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New approaches to qualitative interviewing: Development of a card sort technique to understand subjective patterns of symptoms and responses

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Background

Chronic disease self-management is considered central to maximizing quality of life and minimizing adverse health outcomes in affected individuals, and is thus a frequent target for health behavior interventions (NHLBI, 2007, Rand et al., 2012, Ward et al., 2014). Prerequisite to helping patients achieve better self-management is understanding their perceptions, patterns, beliefs, motivations and rationales for self-management behaviors (Blaakman et al., 2014, Knight, 2005). This can be challenging, as self-management behaviors are the responses of unique individuals to specific events *within* particular situations and are therefore complex, dynamic, and contextually dependent (Ayala et al., 2006, Martin et al., 2010). Thus, understanding self-management requires not only uncovering patterns of perception and response, but also the contexts of these patterns (Mammen and Rhee, 2012).

Ability to elicit individual's perceptions of complex behavioral processes during an interview may be limited, as it hinges not only upon the skill of the researcher, but also upon assumptions of a shared language, and an individual's ability to recall, analyze, and verbalize events (Marshall and Rossman, 2011, Maxwell, 2012). In a recent qualitative study of Teens' Experiences of Asthma Self-management (TEA Study), we attempted to uncover teens' patterns of asthma symptoms and responses, along with their rationales for behaviors, and the contexts in which they occurred. Early in the study, we found that teens' conceptualizations of symptoms often differed not only from prior reports in the literature, but also from each other, and from situation to situation. This made it difficult both to elicit individual processes of self-management and identify common patterns among teens. In

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response to these challenges, we developed a novel card sorting technique to facilitate a more systematic discussion of teens' multiple and varied symptoms and responses, and to establish a shared terminology in order to promote a more in-depth exploration of teens' processes of asthma self-management.

While card sorts have been used previously in both qualitative and quantitative research, prior techniques (see Table 1) have focused on sorting predetermined and uniform sets of items (Chen and Hsu, 2014, Righi et al., 2013, Van Exel and de Graaf, 2005). Some techniques, such as the Q-sort, assess subjective viewpoints by rank-ordering items according to qualities (e.g. most agree vs. most disagree)(Coogan and Herrington, 2011, Van Exel and de Graaf, 2005). More commonly, pictures, words, statements, or vignettes about a specific topic are sorted into groups or categories to elicit information about cognitive processes (e.g. learning, perceptions, information behaviors, cognitive flexibility, adaptive problem solving) (Andrews et al., 2015, Lowe et al., 2014, St Jean, 2014, Stamm et al., 2015). Often, this type of simple sorting is referred to as pile sorting, as cards are placed into conceptually similar "piles" (Boster, 1994, Lynch and Holmes, 2011, Quintiliani et al., 2008, Weller and Romney, 1988). Variations of pile sorting (e.g. hierarchical or sequential techniques) may further differentiate piles into series of primary and subgroupings, by order of relationship or priority (Boster, 1994, Davies, 1996).

In contrast to prior techniques, teens in the present study identified, sorted, and discussed *individually specific* lists of symptoms and responses to explain personal patterns of asthma self-management and the contexts in which they occurred. The purpose of this paper is to describe the development of this new card sort technique and to discuss its utility as an interviewing tool for both research and clinical practice.

Methodological Context

The TEA study was reviewed by the University of Rochester Research Subjects Review Board and was in accordance with standard practices for ethical conduct of research. A case-based, qualitative descriptive design with a two-step purposeful and criterion based sampling approach was used (well controlled vs. not well-controlled asthma; minority vs. non-minority) (Maxwell, 2012). Case-based methodology views individuals and phenomena as contextually embedded units, rather than isolated people or events, thereby helping to develop a real-world understanding of complex social phenomena (Meyer, 2001, Yin, 2014). In this study, cases (N=14) were built around teen-parent dyads (n=14; n=14), with data from each case including: (a) a first semi-structured interview with the teen; (b) a semi-structured interview with the parent; (c) a 2-week self-management voice-diary; and (d) a second unstructured, adaptable, and open-ended interview with the teen, approximately one-month later. Eligible dyads were English speaking, with teens aged 13–17, diagnosed with persistent asthma, and no other major medical or psychiatric disorders. Interviews were approximately one hour each and were audio recorded. Interviews were conducted by JM (doctoral candidate) under the supervision of SN (methodological expert), HR and AB (content experts). Questions and probes were designed to explore teens' perceptions of and experiences with asthma, including their usual symptoms, patterns of responses to symptoms and rationales for their responses within specific contexts. Following the first teen and parent

