**Critical thinking and self-efficacy. Useful concepts in nursing practice and education**

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**Chapter 1**

**General introduction**

*Introduction to the study*

Since the introduction of Bachelor degree nursing education programmes in the mid-1970s, health care institutions as well as educational institutions have been involved in discussions concerning the differences between Bachelor degree and diploma-educated nurses. In practice, the added value of Bachelor degree nurses compared to those with a diploma is the subject of most debate (VBOC, 2006). In this on-going process, some important milestones can be identified. A significant attempt to draw a distinction between the two levels of nursing qualifications was the introduction of the “qualification structure” in 1996 (Commissie Kwalificatiestructuur, 1996). Final qualifications and attainments are described in detail by level and the differentiation between nursing levels is made based on three major criteria: accountability, transfer and complexity (Commissie Kwalificatiestructuur, 1996). Furthermore, within this description, Romiszowsky’s taxonomy of knowledge and skills is applied (Romiszowsky, 1988). This taxonomy differentiates between factual knowledge and insightful knowledge, and skills are differentiated into reproductive and productive skills. “Reproductive skills” refers to those requiring the knowledge of how to apply standard procedures and protocols. “Productive skills” refers to those where the requirement is to think how to apply procedures and protocols, based on learned principles and strategies (Commissie Kwalificatiestructuur, 1996). In the description of the qualifications of diploma nurses and Bachelor degree nurses (also known as level 4 and level 5 nurses respectively), the latter apply considerably more insightful knowledge and reproductive skills.

Another major shift took place at the turn of the century. The qualification structure evolved into a competency‑based description of nursing, resulting in a definition of the professional roles and core competencies of nurses (Pool, 2001). The description of these roles and competencies is specific to Bachelor degree nursing (Pool, 2007), but in this profile a clear distinction between the two nursing levels is missing (Movisie, 2007; VenVN, 2012). The distinction between the nursing levels in health care practice remains ill-defined and the need for clarity is still prominent (VBOC, 2006; Nivel, 2011; VenVN, 2012). One of the major problems is that both diploma nurses and Bachelor degree nurses act within the same legal framework. They both are qualified by law to carry out reserved procedures. One of the recommendations of the VBOC report (VBOC, 2006) is the introduction of two nursing profiles: nurse and nurse specialist.

In the spring of 2012, a proposal based on the recommendations of the VBOC report was presented, which embodies a distinction between diploma nurses and Bachelor degree nurses (VenVN, 2012). In this proposal, diploma nurses no longer hold a legal title and the job title becomes “*zorgkundige*” (literally, “skilled carer”). The legal term “nurse” is reserved for those with a Bachelor degree. The differentiation has a legal basis, as is borne out by statutory disciplinary law: nurses are bound by this law whereas “*zorgkundigen*” are not. Developments within the profession and society as a whole underpin the argument for a distinction between the nursing levels. Health care has become complex and demanding (Nivel, 2011), and to deal with these demands, the quality of education needs to improve. One of the remarks contained in the VenVN report (2012) is that nursing education in the future will take place at a Bachelor degree level. This is a globally observed trend (Mistiaen, Kroeze, Triemstra & Francke, 2011; Francke, Mistiaen, Van der Velden & Batenburg, 2012).

Due to the developments outlined above, the focus within research has shifted from the distinction between the two nursing levels towards concepts that are essential to (Bachelor degree) nursing education. The challenge for the future is to provide education geared towards highly qualified nursing, in which the complex demands of health care consumers can be addressed. In the aforementioned professional profile descriptions, reports, proposals and competency profiles, two concepts are emerging that are essential to nursing: critical thinking and self-efficacy. These concepts are introduced in the following paragraphs.

*Background of the study*

Over the past decades, there has been a lot of interest in how the professional development of nursing students and nurses can be stimulated. The reason for this is that nurses in health care are confronted with complex demands and rapidly changing health care environments (Simpson & Courtney, 2002; Worrel & Profetto-McGrath, 2007; Marchigiano, Edulvee & Harvey, 2011). To be ready for nursing practice, nurses have to possess competences such as clinical reasoning skills in order to make sound clinical judgements (Standing, 2008; Simpson & Courtney, 2009). In addition to this, the focus on evidence‑based nursing is clearly present in nursing practice and education (Profetto‑McGrath, 2005). Nurses are accountable for the care they provide, which is strengthened by the increasing empowerment of health care consumers. These trends and developments have resulted in the fact that nurses must possess specific competences, as is illustrated by newly‑developed professional nursing profiles. Nursing has become a professional practice and is still evolving. Being a nurse requires cognitive skills and the self-confidence to act autonomously. The time of “a doctor orders and a nurse acts” lies behind us. In a series of focus group meetings conducted in this study, the core competences of nursing was the subject of discussion. It was recognised by representatives of the health care sector as well as educational institutions, that cognitive skills and the ability to act autonomously are core proficiencies for nursing. A distinction has been made between the two general nursing levels in the Netherlands (Bachelor degree and diploma nursing level) and several reports and profiles have been published since the mid-1990s, further outlining this distinction (Commissie Kwalificatiestructuur, 1996; VBOC, 2006). The previously mentioned core competences apply especially to Bachelor degree nurses.

In this study, the focus is on two concepts: critical thinking skills and self-efficacy beliefs.

*Perspectives on critical thinking*

A vast number of studies and reports have been published with regard to determining what critical thinking consists of. However, to date, critical thinking is still not defined in a uniform way, and in international literature it has many definitions (Simpson & Courtney, 2002; Banning, 2006; Edwards, 2007; Riddel, 2007). The perspective on critical thinking also determines how it is defined. From a pedagogical perspective, the focus of critical thinking is on the use of subjective knowledge, intuition and emotions, and not only on logical reasoning (Ten Dam & Volman, 2004). From a philosophical point of view, critical thinking is seen as “the norm of good thinking, the rational aspect of human thought, and as the intellectual virtues needed to approach the world in a reasonable, fair‑minded way” (Ten Dam & Volman, 2004, p. 361). However, the dominant perspective on critical thinking skills is of a cognitive psychological nature. From this point of view, the skills needed to think critically are characterised in relevant literature as higher-order thinking skills (Ten Dam & Volman, 2004). Facione, Facione and Giancarlo (2000) state that the cognitive skills of analysis, interpretation, inference, explanation, evaluation, and of monitoring one’s own reasoning are at the heart of critical thinking. In international literature, similar terms such as clinical reasoning or clinical decision-making are frequently applied to illustrate critical thinking skills (Edwards, 2007; Fero, O’Donnel, Zullo, DeVito Dabbs, Kitutu, Samosky , & Hoffman, 2010; Riddel, 2007). Although critical thinking skills are a prerequisite in order to make sound clinical decisions, it is recognised in relevant literature that critical thinking is about the cognitive processing that drives clinical problem-solving, decision-making and reflective thinking (Forneris & Peden-McAlpine, 2006: Cormier, Pickett-Hauber , & Whyte IV, 2010). From this point of view, critical thinking skills can be seen as a meta‑competence (Dries, Vantilborgh, Pepermans & Venneman, 2008). In addition to this, critical thinking encompasses reflective thinking. A person has to analyse his or her own interpretations and decision‑making processes (Simpson & Courtney, 2002; Banning, 2006). The importance of the use of reflective skills in the process of critical thinking is stressed by several authors (Facione, 1990; Paul, 1990; Edwards, 2007). “Thinking about thinking”*,* defined as a meta-cognition (Kuiper, Murdock & Grant, 2010), is related to critical thinking. It is helpful in managing the development of skills such as clinical decision making (Kuiper et al., 2010).

