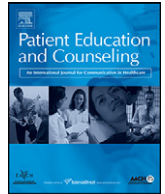




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Thermometer of warmth in the patient–provider relationship (WARMOMETER) – Theory-based development of a patient self-report measure and initial validation using cognitive interview methodology

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ABSTRACT

Objective: The aims of this study are twofold: (1) the theory-based development of a patient self-report measure of physician warmth and (2) the application of cognitive interview methodology to understand patients' perception and interpretation of this new measure.

Methods: A draft measure was developed based on an in-depth literature review of the concept of human warmth by a multidisciplinary expert group. Sixteen cognitive probing interviews were conducted to examine how patients perceive and interpret this new measure and to identify potential problems. A content analysis of the interviews was used to evaluate findings.

Results: Findings indicate that the WARMOMETER is a short patient self-report assessment of physician warmth, which seems easy and intuitive to understand. In addition, most respondents were found to share a common concept of physician warmth.

Conclusions: Verification of our study hypotheses and confirmation of the theoretical assumptions of human warmth give basic indications that the WARMOMETER seems to be a valid and sensitive patient self-report instrument for assessing the socio-emotional quality of physicians.

Practice implications: These first promising results of our cognitive interviews suggest that the WARMOMETER may also be used and further validated in future health communication studies, also with other healthcare professionals.

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1. Introduction

When talking about the “warmth” of a person, we do not refer to body temperature. We perceive a “warm” person as someone who “gives us a pleasant feeling of cheerfulness or friendliness” [1, p. 1186] and “has good, kind, friendly feelings” [1, p. 1186]. By contrast, a “cold” person is someone who “gives us the cold shoulder” [1, p. 191] or comes off as “a cold fish” [1, p. 191].

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Beyond these linguistic facts, there has also been moving research on the concept of warmth in human relationships in recent years. For example, latest studies indicate that, together with “competence”, the warm–cold dimension is one of two main first impressions we spontaneously form of other people. Moreover, studies show that most abstract psychological concepts, such as affection, are metaphorically based on concrete physical and physiological experiences.

Hence, the first aim of our study is to develop a self-report measure based on the concept of warmth in human relationships to assess the socio-emotional quality of healthcare providers from the patients' perspective. Measures based simultaneously on a sound theoretical foundation and on applying in-depth pre-testing methods are still rare. Thus, our second aim is to use cognitive interviewing to understand how respondents perceive and interpret this new measure and to identify potential problems.

1.1. Warmth in human relationships: theoretical and empirical background

1.1.1. Warmth as the most powerful personality trait

Like other perceptions, social perception reflects evolutionary pressures. When interacting with others, human beings are immediately faced with the challenge of determining whether the other is friend or foe and, then, whether the other has the ability to enact those intentions (summaries of research: [2,3]). Following the significant early studies of Asch [4], research in the last few years has established that perceived warmth and competence are the two universal dimensions when people spontaneously interpret behavior or form impressions of others. Evidence for this comes from various sources, including experimental social psychology laboratories, election polls and cross-cultural comparisons [2]. Over the last ten years, advanced studies have firmly shown that people everywhere differentiate each other by liking (warmth, trustworthiness) and respecting (competence, efficiency). According to recent social cognition theory and research, the warmth dimension captures traits related to perceived intent, including friendliness, helpfulness, sincerity, trustworthiness and morality, whereas the competence dimension reflects traits related to perceived ability, such as intelligence, skill, creativity and efficacy [2]. Both dimensions account for 82% of the variance in people's evaluations of social behavior [5], which is a very large amount.

Furthermore, considerable evidence suggests that warmth judgments are primary. Warmth is judged before competence, and warmth judgments carry more weight in affective and behavioral reactions [2,3]. For example, from an evolutionary perspective, the primacy of warmth is fitting because another's intent for good or ill is more important to survival [2].

1.1.2. Warmth as a result of embodied cognition

Research in the last ten years indicates a reasonable rationale why warm and cold are central traits in impression formation [6]. A number of experimental studies have shown that most abstract psychological concepts, such as affection or emotion, are metaphorically based on concrete physical experiences (summaries of research: [6–8]). These findings are consistent with theories of embodied cognition and perceptual symbols [9–11], which say that people conceptualize their internal, mental worlds by an analogy to their physical and physiological world [6–8]. Therefore, concrete experiences (e.g., temperature) seem to be the underlying processes grounding abstract concepts (e.g., affection).

