

Development of the child needle sensation questionnaire (CNSQ)

Abstract

Objective: De qi sensations occur during acupuncture treatment and are believed to be important for a successful acupuncture therapy. Items addressing de qi sensations range from bruised, warm, and spreading to sharp, pricking and electric shock. How does age influence de qi sensations? In order to investigate this, we developed a de qi questionnaire for children.

Methods: We developed a pictographic sentence based de qi questionnaire for children the child needle sensation questionnaire (CNSQ) on the basis of the SNSQ. The first version contained 17 pictographic sentences and 25 items and was tested by means of a 1 to 1 connection test in 40 adults. In the second revised version of the CNSQ, items were reduced to 17 and it was retested in 49 adults. Subsequently we applied bilateral LI 4 Pyonex needle acupuncture to 20 adults and 20 school aged children and measured de qi sensations with the CNSQ. Pain was measured with a visual analogue numeric rating scale (NRS 11) 0-10.

Results: The most common de qi sensation in adults and children was spreading. Children chose fewer items 3, 2 (SD +/-) than adults 6, 7 (+/-) $p < 0,05$. Children 0, 95 (SD +/- 0,95) and adults 1,2 (SD +/- 1,15) reported similar pain on NRS 11. **Conclusion:** CNSQ could be used routinely in acupuncture trials in children to address specific and non-specific acupuncture effects related to acupuncture modalities and sites. Frequency und de qi sensations themselves seem to be strongly influenced by age and should be taken more into account before drawing conclusions from acupuncture trials with inhomogeneous age distribution.

Keywords: acupuncture, children, de qi, questionnaire, development

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Introduction

Acupuncture is an accepted therapeutic method and well established within the integrative medicine. The treatment of pain remains one of the most studied indications for acupuncture therapy. Acupuncture pain research provided data that de qi sensations seem to be important for analgesia.¹ De qi is believed to be a sign for a successful connection of acupuncture needles to energy pathways of the body.² De qi sensations represent a predictor for a positive treatment outcome of acupuncture.³⁻⁶ In order to understand de qi and its relevance for the efficacy and mechanisms of action of acupuncture standardized quantitative de qi scales have been developed. Vincent et al. and later Park et al. started derive these scales from pain questionnaires.⁷⁻⁹ McPherson continued the development and created the SASS (subjective acupuncture sensation scale). Using the SASS McPherson found that numbness and soreness seem to be a positive predictive marker for the therapy effect of acupuncture.^{10,11} After using the SASS for a couple of years the group published a revised version the MASS (Massachusetts General Hospital Acupuncture sensation scale). Finally White and colleagues introduced the SNSQ (Southampton Needle Sensation questionnaire) in 2008. They claimed that former instruments mainly derived from pain questionnaires and added qualitative research methods. They divided de qi in an aching and a tingling de qi. Additionally they measured single items that occurred during acupuncture, but where not closely related to de qi sensations.¹² Items addressing de qi sensations ranged from bruised, warm, spreading and tingling to sharp, pricking and electric shock. The age distribution of the participants reached from 18 to 90 years and the mean age was 51 years. The SNSQ was translated in German and trialled from Pach and colleagues. They proposed that the SNSQ is not able to discriminate between pain and de qi.¹³

The de qi phenomenon is still not completely understood. The different aspects of de qi sensations might be due to different tissues and nerve fibers conveying the local and systemic effects of acupuncture therapy.² Especially in modern acupuncture research like f-MRI or placebo controlled randomised studies de qi sensations should be recorded. As we could not find standardized quantitative de qi questionnaires for children we developed the child needle sensation questionnaire (CNSQ) on the basis of the SNSQ to investigate age specific influences of de qi sensations.