*Critical thinking in nursing education and practice*

To date, critical thinking has generally been viewed as a core element of nursing education and practice (Daly, 1998; Scheffer & Rubenfeld, 2000; Boychuk Duchscher, 2003; Fero et al., 2010). Its origin stems from the mid-1980s, when the American Psychological Association conducted a Delphi study on critical thinking (Boychuk Duchscher, 2003). Since then, nursing education programmes have recognised the importance of developing critical thinking skills (Brunt, 2005; McMullen & McMullen, 2009; Cormier et al., 2010) and these skills are therefore seen as major desired outcomes of nursing education programmes (Staib, 2003; Marchigiano et al., 2010). Critical thinking skills are required to deal with complex care demands (Kaddoura, 2010) and are therefore essential to nursing practice and education. Problems arise when evidence is sought in literature to prove that teaching critical thinking improves clinical performance (Riddel, 2007; Marchigiano et al., 2010). The underpinning assumption is that critical thinking skills can be taught (Riddel, 2007), yet measuring the development of critical thinking skills turns out to be problematic. Evidence regarding if and how teaching methods and strategies affect critical thinking skills is inconclusive and inconsistent (Banning, 2006; Riddel, 2007; Marchigiano et al., 2010).

*Self-efficacy*

The concept of self-efficacy was developed by Bandura and is a key concept in social cognitive theory (Bandura, 2001). Social cognitive theory explains human functioning with the emphasis on a dynamic and interactive process in which cognitive processes play a central role. Cognitive processing is applied by observing others and the environment, and then reflecting on these interactions. In doing so, a person can alter self-regulatory functions (Burney, 2008). Self-efficacy is about the belief in one’s competence to tackle difficult or novel tasks and to cope with adversity in specific, demanding situations.

Bandura (1997) defines self-efficacy as “the belief in one’s capabilities to organise and execute the courses of action required to produce given attainments”. Self-efficacy beliefs makes a difference to how people feel, think and act (Bandura, 1993), and they regulate human functioning. In doing so, cognitive, motivational, affective and decisional processes are involved (Bandura, 2002). Self-efficacy beliefs affect whether individuals think in self-enhancing or self-debilitating ways (Bandura, 2002) and are derived from four principal sources of information: enactive mastery experiences, vicarious experiences, verbal persuasion, and physiological states (Bandura, 1997; Lane, Lane & Kyprianou, 2004; Zulkosky, 2009). In everyday life, people act and interact in many different situations, and in reflecting on situations and experiences, the appraisal of how well one is acting or interacting includes cognitive and affective processing. In predicting events and developing ways to control them, effective cognitive processing of information is required (Bandura, 1993), such as considering options and testing one’s judgments. Self-efficacy beliefs affect the amount of stress and anxiety that is experienced in threatening and difficult situations. This is the emotional mediator of self-efficacy beliefs, which also affects motivation (Bandura, 1993).

Increased self-efficacy enhances the sense of self-control and helps one to perform at a higher level (Bandura & Locke, 2003). Those with high self-efficacy beliefs want to overcome difficult situations instead of avoiding them (McLaughlin, Moutray & Muldoon, 2008; Zulkosky, 2009).

*Self-efficacy in nursing education*

Zulkosky (2009) illustrates the implications of self-efficacy in nursing education by utilising the sources of self-efficacy. In clinical settings, nursing students observe the performance of colleagues, discus this performance and carry out certain actions themselves. In utilising these various sources, the students form self-efficacy beliefs that will help them when they encounter difficulties and challenges in nursing practice. Hence, self-efficacy is a factor in metacognitive self-regulation (Kuiper et al., 2010). Ofori and Charlton (2002) found that students’ self-regulated learning strategies are related to self-efficacy beliefs. Depending on how high this belief is, students put effort into studying, or seek help and support. In line with this, Lenz and Shortridge-Baggett (2002) state that self-efficacy is the most important predictor of change in behaviour.

Self-efficacy is often linked to a specific task (Lane et al., 2004). Knowing what it takes to perform well at a task is positively related to self-efficacy beliefs in relation to the future performance of such tasks (Bandura, 1997). In education research, however, evidence is found that students’ efficacy expectations are also based on other competences generalised from past educational performance (Lane et al., 2004). Research results indicate that self-efficacy beliefs are domain specific as well as task specific (Lane et al., 2004).

*The relationship between critical thinking and self-efficacy*

Critical thinking is determined as a set of skills, consisting of cognitive components. Bandura (1993) argues that it takes self-efficacy beliefs to make good use of these skills. People can have the same level of cognitive skills, but perform differently. Wangensteen, Johansson, Björkström and Nordström (2010) support this line of reasoning. They state that skills such as critical thinking skills alone are not enough to perform well in the workplace, as a person must also be disposed towards using the critical thinking skills that have been learned. Reflecting on how critical thinking skills are applied in various situations is helpful in building self-efficacy beliefs. Bandura (2001) states: “Verification of the soundness of one’s thinking also relies heavily on self-reflective means. In this metacognitive activity, people judge the correctness of their predictive and operative thinking against the outcomes of their actions, the effects that other people’s actions produce, what others believe, deductions from established knowledge and what necessarily follows from it”. Research findings by Fenollar, Román and Cuestas (2007) suggest that the confidence students have in their own capabilities is helpful to them in determining what to do with their knowledge and skills.

Self-efficacy influences how people think and act and is therefore an important contributor to the academic performance of students (Bandura, 1993). This influences the quality of decision making and also academic achievement. In line with this, Zulkosky (2009) relates self-efficacy beliefs to thinking, stating that a strong sense of efficacy facilitates cognitive processes and performance. Furthermore, Greene, Miller, Crowson, Duke and Akey (2004) found significant relationships between self-efficacy and the use of meaningful cognitive strategy. Chowlowski and Chan (2004) as well as Whyte, Ward and Eccles (2009), demonstrated the influence of anxiety on performance through examining the clinical decision‑making ability and performance of (student) nurses. Anxiety operates as a source upon which self-efficacy beliefs are built: a physiological source (Bandura, 1997).

Kuiper et al. (2010) link metacognitive thinking strategies to self-beliefs. A lack of these strategies leads to an overestimation of one’s capabilities. The result of this is that one does not select the appropriate action to become more competent. On the other hand, underestimating one’s capabilities or knowledge means not using established capabilities. In line with this, Zimmerman and Schunk (2001) state that well-developed metacognition enhances performance. It optimises one’s capabilities, meaning that one is aware of strengths and weaknesses in order to manage skill development. They argue that key to this process are self-efficacy beliefs. Chen, Casper and Cortina (2001) state that individual differences, such as cognitive ability, are believed to influence the formation of self-efficacy beliefs. Given the idea that cognitive abilities are of a general and stable nature, this has consequences for the formation of self-efficacy beliefs. Personal resources such as cognitive ability become important in addressing complex tasks. Therefore, the influences of these abilities on self-efficacy beliefs are greater when performing complex tasks (Chen et al., 2001; Kanfer & Ackerman, 1989).

*Aims and outline of the dissertation*

In this study, the main objective is to investigate the role of critical thinking skills and self‑efficacy beliefs in nursing and nursing education. The research questions that are addressed are as follows:

* What is the effect of educational programmes and strategies on the development of critical thinking skills in nursing education?
* How can critical thinking contribute to the differentiation between nursing levels?
* How do nursing students form self-efficacy beliefs?
* What are the effects of learning environments on the formation of self-efficacy beliefs?
* Is there a relationship between critical thinking skills and self-efficacy beliefs?

In Chapter 2, an overview of studies examining the effect of educational programmes and strategies on critical thinking skills is presented. A literature review is conducted, focusing on research using standardised measures to assess critical thinking skills. Finally, outcomes as well as methodological issues are discussed.

In Chapter 3, critical thinking skills are discussed as a means of making a distinction between nursing levels. Critical thinking skills are assessed as a factor related to educational nursing levels, particularly the Bachelor degree level.

Frameworks of critical thinking are presented in Chapter 4 and theoretical works by Benner, Hammond and Eraut are discussed. The focus is on how well these frameworks explain the use of cognitive and critical thinking skills by nurses. It is discussed how this can contribute to the debate concerning the distinction between the educational levels for nurses in the Netherlands.

The development and validation of a “sources of self-efficacy inventory” is presented in Chapter 5. Based on Bandura’s theoretical model on sources of self-efficacy (1997), a fifth source is added to this model.

In Chapter 6, the research question of how learning environments contribute to the formation of self-efficacy beliefs is addressed. Results from comparison between regular clinical learning workplaces and care innovation centres are presented and discussed.

