

A Qualitative Study of the Knowledge of Primary Schoolchildren about Illness Symptoms in Flanders

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Keywords

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Abstract

Objective

Good physician-patient communication leads to better patient outcomes, but this is less evident when communicating with a child. This investigation aimed to describe primary schoolchildren's perceptions of common illness symptoms in order to establish a baseline for healthcare communication with children.

Methods

Data were collected through semi-structured group interviews in ten primary schoolclasses in Flanders, five in the second and five in the sixth year. The interview guide included questions about the definition, causes, symptoms, treatment, and dangerousness of fever, abdominal pain, and cough.

Results

Participants from the second and sixth years of primary education gave roughly the same answers. Sixth-year participants did have more specific knowledge and used more details, practical examples, and anecdotes. Second-year participants had more misconceptions, mostly influencing their ideas about the causes and dangers of illnesses.

Conclusion

Children do have quite elaborate ideas about fever, cough, and abdominal pain when asked to comment on symptoms, causes, treatments, and dangers. No major differences were found between second-year and sixth-year participants with respect to Piaget's levels of cognitive development. Healthcare professionals working with children can and should consider children's perceptions in their consultations to enhance the effectiveness of care.

Introduction

When a physician uses an empathetic, patient-centred communication style, this results in a better patient-physician relationship and more engagement of the patient in her/his own therapy, which in turn leads to better patient adherence and health outcomes (1-2). Studies have shown that this also applies to children and that good physician-child communication, educating the child and letting him/her participate in decision-making, results in better compliance and quality of life (3-4).

Patient-centred communication is more complicated when the patient is a child. For one thing, children have a different understanding of health and illness than adults and their understanding changes with the different developmental stages they go through (5-8). For another, physicians may not be familiar with a child's level of cognitive understanding, due to age-related differences (3-5, 9-10). Furthermore, physicians do sometimes underestimate or overestimate their patient's age, leading to potential communication barriers [10]. Based on a study of children's conceptual development of illness, Perrin and Perrin concluded that healthcare professionals are often unaware of children's knowledge about health and illness and that more than half of their age estimates were incorrect (6).

To understand what can be expected of children in terms of their understanding of concepts at a particular age, it is useful to turn to Jean Piaget's seminal theory of cognitive development (5). In his theory of how formal thought develops, Piaget defined four stages of cognitive development in children (5, 11-12). In the sensorimotor stage (birth-age 2), children use their senses to explore the world and they understand object constancy. Children in the preoperational stage (age 2-7) are egocentric and name things with words, but they lack logical reasoning.

They start to develop speech and over-focus on visual aspects. Actions are now not only purely motor and perceptual but also mental. In the concrete operational stage (age 7-11), children start to think more logically about concrete events and they develop reflection as they think before acting. They become less egocentric and can dissociate their point of view from that of others. In the final stage, formal operational (age 11+), children can think and reason abstractly.

The aim of this study is to deepen our understanding of the knowledge of primary schoolchildren (ages 7 and 11-12) about the semantics of three health symptoms, namely fever, abdominal pain, and cough. This study is the first to assemble baseline data on children's views of fever, abdominal pain, and cough in Flanders. It not only assesses the children's perspectives of illness aetiology, as was done in previous studies, but also at the broader semantic domain associated with these illnesses (13). Its results want to serve healthcare providers to improve the child-directed nature of their communication. It is only when a child can explain its symptoms well and understand the physician's explanations about the aetiology and pathophysiology of the disease, that patient-centred medical decisions can be made. We anticipate that the participants' understanding of illness will increase with age, and therefore a difference will be seen between the younger and older participants.

Design and methods

Sample

The target population consisted of two cohorts of Flemish schoolchildren from the second (7-year-olds) and sixth (11-12-year-olds) year of primary education. School principals were invited by e-mail to participate in the study,

Table 1: Summary of studies researching the most commonly addressed childhood illnesses/symptoms.

