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Does the 'Teddy Bear Hospital' enhance preschool children's knowledge? A pilot study with a pre/post-case control design in Germany

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Abstract

The 'Teddy Bear Hospital' is a medical students' project, which has been increasingly established in many countries. To evaluate this concept, we examined the effects of a German Teddy Bear Hospital on children's knowledge relating to their body, health and disease. Using a quasi-experimental pre/post design, we examined 131 preschool children from 14 German kindergartens with pictorial interview-based scales. The analysis of covariance revealed that the children who visited the Teddy Bear Hospital had a significantly better knowledge concerning their body, health and disease than the children from the control group. This German Teddy Bear Hospital is a good health education vehicle for preschool children.

Keywords

Germany, health education, health promotion, preschool child, 'Teddy Bear Hospital'

Introduction

Children are particularly vulnerable to the stress of hospitalization because of limited understanding of their illness and the unfamiliar situation (Kain and Caldwell-Andrews, 2005). According to psychological stress and coping theories, children who are well informed about procedures will cope better and be less fearful in the real situation (Lazarus and Folkman, 1984; Peterson, 1989).

The 'Teddy Bear Hospital' (TBH) is a worldwide concept, which started with a little one-day education project from the Shriners Burn Institute in Boston (a centre for paediatric burn care) (Creedon, 1989) and via Scandinavian countries came to Central Europe. Within the framework of this concept, children who attend kindergartens are asked to think of a disease for

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their teddy bears and act as their parents in a simulated hospital, while medical students play the role of physicians ('teddy docs'). The main aims of the TBH are to reduce young children's fears of doctors, hospitals and medical procedures and to enhance their knowledge on health and disease as well as to increase medical students' understanding of young children. Piaget's (1963) theory of cognitive development and the important function of role play for preschool children (Pellegrini, 2009) can be seen as a theoretical background for this concept. It can be assumed that visiting the TBH is similar to a 'play preparation' for visiting the paediatrician or for hospitalization (Armstrong and Aitken, 2000; Li and Lopez, 2008).

Health education for children must take into account the psychological level of the children's beliefs about illness as well as their feelings (Varkula et al., 2010). According to Bibace and Walsh (1980), preschool children (pre-operational stage according to Piaget, 1963) are able to understand illness in terms of phenomenism, by which children believe that external, unrelated, concrete phenomena are the cause of illness. Information from the 'teddy docs' during the role-play situation that is adjusted to the children's development should enhance their concepts of body knowledge and illness (Williams and Binnie, 2002).

According to a more 'functionalist' developmental approach, children do not need explanations of illness that differ radically from those given to adults (Eiser, 1989). Some authors even argue that preschoolers will not understand the symbolic relationship between dolls/toys and themselves for the purpose of conveying information about medical procedures (Jaaniste et al., 2007; Salmon, 2006). We were interested in establishing whether the information communicated via role play in the TBH would enhance preschool children's understanding of medical topics. Additionally, we would like to know whether social variables and cognitive development have any meaningful influence on medical knowledge of preschoolers as could be shown by Ball (2004) for school-aged children. Complex preventive interventions in the community setting are difficult to evaluate; examples are oral health or physical activity promotion projects (Jurg et al., 2006; Petersen and Kwan, 2004). The active components are not easy to specify; confounders and surrounding effects are possible (Campbell et al., 2000). This may be one of the reasons why the well-established worldwide project of the TBH has seldom been evaluated so far.

Bloch and Toker (2008) published the first study on the effects of the TBH method on preschool children's fear of future hospitalization. They examined 91 children in a case-control study with a simple 1-item facial image scale a day prior to the intervention and again 1 week after the TBH. The children in the TBH group reported significantly lower levels of anxiety with respect to hospitalization than the control group. One possible mechanism for the reduction of anxiety and distress during the TBH visit could be the provision of information about procedural and sensory aspects of medical situations.

Our primary aim was to examine the effects of a German TBH on children's knowledge about the healthy body, illness, medical examination and procedures:

- It was predicted that visiting the TBH would alter the preschool children's knowledge about their body, health and disease significantly as compared to children not visiting the TBH.

