

Probabilistic Thinking: A Principle-Based Concept Analysis in the Context of Uncertainty in Chronic Illness

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Background and Purpose: The Reconceptualized Uncertainty in Illness Theory (RUIT) includes the concept of “probabilistic thinking” intending to explain the positive reappraisal of uncertainty in chronic illness. However, the description of the concept is vague, thereby limiting the understanding of the theory. Thus, the aim was to develop a theoretical definition of probabilistic thinking in order to increase the explanatory value of RUIT. **Methods:** We conducted a principle-based concept analysis by means of a conceptually driven literature search. Methods consisted of database, dictionary, lexicon, and free web searching as well as citation tracking. We analyzed the concept in terms of (a) epistemology, (b) pragmatics, (c) logic, and (d) linguistics. **Results:** The final data set included 27 publications, 14 of them from nursing. (a) Probabilistic thinking is a coping strategy to handle uncertainty. It involves a focus on either possibilities (in nursing) or probabilities (in other disciplines). (b) There is a lack of operationalization in nursing, though three measurements focusing the handling of probabilities are offered in psychology. (c) Nursing authors interpreting probabilistic thinking as accepted uncertainty lacked logical appropriateness, since probability negotiates uncertainty. (d) Probabilistic thinking is used synonymously with positive thinking and probabilistic reasoning. **Implications for Practice:** Nurses working with chronically ill patients should consider the findings for the application of RUIT. They should recognize whether uncertainty is perceived as a danger and encourage probabilistic thinking. Efforts are necessary to achieve

a common language between nursing and other disciplines in order to avoid misunderstandings in clinical practice and research.

Keywords: principle-based concept analysis; probabilistic thinking; reconceptualized theory of uncertainty in illness; chronic disease

Uncertainty is considered as one of the most significant psychosocial symptoms in illness and can lead to higher levels of stress, depressive symptoms, and poorer emotional well-being. This may result in the inability to cope, to maintain relationships and, as a consequence, an overall decrease in quality of life (Kurita et al., 2013). Uncertainty has been increasingly demonstrated in people with chronic diseases, such as in women with vulvar neoplasia (Raphaelis et al., 2018), breast cancer survivors (Mishel et al., 2005; Nelson, 1996; Pelusi, 1997), human immunodeficiency virus (HIV) patients (Brashers et al., 2004; Katz, 1996), persons with schizophrenia (Baier, 1995), and long-term diabetic patients (Nyhlin, 1990). Individuals with a chronic condition mostly experience enduring uncertainty due to the inability to assign meaning to illness-related events in the course of the disease. This is caused by incomprehensible information or a lack of predictability (Sajjadi et al., 2016).

According to the Reconceptualized Uncertainty in Illness Theory (RUIT) (Mishel, 1990) continuing uncertainty in individuals with chronic illness becomes the basis for reformulating one's view of life over time. This involves probabilistic thinking (PT) which is characterized by accepting uncertainty as part of life and by no longer expecting certainty. According to Mishel (1990), PT shows a potential for people with a chronic illness in terms of positively reappraising uncertainty. This potential could be taken up by nursing practice and research to promote this view on uncertainty among patients. However, the description of PT remained vague in RUIT. Thereby, the understanding and application of the theory is limited. This may significantly slow down the advancement of theory development, practice, and research in the context of uncertainty in chronic illness.

BACKGROUND

To explain uncertainty before and during diagnosis and treatment of persons with an acute illness, Mishel developed the Uncertainty in Illness Theory (UIT) (Mishel, 1988). UIT is based on the assumption that uncertainty exists in illness situations that are unclear, complex and unpredictable. Uncertainty is defined as the inability to assign meaning to disease-related events. It is a cognitive state arising when such events cannot be adequately structured or categorized due to insufficient evidence. UIT explains how patients cognitively structure a subjective interpretation of uncertainty regarding treatment and outcome (Mishel, 1988). Inspired by qualitative data from chronically ill individuals and an awareness of the limitations of UIT, Mishel extended this theory to the RUIT. To explain the evolution of enduring uncertainty in chronic illness where exacerbation or recurrence are likely, she

added the concepts of PT and self-organization. Both concepts lead to a new value system and the acceptance of uncertainty.