ARTICLE	COUNTRY OF STUDY	AGES OF PARTICIPANTS	RESEARCH SUBJECT	RESULTS
Workload and management of childhood fever at general practice out-of-hours care: an observational study (18)	The Netherlands	0-12 years old	Number of childhood fever related contacts during out-of-hours care	31.1%
Diagnostic scope in out-of-hours primary care services in eight European countries: an observational study (19)	Belgium, Denmark, Germany, the Netherlands, Norway, Slovenia, Spain, Switzerland	0-17 years old	Top five symptoms and diagnoses in out-of-hours primary care	Respiratory, digestive, general and unspecified, ear, skin
The frequency distribution presenting symptoms in children aged six months to six years to primary care (20)	United Kingdom	6 months – 6 years	Top five presenting symptoms in primary care organisations	Respiratory, orthopaedics and trauma, skin, gastrointestinal, non-specific symptoms
Everyday symptoms in childhood: occurrence and general practitioner consultation rates (21)	The Netherlands	0-14 years old	Top five occurring symptoms	Colds/flu, respiratory, diarrhoea, musculoskeletal, headaches
Medical problems presenting to paediatric emergency departments: 10 years on (22)	United Kingdom	0-15 years old	Top six symptoms in the emergency department	Breathing difficulty, febrile illness, diarrhoea and vomiting, rash, cough, abdominal pain

resulting in the inclusion of two schools. In Belgium, grade and year are equal to each other (second grade is equal to second year). The first school is a public Catholic school located in a village. Of all the schoolchildren, 8% speak another language at home and 1% come from neighbourhoods with delayed education (14). The second school is also a public Catholic school located in a medium-sized city. About 13% of the schoolchildren speak another language at home and 1/3rd of the children come from a neighbourhood with delayed education. 166 participants from ten classes took part in a focus group interview (one per class).

Topic selection

We based the selection of our topics on the frequency of symptoms in paediatric healthcare. As can be seen from Table 1, studies reported that the most frequently returning symptoms include general symptoms (including fever), respiratory symptoms, digestive symptoms, ear problems, skin problems, orthopaedics and trauma, musculoskeletal problems, and headaches (15-19). Since these studies reported that general symptoms, such as abdominal problems and respiratory tract symptoms are frequently recurring symptoms in children, fever, abdominal pain, and cough were chosen as the topics to be addressed in the focus group interviews.

Data collection

Ten semi-structured class interviews, all conducted by the first author, formed the basis of the data collection. The data were collected in April 2023. We decided to use basic questions to get an overview of the children's knowledge and because we had limited time per class. As can be seen from the interview schedule in Appendix A, questions concerned the definition, symptoms, and causes of the illnesses, whether the illness could be dangerous, what the children do when they get sick, what a doctor can do when you are sick, which medications one can take, etc. In all classes, the same preset questions were asked, but there was also room for spontaneous input from the participants' side. Interviews lasted approximately 50 minutes.

Before the start of the interviews, the children and parents received an information letter explaining the purpose of the study, benefits and risks, the anonymity of the participants, voluntary participation, and the purpose of recording the interviews. The parents were required to complete a consent form beforehand. Only children with parental consents were allowed to participate in the interviews. The study was approved by the Research Ethics Committee UZ/KU Leuven (MP023419).

Data analysis

The interviews were transcribed from the recordings, and all transcripts were anonymized. Two researchers (AF, JT) performed independent coding of transcripts. In the first step of the coding process (open coding) the data were summarized, and concepts were constructed into a preliminary coding framework. In the second step (axial coding) general themes were defined based on the identified concepts. The third step (selective coding) confirmed the associations that were made in the first or second step by examining the categories and data that had been included and omitted across all interviews. A 100% interrater reliability was achieved after discussing some minor differences in the initial coding steps. Quotations were matched to the different themes and translated from Dutch into English. To create an overview of the results, a table with the most important findings was drawn up.

Results

Overall findings

Overall, we found no major differences between the answers from both age groups for the three health symptoms (Table 2). All children had experienced the three symptoms in the past and agreed that everyone can experience those illnesses.