We expected that children who visited the TBH will in particular improve their knowledge of the different organs of the body. Based on the findings in the literature concerning children's concepts of health and illness (Bibace and Walsh, 1980; Myant and Williams, 2005; Salmon, 2006), we were interested in some exploratory questions:

- Do the answers of preschoolers reflect pre-operational thought or do they show different qualitative cognitive levels?

- Does the children's medical knowledge correlate with (1) cognitive development, (2) having siblings or (3) level of mother's education?

Methods

Design and participants

We studied our hypothesis in a quasi-experimental case-control study with a pre–post design. Randomization was not possible because the TBH is an established local project and any kindergarten in the area is free to decide whether it will take part or not. The 5-year-old preschool children and their parents were recruited from kindergartens in and around Marburg (medium-sized university city in Germany). Inclusion criteria for the children were age (4.5–5.5 years) and a sufficient command of the German language. Control children were recruited in kindergartens that could not manage to participate on account of the TBH's time schedule for the yearly event or did not apply for a visit. Children in this group were told that they will take part in a study about young children's concepts of illness.

Children and their parents gave their written informed consent to participate in the study, approved by the local Ethical Committee. All of the 120 kindergartens in and around Marburg, which were asked to take part in the annual event of the TBH in 2009, were informed about our study. Of the 35 kindergartens, 21 kindergartens, which registered via Internet for the TBH, were interested in the study. After personal visits to the kindergartens by the project team, eight kindergartens finally agreed for recruitment in the experimental group.

The eight kindergartens for the control group were recruited through personal visits to the non-participating facilities. We tried to match the control group in terms of residential area and the bodies and organizations responsible for the kindergartens.

Finally, 16 facilities with 139 children formed our study sample. Of these, 58 per cent (81 children, 47% girls) were in the experimental group and 42 per cent (58 children, 39% girls) served as controls. For reasons of non-appropriate age and outlier data, 8 children were excluded from final analysis ($N = 131$).

Socio-demographic information could be obtained from $N = 85$ parents (65% of the analysis sample). Most of the kindergartens were from rural areas around Marburg (60%–80%); significantly more urban facilities were in the intervention group than in the control group.

Socio-demographic and descriptive information from the baseline can be seen in Table 1.

The TBH intervention

National TBH projects in Germany are supported by the European Medical Students' Association (EMSA). The German Association for Medical Students (BVMD) has written a TBH manual as guideline for the medical students who organize the non-commercial project.

In Marburg, the TBH event has been held once a year since 2003 and lasts for 2 days in the summer. About 800 children per year visit the TBH on the market place and in the city hall and are attended to by about 120 'teddy docs' (graduate medical students). The organizing committee is made up of approximately 20 students. Most children attend in groups with their kindergartens (our study groups) but there is also time for visits on their own with their parents.

The visit to the TBH starts with registration when the child with his or her stuffed animal gives his or her name and describes the illness of the soft toy. Then the child can play in a waiting room until a contact person accompanies the child to his or her teddy doctor. Each teddy doctor wears a lab coat and has the usual medical office equipment (e.g. stethoscope, clinical thermometer, syringes and adhesive tapes). In an examination room that is quite realistic, the teddy doctor carries out the physical examination, depending on the individual illness of the soft toy. The children are encouraged to ask questions and take part in the examination. After the consultation, teddy may be referred to the teddy surgeons, to a dentist, to a place with

Table 1. Characteristics of children and their families.

	Experimental group (visiting 'Teddy Bear Hospital'; *N* = 79)	Control group (no intervention; *N* = 52)
Age of children in years (*M* (SD))	5.1 (0.3)	5.2 (0.3)
Girls (*N* (%))	37 (47)	20 (39)
Man-drawing quotient[a] (*M* (SD))	111.3 (15.6)	106.3 (15.5)
ChildMedKnow (baseline M (SD))	19.4 (3.8)	19.2 (4.2)
Data from parents' questionnaire (*N* = 85, 65% of the sample)		
Education of father (*N* (%))		
>10 years of school	30 (54)	21 (72)
≤10 years of school	23 (41)	7 (24)
Education of mother (*N* (%))		
>10 years of school	34 (61)	18 (60)
≤10 years of school	21 (38)	11 (37)
Siblings (yes, *N* (%))[b]	48 (84)	26 (87)
Negative experiences with a physician (*N* (%))[b]	15 (27)	8 (30)
Chronic disease (*N* (%))[b]	6 (11)	5 (18)

SD: standard deviation; *ChildMedKnow*: children's knowledge of body, health and disease.
[a]Reference for the cognitive maturity according to Harris (1963).
[b]Percentage from valid data (30%–40% missing data).

ultrasound, scales or X-ray simulation (camera connected with a computer) or to the operating theatre. The teddy doctors converse with the children in an easy and responsive manner, depending on the child's verbal capability and emotional state.