The use of sensory-based metaphors (e.g., a “warm” or “cold” person) allows people to represent and communicate abstract concepts that would otherwise have no link to sensory-motor experiences. Diverse experimental studies [6–8] have shown that abstract thought includes more grounding in physical and perceptual content than is often assumed. In this view, abstract concepts and concrete experiences that are jointly expressed in a metaphor are co-experienced. In the case of “affection is warmth” [9, p. 50], Williams and Bargh [6], for example, could verify this assumption in an experiment where participants who briefly held a cup of hot (vs. iced) coffee judged a target person as having a “warmer” personality (generous, caring). Zhong and Leornadelli [8] also found in an experiment that participants who recalled a social exclusion experience gave lower estimates of room temperature than did participants who referred to an inclusion experience.

Lakoff and Johnson [9, see also Ref. 6] argued that co-experience is primary. In the case of “affection is warmth,” babies experience the feeling of being held affectionately by their mothers, and being held induces a warm sensation, whereas distance from the caregiver induces coldness. This basic exposure may produce people's first understanding that social closeness equals warmth,

whereas social distance equals coldness [8]. This priming association is underlined by evidence that the insular cortex is involved in processing both psychological and physical warmth [6]. As a result, people express and share the abstract notion of affection in terms of the co-experienced sensation of warmth. Table I in Appendix illustrates that warm and cold expressions are deeply rooted in our language, indicating that they have no linguistic or cultural borders as their meaning is nearly the same (e.g., in German and English). At the same time, we also notice that expressions of warmth are often connected to the “heart” (marked in italics in Table I, Appendix), which is seen as the site of our strongest emotions.

The new evidence-based findings presented in the last two subsections are relevant to healthcare communication research, as described in Section 1.2.

1.2. Hypotheses

In this study, we hypothesize that referring to the warm–cold dimension in a questionnaire is a more valid method for measuring the socio-emotional quality of healthcare providers than using concepts such as empathy and trust. Although human warmth is likely to be related to constructs such as empathy [12–14] or trust [15,16], it has the psychometrical advantage that it is not a construct or latent variable and therefore, does not need to be operationalized in different items. Compared to empathy or trust, warmth is a major and genuine social perception, which is deeply rooted in our evolutionary history and environment (see Sections 1.1.1 and 1.1.2) and, as a result, in our language (see Table I, Appendix). Psychometrically spoken, using the concept of warmth and its wording in scale development should result in a more valid measurement of socio-emotional qualities in (patient–provider) relationships. Consequently, we only need to use the word “warmth” in an assessment since it does not require a range of items.

This should result in a short measure (Hypothesis I), which is easy to understand (Hypothesis II), because it refers to a concept that most people or patients share (Hypothesis III). We attempt to verify these three hypotheses through cognitive interviewing techniques.

2. Methods

This study was reviewed and approved by the Ethics Committee of the Faculty of Health, University of Witten/Herdecke, Germany. All participants were provided with an information sheet about this study and were invited to sign a consent form.

2.1. Thermometer of warmth in the patient–provider relationship (WARMOMETER): development of the draft version

The WARMOMETER was developed based on the theoretical assumptions of warmth in human relationships described in Section 1. These findings were synthesized into a draft measure, which was discussed and reflected on in a multidisciplinary expert group of four physicians (FE, CS, MB, DT), a physicist (DC), and a sociologist (MN) (see Fig. 1).

To evoke the most genuine response possible about warmth from interviewees, the expert group turned to the visual representation of a thermometer. Based on the experiments of Ijzerman and Semin [7], we considered cold to be between 15 and 18 °C and warm to be between 22 and 24 °C. Physically, warmth is defined as “a higher temperature, still pleasant feeling, that is no longer cold and not yet hot” and cold is described as the “absence of warmth” [1]. However, these definitions leave room for individual perceptions and preferences of warmth and cold. For this reason, a temperature range of 0–30 °C was used in the pre-test stage.