The definitions and causes of the illnesses that the participants from the second and the sixth year of primary education reported were mostly the same, but the children from the older group had more specific knowledge, used more details, and provided more practical examples and anecdotes. The more detailed answers usually came from children who had a close personal (or familial) experience with medical problems. E.g., children and relatives who have had appendicitis, an aunt who is gluten intolerant, a father who has had kidney stones, etc. Another observation from the interviews was the lingering influence of the COVID-19 pandemic: at least one child in nine out of ten classes mentioned COVID-19 as the cause of an illness or a COVID test as one of the things a doctor can do. Illustrative quotes can be found in Table 3.

Specific findings

Fever

Knowledge. Both second and sixth-year children came up with the same definition: 'a body temperature higher than normal'. When asked what they felt during a fever, most participants in both age

Table 2: Overview of the results of the interviews, second year and sixth year separated.

	SECOND YEAR	SIXTH YEAR
Fever		
<i>Knowledge</i>		
- Definition	A temperature of more than 37°C-40°C	A temperature of more than 37°C-38°C
- Symptoms	Alternating hot and cold, headache, abdominal pain, not able to eat, nausea/vomiting, nose bleed, ill feeling, cough, flu, sore throat, being pale, fatigue, stuffed nose	Alternating hot and cold, headache, fatigue, abdominal pain, ill feeling, stuffed nose, nausea/vomiting, muscle pain, sore throat, being pale, shocking
- Causes	Not dressing arm enough in cold weather, eating something wrong/raw/mouldy, bacteria, viruses, cancer	Bacteria, not dressing warm enough in cold weather, flu, viruses, cold, eating something wrong, walking barefoot, someone sneezing on you
- Actions	Resting, taking medication, drinking soup/water/tea, placing something cold on forehead, measuring fever, going to the doctor	Resting, taking medication, going to the doctor, drinking hot beverages, drinking cola/water, measuring fever, icepack on the forehead, not dressing too hot
- Dangerous?	When fever is too high, the elderly, babies, transferable to other people	When fever is too high, the elderly, babies, underlying disease
- Medication	Ibuprofen, paracetamol, antibiotics	Ibuprofen, paracetamol, paracetamol-codeine, cough syrup, antibiotics
- Doctor visit	Prescribing medication, examining belly, examining throat, listening to heart/lungs, measuring fever, examining ears, measuring blood pressure	Examining throat/ears, listening to heart/lungs, measuring fever, examining belly, prescribing medication, covid test
<i>Misconceptions</i>		
- Definition	A temperature ranging from 15°C to 70°C	Dressing too hot, a temperature difference between the body and surroundings, eating something you do not like, a big time difference
- Causes	Dressing too hot, eating too much candy, not changing your bed sheets	
- Dangerous	Suffocation, you could get covid/cancer/burning wounds, you cannot eat anything anymore	
- Can everyone get it?	People who eat a lot of vegetables or people who received a shot against it cannot have fever	
Abdominal pain		
<i>Knowledge</i>		
- Definition	Stomach pain, cramps, pressure on the belly, nausea/vomiting, the urge to go to the toilet, the feeling that someone kicked in your belly	Stomach pain, cramps, pressure on the belly, rumbling stomach, vomiting, headache