Finally, the children are given a prescription and go to the TBH pharmacy, where they are provided with tea, warming pans, ice bags, adhesive tapes or bandages from students from the School of Pharmacy. An important aspect of prescription for each child is the 'snuggle therapy' that is recommended for each individual case. The child has the chance of looking into an ambulance and finally goes back to the waiting area, where the nursery teacher or parents wait.

The acting teddy doctors (medical students) are prepared for their role in a 1-day training workshop by an experienced paediatrician and a psychologist. They are given insights into developmental psychology and children's health concepts. They are familiarized with the organizational procedure in the TBH and learn how to react in difficult situations. The teddy doctors act upon a structured protocol of medical examination and treatment but need to be flexible in line with the child's behaviour and teddy illness.

Data collection procedures

Children were assessed in small groups (up to 5 children) in the kindergarten during the week prior to the intervention and 1 week after visiting the TBH. Control children were interviewed twice as well and at a similar time interval (about 21 days). We decided in favour of group interviews because this situation resembles the normal daily situation in kindergarten for the preschoolers. It was important to avoid a situation of test anxiety. In the interests of good cooperation in this field study, the time input and effort for the children and kindergartens was not to be too consuming (kindergartens offered time for approximately 60–90 minutes).

The interviews with the children were conducted by two trained students who were supervised by an experienced psychologist.

Outcome measures

Children's Medical Knowledge Scale (ChildMedKnow). The primary end point was the children's knowledge and understanding of health and disease. An effective and appropriate assessment of children's medical knowledge at preschool age has to take into account several special demands. The pictorial format seems to be appropriate for age-related development and gave greater encouragement to children to take part. Because there is no established questionnaire focusing on preschool children's knowledge about their body, health and disease, an economic picture-based scale to quantify the effectiveness of the TBH had to be developed first.

The scale was theory-driven developed following work from Ball (2004) and Carey (1985). Paediatricians, nurses and psychologists checked the items for appropriateness. We made a pretest with 10 children to evaluate the comprehensibility of the questions.

The final version of the *ChildMedKnow* was assessed with eight standardized questions in interview form. The questions and coding of answers were designed according to Schmidt and Weishaupt (1990), Perrin and Gerrity (1981) and Ball (2004). Questions about their knowledge of the body, health and concepts of illness and their understanding of medical procedures and the physician's function are put verbally to the children. The children gave their answers on paper in picture form. The structure of the questionnaire can be seen in Figure 1.

For statistical analysis, correct answers were coded from 0 to 4 according to their correctness or cognitive level. The coding (following Bibace and Walsh, 1980; Schmidt and Fröhling, 2000) can be seen in Table 2. For the body knowledge, which was asked first, children were awarded points from 0–6, one for each correctly depicted organ. To integrate this question in the *ChildMedKnow* index, the sum was recoded to the 0–4 scale according to the following rule: no correct organ = 0 points, 1–2 correct organs = 1 point, 3–4 correct organs = 2 points, 5 correct organs = 3 points and all organs correctly depicted in the body diagram = 4 points.

Psychometric analysis was conducted using the baseline data from the whole sample. Statistical item analysis revealed acceptable psychometric properties for the single items. Internal consistency as a measure of scale reliability was computed with Cronbach's α coefficient (inter-item correlation). Although questions were related to different aspects of the children's knowledge of their body, health and disease, the aim was to build an indicator variable for their medical knowledge as a whole. Test–retest reliability was evaluated by Pearson product moment correlation of the two measurements from the control group.

Cronbach's α for the *ChildMedKnow* (8 items) was 0.60; the test–retest reliability (interval of 3 weeks) was r_{tt} = 0.83. Taking into account preschoolers' cognitive abilities, memory effects seem unlikely here (Salmon, 2006).