In contrast, UIT results in a return to the previous level of adaptation, whereby uncertainty should be eliminated (Mishel, 1990).

RUIT has been applied several times as a framework for nursing research on uncertainty in chronic illness (Clayton et al., 2018). However, the concept of PT has not been questioned or clarified since Mishel initiated it in RUIT. PT remained mostly untouched by empirical research or results on PT were repetitions of Mishel's description and did not contribute to a deeper understanding of the concept. Consequently, the meaning of the concept remained vague and undifferentiated. However, nursing theories and their concepts are generated for the purpose of describing phenomena, explaining relationships between them, predicting consequences or making recommendations for nursing interventions (Meleis, 2012). It is essential that nurses and other healthcare professionals understand the information a theory provides. How this information can be clinically useful, should also be clear (Risjord, 2019). Also, the progress of theory development and scientific knowledge depends on consistent terminology (Boggatz, 2015). To avoid misunderstandings and to promote advancement in nursing theory, research, and practice, theories and their concepts should be clear and unambiguous (Rodgers, 1989).

In this context, the aim of this work was to analyse the existing state of science of PT and to develop a theoretical definition in order to enhance the explanatory value of RUIT.

METHODS

According to multiple nursing scholars (e.g., Kim & Kollak, 1999; Meleis, 2012; Morse, 1995; Penrod & Hupcey, 2005; Rodgers, 1993; Weaver & Mitcham, 2008) as well as philosophers of science (e.g., Wilson, 1962), concepts are the basis for theory development and the clarification of concepts is the foundation of theoretical thinking. Therefore, we conducted a concept analysis in order to develop a theoretical definition of PT and to enhance the explanatory value of RUIT.

We decided for the approach of *principle-based concept analysis* by Penrod and Hupcey (2005), because it allows to theoretically define a concept and consequently to form a more meaningful and coherent theory by determining potential pathways for concept advancement (Penrod & Hupcey, 2005). First introduced by Morse and colleagues (1996), this method has been further developed by Penrod and Hupcey (2005). In doing so, they departed from evaluating a concept as mature or immature as a result of concept analysis. Instead, principle-based concept analysis provides theoretical definitions of concepts as well as pathways for concept advancement, which can enhance utility in theory development, nursing science, and practice. Therefore, Penrod and Hupcey (2005) consider scientific literature as "the best estimate of probable truth" (Penrod & Hupcey, 2005) of the existing theoretical strands that define a concept. Consequently, principle-based concept analysis

concentrates solely on the use of the concept in scientific literature and dissociates from interpretations found in art or other forms (Penrod & Hupcey, 2005).

Since Mishel's theories of uncertainty have been used in many disciplines with slightly differing definitions, extensions, and applications (Clayton et al., 2018) and Mishel herself originally came from the field of psychology, we furthermore chose the method of principle-based concept analysis because it emphasizes multidisciplinary. According to Penrod and Hupcey (2005) a multidisciplinary perspective is especially important in the nursing field, because certain related disciplines can contribute to nursing's understanding of concepts due to shared paradigms. The multidisciplinary perspective in principle-based concept analysis is supported by analyzing a concept across the scientific literature of multiple disciplines. First, a within-discipline analysis informs about the conceptual meaning from the nursing perspective. A following across-discipline analysis facilitates insights into the perspectives of other disciplines and enables the determination of commonalities and differences about the meanings of a concept with a potential for a more comprehensive theoretical definition.

Principle-based concept analysis evaluates the state of science of a concept based on four philosophical principles, as introduced by Morse et al. (1996): (a) epistemology, (b) pragmatics, (c) linguistics, and (d) logic: (a) The epistemological principle focuses on the discipline's distinction of a concept within the knowledge of the scientific community. It involves the analysis of how clearly the concept has been explicitly and implicitly defined. A concept that is epistemologically mature is well-defined and well-differentiated from other concepts through that definitions. (b) The pragmatic principle concentrates on the concept's applicability in explaining or describing a phenomenon within the discipline. It involves analyzing whether the concept explains a phenomenon encountered within nursing and other disciplines and whether it has been operationalized. Members of the discipline should be enabled to identify manifestations of the concept in practice. (c) The linguistic principle evaluates the appropriate use of the concept, considering the consistency in use and meaning and examining the fit of the concept within context. (d) The logical principle refers to the integration of the concept with related concepts, focusing on conceptual boundaries when positioned theoretically with other concepts.