interview, teens were asked to complete a two-week asthma self-management voice-diary, in which they reported in detail their daily symptoms, self-management behaviors and thoughts about asthma. In the second teen interview, we then sought to bring together and synthesize what was learned from earlier data (i.e. first interviews, voice diary) by more deeply exploring asthma perceptions and experiences, responses, rationales, and the contexts in which these occurred.

Problem

During interviews we found that teens were verbalizing their asthma experiences in a way that we sometimes struggled to understand. Often, teens described varying approaches to managing asthma symptoms, presenting their ideas in patterns unfamiliar to the investigators, and at times in a seemingly contradictory manner. This made it difficult to grasp underlying processes, identify patterns, and synthesize data across sources and cases. Additionally, we noted word choice differences, in that the interviewer tended to use certain terms to talk about asthma whereas teens often used different terms. For example, the interviewer preferred the general term “shortness of breath”, whereas some teens did not use it at all, preferring “hard to breathe,” or “can’t breathe,” while others qualified the term as “mild shortness of breath” and “very short of breath.” We often did not know up-front what terminology to use in asking questions, as word choices varied between teens. This noticeably affected conversation, as asking questions using shared terminology facilitated dialogue, whereas use of unshared terminology impeded conversation.

Development of the symptom-response card sort technique

Dissimilarities in communication were apparent from the first interview. When the teen spoke about how she managed her asthma, we had some difficulty following her story and understanding her experiences. Her narrative patterns and word choices to describe her symptoms and responses did not fit traditional clinical patterns. To make sure that we were understanding what she was telling us, we decided to try writing the teen’s self-identified self-management responses (derived from listening to her recorded first interview and diary) on blank index cards, with one behavior per card. At her second interview, we asked her to use these “response” cards to help describe her asthma experiences, and to arrange her responses to symptoms in the order she did them, so that we could better understand how she managed her asthma. We were also careful in follow-up questions to refer to her actions using her preferred terminology, by referencing the cards on the table.

The addition of the self-management response cards dramatically improved the second interview. The teen relaxed, talked freely, shuffled the cards around the table, and began telling stories about her symptoms and how she responded to them under different situations. By following her use of the cards, we were easily able to understand her narratives and to grasp the stories she was telling. Asking follow-up questions was also easier as we could point to a specific card while doing so.

Based on initial success of using response cards, we decided to incorporate the technique into subsequent second teen interviews. By the third participant, we noted that teens were

discussing extensive patterns of symptoms corresponding with their recurrent, but contextually variable self-management responses. In hopes of identifying patterns in their symptoms and responses, we began making a separate card pile of symptoms, which were also included in the card sorting activity. This was so successful in promoting conversation and increasing understanding of teens' experiences that we began systematically incorporating the technique for subsequent participants. Thus, in all 12 second interviews following the first three cases, teens were asked to sort their unique sets of asthma symptoms *and* self-management responses, and to discuss their perceptions of symptoms, along with rationale for timing and chronology of self-management behaviors.

The symptom-response card sort technique as presently developed entails three steps: (1) sequencing of an individual's symptoms chronologically (2) associating their specific self-management responses to symptoms; and (3) developing a contextually-grounded narrative explanation of the symptom-response pathway. This process is presented graphically in Figure 1 and further detailed below.

Step 1: Symptoms

We first derived a list of symptoms for each teen by reviewing their first interview and digital diary and noting down symptoms in the teens' own terminology. All symptoms, identified by *either* the teen or interviewer as a symptom of the teen's asthma, were included. These terms were hand-written on blank 3"×5" index cards in marker, with one item per card. At the follow-up interview, the teen was given the stack of symptom cards and asked to review them, modifying, merging, adding, or removing symptoms as needed. Next, teens were asked to place their symptoms in the order in which they typically occurred.