Methods

Development of questionnaire

We used the German version of the SNSQ by Pach and colleagues. We created sentences that pictographic describe the properties of a specific item for every of the 17 SNSQ items. For some difficult and problematic items like "Blauer Fleck" English version "bruised" we added one extra synonym to enhance better understanding. We ended up with 17 sentences and 25 Items. Forty adults were asked to link the pictographic sentences to the best fitting item. Per sentence one item could be chosen only once. In a second step we revised ambiguous pictographic sentences and reduced the numbers of items back to 17 according to the results of the first version and the original metric outline of the SNSQ. Again 49 adults connected the pictographic sentences to the best fitting items in the revised version of the CNSQ.

Measuring of de qi sensations and acupuncture

We examined de qi sensations in adults and children on the basis of the CNSQ (Figure 1). We elicited de qi by performing acupuncture bilateral at LI 4 (Hegu) with indwelling Pyonex needles 0,2x 0,6mm from Seirin. LI 4 is located on the dorsum of the hand, between the 1st

and 2nd metacarpal bones, in the middle of the 2nd metacarpal bone on the radial side. Pyonex needles were stimulated simultaneously for 1 minute and afterwards we interviewed adults and children with the CNSQ. Acupuncture was performed through the same licensed medical doctor in all adults and children.

Does it feel like...	None	Slight	Moderate	Intense
You bumped yourself and grazed something.				
Pain you cannot point at with your finger.				
Your arms or legs become heavy				
You get hurt by boiling				
Water you are very uncomfortable				
Pain you can only feel deep inside				
A hallway blown up hallon at your m outh				
A radiator in winter time				
Something radiating from a point				
You sat a long time with bended legs and afterwards they hurt				
As if ants are crawling all over your hand				
Something has stung you.				
As if you had stubbed yourself and the pain is easing slowly				
As if you are a door and somebody would constantly knock				
Touching a hedgehog or walking barefoot over spiky stones				
The cutting side of a knife				
Sparkling, this happens sometimes when you touch somebody				

Figure 1 CNSQ - child needle sensation questionnaire.

Pain assessment

We used a visual analogue scale for children with a numeric rating scale 11 (0-10) to measure pain.

Statistics

All analyses were done with IBM SPSS Statistics 18 (SPSS Inc., an IBM Company, and Chicago IL, USA).

Approval ethic committee

The Ethic Committee of the Carl Gustav Carus University Hospital – Technical University Dresden approved this study.

Results

Development of questionnaire

The first version was tested in 40 adults. The distinctive feature was the connection of 17 pictographic sentences to the best fitting item out of 25 presented items. In the first version of the CNSQ sentences for the items warm, pricking, throbbing and stinging were recognized by more than 70% of the tested adults. Between 50 – 70 % of our test persons identified items fading, tingling, twinge, spreading, pressure, deep ache and heavy. The most difficult items to detect from our sentences were sharp, numb, hidden pain and bruised. The worst identification rate with 37.5 % of the participants showed hidden pain.

To discriminate between two items with similar meanings e.g. dull ache and hidden pain we analysed item recognition results for the first 2 most frequent connections of the participants between pictographic sentence and item. Items were then identified over 80 % for sensations electric shock, pricking, throbbing, twinge, tingling, warm, pressure, deep ache, uncomfortable and stinging. A recognition rate of 60-80 % showed items sharp, fading, numb, spreading, heavy, hidden pain and bruised. The worst identification rate showed the item bruised with 62.5%.

According to these results we revised our questionnaire in two ways. We reduced the items from 25 to 17. Secondly we adapted some sentences to raise the discriminatory power. The revised version of the CNSQ questionnaire was tested in 49 adults. Finally the mean item identification rate achieved by participants was above 90 % (Figure 2).

Does it feel like ...		
Aching deqi	Item	IDR in %
You bumped yourself and grazed something	bruised	87.8
Pain you cannot point at with your finger	hidden pain	85.8
Lifting something with a lot of weight	heavy	100
You get hurt by boiling water	stinging	93.9
You are very uncomfortable	uncomfortable	91.9
Pain you can only feel inside	deep ache	85.8
A half-way blown up balloon at your mouth	pressure	79.8
Tingling deqi		
A radiator in winter time	warm	98
As if something radiates from one point	spreading	77.6
You sat a long time with bended legs	gone asleep	91.9
As if ants are running all over your hand	tingling	93.9
A mosquito has stung you.	twinge	81.7
As if you had stubbed yourself and the pain is easing slowly	fading	91.9
You are a door and would constantly knock	throbbing	91.9
Separate		
Walking barefoot over spiky stones	pricking	81.7
The cutting side of a knife	sharp	100
Sparkling, which sometimes happens when you touch somebody	electric shock	100
IDR = item detection rate in %	Mean:	90.2

Figure 2 Children de qi questionnaire revised version.