Finally, these insights are integrated into a theoretical definition summarizing the scientific communities' state of science of a concept (Penrod & Hupcey, 2005).

DATA SOURCES

The first step of principle-based concept analysis consists of collecting scientific literature from disciplines considered applicable to the inquiry (Penrod & Hupcey, 2005). Therefore, we conducted a comprehensive, conceptually driven literature search in April 2020. Included were entries of lexicons and dictionaries, journal publications, and scientific books. We searched the online versions of the Cambridge Dictionary, the Oxford English Dictionary, the Merriam-Webster's Collegiate Dictionary, the Stanford Encyclopedia of Philosophy, the German Dictionary

“Duden,” “Dorsch – Lexicon of Psychology, and the Encyclopedia of Psychology for the term “probabilistic thinking” in English and German. Additionally, we searched the Oxford Dictionary of Psychology by hand. Furthermore, we searched the following databases: CINAHL Complete, MEDLINE, PsycINFO, and Scopus. Eligible for inclusion was literature in the field of nursing and other health and social sciences disciplines in English or German explicitly or implicitly addressing PT in the context of any social phenomenon. We assigned the disciplines according to the affiliation of the first authors. We refrained from any time restrictions to determine the origin of the concept’s appearance in the literature and evolutionary progressions, as recommended by Penrod and Hupcey (2005). Furthermore, we did not place restrictions on the study design. To keep the search as sensitive as possible, the search strategy consisted only of the component “PT.” To identify synonyms and keywords, we used a thesaurus and keyword catalogues of the different databases. Since controlled vocabulary and synonyms were not available, our search strategy consisted only of the term “probabilistic thinking” using database-specific search commands, wildcards, and phrase searching. Additionally, we performed backward and forward citation tracking of included studies via Web of Science Core Collection, and free web searching via Google Scholar. The first author performed the search and screened titles, abstracts, and full texts for inclusion. Figure 1 shows the process of identification and selection.

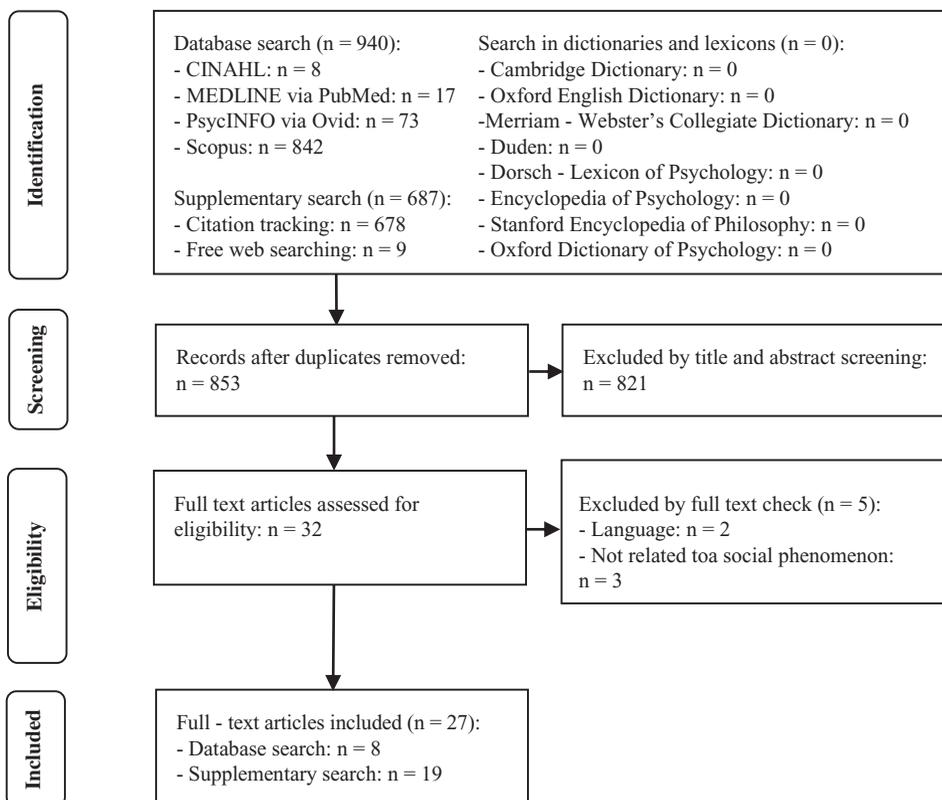


Figure 1. Literature identification and selection process.