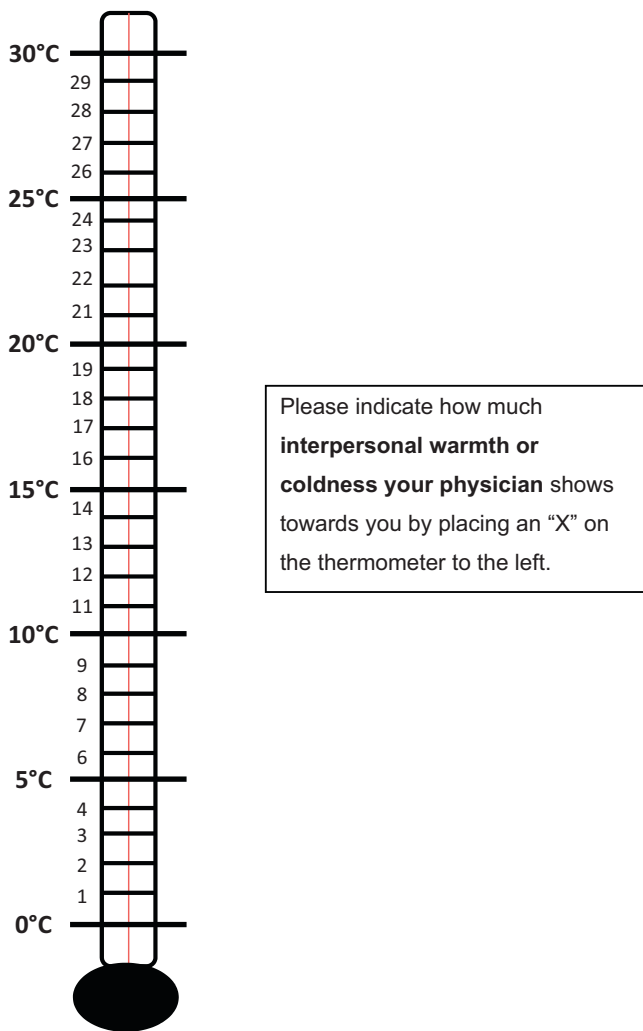


Fig. 1. First draft of the WARMOMETER (see Section 2.1). Note: C = standard German abbreviation for “Celsius”.

The thermometer response format has some psychometric advantages because of its continuous interval scale measurement, which allows conducting advanced statistical analyses [26]. Moreover, the draft version of the WARMOMETER is in parts a numerical rating scale (NRS), which has the advantage of being easily understood by patients [27,28]. In a NRS patients are asked to assign a number (here: °C) to a specific emotional perception (here: human warmth) with extreme labels at the beginning and the end of the measure as in visual analogue scales (VASs) [27,28]. However, the draft WARMOMETER did not yet include extreme labels.

Although the measure may potentially be used for all healthcare providers, we asked study participants (patients and healthy persons) to refer to either their private practice or hospital physician in order to reduce any potential social desirability bias when talking about a hospital physician who might be close to the interview room. We also reassured participants that their comments were not likely to be heard, as we were conducting the interviews behind closed doors.

2.2. Cognitive interviewing technique

Many researchers who rely on self-report data assume that the respondent understands the question and terminology of a new

measure in the same way the researcher does. This assumption may or may not be accurate or reasonable [17]. That is, we are aware of a range of variables affecting the ability of respondents to accurately answer a question, which are:

- (1) comprehension of a question,
- (2) retrieval of information from autobiographical memory,
- (3) use of heuristic and decision processes to estimate an answer,
- (4) formulation of a response.

This four-stage model, proposed by Tourangeau et al. [18], is the most frequently cited model explaining how respondents answer questions and indicating the core sources of survey error. By not investigating problems related to these four cognitive processes prior to the distribution of questionnaires, there is a potential risk for high non-response or non-completion of questionnaires during the survey and/or high measurement error during data analysis.

Cognitive methodology as an amalgamation of cognitive psychology and survey research is a method which can be used to reduce these sources of survey error [19–21]. It allows researchers to understand questionnaires from the respondents' view. This is particularly useful when developing new questionnaires and when it is unclear how participants will respond or if they will understand the wording [19].

Willis [22] divides cognitive techniques into “evaluative” and “experimental” ones. Evaluative methods include expert cognitive assessment of a questionnaire, cognitive task analysis, focus groups, and cognitive interviews [17]. Experimental techniques are based on hypothesis testing and include cognitive experiments in laboratories, cognitive field experiments, and cognitive experiments embedded in field surveys [17].

An effective process is to first develop new questions using evaluative techniques, such as the think-aloud and/or probing technique. Using the think-aloud method, respondents are asked, “Please tell me what you are thinking while answering the following questions,” before even looking at the questionnaire in order to find out their thoughts. Probe questions are also extensively used to understand the underlying cognitive processes [17]. Probing consists, for example, of requesting respondents to paraphrase questions, define the meanings of words, explain their responses and identify areas of the measure that pose difficulty in understanding, interpretation or completion [19].

In our study, we applied retrospective probing [17,22]. While the retrospective technique involves a response after the respondent has answered the draft measure, the concurrent technique requires that respondents give a verbal account of their thinking during the interview. Although both techniques have its advantages [22], we chose the retrospective technique in order to: (1) gain detailed information about the cognitive processes and (2) reduce the artificiality of concurrent interviews by asking the respondent after completion of the measure [17].

2.3. Cognitive (probing) interview questionnaire of the study

The probing questionnaire is based on our hypotheses (Section 1.2) and on three of the four stages of Tourangeau's model [18]. We did not ask for probes of “retrieval of information from autobiographical memory” as the WARMOMETER refers either to a private practice physician or to a hospital physician, both of which the respondent has known for a long period of time, making issues with the retrieval of information very unlikely. The proposals of Willis' for cognitive probes [22, p. 48] and cognitive questionnaires [22, p. 275f] were also used as a model for our questionnaire. The introduction to the probing interview and questions can be found in Table 1.