The relationship between critical thinking skills and self-efficacy beliefs is the subject of Chapter 7. Building on earlier research, it is investigated whether Bachelor degree nurses have higher critical thinking skills than diploma nurses do. If so, does this have a significant effect when comparing their self-efficacy beliefs?

Finally, an overall conclusion and discussion is presented in Chapter 8. The study’s main conclusions as well as a reflection on the methodology and implications for practice are described.

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**Chapter 2**

**Factors influencing critical thinking skills in nursing education: a literature review**

**Introduction**

Critical thinking skills are seen as major desired outcomes of nursing education programmes (Banning, 2006; Beckie, Lowry & Barnett, 2001; Drennan, 2009; Scheffer & Rubenfeld, 2000; Spelic, Parsons, Hercinger, Andrews, Parks & Norris, 2001). The development of critical thinking skills is essential to nursing for various reasons, including that health care has become increasingly complicated (Brunt, 2005a; Simpson & Courtney, 2002). Technological and sociocultural changes (for example, the ageing population and increasing amount of home care) also influence the nature of health care. To deal with these changes, higher‑order thinking skills are required (Edwards, 2007). Scheffer and Rubenfeld (2000) used the Delphi method to identify critical thinking in nursing: “critical thinking in nursing is an essential component of professional accountability and quality nursing care”. Critical thinking is required to support clinical decisions and judgements about client care (Brunt, 2005; Edwards, 2007; Simpson & Courtney, 2002), as nurses need to understand both the context of care and patients’ experiences (Ironside, 2003). This process requires strong critical thinking skills and nursing education programmes reflect the importance of developing these skills (Brunt 2005b). Critical thinking has become a core element of nursing education programmes and thereby an outcome of them (Edwards, 2007; Marchigiano, Eduljee & Harvey, 2011)*.*

Over the years, many studies have focused on the assessment of the development of critical thinking skills in educational programmes. However, research findings show inconsistent results (Adams, 1999; Banning, 2006; Spelic et al., 2001; Staib, 2003; Zygmont & Schaefer, 2006). Many studies have investigated the relationship between complete programmes and the overall development of critical thinking skills in nursing education (Brown, Alverson & Pepa, 2001; Drennan, 2009; McCarthy, Schuster, Zehr & McDougal, 1999; Shin, Jung, Shin & Kim, 2006; Walsh & Seldomridge, 2006). Other studies have examined the relationship between critical thinking skills and teaching strategies or methods such as problem‑based learning (Tiwari, Lai, So & Yuen, 2006) or simulation (Ravert, 2008). Problems identified by several authors (e.g. Walsh & Seldomridge, 2006b) are the variety of definitions of critical thinking used in studies and the differences in the instruments used to assess critical thinking skills. This makes it difficult to compare the outcomes of studies. Staib (2003) conducted a review of studies on critical thinking strategies in nursing education. One of the findings was that only a few methods used to develop critical thinking skills have been systematically evaluated and that many conclusions have been drawn based on anecdotal reports. Furthermore, Staib (2003) points out that it is difficult to operationalise critical thinking and to translate it into concrete teaching methods. However, despite the difficulty in measuring the development of critical thinking skills, it is believed that these can be taught (Riddel, 2007).

In this review section, we focus on the following research questions:   
(1) Do nursing programmes in general contribute to increased critical thinking skills?   
(2) Which teaching strategies or methods in nursing education programmes promote critical thinking skills?   
(3) Which factors other than teaching strategies and methods are reported to have an effect on the development of critical thinking skills in nursing students?

**Background**

*Definitions of critical thinking*

There is no uniformly accepted definition of critical thinking in general, or more specifically in relation to nursing. In relevant literature, concepts of critical thinking are analysed and considered in many different ways (Brunt, 2005a; Riddel, 2007; Romeo, 2010; Scheffer & Rubenfeld, 2000). There are different perspectives on the concept of critical thinking, such as cognitive, pedagogical, and philosophical (Ten Dam & Voldam, 2004). The most dominant perspective is the cognitive, derived from cognitive psychology. This perspective is represented, amongst others, by Ennis (1985) and Facione (1990). In this perspective, critical thinking skills are seen as higher‑order thinking skills, such as analytical and evaluating skills (Facione, 1990), and the focus is on rational and logical reasoning. Definitions of critical thinking within the cognitive perspective include, for example “Reasonable and reflective thinking focused on deciding what to believe or do”(Ennis, 1985), “Purposeful, self-regulatory judgement that results in interpretation, analysis, evaluation and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual consideration upon which that judgement is based” (Facione, 1990; Facione, 2006) and “The assessment of what might be called evidence, in order to make a judgement”(Moon, 2008 p. 33). Turner (2005) also conducted a concept analysis on critical thinking in nursing education and practice, and presented the following definition:

“Critical thinking in nursing is a purposeful, self-regulatory judgment associated in some way with clinical decision making, diagnostic reasoning, the nursing process, clinical judgment, and problem solving. It is characterized by analysis, reasoning, inference, interpretation, knowledge, and open-mindedness. It requires knowledge of the area about which one is thinking and results in safe, competent practice and improved decision making, clinical judgments, and problem solving”.

These definitions have in common that critical thinking skills are considered to be required in order to make clinical decisions and/or judgements and can therefore be conceived of as a meta‑competence (Gloudemans, Schalk & Reynaert, 2010).

In both the pedagogical and philosophical perspectives, definitions are not formulated in a concrete way. The boundaries of what critical thinking skills encompass are not clearly articulated, though both perspectives consider cognitive skills as a dimension of critical thinking skills. Additionally, affective and emotional components, intuition and dialogue, are seen as key elements of critical thinking (Ten Dam & Voldam, 2004).

In nursing literature, different concepts have been introduced to explain critical thinking, such as clinical decision making, reflective practice and problem solving (Edwards, 2007; Fero, O’Donnel, Zullo, DeVito Dabbs, Kitutu, Samosky & Hoffman, 2010; Riddel, 2007). Turner (2005) notes the use of many different terms (surrogate terms) and concludes that critical thinking is well defined in literature but that the concept lacks clear boundaries.

*Measurement of critical thinking in nursing*

Many different instruments are used to assess critical thinking skills. Depending on the definition used to assess critical thinking and how it can be measured, researchers have chosen specific measurements. Reviewing relevant literature, the three most widely and globally used instruments are: The Watson Glaser Critical Thinking Appraisal (WGCTA), the California Critical Thinking Skills Test (CCTST), and the California Critical Thinking Disposition Inventory (CCTDI) (Fero et al., 2010; Hicks‑Moore & Pastirik, 2006; Ku, 2009; Romeo, 2010; Walsh & Seldomridge, 2006a).

The WGCTA, developed by Watson and Glaser (1980), is a general measurement for critical thinking and is a non-discipline‑specific measurement of both the logical and creative components of critical thinking (Brunt, 2005b). The WGCTA is divided into five subsets: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. The CCTST resulted from a Delphi study (Facione, 1990; Kuiper & Pesut, 2004). It consists of 34 items, divided into five subscales: analysis, evaluation, inference, deductive reasoning, and inductive reasoning (Brunt, 2005b; Romeo, 2010). The CCTDI, also a result of a Delphi study (Facione, 1990), assesses internal motivation towards critical thinking (Fero et al., 2010). It contains seven dispositions: truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and cognitive maturity (Brunt, 2005b; Romeo, 2010). Staib (2003) and Brunt (2005b) identified, in addition to the above described instruments, two commonly used standardised critical thinking instruments. The Ennis‑Weir Critical Thinking Essay Test (Ennis & Weir, 1985) and the Cornell Critical Thinking Test (Ennis, Millman & Tomko, 1985). The latter has not been used in studies examining critical thinking skills in nursing. The Ennis-Weir Critical Thinking Essay Test assesses to what extent participants can evaluate given arguments in the format of a written essay. Subsets that are measured are: getting the point, seeing reasons and assumptions, stating one’s point, offering good reasons, seeing other possibilities, responding appropriately, and avoiding legal arguments (Brunt, 2005b; Ennis & Weir, 1985).