ANALYSIS

The identified literature was assessed according to the four principles by Penrod and Hupcey (2005). First, all included articles were read several times. Text passages addressing PT (explicitly or implicitly) were descriptively and a priori coded based on the principles. Afterwards, we thematically linked the codes with subcategories specifying the assessment of the principles. During the analysis, memos were written according to each principle and screened for emergent themes. First, we analyzed the concept within the nursing literature. Afterwards we examined the combined evidence from the other selected disciplines. In a final step, we analyzed the whole data set across all the disciplines, thereby identifying similarities and differences regarding the epistemology, pragmatics, linguistics, and logic of the concept. In several analysis sessions with a research group and supervisors, we critically reviewed and discussed the results until we reached a consensus. Finally, we developed a theoretical definition by crystallizing and assembling the essence of the insights of the different disciplines associated with each principle. We used MAXQDA for data management and analysis.

FINDINGS

The search yielded 27 relevant hits, including 14 publications in the field of nursing (Baier, 1995; Bailey et al., 2004; Bailey et al., 2007; Brashers et al., 2003; Brown & Powellcope, 1991; Fleury et al., 1995; Hilton, 1988; Kang, 2009; Maher & de Vries, 2011; McCormick, 2002; Nelson, 1996; Penrod, 2007; Perrett & Biley, 2013; Sarenmalm et al., 2009), three in psychology (Gasparski, 1989; Hayslip et al., 2014; Wright et al., 1978), three in sociology (Burton-Jeangros et al., 2013; Clarke, 2007; Heyman et al., 2013), three in communication science (Brashers, 2001; Brashers et al., 2004; Brashers et al., 2000), one in social work (Parry, 2003), one in medicine (Knaus, 2004), one in public health (Dauphin et al., 2020), and one in health sciences (Leontini, 2010). They were published between 1978 and 2020, performed in Canada ($n = 2$), Europe ($n = 9$), South Korea ($n = 1$), and the United States of America ($n = 15$). The majority were qualitative studies ($n = 15$), followed by discussion articles ($n = 4$), correlational studies ($n = 3$), and concept analyses ($n = 2$), one interventional study, one editorial and one scientific book. We could not identify any relevant entries in lexicons or dictionaries.

Below we report the results concerning the four principles and finally present our theoretical definition.

EPISTEMOLOGICAL PRINCIPLE

Nursing. For the most part, PT is implicitly defined in relation to individuals coping with uncertainty in chronic illness. It is a strategy to manage enduring uncertainty and implies an open mindset characterized by accepting and reappraising uncertainty. Uncertainty is appraised as pervasive in human experience (Penrod, 2007), a factor of life (Nelson, 1996), and a natural component in an illness situation

(McCormick, 2002). PT even involves the acknowledgment of uncertainty (Perrett & Biley, 2013), and the delicacy and conditional nature of life (Bailey et al., 2004). This contributes to self-organization, reaching a broader perspective of life, and growth through uncertainty (Nelson, 1996). However, it is controversially discussed within the concept analysis of "uncertainty in illness" by McCormick (2002), as patients weigh the odds of a potential health outcome.

Other Health and Social Science Disciplines. PT is rather explicitly defined in other disciplines as overcoming uncertainty, aiming to reduce or eliminate it by expressing uncertainty as a mathematical probability (Kostera & Zdrowski, 2012; Wright et al., 1978). PT is furthermore a way of thinking derived from probability theory (Clarke, 2007) focussing the predictability of consequences (Heyman et al., 2013). It is associated with objectivity and rationality (Butcher & Clarke, 2006). Furthermore, is a culturally dependent cognitive style (Hayslip et al., 2014) influenced by the cultural orientation towards arts and science (Wright et al., 1978). In medicine PT stands for physicians' highly analytic process of decision-making with regard to therapy options in critically ill patients, thereby weighing the odds (Knaus, 2004).