- Causes	Eating too much / too fast / too little / unhealthy, eating something bad / raw / past date, food intolerance, being in the car, drinking too much water, breathing fast, illness, appendicitis, constipation, poisonous spiders, bacteria, viruses, allergies, someone kicking in your belly	Eating too much / too fast / too little / unhealthy, eating something bad / raw / past date, bacteria, stress, allergies, eating things that do not fit together after each other, having it too hot, drinking too much water, viruses, constipation, appendicitis, someone kicking in your belly, taking too much medication, menstruation, tapeworm, flu, animals carrying diseases, giving birth
- Actions	Taking medication, resting, going to the doctor, drinking cola, pressing in your belly, going to the toilet	Resting, finding a comfortable position, taking medication, going to the toilet, going to the doctor, drinking water / soup / cola, hot water bottle, vomiting
- Dangerous?	If it doesn't go away, the elderly and babies, if you have to go to the hospital, appendicitis, if you cannot eat anymore	If it doesn't go away, if you have to go to the hospital / get surgery, appendicitis, the elderly, tapeworm, kidney stones, underlying disease
- Medication	Paracetamol	Paracetamol, macrogol, ibuprofen, antibiotics
- Doctor visit	Prescribe medication, examine throat / ears, examine belly / heart / lungs, draw blood	Examine belly / heart / lungs / throat / ears / give medication, examine urine, draw blood, perform ultrasound
<i>Misconceptions</i>		
- Causes	Eating something you do not like	
- Dangerous?	You can get covid and / or cancer from it and die	
Cough		
<i>Knowledge</i>		
- Symptoms	Tremor or itch in the throat, mucus in the throat, sore / dry throat, stuffed nose, a feeling that something is blocking the throat	Tremor or itch in the throat, sore / dry throat, air hitting your throat very hard, air passing over bumps in your throat, swollen and painful tonsils
- Causes	Not dressing warm enough in cold weather, allergies, cold, choking, itch in the throat, dirt / mucus / dust in throat, bacteria, viruses, fever, having it too hot, unable to breathe well, fever, smelling something bad	Choking, cold, sore throat, mucus / dust in throat, allergies; viruses, after eating ice cream, after gagging, smelling powder / something bad, itch in the throat, after covid test, asthma, bacteria, dry throat, sharp food, insect stuck in throat, croup / laryngitis, not dressing warm enough in cold weather
- Actions	Cough in elbow / hand / tissue / away from others, drink tea / water, honey, take medication	Take medication, drink tea / warm milk / water, take puffer, cough in elbow, hit person coughing on the back
- Dangerous?	Suffocation, transferable to other people, the elderly, babies	Suffocation, transferable to other people, the elderly, babies, smokers, asthma, bronchitis, pneumonia, breathing problems, laryngitis, rib fracture
- Medication	Cough syrup, paracetamol, ibuprofen	Paracetamol, macrogol, ibuprofen, antibiotics
- Doctor visit	Examine throat, prescribe medications, covid test, listen to lungs / heart	Examine belly / heart / lungs / throat / ears / give medication, examine urine, draw blood, perform ultrasound
<i>Misconceptions</i>		
- Causes	Having it too hot	
- Dangerous?		Fatigue, not brushing teeth Damaging the throat resulting in bleeding or death, damaging lungs causing a hole resulting in bleeding