Table 1
Cognitive interview questionnaire.

Introduction to the cognitive interview questionnaire		
Important things to know before answering this questionnaire		
<i>This is a completely anonymous survey, which means that the Federal Data Protection Law applies to everything you say during this interview</i>		
<i>Please respond spontaneously to all questions and statements. Trust your first thoughts or inspiration</i>		
<i>There are no right or wrong answers – only your personal opinion counts</i>		
<i>If you think that a question or statement does not fit your feelings 100% or if an answer does not come easily to you, please choose a response that comes closest to describing how you feel</i>		
First question: see Fig. 1, draft of the WARMOMETER		
Probe question	Type of probe [22]	Link to Tourangeau's model [18]
(1) What characteristics and type of behavior demonstrated by your physician is your assessment based on?	Interpretation	Use of heuristic and decision processes to estimate the answer
(2) How did you arrive at your answer on the thermometer?		Formulation of the response
(3) How do you perceive the way in which the physician talks to you?	Interpretation: quality of verbal interaction	Use of heuristic and decision processes to estimate the answer
(4) What do the gestures of your physician mean to you (e.g., your physician shakes your hand to you welcome you)?	Interpretation: quality of non-verbal interaction	
(5) Has your assessment of your physician changed since your first contact with him/her?	Confidence judgment	Formulation of the response
(6) What do you think about the thermometer as a response format? Would you change anything?	General probe	
(7) Can you please repeat the first question in your own words? What is this question about in your view?	Paraphrasing	Comprehension of the question
(8) Was the question easy for you to understand? Would you change anything?	General probe	
(9) Please indicate how much warmth your ideal physician would show towards you by placing an "X" directly on the thermometer to the left.*	Specific probe: reference value for Fig. 1	Use of heuristic and decision processes to estimate the answer in Fig. 1
(10) What characteristics and type of behavior of an ideal physician is your answer based on?	Interpretation	
(11) Please imagine a person from your personal environment (e.g., family, friends, neighbors, colleagues) who shows great warmth towards you. Indicate how much warmth this person shows to you by placing an "X" directly on the thermometer to the left.*	Specific probe: reference value for Fig. 1	
(12) What characteristics and type of behavior is your assessment based on?	Interpretation	
(13) Please imagine a person from your personal environment (e.g., family, friends, neighbors, colleagues) who shows an average amount of warmth towards you. Indicate how much warmth this person shows you by placing an "X" directly on the thermometer to the left.*	Specific probe: reference value for Fig. 1	
(14) What characteristics and type of behavior is your assessment based on?	Interpretation	
(15) Please imagine a person from your personal environment (e.g., family, friends, neighbors, colleagues) who shows coldness towards you. Indicate how much coldness this person shows you by placing an "X" directly on the thermometer to the left.*	Specific probe: reference value for Fig. 1	
(16) What characteristics and type of behavior is your assessment based on?	Interpretation	
(17) Do you have any other comments on the issue of human warmth in the patient–provider relationship? Or, is there anything else I should know?	General probe	

Note: *Respondents were also given a copy of the WARMOMETER (see Fig. 1) in order to answer this question.

2.4. Procedures

To take part in the study as a patient of the Gemeinschaftskrankenhaus Herdecke or as a healthy person, participants had to be at least 18 years of age, speak and read German fluently and provide informed consent. Participation was voluntary. Participating hospital patients were compensated with a 10€ book voucher from the hospital book shop, and healthy participants received a ten euro voucher from amazon.de.

Participants were recruited using purposive sampling [23], a non-random sampling technique based on member characteristics relevant to the research problem. The aim of the study was to obtain a maximum sampling variation in order to understand a broad range of different cognitive processes. We therefore looked to recruit a balanced number of (1) ill and healthy patients, (2) older and younger participants, (3) participants with different

levels of education, and (4) female and male participants. Patients from the Gemeinschaftskrankenhaus Herdecke were identified by a physician (CS) through review of clinic appointment books. Healthy participants were recruited from the broader personal environment (e.g., neighbors, friends) of all authors.

The cognitive interviews were carried out in semi-structured, face-to-face interviews in an environment where the respondents felt comfortable and away from potential social desirability influences. The interviewer (MN) in this study is experienced and trained in cognitive interview theory and procedures, having conducted prior studies using cognitive techniques [12,13,24]. In the interview, participants were first familiarized with the task and permitted to become used to it. The interviewer wrote down the respondents' answers in a protocol during the interview [22]. The handwritten comments were then typed into an electronic copy under each target question (Table 2).

Table 2
 Participant characteristics.