In summary, PT is, for the most part, implicitly and consistently defined in the nursing literature, and rather explicitly defined in the literature of other disciplines. Across-disciplines definitions are contradictory, either involving a dismissive attitude on uncertainty in other health and social science disciplines or an appreciative attitude in nursing.

PRAGMATIC PRINCIPLE

Nursing. PT mostly manifests in individuals by focusing on possibilities instead of limits due to the uncertain nature of their disease (Baier, 1995; Bailey et al., 2004; Bailey et al., 2007; Fleury et al., 1995; Kang, 2009; Penrod, 2007). This involves exploring individual goals (Fleury et al., 1995) and making experiences that would not have been possible without the disease. PT appears as a heightened awareness of things that were otherwise overlooked (Perrett & Biley, 2013). It implies seeing new contingencies in unpredictable situations. PT is recognized as attitudinal change in people experiencing enduring uncertainty in illness, starting to live with more purpose (Hilton, 1988; Perrett & Biley, 2013). PT makes individuals realize that life is no more certain for those living without a disease (Perrett & Biley, 2013) and no one knows what tomorrow will bring (Nelson, 1996).

PT is promoted by temporality since it occurs gradually over time (Brashers et al., 2003).

We identified one measurement of PT, the Growth through Uncertainty Scale by Mishel and Fleury (1997) (unpublished manuscript).

Authors emphasized the importance of interventions to promote PT in patients with a chronic illness (Bailey et al., 2004). Nurses should increase social support to encourage perspective shifts (Brashers et al., 2004). This contains active listening (Monsivais, 2005) to notice enduring uncertainty perceived as danger (Bailey et al., 2007). Interventions comprised patient education for recognizing possibilities arising

from uncertainties associated with illness (Fleury et al., 1995; Monsivais, 2005), and cognitive-behavioral therapy for changing uncertainty appraisal (Brashers et al., 2003).

Other Health and Social Science Disciplines. PT manifests in individuals focusing on probabilities aiming to reduce or eliminate uncertainty. It occurs as thinking in probabilities of a future outcome (Burton-Jeangros et al., 2013) in terms of chance and likelihood (Clarke, 2007). Individuals can express uncertainty verbally or as mathematical probability. PT is independent from personal attributes. Authoritarian, conservative, dogmatic persons, who are intolerant towards ambiguity, are as capable of PT as persons of opposite characteristics (Wright et al., 1978). Though, age and gender have an influence on PT as younger adults reported a higher degree of PT than older adults, just like men compared to women. Furthermore, individuals with prior death experiences, persons acting according to social desirability (Hayslip et al., 2014), and people with higher graded external locus of control were better trained in PT (Gasparski, 1989). In the psychological literature, PT is operationalized in form of three measurements. The PT Scale measures the degree to which individuals will use probability to distort reality in order to distance themselves from the possibility of injury, illness, or death. Risk-repressing, risk-seeking, death denial, and wilful neglect are constructs of PT (Hayslip et al., 2014). Furthermore, the View of Uncertainty Questionnaire indicates the verbal handling of uncertainty. The Probability Assessment Questionnaire refers to mathematical and verbal skills in PT (Wright et al., 1978).

In summary, PT is present as a focus on possibilities in nursing practice. Due to the absence of a measurement, it might be difficult to estimate. In other disciplines, PT manifests itself by focusing on probabilities regarding future health outcomes. Available instruments in the field of psychology concentrate on handling uncertainties by thinking in probabilities.

LINGUISTIC PRINCIPLE

Nursing. The understanding of PT in nursing is based on the assumption that probabilities restrict the understanding of uncertainty (Penrod, 2007). Accordingly, certainty and predictability are not expected in chronic illness (Clayton et al., 2018). However, since the term “probabilistic thinking” literally refers to probabilities, the linguistic appropriateness of authors in the field of nursing equating PT with the negotiation of probabilities seems misleading and incomprehensible.