Table 3: Overview of citations.

	SECOND YEAR	SIXTH YEAR
Fever		
<i>Knowledge</i>		
- Definition	'If the temperature of your body is too high'	'If the temperature of your body is higher than normal'
- Symptoms	'That is when your head is so hot and you have an headache and then you can also cough' 'Sometimes you are pale and you don't feel well and then you have to go home because you are so ill'	'I think sometimes you feel warm but then you are cold because you have those chills' 'I am also always hot and cold, my throat always hurts, when you lie in your bed and you get up again, your head hurts a lot afterwards'
- Causes	'Because microbes get into your stomach' If you go swimming and you have wet hair and you don't put on your hood, you can also get sick and get fever' 'If you eat something mouldy'	'If someone sneezes in your face you may also get a fever' 'Like if you go outside with wet hair when it's freezing' 'Eating something wrong'
- Dangerous?	Fever can sometimes be so hot that you can die from being too hot' 'If your grandfather and grandmother are very old, they can die from it' 'Because when you visit older people you can pass that on'	'if it gets very high' 'It can be worse in older people and babies, because they are more sensitive' '-People with cancer or people who are already ill because of something'
<i>Misconceptions</i>		
- Causes	'If you don't change your bedsheets' 'Some people cannot get fever because they eat a lot of vegetables'	
- Dangerous	'If you have it for top long you can choke' Yes, then you can get corona and corona can give you cancer and kill you' 'Then you can no longer eat as much because then you become afraid if you eat something hot, you will feel even hotter' 'You can get burning wounds from it'	'For example, if you are inside and that takes another 5 minutes and you already put on your coat and your scarf and so on, you are very warm and if you have to go in the car and take it off. Then the environment is colder'
Abdominal pain		
<i>Knowledge</i>		
- Symptoms	'It's like having cramps' 'Then your stomach hurts and you think you have to throw up'	'If you get a lot of pain in your stomach, or if you get kicks in your stomach or if you have cramps, and also just really pain'
- Causes	'If you have eaten something bad that your stomach cannot handle very well' 'That's because you ate too much, also my stomach hurts when I'm breathing very fast' 'I have a stomach ache because there is a lot of poop in my stomach and it hurts and then I have to take something in my water or milk every morning and I find that very disgusting' 'If someone who is sick coughs near to you'	I have stomach ache when I am stressed or eat too much, but I also have stomach ache when I have eaten too little, so if I have not eaten for a long time I also get stomach ache'
- Dangerous?	'This is also dangerous for older and younger people' 'You can die if the stomach ache is super painful'	'Yes, if that continues and there are many bacteria and viruses in your stomach, and they continue and then sometimes you may have to go to the hospital' 'My dad once had kidney stones and had also a lot of stomach pain, so I also think that can be dangerous. Not fatal, but dangerous' 'Appendicitis, I think if it were to explode it would release toxins in our stomach and that could be dangerous'
<i>Misconceptions</i>		
- Dangerous?	If you have a lot of abdominal pain then you will become very ill or you could get corona or maybe cancer or something. If you get corona from the stomach pain then you might get cancer from corona if you are very ill'	
Cough		
<i>Knowledge</i>		
- Symptoms	'It vibrates in your throat when you cough, that's when you sneeze or cough'	'It actually feels like air hitting your throat really hard'
- Causes	Sometimes you have mucus in your throat and the you have to cough that mucus away' 'Coughing can sometimes be because you may have bacteria in your throat' 'I often cough because I have a cold' 'If I smell something I'm allergic to I always have to cough' 'When the weather was cold and you had been playing outside and you hadn't dressed very well'	'If food comes in your windpipe then you have to cough to get it out' 'If you have a pollen allergy' 'When you go outside in the cold without much clothes'
- Dangerous?	'If you cough very hard you can make other people sick' 'Because sometimes you can choke and some people can suffocate easily. My sister also had to cough a lot and she had inflamed tonsils and she could hardly breathe' 'If you cough on older people, they can die more easily'	'I think it can suffocate you if you choke or if something is stuck that can suffocate you' 'Yes, because you can then pass it on to other people, such as bacteria for example' 'It can be dangerous to older people'
<i>Misconceptions</i>		
- Causes	'When you are extremely hot, you have to cough'	'If you haven't brushed your teeth for a long time'
- Dangerous?		'Yes, because if you cough up your throat, you will die of pain' 'If your lungs are damaged and you have to cough, you are coughing blood. Can be dangerous because then there is a hole in it somewhere and you can no longer breathe properly' 'If you cough a lot, I think that you can cough open your throat and that the skin in your throat has been coughed away and that a lot of blood flows into your food pipe and that you will then lose too much blood'

groups mentioned feeling hot and cold, a headache, and fatigue. They also mentioned abdominal pain, being pale, nausea/vomiting, feeling ill, a stuffed nose, etc. One participant mentioned shivering, something she had experienced herself before. Regarding the causes of fever, many participants mentioned: not dressing warm enough in cold weather, eating infected food, and bacteria and viruses (mostly bacteria were mentioned). Most participants rest and take medication when they have a fever. Some drink hot beverages, place something cold on their forehead, or go to the doctor. Sixth-year participants were able to mention more medication names for fever than second-year participants. Most participants in both years agreed that a fever can be dangerous if it becomes too high, and that the elderly and babies are more vulnerable. Two sixth-year classes also mentioned that it can be more dangerous for people with an underlying illness (for example cancer, or a weak immune system). When asked about medical interventions, most of the answers included: measuring the fever, looking in the throat and ears, listening to the lungs and heart, examining the abdomen, and prescribing medications.