De qi measurement with the CNSO - adults

20 adults received acupuncture with Pyonex needles bilaterally at LI 4 and after stimulation completed the revised sentence questionnaire rating each de qi sensation sentence synonym CNSQ with a 4 item Likert scale (0 = none, 1 = slight, 2 = moderate and 3 = intense). The mean age was 23, 5 years (SD +/- 2,7) and gender distribution 8 male to 12 female. Participants tended to score towards the low end. The most frequent items revealed to be spreading, stinging, twinge and deep ache (Table 1). The mean VAS pain score on NRS 0-11 was 1, 2 (SD +/- 1, 15).

De qi measurement with the CNSQ - children

We trailed 20 school children mean age 11,1 years (+/- 3,2) with our CNSQ after they had received bilateral acupuncture at LI 4 with Pyonex needles. Children used to rate to the lower end of the Likert scale. Children never reported bruised and pricking. Children gave account to significantly fewer items than adults. Children chose items warm and heavy more often than adults to describe de qi sensations. Adults and children reported similar results for spreading, pressure and fading (Table 1). Children indicated Pyonex acupuncture to be nearly pain free with a mean score of 0, 95 (+/- 0,95) on visual analogue NRS 11. Adults reported significantly more items namely 6,7 items and children 3,2 items (Figure 3).

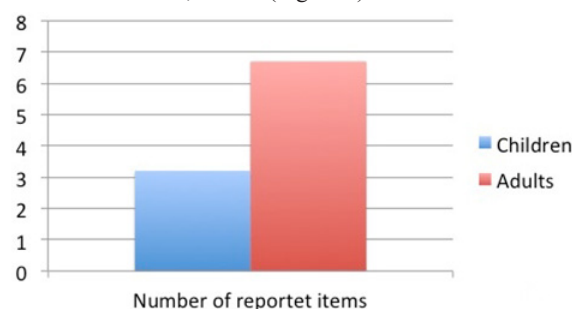


Figure 3 Number of reported items.

Table 1 Most frequent items revealed to be spreading, stinging, twinge and deep ache

Item	Adults, n=20	Children, n=20	Difference
Aching sensations	MSS	MSS	0,26
Bruised	0,25	0,05	0,2
Hidden pain*	0,65	0,25	0,4
Heavy	0,2	0,2	0
Stinging*	0,9	0,3	0,6
Uncomfortable*	0,35	0,05	0,3
Deep ache*	0,8	0,3	0,5
Pressure	0,1	0,1	0
Tingling sensations	MSS	MSS	0,3
Warm	0,25	0,4	-0,15
Spreading	1	0,8	0,2
Gone asleep	0,35	0,05	0,3
Tingling	0,6	0,45	0,15
Twinge	0,85	0,3	0,55
Fading	0,55	0,3	0,25
Throbbing*	0,55	0,1	0,45
Single items	MSS	MSS	0,42
Pricking**	0,6	0,05	0,55
Sharp	0,6	0,15	0,45
Electric shock	0,6	0,35	0,25

*p<0,05; **p<0,001

MSS, Mean Sum Score.