The above‑mentioned instruments are all standardised and quantitative in nature, and are generally applicable. One of the key discussion points regarding measuring critical thinking skills in nursing education is whether these instruments reflect critical thinking skills that are specific to nursing (Adams, 1999; Brunt, 2005; Romeo, 2010; Simpson & Courtney, 2002; Worrel & Profetto‑McGrath, 2006). Brunt (2005b p. 261) points out that these types of instruments “may not capture the richness and qualitative aspects of critical thinking in professional nursing practice”*.* This has resulted in a number of newly developed critical thinking evaluation tools, often developed by faculties to evaluate existing or newly‑developed educational programmes (Staib, 2003). Romeo (2010) gives an overview of quantitative standardised critical thinking measurements. These are all specifically designed to measure critical thinking in students of nursing. All five measurements are lesser known and therefore have not generally been applied in relevant research (Romeo, 2010). In addition to the already mentioned instruments, there are studies that use the Critical Thinking Scale (Chen, Casper & Cortina, 2011; Lee, Chiang, Liao, Lee, Chen & Liang, 2012; Tseng, Chou, Wang, Kuei Ko, Jian & Weng, 2011). This instrument contains 60 items and is divided into five subscales (Lee et al., 2012). The Critical Thinking Scale is mostly applied in research conducted in Taiwan.

Qualitative designs and measurements are an alternative to quantitative approaches. Staib (2003) gives an overview of studies evaluating critical thinking strategies. The evaluation methods are predominantly of a qualitative nature, such as anecdotal reports. Walsh and Seldomridge (2006b) report on the use of portfolios, reflective assignments and narratives. Fero et al. (2010) discuss the use of simulation-based performance to measure critical thinking skills and Marchigiano et al. (2011) go into self‑reported perceptions. Limitations to the use of these designs are low inter‑rater reliability and the inability to compare outcomes across different studies.

As mentioned before, the evaluation of critical thinking in nursing education is difficult. Designs and measurements used in studies to evaluate critical thinking strategies show a great variation. This problem has already been highlighted in earlier reviews and studies (Brunt, 2005b; Walsh & Seldomridge, 2006a). This may explain the contradictory and inconclusive results of studies on the development of critical thinking. Given the fact that the cognitive perspective on critical thinking is the dominant one, we assume that nursing educational strategies and programmes are based on this perspective. To be able to compare research findings, we made a selection of measurements of critical thinking that are of a cognitive nature and are standardised. In this review, we therefore focus on the three most commonly and globally‑used instruments: the WGCTA, the CCTST and the CCTDI.

**Methods**

The databases PubMed, Cinahl, ERIC and Sage were searched for publications from January 2000 to December 2011. The keywords (both separately and combined with the Boolean operators “or” and “and”) searched were: critical thinking, critical reflection, clinical decision making, and nursing education. In order to be included, studies had to meet the following criteria:

(1) the article or paper should describe empirical research;  
(2) one of the following critical thinking measurements had to be used in the study: the California Critical Thinking Skills Test (CCTST), the Watson Glaser Critical Thinking Appraisal (WGCTA) or the California Critical Thinking Dispositions Inventory (CCTDI);  
(3) the study had to address one of the following topics: teaching methods in nursing (associate degree and Bachelor programmes), teaching strategies in nursing, or educational programmes in nursing, together with their relationship to the development of critical thinking skills.

The abstracts from publications were initially screened based on these criteria, and in case of insufficient information, the entire article was screened.

**Results**

In total, fourteen articles met the criteria that focussed on educational programmes and five on the relationships between teaching strategies and/or methods and critical thinking.

**Educational programmes**

Fourteen studies focused on the development of critical thinking skills during an educational programme. The results of the studies are mixed. Five (Daly, 2001; Girot, 2000; Profetto-McGrath, 2003; Rogal & Young, 2008; Stewart & Dempsey, 2005) found no significant increase in critical thinking skills. One study (Giddens & Gloeckner, 2005) found a significant increase on subscales, but not on total scores. Within the remaining eight studies, significant increases in critical thinking skills were found. An overview of the studies is presented in Table 1.

*Table 1: General description of included studies on educational programmes in nursing*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Author/year** | **Research subject** | **Design** | | **Instrument(s)** | **Sample** | | **Findings** |
| Girot (2000) | Examining the development of critical thinking at different stages of the academic process | Quasi‑experimental design | | WGTCA | 32 undergraduates  19 year four students  17 graduate practitioners  15 non-academic practitioners | | No significant increase in critical thinking scores |
| Beckie et al. (2001) | Assessing critical thinking skills after curriculum revision in a Bachelor degree nursing programme | Pre-test post-test control group design | | CCTST | 55 old curriculum students (cohort 1)  55/73 new curriculum students (cohorts 2 and 3) | | Significant increase to cohort 2 over cohort 1. Cohort 3 showed no significant increase |
| Brown et al. (2001) | Assessing the influence of a baccalaureate programme on critical thinking skills with students pursuing different pathways | Pre-test post-test design | | WGCTA | Traditional: 45  RN-BSN: 35  Accelerated: 43 | | Significant increase in traditional and RN-BSN students. No significant increase with accelerated students. |
| Daly (2001) | Exploring the effect of a common foundation programme on critical thinking | | Multi-method design including pre-post-test | WGCTA | | 43 pre‑registration nursing students | No significant differences between pre and post-programme scores. |
| Spelic et al. (2001) | Evaluation of critical thinking outcomes of a BSN programme | Pre-test post-test design | | CCTST | Traditional: 51  Accelerated: 68  RN-BSN: 17 | | All three groups showed an overall significant increase, with the exception of 1 subscale for RN-BN students |
| Profetto-McGrath (2003) | Development of critical thinking skills in a baccalaureate nursing programme | Cross‑sectional design | | CCTDI  CCTST | 228 Bachelor degree students | | No statistically significant difference over the four years of the programme. |
| Stewart and Dempsey (2005) | Examining dispositions towards critical thinking in a Bachelor degree nursing programme. | Longitudinal descriptive design | | CCTDI | Sophomore II: 55  Junior I: 49  Senior I: 36  Senior II: 34 | | No significant increase in critical thinking throughout the programme |
| Giddens and Gloeckner (2005) | Investigating the relationship between critical thinking skills and performance on NCLEX-RN | Non‑experimental ex-post-facto design. | | CCTDI  CCTST | 218 Bachelor degree students | | With the exception of two subscales, no statistically significant increase in critical thinking was found. |
| Sulliman (2006) | Comparing a conventional programme with an accelerated programme | Survey design | | CCTDI | Conventional: 80  Accelerated: 50 | | Accelerated students showed significantly higher scores compared to conventional students |
| R.K. Shin et al. (2006) | Assessing the development of critical thinking skills in a Bachelor programme | Longitudinal design (four questionnaires) | | CCTDI | 32 Bachelor degree nursing students | | Significant increase on scores by academic year |
| K. Shin et al. (2006) | Investigating the critical skills of senior nursing students | Survey design | | CCTDI  CCTST | Associate: 137  Bachelor: 102  RN to BSN: 66 | | Bachelor students showed significant higher scores on critical thinking, compared to associate and RN to BSN students. |
| Rogal and Young (2008) | Assessing registered nurses’ critical thinking skills in a critical care course | Pre-test post-test design | | CCTST | 31 postgraduate nurses | | No significant difference in scores |
| McMullen and McMullen (2009) | Examining changes in critical thinking skills in a graduate nursing programme | Pre‑test post-test design. | | CCTST | 82 nursing students in a graduate NP programme | | Students low on critical thinking skills at programme entry, showed substantial growth. |
| Drennan (2009) | Comparing critical thinking skills in graduate and commencing Master degree nursing students | Cross-sectional cohort study | | WGCTA | Commencing: 110  Graduates: 222 | | Significantly (modest) higher scores for graduates |

The studies we have included used a variety of research questions and designs. Some focus on the development of critical thinking skills during a nursing programme, others focus on different pathways or curriculum revisions and the relationship with critical thinking skills.