Step 2: Responses

As was done for the symptoms, a list of responses was derived from review of prior data. Similarly, these were written on cards with one item per card. After ordering the symptoms, teens were given the response cards and again asked to review, correct, merge, add, or remove items. Once they had verified the list of responses, they were asked to place response(s) next to the symptom(s) that would precipitate that action, using whatever pattern was most intuitive to them.

Step 3: Narrative

When all cards were sequenced, teens were asked to discuss their card sort, including their perceptions of the symptom and response pattern they had created, onset, quality, and duration of symptoms, along with timing and rationales for responses. Lastly, they were asked to apply it, making modifications as needed, to recent asthma experiences in varying contexts (i.e. home, classroom, sports). Narratives were audio recorded, and pictures were taken of completed card sorts for analysis.

Results

Completed card sorts graphically displayed the symptoms (range 2 to 9) and responses (range 2 to 11) each participant identified. Ordering of symptoms and responses varied by

context (e.g. school vs. home), and by the physical patterns in which teens laid them out. Teens organized their symptoms and responses into vertical, horizontal, diagonal, or dual axis displays, with passive or active response to asthma symptoms occurring at different points for each participant.

Symptoms

From review of symptoms cards, it quickly became apparent that there were discrepancies in symptom perceptions between the interviewer and teens (i.e. teen identified vs. unidentified symptoms of asthma). Discrepancies included teen perceived symptoms of asthma not typically attributed to asthma by clinicians (e.g. lightheaded, dry throat), and interviewer perceived symptoms of asthma that were identified by teens as *not* attributable to asthma (i.e. coughing). Additionally, variations in terminology between the interviewer and teen were identified (e.g. teen's use of "pushing on chest" vs. interviewer's preference for "chest tightness"). Although seemingly minor semantic differences, use of the teen's preferred terminology resulted in improved conversational flow, and increased both depth and quality of the second interview.

Responses

The visual format of the card sorts aided in identification of both type (active vs. passive; non-pharmacologic vs. pharmacologic) and frequency of self-management responses to asthma symptoms used by teens. This in turn facilitated comparison of response pathways between well-controlled and not-well-controlled teens. For instance, teens with uncontrolled asthma were using more non-pharmacologic self-management strategies (e.g. breathing techniques, calming strategies) than those with well-controlled asthma, and were deferring use of their rescue inhaler for much longer, as well as tolerating a higher level of symptoms.

Narrative

Teens' narrative explanations of the card sorts yielded rich and abundant data. In particular, ability for the interviewer and teen to jointly examine and discuss the symptom-response pathway facilitated a greater depth of discussion about self-management processes than would have otherwise been possible. We found the card sort technique useful in stimulating conversation, bridging language barriers (i.e. creating shared terminology), and identifying usual versus contextually varying patterns of self-management. Teens also indicated that they found it easier to talk about their experiences when using the cards.

Second, visual correlation of particular symptoms to specific self-management responses helped to reveal how teens perceived and categorized symptoms and symptom severity, along with key transition points in thinking and behavior (e.g. classification of unimportant versus important asthma symptoms; thresholds for deciding to use rescue medication versus waiting for symptoms to subside). For example, card sorts highlighted teens' tendency to evaluate and identify asthma symptoms as either "*normal*" or "*unusual*," based on individual norms and baseline symptoms of asthma. Conceptions of normal versus unusual symptoms in turn affected teens' self-management responses and thresholds for initiating rescue medication. Using the cards, we were able to see that teens transitioned from comparatively passive responses to asthma symptoms (i.e. waiting, slowing down, resting) into more active

responses to symptoms (e.g. drinking water, holding breath, using rescue inhaler) at individually specific thresholds, as symptom intensity and duration increased (see Fig 2).

Lastly, card sorts produced data that were visually easy to follow discuss, which facilitated comparison of self-management processes across teens. Thus, the symptom-response card sort allowed us not only to explore individual teen's experiences more effectively, but also to identify patterns of thinking and decision-making shared by other teens in the study—in particular, differences in symptom categorization and thresholds for action between teens with well controlled and not-well-controlled asthma.