Misconceptions. There were more misconceptions in the second-year group. With the definition of fever, many children did not know the cutoff temperature. Most second-year participants guessed between 37°C and 40°C (but with a range of 15°C to 70°C). Another misconception was that a fever is defined as a body temperature not only higher but also lower than normal. Misconceptions about the causes of fever included: a too-warm environment (for example in summer), eating too much candy, and even 'not changing your bedsheets'. They thought a fever could be dangerous for the wrong reasons: you can suffocate, you can get COVID, cancer or burning wounds from a fever, and you cannot eat anything warm because then you will get even warmer. Two participants did not believe that all people can get a fever: some people eat a lot of vegetables, and some have received a vaccine and therefore cannot get a fever.

Sixth-year participants had fewer misconceptions, yet some of them thought that 'dressing too hot,' 'eating something you do not like' and 'a big-time difference' could be causes of fever. Another misconception was thinking that a fever is dangerous when your temperature reaches 45°C.

Abdominal pain

Knowledge. When asked about the definition, most participants started to explain based on prior experience (what they felt themselves) or gave potential causes. Participants in both years of study described abdominal pain as 'a lot of pain and cramps in their belly.' Some also added: nausea/vomiting, pressure on the belly, and the feeling you need to go to the toilet. The most prevalent cause according to both age groups was food-related: eating too much or too little, eating something wrong or past date, eating something raw, or eating a substance against which one is intolerant (gluten, milk) or allergic. Other causes included stress and being in the car for too long. In most sixth-year classes, bacteria were mentioned. In all classes across both years, viruses were mentioned after more extensive questioning by the interviewer. One participant from each age group mentioned appendicitis, something they or a relative/friend experienced. When asked what the participants do when they have abdominal pain, most answered that they rest, take medication, or go to the doctor. Some go to the toilet or find a comfortable position. Second-year children were not able to mention medication names, sixth-year children mentioned painkillers, antibiotics, and Macrogol. The children think that abdominal pain can be dangerous when it goes on for too long, if you are in too much pain, if you must go to the hospital, if you have appendicitis, if you have kidney stones or an underlying condition (for example cancer). They also mentioned that the elderly and babies are more vulnerable. Both groups gave similar answers to the question 'what can a doctor do?': prescribe medication, examine the abdomen, look in the ears and throat, listen to heart and lungs and take a blood sample. In the sixth-year of primary education, examining the urine and performing an ultrasound were mentioned by two participants, both due to personal experience.

Misconceptions. Second-year participants thought that eating something you do not like' or fatigue are causes of abdominal pain. Two participants thought abdominal pain was dangerous because you could get COVID from it and you could then get cancer from COVID and die.

There were no misconceptions mentioned by the sixth-year classes.

Cough

Knowledge. Most participants gave a demonstration of a cough when we asked to define a cough. When asked what they felt, most stated that it felt like a tickle in the throat and a sore or dry throat. Three sixth-year participants gave a more detailed explanation: the feeling of air hitting your throat very hard, air passing over bumps in your throat, painful and/or enlarged tonsils. The most common causes in second-year classes included: allergies, a cold, not dressing warm enough in cold weather, and viruses. In the sixth-year class, the most common cause was choking, followed by a cold, sore throat, mucus in the throat, allergies, and viruses. When having a cough, most children took coughing syrup and drank some water or hot beverages. In the younger age group, some participants mentioned that they cough in their elbow or in a tissue. A sixth-year participant with asthma stated she uses her inhaler when she coughs a lot. When we asked which medication the participants took, most answered that they took a cough syrup. Some mentioned pain medication and some sixth-year participants took throat pastilles or antibiotics. Some participants in both age groups did not think a cough could be dangerous, while others thought it could be dangerous because you can pass it on to someone else and because you could suffocate. When asked if certain people are more vulnerable, second-year participants mentioned the elderly and babies. Sixth-year participants also mentioned people with asthma, bronchitis, or pneumonia, and people who smoke a lot or have trouble breathing. One participant mentioned a teacher once broke a rib because of a coughing fit. Their examples of what a doctor can do were more focused on fever and abdominal pain: prescribe medication, look in the throat and listen to the lungs. A sixth-year participant mentioned a laryngoscopy, as he had experienced one before.