Gender	Age	Education	Kind of disease	Length of interview (min)
(1) Male	43	Academic	/	35
(2) Male	70	VET	/	40
(3) Female	66	VET	/	55
(4) Female	28	Academic	/	70
(5) Female	46	VET	/	55
(6) Female	86	VET	Coronary disease	30
(7) Male	70	VET	Not identified	30
(8) Male	60	VET	Cancer	35
(9) Male	55	Academic	Cancer	125
(10) Male	25	Academic	/	45
(11) Female	44	VET	Arthrosis	60
(12) Female	49	VET	Rheumatism	60
(13) Female	73	VET	Arthrosis	65
(14) Female	40	Academic	/	35
(15) Male	28	Academic	/	60
(16) Female	33	VET	Coronary disease	90

Note: VET, vocational education and training; (min) minutes.

2.5. Data analysis

Content analysis [25] was applied to summarize the content and difficulties in questionnaire response and to elucidate any emerging themes in the probe questions (Table 2). The three stages from Tourangeau’s model [18] as well as our hypotheses (Section 1.2) were used as taxonomies to classify participants’

Table 3
 Modifications to the WARMOMETER based primarily on probe questions 8, 9 and 17 following the cognitive interviews (see Table 1).

Initial phase (see Fig. 1)		
Revision	Reason for revision	Link to Tourangeau’s model [18]
Omission of “interpersonal”	The first four participants found the use of both “interpersonal” and “warmth” redundant One participant also said the word “interpersonal” implies something positive, thereby possibly leading to a more positive assessment and to a positive bias Another one said: “Using the terms ‘interpersonal’ and ‘cold’ together is misleading because ‘interpersonal’ is associated with interaction and there is no interaction when a person is cold. So, the two terms contradict each other.” (ID 1, male)	Comprehension of the question
Inclusion of “Please indicate your assessment by placing an “X” directly on the thermometer to the left as shown in the example below:” and a picture demonstrating where to place an “X” (see Fig. 2)	In the first four interviews, the interviewer observed that the participants were looking around to see where to place the X (e.g., on the left or right of the thermometer)	Formulation of the response
Omission of “coldness”	Study participant (4) proposed the following very understandable change: “I would only ask about warmth; using both words together is irritating. To imply that someone is cold is very difficult for me, it’s so negative. It is easier for me to mark praise in varying degrees because then you don’t have a guilty conscience. Then, it is not a criticism but a neutral question and decision. It probably reduces social desirability as well.”	Heuristic and decision processes to estimate the answer
Inclusion of –10 °C on the thermometer	Study participant (4) proposed this very logical change: “I would extend it to minus 10 degrees because patients with resentment or those who feel very hurt should also be considered.” Study participant (5) recommended the same change	Formulation of the response/Heuristic and decision processes to estimate the answer
Second phase		
Revision	Reason for revision	Link to Tourangeau’s model [18]
Visual refinement: sections of temperature lines jutting out on the right-hand side of the thermometer were deleted and temperature lines in bold were changed to match the smaller lines	Study participant (10) was significantly disturbed by the initial version	Formulation of the response
Third phase: final refinement (see Fig. 2)		
Revision	Reason for revision	Link to Tourangeau’s model [18]
Change from a request into a question	Study Participants 15 and 16 both remarked that a question would be easier to understand; participant 16 was irritated by the formulation “Please assess ...”	Comprehension of the question

responses. The analysis findings were then used to refine the questionnaire.

The cognitive interviews were conducted in three phases to maximize their benefit. Preliminary analysis of the first five interviews was used to modify the draft measure (Fig. 1) by eliminating apparent and basic difficulties. This modified version was then used in the second phase with the next five interviews in order to (a) verify the progress of the initial modifications and (b) concentrate more on the probe questions. Final refinement of the WARMOMETER was then made after completion and analysis of interviews 10–16.

3. Results

3.1. Characteristics of study participants

A total of N = 16 persons participated in the study (N = 8 patients; N = 8 healthy participants). Three patients declined to take part as they suffered too much from their disease. Table 2 provides more details on the participants’ characteristics. Interview length ranged from 30 to 120 min. Answering the WARMOMETER alone (Fig. 1) took an average of 1–2 min.

3.2. What kind of modifications were proposed by study participants?

Table 3 provides detailed information about the modifications made to the WARMOMETER during the three study phases. During

the third phase, participants found the sun and the snow symbols to be particularly helpful. Table 3 demonstrates that difficulties occurred during each of the three stages of Tourangeau's four-stage model [18]. Fig. 2 shows the final version of the WARMOMETER.