Discussion

Card sorting techniques have been used both qualitatively and quantitatively to categorize subjective understandings of individuals or groups, elicit significant differences between concepts, generate taxonomies, and identify patterns in thinking (Chen and Hsu, 2014, Righi et al., 2013, Van Exel and de Graaf, 2005). While useful for exploring perceptions of predetermined subject areas, use of constrained and uniform item sets is less useful for exploring how individuals perceive their own experiences (Chewning et al., 2012, Saunders and Thornhill, 2011, Towse et al., 2000). Unlike prior techniques that have focused on sorting pre-determined sets of items into groups or categories (Coogan and Herrington, 2011, Davies, 1996, Hudson, 2014, Neufeld et al., 2004), participants in this study sequenced their own *individual and unique* sets of symptoms and self-management responses, and developed contextually grounded narratives about their experiences with asthma. This resulted in a visual map of symptom sequences and respective responses, which facilitated a more systematic discussion of complex and contextually dependent self-management behaviors. To our knowledge, similar approaches have not been previously reported in the literature. An individualized and unconstrained card sort, such as described here, can contribute to better understanding individuals' experiences, particularly where communication between participants and an interviewer may be challenging. Knowledge about others' experiences is co-created, and negotiated via interpersonal exchanges of information, the quality of which hinges upon the ability of both sides to give and receive understanding. Communication barriers, such as we encountered, can therefore substantially limit the depth, breadth, and quality of understanding formed via interviews. Evidence from multimedia learning research indicates that addition of simplistic visual aids to auditory narratives can substantially increase learning (Mayer, 2003, Moreno and Mayer, 2002). Thus it is logical that inclusion of visual techniques into oral interviews would increase the quality of understanding created between interviewer and participants. We found using cards as a visual aid to narrative was effective both for helping teens verbalize and discuss complex symptom and response patterns, and for helping the interviewer to make sense of the narratives. It also created shared terminology and helped bridge age- and occupation-related language barriers. This resulted in a higher quality of knowledge construction than we might have obtained otherwise.

This approach has many potential applications for both research and clinical practice. The experiences and approaches described here will likely be transferrable to the study of other behavioral processes with similarly complex and individual-specific experiences, in

particular those involving sequences of events and self-management responses (e.g. chronic pain, diabetes, bullying, domestic violence) (Kearney, 2001). For researchers, explicating event chronology along with underlying perceptions and rationales for responses will help to increase understanding of specific behavioral patterns and identify areas of potential intervention. Researchers interested in quantitatively measuring perceptual and behavioral processes may also find this a useful technique for instrument development, as the resulting visual map and supporting narrative is readily amenable to cross-case analysis.

Clinically, the symptom-response card sort may serve as a device for communication and assessment of health behaviors. First, it can be used to develop shared terminology, thereby contributing to better understanding between patients and providers. Second, eliciting and sequencing perceptions of symptoms and responses can help to identify individual thresholds for treatment, normalizing of symptoms, and patterns in self-management. Identification of these behaviors and perceptions is vital to management of chronic diseases, as they not only affect how symptoms are managed (e.g. at what point patients use their medication), but also what symptoms are reported to the clinician. Lastly, the technique may facilitate shared decision-making. Visual mapping of symptoms and responses can not only promote clearer discussion and mutual understanding of targeted processes, but also aid in development of more explicit management plans.

In conclusion, this paper provides a description of a new interview technique used in a single study, and as such is not intended to be broadly generalizable (Morse, 1999). Furthermore, there are likely limitations to this type of methodology. First, use of the card sort technique during interviews could inadvertently constrain participants' responses and thereby limit the type of data collected. However, the risk of constraining interviews is likely to be mitigated by using the participants' own words. Second, this method may be difficult to incorporate into larger studies, as the technique is time-consuming, entailing both a preliminary and follow-up interview. A modified version (e.g. a "focused" approach) using only a single brief interview to first derive and then sort symptoms and responses may be similarly effective. Applications of this sort may be suitable to brief clinical interviews or larger scale studies with a more quantitative intent. Further modifications such as use of picture cards (for younger ages), or card banks (exhaustive lists of items from which participants could select those best representing their experience) may also be plausible. Such modifications may produce similar results while diminishing the time investments required. Further research would need to be conducted to determine the feasibility and efficacy of these approaches.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Contributions of the paper