Reliability indices of the interview scale, therefore, meet standards for group comparison purposes. The coefficient is evaluated as adequate to form an indicator variable (by summation) for the *ChildMedKnow*.

Predictive and control variables. At the beginning, the children were asked to draw a person as well as they could. This German 'man-drawing test' developed by Ziler (1996) is regarded as a good 'icebreaker' and a rough reference for the cognitive maturity (Brosat et al., 2007; Harris, 1963). The figure is analysed for the amount of details (objective scoring): a 'man-drawing age' and (by dividing by age) a 'man-drawing quotient' can be computed as an estimation of cognitive development. For the 'man-drawing quotient' with the German evaluation method by Ziler (1996), modernized by Brosat et al. (2007), a predictive validity with school performance is reported between $r = .4$ and $r = .66$.

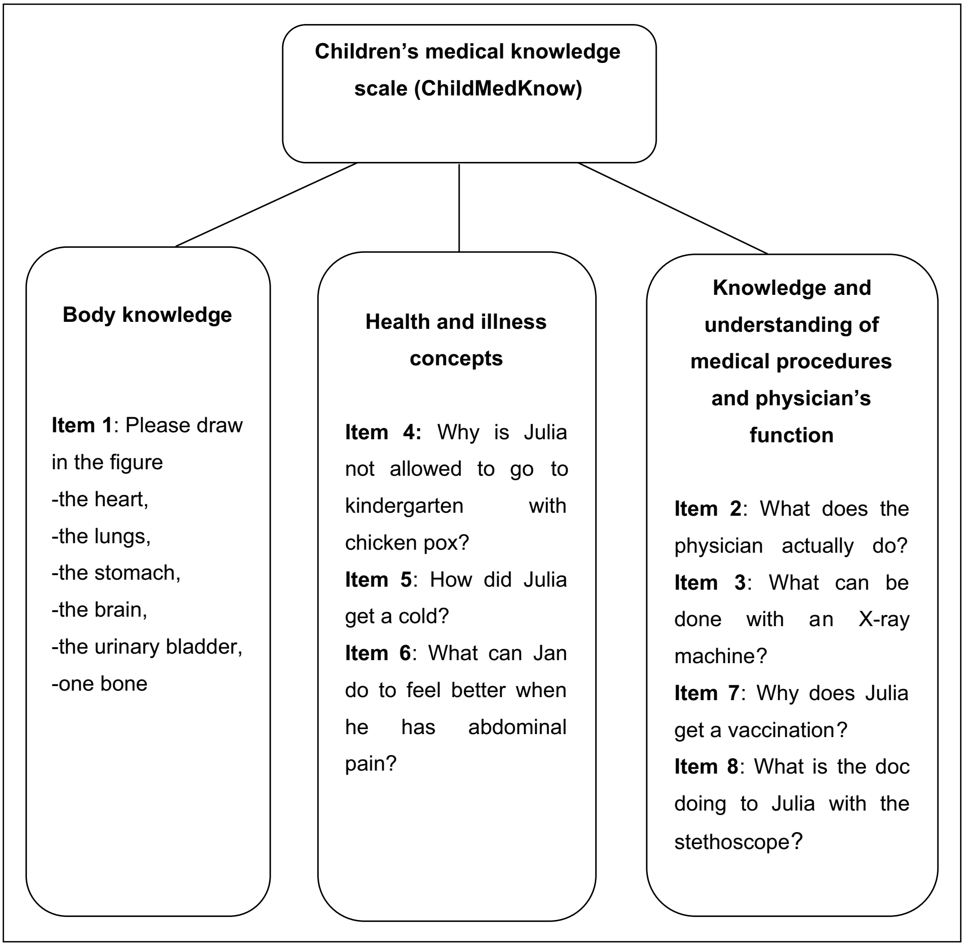

Figure 1. Structure of the Children's Medical Knowledge Scale.

Parents completed a questionnaire for demographic data and their child's experiences with hospitalization and visits to the doctor (there were also other parts to the questionnaire that are not evaluated here). The kindergarten teachers were asked how many hours were spent preparing the children for the visit to the TBH.