Beckie et al. (2001) investigated the effect of a curriculum revision (that incorporated more emphasis on critical thinking skills) on critical thinking scores using two experimental cohorts and one control cohort (using the old curriculum). One of the experimental cohorts showed a significant increase compared to the control cohort. The authors suggest that the personal characteristics of the students in the second experimental cohort affected the results.

Sulliman (2006) found that accelerated students show significantly higher scores on the CCTCI compared to conventional students. This is in contrast to the findings of Brown et al. (2001), who found that accelerated students did not show a significant increase, whereas RN-BN and traditional nursing students did. Shin et al. (2006) found that Bachelor degree students showed significantly higher scores compared to associate and RN-BN students. Spelic et al. (2001) found that all pathways (traditional, RN-BN and accelerated) showed an increase on critical thinking scores. They do not report the differences in the scores between groups.

McMullen and McMullen (2009) found mixed results when examining critical thinking skills in a graduate nursing programme. Using the CTTST, they found that students who scored low on critical thinking skills at programme entry showed a substantial growth in critical thinking scores. Those high on critical thinking scores at programme entry showed a decline in analytic skills (subscale CCTST) during the programme. They reason that the level of support for the latter group was insufficient to maintain higher analytical skills. Rogal and Young (2008) investigated the development of critical thinking skills during a critical care course. They report that the pre-test mean scores on the CCTST were above the established norms and they conclude that this was the reason for a non-significant increase or even decline in post-test critical thinking scores.

Drennan (2009) found that graduates from a Master degree programme made statistically significant gains in critical thinking scores when compared to students commencing the programme. Shin, Lee, Ha and Kim (2006) found significant increases by academic year during a Bachelor programme. Using a longitudinal design, they noted significant increases on CCTDI scores. These results are not in line with those produced by Daly (2001), Profetto-McGrath (2003), and Stewart and Dempsey (2005). Stewart and Dempsey (2005) found no significant increase in critical thinking dispositions during a four‑year Bachelor programme. The research findings of Profetto-McGrath (2003), using a cross-sectional design, also showed no significant increase. Daly (2001), using a pre‑test post-test quasi‑experimental design, found that there was no significant increase over a period of 18 months. It is argued that the period of time (18 months) over which the research took place, is rather too short to develop critical thinking skills.

*Summary*

The results of the studies that focus on the development of critical thinking skills during a programme are varied. There is no conclusive evidence allowing us to state that nursing programmes promote critical thinking skills. Research topics vary in the studies included and we also note that they used different populations. Initial, as well as accelerated and Master programmes are included in the studies. This, together with the use of predominantly small sample sizes, makes it difficult to draw solid and robust conclusions. Further, other variables such as entry level and experience are suggested as having an impact on the development of critical thinking scores (McMullen & McMullen, 2009), and these factors were not always taken into account in the studies.

**Teaching methods or strategies**

We included nine studies that reported the effects of teaching strategies or methods on the development of critical thinking skills. Five studies focused on problem‑based learning, three on simulation techniques and one on concept mapping (Table 2).

*Table 2: General description of included studies on teaching methods or strategies in nursing*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Author/year** | **Research subject** | **Design** | **Instrument(s)** | **Sample** | **Findings** |
| Magnussen et al. (2000) | Evaluating the effects of inquiry‑based learning on critical thinking scores | Pre-test post-test design | WGCTA | 228 first semester and 257 final semester nursing students | When stratified, the group with initially low scores on WGCTA scored significantly higher, the medium group no changes and the high group a significant decrease on WGCTA scores |
| Chau et al. 2001 | Effect of videotaped vignettes on critical thinking skills | Pre‑test post‑test design | CCTST | 83 first and second year Bachelor nursing students | No significant increase on CCTST scores |
| Day and Williams (2002) | Effect of one year PBL programme on critical thinking skills | Pre‑test post‑test design | CCTST  CCTDI | 27 year one baccalaureate nursing students | Significant increase on CCTST and CCTDI |
| Wheeler and Collins (2003) | Effect of concept mapping on critical thinking skills | Pre-test post-test experimental design | CCTST | 76 baccalaureate nursing students (44 concept map group and 32 control group) | Significant increase on CCTST overall scores for experimental group, various results on subscale scores. Between‑group post‑test scores not significant |
| Tiwari et al. (2006) | Comparing the effects of problem‑based learning and lecturing on critical thinking skills | Pre-test post‑test experimental design | CCTDI | PBL group: 40 undergraduate nursing students  Control group: 39 undergraduate nursing students. | PBL students showed significant increase on CCTDI scores |
| Ravert (2008) | Comparing the effects of simulation techniques combined with enrichment sessions on critical thinking scores | Pre-test post‑test experimental design | CCTDI  CCTST | Simulation: 12  Non simulation: 13  Control: 15 | No significant difference between groups on critical thinking scores |
| Yuan et al. (2008b) | Effect of problem‑based learning on critical thinking skills | Pre‑test post‑test design | CCTST | PBL group: 23 undergraduate nursing students  Control group: 23 undergraduate nursing students | Significant increase and higher scores for PBL group |
| Ozturk et al. (2008) | Effect of problem‑based learning on critical thinking skills | Survey design | CCTDI | PBL group: 52 senior nursing students  Control group: 95 senior nursing students | Significantly higher scores on CCTDI for PBL group |
| Wu et al. (2010) | Comparing changes in critical thinking dispositions, related to simulation as a learning style | Non‑experimental descriptive design | CCTDI | 409 nursing students (207 year one, 202 year two) undergoing enrolled nurse training. | Year two students showed higher scores on critical thinking |

*Problem‑based learning*

Problem‑based learning (PBL) is a method in which small groups of students work together on real‑life tasks (Oldenburg & Hung, 2010). It is a self-directed and student‑centred learning method in which students learn to apply concepts and generate and evaluate solutions in a real-life context (Worrel & Profetto-McGrath, 2007). Other terms that are frequently used to describe this method are inquiry-based learning (Magnussen, Ishida & Itano, 2000) and context-based learning. Based on the results of a literature review, Simpson and Courtney (2002) conclude that PBL promotes critical thinking scores. Yuan, Williams and Fan (2008a), however, conclude that there is no supportive evidence that PBL leads to higher critical thinking skills among nursing students. In their review, they included studies that used a variety of designs (descriptive and quasi-experimental).

Magnussen et al. (2000) used the WGCTA to determine whether inquiry‑based learning promotes critical thinking skills. In a sample of 228 nursing students in the first semester and 257 students in the final semester of a programme, they found mixed results. After stratifying the scores into three different groups (low, medium and high on pre-test scores), they found that the students in the low group showed a significant increase in the mean score. In the medium group, no significant change was found. In the high group, a significant decrease in scores was found.

Day and Williams (2002) found that first year baccalaureate nursing students showed a significant increase on both CCTST and CCTDI scores after a year of using PBL as a teaching strategy. They did not use a control group in their study.

Tiwari et al. (2006) conducted a study comparing a PBL teaching strategy to traditional lecturing in a nursing programme at Hong Kong University. First year undergraduate nursing students were randomly assigned to a PBL group (n=40) or a lecture group (n=39). At pre-test, no significant different scores on the CCTDI were found. After year one, all the students underwent the same educational teaching strategies, which did not include PBL. The results showed a significant difference in CCTDI total scores and at most of the subscales at the end of the first year and two years afterwards between the two groups.

Ozturk, Muslu and Dicle (2008) found a statistically significant difference when comparing a nursing programme based on problem‑based learning (n=52) with a traditional programme (n=95). Although they showed that the two groups were comparable (mean age, gender and background), the report of the study lacks a solid description of the traditional programme. It is therefore hard to interpret the results and conclusions. Yuan et al. (2008b) found a significant increase in scores on CCTDI for students who were assigned to a problem‑based learning group (n=23). They also scored significantly higher than students in a control group (n=23).