3.3. Is the WARMOMETER easy to understand?

Apart from the modifications to the draft measure, almost all participants perceived the question and the thermometer response format as easy to understand. When answering probe question 8 (Table 1), most found the question on physician warmth "easy to understand" and "intuitive". The thermometer was also seen as a suitable and clear method for measuring warmth or affection (probe questions 2 and 6). One healthy participant said:

"I immediately knew what was meant. It is good visually, it is easy to make an X and my feelings are easily classifiable. The visual thermometer format is not as abstract as numbers, which don't correlate so easily with inner feelings." (ID 4, female)

Most participants arrived at their answer by searching for a comfortable, pleasantly warm outside temperature as a reference

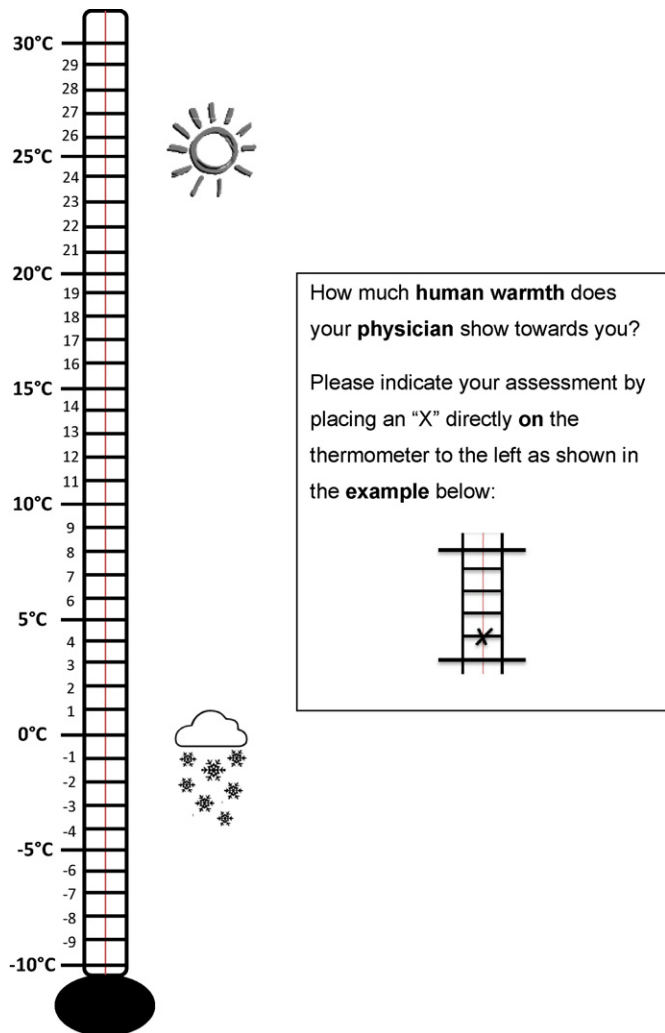


Fig. 2. Final version of the WARMOMETER (see Section 2.1), see Figs. I and II in Appendix for Fahrenheit version of the WARMOMETER. Note: C = standard German abbreviation for "Celsius". We propose to always use the two versions of the WARMOMETER together when surveying patients: first asking patients about the perceived warmth of their ideal physician (or other healthcare provider) and then about the warmth of their current physician (or other healthcare provider) (compare Figs. I and II in Appendix).

point on the thermometer. With this temperature in mind, they then responded based on cognitive processes as the following healthy participant described:

"I compared the outside temperatures on the thermometer and compared what a feeling I had with this temperature." (ID 10, male)

Some went a step further and formed temperature categories for different groups of people ahead of time. For example, one patient thought aloud and said very spontaneously:

"... my family is at 30 degrees, my friends at 25, my physician at 20 and my neighbors and work colleagues at 15." (ID 8, male)

Only two of 16 participants hesitated on the thermometer like the following patient:

"If I had an answer category from 1-10, it might be easier, but it wouldn't suit the question. If you want to measure human warmth, the thermometer is quite good." (ID 12, female)

Further, there seemed to be no difference in the understanding of patients or healthy persons, males or females, younger or older participants and those with a higher or lower education.

3.4. Is "physician warmth" a concept that most patients share?

3.4.1. Characteristics of physician warmth

Participants giving either a positive or a negative narrative of their physician warmth (probe question 1, Table 1) tended to describe it in the same way. Patients or healthy persons who mainly shared positive characteristics of their physician described warmth as "friendly, nice, trustworthy, showing interest, respectful, calm, security with the physician, empathetic, positive, open, honest, takes time and gives me a good feeling" (interview transcriptions are available on request). Common characteristics were also found among the negative narratives provided by participants 3, 5 and 14. Participant 14, who is culturally embedded in the UK, was an exception.

The characteristics attributed to physicians by the patients also seem to be based on a range of verbal and non-verbal qualities (e.g., gestures, voice, facial expression and touch), context factors (e.g., cozy waiting room, nice clothing, friendly receptionists, bowl with sweets) and the physical characteristics of the physician (e.g., fuller figure).

Additionally, the paraphrasing probe question (7) reflects that most study participants understood the question as referring to personality traits or human behavior.