Statistical analysis

Data analyses were carried out with SPSS 17. We computed the group differences with an analysis of covariance (ANCOVA) with the pretest scores as covariates (see recommendations by Allison et al. (1993). We will show descriptive results (baseline data) of the whole sample of the preschool children's quality of answers (evidence for pre-operational thought or interindividual variability).

For the explorative analyses, we computed Pearson product moment correlation between the *ChildMedKnow* and cognitive development ('man-drawing quotient'). Possible influences of having siblings and the mother's level of education with respect to medical knowledge will be analysed descriptively and presented if there are potential relationships in the data. We only analysed complete data sets but had hardly

Table 2. Coding of answers according to cognitive level.

Points	Quality of answer	Description/examples
0	No answer	
1	Freely fabulated answer, phenomenism	Answer without any relation to illness or therapy (sun or God as causes)
2	Concrete associations, phenomenism	Pre-logical explanations for cause of illness, diagnostic procedures or therapy (e.g. contagion only through proximity; not allowed to go to kindergarten with chicken pox because nursery teacher would be angry)
3	Concrete, logical explanation, not differentiated	Pre-logical explanations, more differentiated Contamination as cause for illness (e.g. child's body physically contacting the ill person)
4	Physiologically differentiated answer	Concrete, logical explanation (e.g. virus or germ can cause contamination; doctor can listen to the pulmonary function by stethoscope)
5[a]	Psychophysiological explanation	Formal and logical explanations Psychological cause as additional or alternative to physiologic ones

[a]According to Piaget (1963: 20), the formal operational stage will not be seen in preschoolers.

any missing data based on the interview form of data collection.

Sample size

As a pilot study, there were no assumptions about attainable effects. We calculated 64 participants per group as necessary to achieve medium effects with a power of 0.80 at type 1 error level of 0.05 in the ANCOVA procedure (G*Power; Erdfelder et al., 1996). Assuming some dropouts and inappropriate data, 80–90 children in the experimental and control groups were planned for enrolment.

Results

Descriptive results and explorative analyses

Means and standard deviation (SD) for the baseline *ChildMedKnow* items can be seen in Table 3. The most item medians show concrete associated or concrete logical cognitive level for the majority of children at baseline. The most sophisticated question was the one on possibilities of therapy against abdominal pain (median = 1.5 in the range from 0 to 4).

Children with a higher 'man-drawing quotient' had a better medical knowledge at baseline (r_p = 0.54). Children with siblings or children from mothers with technical college or university entrance qualifications did not have a higher medical knowledge at baseline; therefore, results are not presented here.

The hours of preparation on the subject at the kindergartens varied (2–6 hours, 4 hours as a medium). To check for systematic relations between hours of preparation and the children's results, we aggregated the *ChildMedKnow* results for each kindergarten. However, the mean changes per kindergarten were similar, irrespective of the hours of preparation.

Effectiveness of the TBH intervention on knowledge

The ANCOVA revealed that the children who visited the TBH had a significantly better knowledge of their body, health and disease

Table 3. Quality of answer (range 0–4) for the *ChildMedKnow* items (whole sample at baseline) (N = 127).

Item in interview-based scale (in note form)	Mean	SD	Median
1. Knowledge of body organs	1.93	0.94	2
2. What physician actually does	2.64	0.99	3
3. What can be done with X-ray	2.72	1.17	3
4. Reasons for not being allowed to go to kindergarten with chicken pox	2.69	0.92	3
5. How to get a cold	2.46	0.90	2.5
6. What can be done against abdominal pain	1.62	0.90	1.5
7. Reasons for getting a vaccination	2.64	1.03	3
8. Function of stethoscope	2.65	0.89	3

ChildMedKnow: Children's Medical Knowledge Scale; SD: standard deviation.

Quality of answer for questions 2–8: 0 = no answer; 1 = freely fabulated answer, phenomenism; 2 = phenomenism of concrete associations; 3 = concrete, logical explanation, not differentiated; 4 = physiologically differentiated answer.

(ChildMedKnow at time point 2*)* than the children from the control group (F(1, 118) = 141.07, $p < 0.001$). The effect size was large (partial η^2 = 0.55). There was an influence of the baseline score as well (F(1, 118) = 213.55, $p < 0.001$, partial $\eta^2 = 0.65$).