Misconceptions. A second-year participant thought you could get a cough if you are too hot. In the sixth-year, misconceptions about the causes of a cough included fatigue and not brushing your teeth for a long time. Three sixth-year participants thought a cough could be dangerous because you can damage your throat resulting in bleeding or death, or because you can damage your lungs by causing a hole in them, which in turn can result in bleeding.

Discussion

In this study, we did not find major differences between the semantic fields used to describe three frequent medical symptoms in our second- and sixth-year groups (13). Both groups reported similar definitions and symptoms. Both also mentioned many external factors as possible aetiologies of the symptoms. Sixth-year participants were able to mention more medication names, used more specific language, and recounted more anecdotes, suggesting that their mental representations of the illnesses investigated may be more elaborate and different from those of the children in the younger age group. Regarding the pupils' misconceptions, our findings show that the second-year participants had slightly more misconceptions than the sixth-year participants, in the categories of causes and dangers related to illnesses. Common misconceptions among the younger participants included the cut-off temperature for a fever, the belief that one can get cancer from the symptoms, the belief that eating something they do not like can be a cause for the symptoms, and the belief that coughing can cause severe complications in the throat.

In paediatric clinical practice, an explanation from a healthcare professional is more genuinely reassuring for a child when it is framed within the cognitive and psychological or emotional level of the child's understanding of illness. To do so, the professional needs to be aware of the age-related stages of cognitive development of the children under their care. As mentioned in the introduction, Piaget's theory

is an accepted concept to frame our findings. There are studies that further refine the four stages of Piaget in the context of symptoms and disease aetiology (7-8).

These studies confirm that children in the concrete operational stage (the second-year participants in our study) can differentiate internal (self) from external reasons for illness. They use contamination and internalization as explanations of illness. Children in the formal operational stage (the sixth-year participants in our study) use physiological and psychophysiological explanations, as the differentiation between internal and external explanations becomes larger in this stage and they understand that illness can arise from various causes. In this light, our findings corroborate findings from earlier studies, indicating that the situation has not changed much over the years and that today's children appear to process illness symptoms in the same way as children did two or three decades ago (20-21). This is an expected finding when we consider that today's children, like children from previous decades, are cognitively maturing and proceed through the different stages of cognitive development just like children from previous decades. On a more pessimistic note, this suggests that the health literacy of children, and particularly the older children, has not grown much over the years. This may in part be due to the fact that the attainment targets for health education for primary education are quite vague and are not easily translated into a concrete curriculum for younger and older children. Teachers may for example focus on hygiene, and relate hygiene to the prevention of illness, but they may not necessarily also provide information on potential physiological or psychophysiological explanations for illnesses, i.e. information that the older children could grasp given their cognitive developmental stage (formal operational stage with abstract thinking).

Not all children in our two groups behave exactly according to the age-related categories. For example, some sixth-year children display opinions that can be categorized as typical of the concrete operational stage, rather than the formal operational stage where the ability to think abstractly is developing. This became clear in some of the misconceptions that were emerging during the focus group discussions. In other words, Piaget's age ranges may have to be considered loosely rather than strictly with some children being more mature than their age group suggests and others less so. Thus, our findings suggest that the sixth-year children find themselves at a turning point between the concrete operational and the formal operational stage, with some of them already having crossed the line and others not. A possible explanation for this is the fact that the previous studies relied on individual interviews, rather than focus group discussions. It is possible that children behave differently or state different opinions when they are in a group. We did notice that some of the participants made statements that evoked laughter or expressions of amazement in the group. It is unclear if they would have done so in an individual setting as well.