Other Health and Social Science Disciplines. In contrast, there is a focus on probabilities in the understanding of PT in the literature of other disciplines. Probability is assigned as a core element of PT in patients examining the diagnosis, treatment, and prognosis of an illness situation. In this interpretation, PT refers to the determination of probabilities for health-specific outcomes. In general, the term “probabilistic” is defined as relating to or expressing probability (Oxford English Dictionary, n.d.), thereby matching the understanding in other disciplines.

In summary, the nursing literature lacked linguistic consistency and appropriateness. It therefore appears that PT is not only perceived differently but contradictory

in comparison with other disciplines and dictionary interpretations of PT as thinking in terms of probability.

LOGICAL PRINCIPLE

Nursing. In the nursing literature, related concepts are used interchangeably with PT. This applies to positive thinking (Fleury et al., 1995; Hilton, 1988) and cognitive reframing (Bailey et al., 2004; Bailey & Wallace, 2007; Bailey et al., 2007). PT includes focusing on life changes in a positive way (Fleury et al., 1995) and optimism concerning the future (Hilton, 1988). However, cognitive reframing is focused on the restructuring of beliefs and expectations about events (Bailey et al., 2004). The concepts are used as synonyms without setting boundaries.

Other Health and Social Science Disciplines. In the literature of other disciplines, related concepts are also used synonymously. First, probabilistic reasoning refers to active management of personal probabilities (Heyman et al., 2013). According to Leontini (2010), probabilistic reasoning means the recognition of probabilities arising from risk factors in order to manage the probability of experiencing an adverse event. Furthermore, PT is discussed as a variant of thinking contingently (Heyman et al., 2013). According to Heyman et al. (2013) contingency is perceived whenever someone considers that one of two or more alternative outcomes might happen. However, there is one conceptually related approach in sociology. Possibilistic thinking is a complement to PT and not a replacement for PT. According to Clarke (2007), it draws attention to consequences of events in a more emphatic way than PT. Possibilistic thinking implies that even things with the smallest probabilities can happen.

In summary, related concepts across the disciplines show similarities with PT and are used synonymously. However, most boundaries are blurred and need to be further established.

THEORETICAL DEFINITIONS

Due to fundamental inconsistencies between nursing and other disciplines regarding the conceptual meanings of PT, we did not develop a transdisciplinary theoretical definition. Instead, we present one theoretical definition for nursing and one for other health and social science disciplines.

PT in Nursing. PT is a coping strategy to manage enduring uncertainty. It stands for an open, appreciative attitude towards uncertainty regarding future life and health events, resulting in a changed view on life in which uncertainty is accepted. Individuals thinking probabilistically no longer expect certainty and predictability. PT is characterized by an emerging mindset that develops over time. It manifests itself as mental focus on possibilities arising from the uncertainties of a disease or treatment. PT is influenced by social support, cognitive reframing, and time.

PT in Other Health and Social Science Disciplines. PT is a cognitive coping style including a dismissive view on uncertainty regarding future life and health events, aiming to reduce or eliminate it. Individuals consider risks in decision-making for treatment pathways by means of determining the probabilities of outcomes. PT

is characterized by a complex way of thinking, mostly manifest as ability to verbally or mathematically express probabilities. It is influenced by the orientation towards arts and science, gender and age.

DISCUSSION

To the best of our knowledge, this concept analysis is the first to specifically investigate the phenomenon of PT in the context of nursing. It resulted in two theoretical discipline-specific definitions. They address different attitudes towards uncertainty, both functioning as coping mechanism.

Our overall aim was to increase the explanatory value of RUIT in order to support the application of the theory in research and practice, thereby promoting theory development in nursing. Theory development is understood as a dynamic process in which theories should be continuously tested, modified, and further developed, according to research findings (Grover & Glazier, 1986). By pointing out the ambiguities of a theory, possibilities for advancement and the need for further development are identified. Such further development includes the clarification, refinement, and expansion of a theory (Fawcett, 2005).