*Simulation‑based learning*

Simulation techniques, especially human simulation, provide a safe and secure environment for the development of necessary nursing skills (Cant & Cooper, 2010). The aim of simulation is to replicate the essential aspects of clinical situations, so they can be managed and understood when occurring in real practice (Hovancsek, 2007). Bland, Topping and Wood (2011) conducted a concept analysis of simulation and defined it as “A dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation and reflection”*.* There are various simulation techniques, such as peer‑to‑peer learning, screen based computer simulations and standardised patients (Cant & Cooper, 2010).

The study by Chau, Chang, Lee, Ip, Lee and Wootton (2001) was conducted among first and second year baccalaureate nursing students, investigating the effect on critical thinking skills of videotaped vignettes of simulated clinical situations. Each of the videotaped vignettes incorporated critical thinking components specific to the simulated situation and critical thinking guidelines were developed for each. There was no significant increase in scores on the CCTST by year. This suggests that the students involved in the study had limited experience with the intervention and that therefore the effect was not reflected in the CTTST scores.

Wu Xi, Tham, Tan-Toh, ST and Than (2010) compared critical thinking dispositions between first and second year nursing students while undergoing simulation based learning. They found that second year students had stronger critical thinking dispositions than those in year one. However, the study has limitations in terms of its design: second year students had experience of various forms of learning (including clinical placement) and were more familiar with discussing and reflecting on their own performance among peers. Second year students also had higher preference scores in simulation‑based learning. These experiences and circumstances stimulate the use of critical thinking skills and enhance critical thinking dispositions.

Ravert (2008) conducted a pre‑test post‑test design study, comparing a group of students undergoing regular education plus non-human patient simulation with a group of students undergoing regular education plus human patient simulation. A third group acted as a control group. All groups showed an increase in scores on the CCTDI and CCTST, however none was statistically significant. In addition, there was no statistically significant difference in the scores between groups. The small sample size (40 students divided into three groups) might be the reason for this result. The researcher also pointed out that the experimental conditions meant that groups received almost the same guidance (personal attention, time to ask questions, etc.) and that human patient simulation did not add anything to the discussion, and hence neither to a significant increase in critical thinking scores.

*Concept mapping*

Concept mapping involves creating hierarchical arrangements of concepts (and sub concepts) and identifying the relationships between these concepts (Wheeler & Collins, 2003). It is an active way to involve students, in which they develop new knowledge based on prior experience. Cognitive skills used in concept mapping, such as analysis, evaluation and reasoning, are believed to promote critical thinking skills (All & Havens, 1997; Chabeli, 2010). Chabeli (2010) highlights how critical thinking skills are grounded in the different stages of concept mapping. Research findings from the 1990s provide indications that concept mapping does contribute to critical thinking skills (Wheeler & Collins, 2003). However, these studies did not use standardised tests to measure critical thinking skills, and used for example self-reported perceptions or specially developed concept mapping measurement tools that incorporate critical thinking skills (Wilgis & McConnel, 2008).

Using the CCTST, Wheeler and Collins (2003) found that concept mapping contributed to the development of critical thinking skills within a group (n=44). However, no significant difference on scores was found when compared to a control group (n=32).

*Summary*

In reviewing literature concerning the relationship between teaching methods and the development of critical thinking skills, we found mixed results. The results from four studies focusing on problem‑based learning supports the idea that this will lead to an increase in critical thinking skills. One study (Magnussen et al., 2000) showed inconclusive results. It should be noted that different designs were used and that most samples were relatively small. Results of studies investigating the effect of simulation‑based learning on critical thinking skills are mixed. Finally, only one study focused on concept mapping, where no significant increase in critical thinking skills was found.

**Other factors that influence critical thinking skills outcomes**

In the articles included in this study, several authors discuss the effect of factors other than educational programmes and/or strategies on the development of critical thinking skills. These factors (age and experience, learning style and entry level) were not research topics themselves, but were often the subject of discussion in interpreting the results of the studies. In this section, we add research findings from studies that support the impact of the aforementioned factors.

*Age and experience*

It has been suggested that the development of critical thinking skills takes a considerable time (Daly, 2001; Brown et al., 2001). In the discussion sections of the studies included in this review, some authors relate age and experience to the development of critical thinking skills. For example Sulliman (2006) and Drennan (2009) report that variables such as age and experience might influence outcomes. Looking for evidence to support these suggestions, we found a study conducted by Wangensteen et al. (2010). They concluded that registered nurses over 30 years of age showed statistically significant higher scores on CCTDI than their younger colleagues. Especially within studies using samples of Master students, the level of experience may have influenced the results. Drennan (2009) states that prior (clinical) experience and education contribute to critical thinking skills, and therefore the level of these skills are probably not the result of a programme alone. Earlier research conducted by Macpherson (2002) indicates that maturation and cognitive development have a positive effect on problem solving skills, which are related to critical thinking skills. Macpherson (2002) found that students over 30 years of age were better problem solvers.

*Learning style*

Zang and Lambert (2008) found that Chinese nursing students scored low on critical thinking dispositions using the CCTDI. They argue that Chinese students in general are visual learners and do not have the learning styles that promote critical thinking skills. This is due to cultural elements of the educational system and is in line with Wu Xi et al. (2010), who argue that passive learners (as a result of the educational system) are weak critical thinkers. They found that students who preferred active learning (such as simulation) showed higher scores on the CCTDI. Sulliman (2006) investigated the relationship between learning styles and subscales of the CCTDI and found that nursing students who preferred abstract conceptualisation showed more positive significant relationships with CCTDI subscales than those with other learning styles.

*Entry level*

Magnussen et al. (2000) found that students who had a low pre-test score on the WGCTA, showed a significant increase in scores at post-test. Rogal and Young (2008) argue that high scores at pre-test (above the average norms) might be responsible for a non-significant change or even decrease in scores at post-test. McMullen and McMullen (2009) found similar effects in their study, contributing to the evidence that entry level has an effect on the development of critical thinking scores during educational programmes.

**Discussion**

In this article, we reviewed studies that focus on educational programmes, teaching methods or strategies, and examined factors that promote critical thinking skills. Given the variety of different instruments used in assessing critical thinking skills, we only included research on the development of these skills that used the WGCTA, CCTST or CCTDI.

In reviewing educational programmes, we found that the results from the studies included are inconclusive. In nine out of fourteen of the studies, a significant increase of some kind on critical thinking scores was found. We should point out that these nine studies are based on a variety of research topics and designs. For example, there are studies comparing different learning pathways and others comparing curricula after revision. The designs applied are also varied. Furthermore, not all the studies describe in detail the content of the educational programme or the pathway. For example, Beckie et al. (2001) report “Socratic questioning”, “actively engaging students” and “reflective journal writing” as elements of a revised curriculum, while Spelic et al. (2001) mention activities such as “clinical problem solving” and “diagnostic reasoning” as learning activities. In many studies, it remains unclear how the programme as a whole is responsible for the increase in critical thinking skills.

The level of critical thinking at the beginning of nursing education programmes is reported by some authors as being a significant factor in the degree of development of these skills (Magnussen et al., 2000; McMullen & McMullen, 2009; Rogal & Young, 2009). In general, students with low critical thinking scores at entry show a greater increase. This might explain why, for example, Master degree students showed no increase in critical thinking scores whereas graduate nursing students did (Drennan, 2009).

Reviewing educational methods or strategies, we found some evidence to support the idea that problem‑based learning stimulates critical thinking skills (Ozturk et al., 2008; Tiwari et al., 2006; Yuan et al., 2008b). However, the evidence is inconclusive. Magnussen et al. (2000) only found a significant increase for those who scored low on critical thinking at programme entry. Furthermore, the studies that found an increase in critical thinking scores used small sample sizes. Wheeler and Collins (2003) found that concept mapping does stimulate critical thinking skills. However, compared to their control group it turned out not to be significant, and again, a small sample was used. There is a lack of results to provide evidence that concept mapping contributes to the development of critical thinking skills. In the studies focusing on simulation techniques, the results are also inconclusive. Two studies (Chau et al., 2001; Ravert, 2008) found no significant increase in critical thinking scores. The one study that did find a significant increase used a control group that did not have the same degree of educational experience. In summary, we did not found convincing evidence that simulation enhances critical thinking skills.