Discussion

Our study supports other trials that the SNSQ is able to detect de qi sensations. It contains 17 very closely related items, often possessing similar meaning. This fact made it difficult to find appropriate pictographic sentences describing this detailed sensations adequately. Pach and colleagues found more than 50 % of the items were rated to be absent.¹³ Our results in adults did not point at specific items that were not felt during Pyonex needle acupuncture at LI 4. De qi sensations seem to be very individual and interfere with person's experiences. No child detected the items bruised and pricking. Children reported de qi sensations warm and heavy more often than adults. These results might be due to the fact that children are more familiar with these sensations. Analogically to children projecting different pain locations primarily into the stomach. The most frequent de qi sensation spreading was comparable in children and adults. This is a very interesting finding. Imagination and expectation are able to highly influence perception, arousing the question whether spreading is truly felt, thought to be felt or both. De qi interaction effects seem to concern acupuncture site, mode of acupuncture, laterality, needle manipulation and prior acupuncture experiences. Our test persons received acupuncture bilaterally with Pyonex needles at LI 4. Needles were stimulated by simultaneously pressing the acupuncture stickers for one minute. All adults and children with the exception of one adult had not received acupuncture before.

Therefore our results are limited to bilateral Pyonex needle acupuncture at LI 4 and healthy acupuncture inexperienced adults and children.

Some researchers promote the argument that de qi research can only be performed in acupuncture experienced participants. We

strongly disagree with this. Acupuncture experienced participants may be conditioned and we presume that they are less flexible and sensible due to their experience. In order to gain a greater picture and variety of de qi sensations we aimed on acupuncture naive participants. Taking the risk that they might lack experience in depicting de qi sensations. Research showed that de qi sensations seem to be conveyed through different nerve fibres. More over exist specific local effects or mediators for instance Substance P or CGRP, effects on spinal chord segments and systemic effects. There are studies showing important involvement of endorphins and the autonomous nerve system in mechanisms of action and the effect of acupuncture.

According to the results de qi research should focus on acupuncture specific and unspecific effects. The relation of different de qi sensations to certain nerve fibres and mediators should be studied. Additionally de qi questionnaires could be considered as standard content in every clinical acupuncture study.

An unspecific effect of acupuncture therapy seems to be age. Combining the results of the SNSQ and our CNSQ study we get strong evidence, that age directly influences the recognition and the character of de qi sensations. Over 50 % of the participants, mean age 51 years (range 18-90), in the SNSQ trial chose pricking, dull ache and sharp to describe their de qi sensation.¹² Nearly 2/3 of these participants rated these items as painful. Unfortunately study data does not give information on age dependency. In contrast our age homogeneous adult group, mean age 23, 5 years (+/- 2,7) most frequently reported spreading and hardly no pain. Presumably humans tend to become more pain sensible with increasing age.¹⁴ If you combine these results with findings from placebo research, that painful interventions have a greater therapeutic effect. SNSQ and our data suggest that acupuncture trials should be age controlled. Acupuncture studies often reveal a wide age range, due to recruitment difficulties and still missing general acceptance. The routine use of de qi questionnaires could contribute to a better detection and understanding of specific, unspecific and psychological effects of acupuncture regarding its efficacy.

The visual analogue NRS 11 results for Pyonex acupuncture at LI 4 from this study confirm studies of Anders et al., that Pyonex acupuncture is a nearly pain free and a suitable acupuncture modality in children and adults.^{15,16} Interestingly we found no differences in pain intensity between children and adults.

The CNSQ needs to be validated separately for other acupuncture modalities, sites and disease specific acupuncture therapies. Limits of our study are the small sample size and that the de qi questionnaire was tested solely after acupuncture without pre testing. Furthermore the results are limited to bilateral LI 4 and Pyonex needle acupuncture.

Conclusion

The CNSQ is the first quantitative de qi questionnaire for children. De qi sensations seem to be an essential part to understand effects of acupuncture and should be recorded in every acupuncture trial. There are strong hints that age influences the frequency and quality of de qi sensations. Examining acupuncture therapies in homogeneous and age-controlled study designs might be beneficial. Younger adults and children seem to perceive similar pain intensities. Children tend to report significant fewer de qi sensations than adults.

Contributor ship statement

Conception & Conducting EA; Development of questionnaire EA, CV; Drafting EA, MR; Revision MR, CV.

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None

Conflicts of interest

The authors declare that there are no conflicts of interest.

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