Children who visited the TBH improved their knowledge of the different organs of the body significantly (F(1, 121) = 79.43, $p < 0.001$, partial η^2 = 0.41). Children from the intervention group knew the organs of their body better after visiting the TBH (M = 4.5, SD = 1.1) than children in the control group (M = 3.1, SD = 1.2). The ANCOVA also revealed here a significant baseline score as covariate (F(1, 121) = 111.05, $p < 0.001$, partial η^2 = .48). Considering outliers or extreme values identified by box plots, there was no difference between the results.

Discussion

We were able to show that children visiting the TBH enhanced their knowledge of the body, health and disease. This was particularly evident with the children's knowledge about internal body parts. Preschoolers were able to learn effectively during the role-play situation. This contrasts with the assumptions of some authors who doubt that children can understand and appreciate symbolic relationships (Jaaniste et al., 2007) but is in line with the general function of play at preschool age. Instead of preparing children for medical procedures while visiting a physician or staying in a hospital, the TBH visit was directed at healthy children in a protected environment. The active participation and the kind of explanations given by the 'Teddy docs' (medical students) enhanced the preschoolers' concepts of medicine and illness, which is in line with conclusions by Myant and Williams (2005) about children's concepts of health and illness. The qualities of the answers show slight differences in this age group, which could be an argument in favour of the functionalist approach, where children are seen as active theory builders (Eiser, 1989).

To the best of our knowledge, only one study that evaluated the effectiveness of the TBH has been published. In the same way as this study, we examined a group of preschool children in the weeks before and after the visit of a TBH, while a group of age-matched children served as controls. The number of control children was identical in both studies; the number of children in the intervention group was about twice as high in our study. Whereas the study of Bloch and Toker (2008) was restricted to the question of fear reduction, we investigated preferentially the effect on the children's medical knowledge and understanding.

There are some limitations to our study. The response rate among the parents was low; this seems to be a problem, especially with families from a low socio-economic background. Apparently, the data available from the parents were supplied by those who were more interested and had a higher level of education. The measurement instrument was new, and further evaluations have yet to be carried out, although the first analyses of reliability were promising.

There can be various confounders in this field study. The allocation of the children to the experimental and control groups was not randomized. The intervention is not standardized, as mentioned above. We could not prove exactly how the facilities educated the children on medical topics between the two measurement points. The effectiveness of children's knowledge could also be a result of discussing the medical topics afterwards in families or at kindergarten. We could not separate the direct TBH effect from these 'surrounding' effects, but a discussion at greater depth about medical topics after visiting the TBH can also be seen as a positive effect.

During this event every year in our city, hundreds of children pass through the TBH, and the skills of the medical students who act as 'Teddy docs' always differ. Although there is a manual on the approach to be taken with the children, the procedure depends on the type of illness the children choose for their stuffed animal and is very individualized. The idea behind the 'Marburg TBH' is to explain the medical procedures to the children and encourage them to engage as parent of their stuffed animal. It would be interesting to compare children who consulted the same 'teddy doc' and their medical understanding with children from another 'teddy doc' because the individual medical students' skills who act as teddy doctors could be one factor influencing the effectiveness.

Conclusion

This German TBH provides an excellent opportunity for introducing health-care information to young children and to help them develop correct concepts of their body in health and disease. To evaluate the effects of TBH in future, reactions of the children in real-life medical situations would be crucial, especially to estimate the relationship between better knowledge and coping behaviour, as is predicted in stress and coping theories (Lazarus and Folkman, 1984; Petersen and Kwan, 2004). This would require long-term data from highly individual situations and experience.

This was one of the first studies to evaluate the effectiveness of the TBH concept, so popular worldwide. Findings have to be replicated in a larger multi-centre study, where individual interviews with the children and a randomized design can be realized. Possible effects on medical fears should be evaluated in the real situation if the child is in contact with the paediatrician or if hospitalization is planned.

Further studies are needed to explore whether the intervention helps medical students to improve their communication skills with children. Moreover, it will be interesting to find out whether visiting the TBH has long-term effects.

Practical implications

If these findings can be replicated in a larger study with randomized design, this community intervention should not only take the form of a yearly event but also become an integrated part of health education for preschoolers. Communities could establish this concept as part of an 'experience museum' to give a continuous opportunity of health education for children.

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