What is already known

- Understanding teens' contextually dependent patterns of asthma self-management is critical to designing effective asthma management interventions and promoting better asthma control
- Qualitative research into complex phenomena such as self-management is limited by participants' ability to recall, analyze, and communicate effectively

What this paper adds

- The symptom-response card sort technique is a new and effective approach to exploring the dynamic, individual-specific, and contextually dependent processes of teen asthma self-management.
- Card sorting helps to bridge communication barriers, develop shared terminology, and promote more effective communication between teens and interviewers.
- Visual mapping of symptom-response pathways via card sort facilitates a more in-depth exploration of individual experiences as well as comparison of behavioral patterns across teens.

Figure 1.
Graphical Display of the Symptom Response Card Sort (Case #12)

Teen perceived normal (usual) symptoms					Treatment Threshold ↓ Teen perceived abnormal (unusual) symptoms			
1. Wheeze	2. Chest Tightness	3. Phlegm/Mucus	4. Mild Shortness of Breath	5. Mild Cough	6. Persistent Shortness of Breath	7. Persistent Cough	8. Thick Dark Phlegm	9. Cough to nearly throwing up
			WAIT (#1-4)	PLAN TO TAKE RESCUE INHALER NEXT DAY BEFORE SPORTS (#5)	TAKE RESCUE INHALER (late #6-7)		TAKE NEBULIZER (#7-9)	

Figure. 2.

Symptom-Response Card Sort showing treatment threshold (Case #09)

Table 1

Comparison of Card sorting techniques for eliciting subjective experience

	Symptom-Response Card Sort (NEW)	Card Sorting ^a	Q-Sort ^b	Hierarchical Card Sorting (HCS) ^c
Description	Technique for qualitatively mapping individuals' subjective experiences and responses	Technique used to understand how people group information, including thought processes, reasoning, and reactions. Quantitative or qualitative.	Systematic and typically quantitative approach to measuring subjectivity (e.g. beliefs, opinions, views, tastes, preferences).	Qualitative approach to understanding how people understand and differentiate between sets of items.
Purpose	To facilitate in-depth exploration of an individual's experience, perception of symptoms, responses, and rationale for responses. To identify similarities and differences between individuals.	To identify patterns in thinking and response.	To find <i>clusters</i> of subjective experiences that represents the opinions of functionally different groups of people.	To identify meaningful differences between items
Item Source	Derived from participants own words to represent the <i>individual's experience</i>	Derived from research area; group of items in which the researcher is interested (e.g. all items for layout on a webpage)	Derived from interviews, literature, or the comments of multiple individuals to represent a range of views/opinions in a research area.	Derived from research area; group of items in which the researcher is interested
Item sets	Individualized set of items specific to each participant's experience Ex. "wheezing," "coughing," "take inhaler," "stick head in freezer"	Uniform set of items, statements, or vignettes. Ex. "wheeze," "cough," "inhaler," "cold medicine"	Uniform set of representative opinion statements. Ex. "I can talk to my friends," "I can talk to my doctor"	Uniform set of items from a broad category Ex. list of items such as businesses
Ordering of items	Symptoms are placed in the order in which they occur, with specific responses placed next to the corresponding symptom.	Grouped into conceptually similar categories; Categories may be generated by the participant (open) or predetermined (closed).	Statements are rank-ordered according to a condition or instruction (e.g. agree—disagree).	Items are repeatedly split into two groups by the most meaningful difference, resulting in progressively more differentiated conceptual categories.
Elicits	Individually specific sequence of symptoms and responses	Conceptual groupings	Patterns of subjectivity across individuals or contexts	Perceived differences between groups of items and order of importance
Data	Visual representation of symptoms and responses Narrative explanation	Categories or Piles May/may not include narrative explanations	Measurable distribution of items/Factorial clusters May/may not include narrative explanations	Branching tree or table of sort data Narrative explanation of differences
Data Type	sequential/process	categorical	hierarchical	hierarchical and categorical

Notes:

^aHudson (2014);^bVan Exel & de Graaf (2005), Coogan & Herrington (2011);^cDavies (1996)