Other factors that are of potential importance in the development of critical thinking skills are learning styles, age, experience and entry level. It turned out that many studies used convenience samples, and that a robust analysis of the above‑mentioned variables is missing in most of the studies. These issues are addressed in the studies discussion section and it is suggested that, in order to prevent selection bias, these variables are taken into consideration.

*General remarks*

Various authors discuss the validity of the instruments used, which raises doubts regarding the applicability of critical thinking assessment to nursing education (Beckie et al., 2001; Chau et al., 2001; Stewart & Dempsey, 2005; Shin et al., 2006; Walsh & Seldomridge, 2006a). Particularly when compared to other outcomes, such as self-reported perceptions or nurse educators’ comments, scores on standardised instruments may not entirely reflect the development of critical thinking skills. This is in line with earlier statements (e.g., Walsh & Seldomridge, 2006a).

A number of studies used convenience samples of nursing students. This may influence the generalisation of study results (Lee et al., 2012). In general, the samples used in the studies included are relative small, which has consequences for the reliability of the results. This issue is frequently addressed in the discussion sections of the studies. For example, Yuan et al. (2008b) recommend the use of larger sample sizes.

The designs applied in the included studies are rarely of a longitudinal nature and not always of experimental nature, in fact many are of quasi-experimental nature. As stated before by Yuan et al. (2008a), there is a lack of high quality designs in research on the development of critical thinking skills. In case of an experimental design, interventions are not always described in detail. In addition, the control conditions (for example the traditional programme in case of a curriculum revision) or influencing variables are not fully described. Traditional programmes might also incorporate elements that will influence the development of critical thinking skills (Yuan et al., 2008b). Because of all these factors, any potential bias in the results is difficult to identify.

Several studies (Brown et al., 2001; Daly, 2001; Profetto-McGrath, 2003), have suggested that it takes considerable time to develop critical thinking skills. A four‑year baccalaureate programme may be too short to show a significant increase in cognitive development. We found that in some studies, the period during which the intervention and research took place was limited. Brown et al. (2001) argue that accelerated programmes do not offer sufficient time for students to reflect on the information presented in the course.

The number of articles included in this study is limited, as few met the criteria that were set. We are aware of the fact that the criteria exclude studies using other instruments than the WGCTA, CCTST and CCTDI.

**Conclusions and implications**

In addition to the need for a clear and consistent definition of critical thinking in order to compare the outcomes of research (Brunt, 2005a), it is also necessary to describe in detail teaching strategies and how they relate to the development of critical thinking. As Simpson and Courtney (2002) state, critical thinking skills develop as a result of various experiences. We found that the studies we included lack a detailed description of interventions and/or control group conditions. Furthermore, the studies investigating the development of critical thinking skills use relative small sample sizes and are often not of longitudinal nature. In order to determine whether educational programmes or strategies contribute to the development of critical thinking skills, experimental designs over a sufficient period of time with substantial sample sizes are recommended. Additionally, influencing factors other than educational strategies, such as age and experience, should be taken into consideration. Finally, exploring and defining a multiple perspective on critical thinking is recommended.

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**Chapter 5**

The development and validation of a five-factor model of Sources of Self-Efficacy in clinical nursing education.

**Abstract**

**Background:** The aim of this study is to validate a newly developed nurses' self-efficacy sources inventory. We test the validity of a five-dimensional model of sources of self-efficacy, which we contrast with the traditional four-dimensional model based on Bandura’s theoretical concepts.

**Methods:** Confirmatory factor analysis was used in the development of the newly developed self-efficacy measure. Model fit was evaluated based upon commonly recommended goodness-of-fit indices, including the χ2 of the model fit, the Root Mean Square Error of approximation (RMSEA), the Tucker-Lewis Index (TLI), the Standardized Root Mean Square Residual (SRMR), and the Bayesian Information Criterion (BIC).

**Results:** Structural equation modeling showed that a five-factor model is favoured over the four-factor model.

**Conclusions and implications:** Results of this study show that differentiation of the vicarious experience source into a peer- and expert based source reflects better how nursing students develop self-efficacy beliefs. This has implications for clinical learning environments: a better and differentiated use of self-efficacy sources can stimulate the professional development of nursing students.

**Key-words:** self-efficacy, nursing education, clinical learning environment

**Introduction**

In nursing education, clinical experience has become an important part of performance assessments. These assessments are used to evaluate educational programs, or to assess students’ self-efficacy beliefs (Clark, Owen & Tholcke, 2004; Schlegel, Woermann, Shaha, Rethans & van der Vleuten, 2012). The relevance of self-efficacy beliefs in nursing and nursing education has been demonstrated by several authors. For example, Peterson (2003) relates self-efficacy to predicting academic success in Bachelor degree nursing programs. Pisanti, Lombardo, Lucidi, Lazzari and Bertini (2008) relate self-efficacy to nurses’ coping ability in stressful situations.

Although the concept of self-efficacy is extensively studied, the sources underlying self-efficacy beliefs are poorly investigated (Pajares & Urdan, 2006; Usher & Pajares, 2009; Klassen, Tze, Betz & Gordon, 2011). We suggest that more insight into how nursing students form self-efficacy beliefs will help build more powerful clinical learning environments. The aims of this study are (1) to validate a newly developed nurses' self-efficacy sources inventory, and (2) to identify the most important sources of self-efficacy. We test the validity of a five-dimensional model of sources of self-efficacy, which we contrast with the traditional four-dimensional model based on Bandura’s theoretical concepts (Bandura, 1997). We hypothesize that a further differentiation in sources of self-efficacy will reflect more accurately how nursing students form self-efficacy beliefs. Furthermore, we investigate whether sources are differentially related to self-efficacy beliefs, or whether there is one main specific source on which self-efficacy beliefs are built.

**Background**

*Definition of self-efficacy*

Self-efficacy is defined by Bandura [8] as “*the belief in one’s competence to tackle difficult or novel tasks and to cope with adversity in specific demanding situations. It* *reflects the belief in one's capabilities to organize and execute the courses of action required to produce given attainments*” Self-efficacy makes a difference in how people feel, think, and act. Those with high self-efficacy beliefs want to overcome difficult situations instead of avoiding them (Anderson & Betz, 2001; Steyn & Mynhardt, 2006). Increasing self-efficacy enhances the sense of self-control and helps one to perform at a higher level (Van Dinther, Dochy & Segeres, 2010).

*Sources of self-efficacy*

Bandura’s idea that self-efficacy is based on the interpretation of information from four sources is widely accepted (Anderson & Betz, 2001; Steyn & Mynhardt, 2006; Van Dinther et al., 2010). These sources are mastery experiences, vicarious experience, verbal/social persuasion and physiological/affective states (Bandura, 1997; Van Dinther et al., 2010; Hodges & Murphy, 2009). Mastery experiences are seen as the most powerful source of information in the formation of self-efficacy beliefs (Bandura, 1997). Students gain evidence that is authentic, which feeds a strong sense of self-efficacy in performing and succeeding at particular tasks (Palmer, 2006).

The second source of self-efficacy beliefs is vicarious experience: obtaining information through observational experiences to assess one’s own capabilities and performance (Bandura, 1997, Van Dinther et al., 2010). Comparing performance, especially to that of peers, can increase or decrease self-efficacy beliefs. Research indicates that students differentiate between the vicarious experience sources (Lent, Lopez, Brown & Gore, 1996; Usher & Pajares, 2006). They make different comparisons with regard to the experiences of peers and experienced colleagues which they see as experts. For example, evaluating performances of experienced colleagues can lead to a decline in self-efficacy beliefs: one might think that he or she will never achieve a comparable level of performance. Several authors report that information based on vicarious experience especially enhances self-efficacy beliefs if the experience or knowledge is of a similar level (Bandura, 1997; Margolis, 2005).

The third source as identified by Bandura (1997) is verbal persuasion. This pertains to the influence of persuasive communication by significant others (Van Dinther et al., 2010). Evaluative information and feedback is most powerful when provided by people who are perceived by students as knowledgeable and reliable (Bong & Skaalvik, 2003).