Our findings of congruence between the answers in the two age groups differ from some previous studies of healthy children. One study interviewed three age groups of Icelandic schoolchildren: 6-7 years old, 10-11 years old, and 14-15 years old (22). In individual interviews, the authors asked about the causes, symptoms, prevention, and treatment of illnesses. They found a significant difference between all three age groups. The 6-7-year-old participants were at the beginning of the concrete operational phase and the 10-11-year-old participants were in the formal operational stage. In all age groups, their understanding of the causes of illnesses was higher than their understanding of treatment and prevention. They also mentioned examples of answers the children gave, so we are able to compare those to our results. The 6-7-year-olds mostly associated cold weather and not dressing warm enough with causes of illness, while the 10-11-year-olds mostly mentioned germs. This is in contrast with our results, where both age groups mentioned these causes. For the treatment of illnesses, the second-year group mostly mentioned medical treatment, while the sixth-year group also mentioned self-care. In our study, both age groups mostly mentioned a combination of resting and taking medication.

One reason for our non-corroborating findings may lie in the fact that we did not use individual interviews to collect our data, but group interviews. Chances are that when we would have interviewed our participants individually, the individual children would not have been able to come up with the same amount of knowledge as the class as a group could. When interviewed as individuals, we might have seen a clearer distinction between the age groups. As individuals, the younger students from the second-year group might either have been in the preoperational or the concrete operational stage, depending on their degree of maturation. The older children might either have been in the concrete or the formal operational stage as already suggested above.

One interesting and understudied part of the study concerns the children's misconceptions. Even in the older age group, such misconceptions are persistent. When health professionals talk to children about their illnesses, they may have to consider -next to the cognitive developmental stages- the possible misconceptions or lack of information that could burden children with a wrong conception of the causes of their illness or how to treat it. A dialogic approach where the health professional listens to the young patient instead of talking about the young patient is needed to engage the child in the healing process and in a process of health education. Every doctor's appointment could thus become an opportunity for health literacy enhancement in young children, taking away misconceptions and reassuring the child that what it says is meaningful. The doctor's appointment also presents an opportunity to educate the children's parents, since many misconceptions stem from parental influence (23). Fever phobia is prevalent amongst most parents, often caused by poor knowledge and potentially resulting in excessive treatment. Parents may also transfer their own (poor) knowledge about medication usage to their children, since the subject is not covered in school (24). Apart from health professionals, educators can also utilize information about children's misconceptions to design age-appropriate and child-centred learning materials that can take away such misconceptions and help to alter them, perhaps helping the child move to the next stage of Piaget's model of cognitive development and taking away unnecessary fears on the side of the children.

Our study has some limitations. We only interviewed children from the second- and sixth-year group, which does not allow comparisons over a broader age spectrum. To include more children in the study, the interviews were conducted in groups (per classroom) instead of individually. This gave us a broad overview of their general knowledge but made it impossible to see strictly individual differences in knowledge and personal ideas. The interviews were performed in two public catholic primary schools in Flanders, excluding private and special education schools. Both schools were quite similar as they both had a relatively low percentage of schoolchildren who come from a relatively more deprived educational region and/or speak another language at home.

Conclusion

The aim of this study was to increase our understanding of the knowledge of primary school children about the semantics of health symptoms so that healthcare professionals in Flanders can improve their communication with children.

On the basis of our study and earlier studies, we can conclude that no large differences in describing common illnesses (fever, abdominal pain, cough) exist between children from the second- and sixth-year groups, except for the reasons that children see for having attracted a certain illness. This lack of difference between the age groups is not something we expected, given Piaget's distinct levels of cognitive development and some previous studies that have shown clear distinctions between age groups when inquiring about children's conceptions of causes and symptoms of illnesses.

Based on our overall findings, topic descriptions, and collection of interview quotations taken from the focus group interviews, we recommend that health professionals talking to children take account of children's preconceived ideas and, in particular, their misconceptions

regarding common illnesses and symptoms, such as fever, abdominal pain, and cough. More patient-centred communication should result in better and faster health outcomes, and children's enhanced health literacy. The findings are also relevant for educators who can refine their health curricula to correct and enlarge children's mental representations of common illnesses and assist sixth-year children in achieving Piaget's stage of formal operational thinking.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest with regards to the acquisition and reporting of the data of the study presented in this manuscript, all procedure were in line with the editorial policy of the Belgian Journal of Paediatrics.

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