3.4.2. Confidence judgment over time

In probe question 5 (Table 1), all participants responded that their assessment of physician warmth had not changed since their first contact with him/her.

3.4.3. Variations of assessment: warmth of the physician, the ideal physician, and people with great warmth, average warmth and coldness

Table 4 compares participants' perceived temperatures of physician warmth, the warmth of their ideal physician, and people who are either very warm, cold or have average warmth (see Table 1 for the probes). The most noticeable findings from Table 4 in association with the corresponding probe questions (10, 12, 14 and 16) are the following.

There is obvious variation in the way participants assess these five different groups (Table 4), which is also found through descriptive comparison of the mean values (Table 4, last line).

Table 4

Descriptive comparison of the physician warmth temperatures perceived by participants in response to probe questions 9, 11, 13 and 15 (see Table 1).

ID	Physician ^a warmth	Ideal physician warmth	Person with great warmth	Person of average warmth	Cold person
1	23	23	25	21	10
2	24	24	26	19	9
3	15^b	25	30	11	5
4	22	24	30	21	5
5	19^b	25	25	22	6
6	30	30	30	20	–10
7	25	25	25	20	10
8	20	20	30	15	–5
9	26	26	26	19	9
10	23	24	26	20	18
11	22	23	29	18	–9
12	<u>20^c</u>	25	27	14	1
13	<u>20^c</u>	25	30	16	10
14	16^b	18	26	12	1
15	14 ^b	23	26	17	4
16	25	25	30	12	0
M	21.4	24.1	27.7	17.1	3.6

Note: ID, participant identification number; M, mean value.

^a Only participants 9 and 16 referred to their hospital physician, the others wished to talk about the private practice physician they regularly visit.

^b Bold numbers refer to study participants who gave rather negative narratives of their physicians' warmth in probe 1 (interview transcriptions are available upon request), except for study participant 14 who is culturally embedded in the UK.

^c Underlined numbers refer to study participants who not only gave a rather positive narrative of their physicians' warmth, but also used a criticizing tone (interview transcriptions are available upon request) which seems to reflect their wish for an ideal physician with a temperature of 25 °C (column 3).

Positive descriptions in response to probe question 1 seem to correspond with temperatures of 20 °C or higher. The same is true for negative descriptions which correspond to temperatures lower than 20 °C. Participant 14, who is culturally embedded in the UK, is an exception.

Although participants 12 and 13 gave rather positive narratives of their physicians' warmth and an estimation of 20 °C, they also used a criticizing tone or expressed doubts. This seems to reflect their wish for an ideal physician at 25 °C (Table 4, column 3).

Twelve of the 16 participants gave a "person with great warmth" a higher temperature than their ideal physician. The majority of them used family or best friends as a reference for a "person with great warmth" with the characteristics of love, physical closeness and touch. Several study participants responded in probe questions 12 and 10 that too much warmth (around 30 °C) in the patient-provider relationship is too close and a "healthy distance" or more "balanced/professional relationship" is needed.

A clear distinction can be made between nearly all of the temperatures for people who are either very warm, have average warmth or are cold (Table 4, columns 4–6). All participants rated cold people between 10 °C and lower. These lower temperatures are clearly reflected in the negative personality traits provided by participants in probe 16. The characteristics of a person with average warmth also corresponds to the warmer temperatures estimated by participants. These people are neither warm nor cold, i.e., "neither fish nor fowl" (ID 10, male).

When comparing the temperatures of an ideal physician with those of a person with great and average warmth, one may descriptively derive that an ideal physician should not be as warm as a very warm person, but should have more than average warmth.

There do not seem to be any differences in the temperature estimates of patients or healthy participants, males or females, younger or older participants, or those with a higher or lower education.

4. Discussion and conclusion

4.1. Discussion

4.1.1. General discussion

Despite the limitations of our study (e.g., not a multi-center or cross-cultural study, self-selection bias of participants), the

WARMOMETER seems to be a short patient self-report assessment of physician warmth (Hypothesis I), which is easy and intuitive to understand (Hypothesis II). Furthermore, physician warmth was found to be a concept shared by most respondents, regardless of their characteristics. Participants provided similar positive or negative characteristics of warmth, paraphrased the WARMOMETER in a similar way, and none of them changed their positive or negative judgment since their first contact with their physician (Hypothesis III). These results correspond to those of the social-psychological studies mentioned in Section 1.1.1 [2,3]. Our findings also indicate that physician warmth is a genuine concept shared by most people and thus easy to understand. Moreover, when asking patients about the characteristics of physician warmth, it seems that physician warmth is a much more primary, genuine and broader concept than physician empathy or trust, because physician warmth combines all positive personality attributes of a human being or physician, i.e., also empathy, trust etc. (compare Section 3.1). In this sense, physician warmth does really get at the primary dynamic when forming impressions about a physician or another human being.