As a first step, this concept analysis contributes to the further development of RUIT by filling parts of the gaps concerning the meanings of PT. Mishel (1990) developed RUIT by using the process of theory derivation as described by Walker and Avant (1989). For this purpose, she selected Chaos Theory as parent theory (Mishel, 1990). Chaos theory is originally assigned to the field of applied mathematics and deals with orders in dynamic systems (Barton, 1994). However, derived theories can be limited in explanation if the context and logic of the parent theory cannot be sufficiently linked to the phenomenon of interest (Walker & Avant, 1989). This may be evident with RUIT as it shows theoretical gaps concerning the explanation of uncertainty evolution and its appraisal over time.

Furthermore, theory development is an essential part of scientific disciplines. Theories form a central body of knowledge relating to significant issues in a field. They define the thematic boundaries of a discipline (Pettigrew & McKechnie, 2001). In this concept analysis, we present discipline-specific definitions, thereby pointing out various forms of understandings. Since nursing professionals act with other professions in which PT also occurs, these insights can be helpful to avoid misunderstandings. Inconsistent meanings of the conceptual label and variability in operationalization may affect the efforts of all disciplines searching the literature to learn more about the concept. This can lead to misconceptions among different disciplines with regard to RUIT. Moreover, the theoretical definition of PT of other disciplines serves to specify the concept's meaning in nursing. Indeed, the discipline-specific definitions have common elements in the context of RUIT, such as coping and cognition. Nevertheless, the theoretical definition of other disciplines contributes to clarify the meaning of PT in nursing, by contrasting what PT is *not*.

However, there should be an attempt to resolve the inconsistencies between nursing and other disciplines. In our opinion, this requires another term for

the nursing context. The term “probabilistic thinking” chosen by Mishel (1990) could lead to misunderstandings since it is literally associated with “thinking in probabilities,” even though that was not intended by her. We might consider the term “possibilistic thinking” from the field of sociology to be more appropriate for the nursing context. However, this requires a further concept analysis for clarification.

LIMITATIONS

One limitation of this concept analysis relates to the disciplines chosen for inclusion. The inclusion of literature from natural scientific disciplines, such as mathematics, and philosophy could have provided more insight into the concept’s origin. Furthermore, the process of identification and selection of literature by a second, independent person could have contributed to more valid search results.

CONCLUSIONS

With this concept analysis, we take the first step towards filling theoretical gaps in RUIT, aiming to explain the evolution of uncertainty and its appraisal in chronic illness more sufficiently. We increased RUIT’s explanatory value by presenting the concept’s unique meanings in nursing and by contrasting contrary understandings of other disciplines. Furthermore, we show paths for concept advancement of PT, serving for future expansion of RUIT. Finally, these findings offer important indications for the creation of a unified language beyond the disciplines, thereby affecting theory development, research, practice, and education by avoiding misunderstandings.

INTERNATIONAL IMPLICATIONS

PRACTICE

The results of this work increase the understanding of the RUIT and therefore support its application in international practice where nurses are confronted with chronically ill patients who perceive uncertainty as a danger. Furthermore, the findings can serve as a sensitization for PT. Nurses working with chronically ill patients should be attentive whether they recognize uncertainty in chronic illness as a danger and consider the potential of PT regarding the positive reevaluation of uncertainty. They should encourage or maintain PT by drawing on the presented indications for nursing interventions.

THEORY DEVELOPMENT AND RESEARCH

Although we clarified what PT is in nursing and what it is not, certain aspects remained unanswered. They should be taken up in terms of a future concept advancement in order to fill further gaps and to expand RUIT. This requires targeted research on PT.

First, the concept should be operationalized. Its constructs should be determined in order to establish a measurement, enabling to recognize and measure PT in practice. To specify the temporality of PT, empirical longitudinal research is needed. It allows to explore the evolution of PT over time. This will serve as theoretical basis for timing interventions by informing about the appropriate point of time and duration. Furthermore, it should be investigated which factors (age, gender, culture, previous experiences, or beliefs) promote or inhibit PT. This is required in order to develop adequate interventions for persons affected. Nevertheless, boundaries with related concepts should be determined to obtain further clarity of the concept and its use in RUIT.

EDUCATION

To provide future nurses with a deeper understanding of PT in individuals with a chronic disease already during their training, the inclusion of the topic into nursing curriculum should be considered, for example, in courses about chronic diseases at Bachelor and Master level. In addition, a specialized counselling module on uncertainty management could be established as further training for qualified nursing staff.

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