry does not take place in Germany yet, but it must be established. For this purpose, information could be offered for handling, positioning and motor development specifically in a parent training shortly before or after birth. At this point, physiotherapists could be employed by means of courses for parents. Training for midwives by physiotherapists would also be conceivable. Physiotherapists working at clinics could also develop information material for parents. Whether this preventive training need to be done in practice or whether information material is enough would still have to be evaluated. For this, RCTs are an option, which could investigate in three groups, whether and if yes, what kind of prevention methods are successful.

In any case, physiotherapists should play a part as experts in this field of physiological movement. For those methods of treatment which did not reach a consensus, evidence of efficacy must be achieved. In this study, stretching and strengthening exercises barely missed a consensus. In future investigations, these should be specified precisely and tested in larger groups. For stretching techniques, as described before, there are already investigations in a large group, but this work shows that there are doubts especially

about potential side effects. In future investigations, these side effects should also be addressed.

The fact that experts from five different countries and culture groups agreed so early on the issue of prevention makes this result particularly significant. First proofs of efficacy are already available and should be quantified in large populations.

That no consensus could be found in the other techniques does not mean that for these no evidence of efficacy is needed. Instead, in times of scarce resources the priority can be set on the other methods. Also, clear trends are visible even with these techniques. For physical therapists without practical experience little possibilities of ultrasonic therapy selection occurred, as described before.

These results can be used to decide based on the experience of global experts. This should not be done without reading the results of the third round so that potential risks can be better assessed. Of course, it is important to note that for many of these applications, specific training is necessary. For referring physicians, midwives, nursing staff, speech, occupational therapists, this work shows once again that this clinical picture absolutely needs to be treated and should not be put on hold. On the other hand, it becomes apparent that the expectant parents or parents affected need good advice and guidance.

Compliance with Ethical Standards

Conflict of interest: Author A declares that he has no conflict of interest.

Funding: No funding was received

Informed consent: “Informed consent was obtained from all individual participants included in the study.”

Ethical approval: This article does not contain any studies with human participants performed by any of the authors.

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