The fact that participants provide similar temperature assessments for each of the five different groups (Table 4) is a further indication that most people share a common view of the characteristics of physician warmth/coldness (Hypothesis III). These temperature variations reflect the positive and negative narratives provided by participants about the five groups, which is again a sign of a shared concept (Hypothesis III). Therefore, our study supports Lakoff's and Johnson's [9] hypothesis that "affection is warmth" as higher temperatures were found to be associated with positive, humanistic characteristics and lower temperatures with rather negative ones.

It is also important to note that the use of temperature in the form of a thermometer was found to be a sensitive method for distinguishing between different types of physician warmth and coldness (Table 4). That is, the WARMOMETER is able to reflect different levels of physician warmth and physical closeness by referring to corresponding outside temperatures. This finding provides further support for the theory of embodied cognition [9–11]: people conceptualize their mental world by an analogy to concrete experiences (here: outside temperature) which seem to ground abstract concepts (here: positive personality attributes).

From a psychometric perspective, it is central to notice that the final WARMOMETER (Fig. 2) does now include also extreme labels as in a visual rating scale (compare Section 2.1), but in the form of visual signs of a sun and snow. These signs needed to be included as study participants missed reference categories which “bridge” human warmth and the outside temperature degrees (see Table 3). As a result the final WARMOMETER is a combination of a numerical rating scales and a visual rating scale [27,28].

4.1.2. Future research

The present study was the first step to use the new and stimulating empirical knowledge on human warmth for the development of an optimized measure of the social–emotional quality in the patient–physician relationship. Cognitive interview methodology is a highly recommended but basic element of psychometric validation which was performed in this study. Therefore, the next crucial steps in further validation of the WARMOMETER would be to test its applicability in large patient surveys and to analyze associations (1) to other relevant constructs and instruments (construct validity) and (2) to patient-reported health outcomes (criterion validity) [26]. Additionally, cross-cultural research and validation would be also of high importance as patients' perceptions of physician warmth might be different when they live in warmer or colder climates (compare Table 4, participant 14 who is from England). Besides, patients' perception of physician warmth can also be influenced by context factors such as temperature of the consulting room, warm vs. cool colors in the room or in the physicians' clothing.

If these studies show satisfying results, experimental research needs to be conducted to verify which verbal (e.g., being positive) and non-verbal behaviors (e.g., handshake, smiling) and/or context factors (e.g., white coat) are associated with physician warmth. Thereby training and education strategies might be developed to assist medical students and physicians to extend a warmer impression to their patients.

4.1.3. Relevance and application of the cognitive interview methodology for health communication research

Despite some disadvantages and limitations to cognitive techniques (e.g., [19,22]), the results of our study illustrate that they are a simple and yet very enlightening method of verifying underlying theory of a new measure and/or improving the measurement accuracy. It is not likely that the wide range of modifications proposed by study participants (Table 3) could have been anticipated by researcher(s). Moreover, the kinds of modifications proposed clearly demonstrate that “the devil is in the detail” and that every research field using surveys for data collection should use this methodology to avoid non-response, non-completion and/or measurement error. Health communication research is a field where data is often collected in surveys via patients' subjective perspectives on complex issues such as verbal and non-verbal interactions, emotions, health behaviors and health literacy. The application of cognitive interview techniques is, therefore, highly relevant in health communication research for improving measures and gaining valid results.

4.2. Conclusions

Verification of our study hypotheses and confirmation of the theoretical assumptions of human warmth give basic indications that the WARMOMETER seems to be a valid and sensitive patient self-report instrument for assessing the socio-emotional quality of physicians. Moreover, this study also shows the effectiveness of the cognitive interview technique to develop and refine a measurement instrument.

4.3. Practice implications

The promising results of our cognitive interviews indicate that the WARMOMETER may be used and further validated in future patient surveys and with other healthcare professionals. Due to (a) somewhat different temperature estimates of current and ideal physicians, (b) individual preferences for ideal physician warmth and (c) possible cultural differences affecting preferred physician warmth (Table 4, participant 14), we propose to always use in patient surveys the two versions of the WARMOMETER together (compare Figs. I and II in Appendix). That is, in future studies it is recommended that a target-performance comparison should be conducted by first asking participants about the perceived warmth of their ideal physician (or other healthcare provider) and then about the warmth of their current physician (or other healthcare provider). In this way, we will be able to obtain a delta value, which is particularly important in health outcome studies.

We invite researchers to collaborate on further and cross-cultural cognitive validation and psychometric validation of the WARMOMETER.

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Conflict of interest

We confirm that all patient/personal identifiers have been removed or disguised to ensure anonymity of all patients/persons described. The authors indicated no potential conflict of interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.pec.2011.01.003.

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