Physiological symptoms such as increased heart rate and transpiration and emotions or feelings such as excitement are the fourth source of self-efficacy beliefs (Bandura, 1997, Van Dinther et al., 2010).

*Sources of self-efficacy and clinical nursing education*

To date it is not clear, however, how nursing students use these sources and how they relate to the formation of self-efficacy beliefs.

Insight into how these sources influence self-efficacy beliefs has implications for nursing education. It can contribute to the design of learning environments in clinical practice. For example, Baeten, Kyndt, Struyven and Dochy (2010) looked at factors that stimulate deep approaches to learning. They found that self-confidence and self-efficacy are important factors in students’ adoption of a deep approach to learning. Self-confidence and self-efficacy can be enhanced in (clinical) learning environments. Hence, further insight into how self-efficacy sources influence self-efficacy beliefs can help improve the professional development of nursing students and nurses.

Clinical learning environments tend to have an informal character (Eraut, 2004). Often, there is no formal structure to guide or define what learning should take place. Furthermore, as the focus is generally on treatment and care, less attention is paid to learning and professional growth (Berntsen & Björk, 2010). This does not mean, however, that no learning takes place. Tynjälä (2008) reviewed the different perspectives on learning at the workplace. One of the research questions was how people learn at the workplace. He found that people learn by doing the job itself, by interacting with colleagues, and by reflection on and evaluation of one’s performance. The need for tailored supervision was underlined by the results of a study by Warne, Johansson, Papastavrou, Tichelaar, Tomietto, Van den Bossche, Moreno and Saarikoski (2010). They found that individually tailored mentorship helps nursing students in their professional development. They argue that mentoring in combination with working with patients are the two core elements of professional development in nursing.

This is in line with Bandura’s (1997) theory that, by learning, people gather information on which they form self-efficacy beliefs. Examining the role of self-efficacy sources and making these sources explicit opens up means of enhancing self-efficacy beliefs, which will stimulate the professional development of individuals.

**Operationalization and Methods**

***Sources of Self-Efficacy***

Since, to our knowledge, there are no validated instruments to assess sources of self-efficacy in nursing, we developed a new instrument. We used the Sources of Self-Efficacy Inventory (SOSI) developed by Kieffer and Henson (2002) as a basis to develop an instrument for the nursing context. The SOSI is a 35-item inventory developed to assess teacher self-efficacy. The items are divided into four subscales based on the work of Bandura [8]. The reliability coefficient of these subscales ranges from .47 to .78 (Kieffer & Henson, 2002). Mohamadi, Asadzadeh, Ahadi and Jomehri (2011) examined the construct validity of the SOSI using confirmative factor analysis. After translation and some adjustments, they found an acceptable fit for a four-factors model (RMSEA .043, CFI .96), which is in line with Bandura’s theory.

To build an initial item pool, we adapted the items from the teacher context to the specific nursing context. Items were written as first-person statements. For the vicarious experiences source we included both peer-based and expert-based experiences. This means that the vicarious experience source is divided into two factors, leading to a five-sources model. We used a 5-point self-rating scale, ranging from 1 to 5.

Content and face validity of the initial item pool was evaluated through two feedback channels, one consisting of experts and one based on feedback from members of the target population. For the expert channel we organized a focus group session for lecturers in nursing (n =18), with the aim of critically examining the validity of the items and the fit in the five-sources model. Usher and Pajares (2009) state that many instruments used to rate self-efficacy beliefs contain items that are inconsistent with Bandura’s sources of self-efficacy. The lecturers were asked to evaluate the following issues: (i) fit of the items with the sources, (ii) formulation of the items, (iii) uniqueness of each item, and (iv) the content validity of the instrument as a whole. In addition, a small group of students (n = 16) was invited to complete the questionnaire and to provide feedback on item wording, clarity and fit with the theoretical model. All students had completed at least one period of clinical learning (22 weeks per period), enabling them to reflect on the content of the instrument.

Based on these two feedback channels, items were then reformulated. Of the initial 35 items in the questionnaire, 13 items were eliminated because they had factor loadings lower than .40 on the target factor. An overview of the final item pool of 22 items is given in Table 1. The five sources in this blueprint are Mastery Experiences (ME), Vicarious Learning Experts (VLE), Vicarious Learning Peers (VLP), Verbal Persuasion (VP) and Physiological Symptoms (PS). Each source is operationalized by a set of 4 to 5 items.

*Table 1. Conceptual blueprint of the item pool for the Sources of Self-Efficacy Inventory.*

|  |  |  |
| --- | --- | --- |
| Source | Items | Example |
| 1. ME: mastery  experiences | 5 | “Providing good care gave me a sense of personal success”. |
| 2. VLE: expert-based  vicarious experiences | 4 | “I have learned a lot by watching registered nurses in action”. |
| 3. VLP: peer-based  vicarious experiences | 4 | “I often compared my actions with actions performed by peers”. |
| 4. VP: verbal/social  persuasion | 4 | “Feedback gave me a sense of self-confidence”. |
| 5. PS: physiological  affective states | 5 | “When making mistakes, I felt that my heart was beating faster and louder”. |
| Total | 22 |  |

***Self-Efficacy***

To operationalize the self-efficacy construct, the Dutch version of the General Self-Efficacy scale (GSE) (Schwarzer & Jerusalem, 1995) was used. The GSE is an established self-efficacy measure and a review of its use in 25 countries (Scholz, Gutiérrez-Doña & Schwarzer, 2002) found Cronbach’s alpha’s ranging from 0.75 to .91. Given the differentiation in learning environment characteristics, this instrument was chosen. The GSE is applicable regardless of context. Generalized self-efficacy represents an individual’s perception of the ability to perform across a variety of situations Judge, Erez & Bono, 1998). The GSE is applied in numerous studies including nursing educational research, for example to measure self-efficacy as a predictor of well-being of nursing students (Gibbons, Dempster & Moutray, 2011).

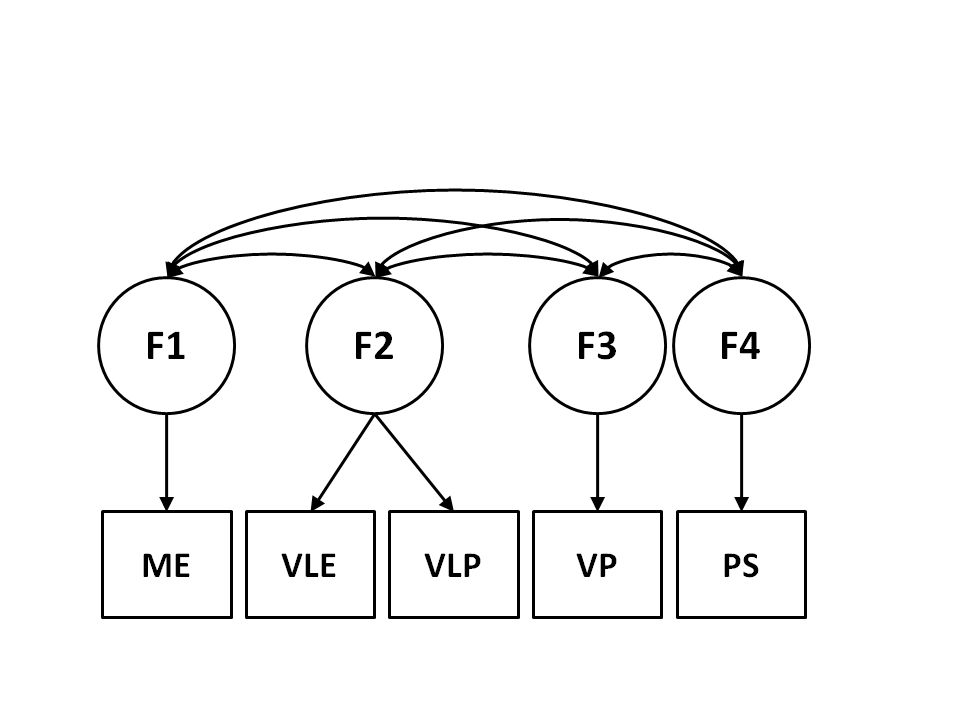
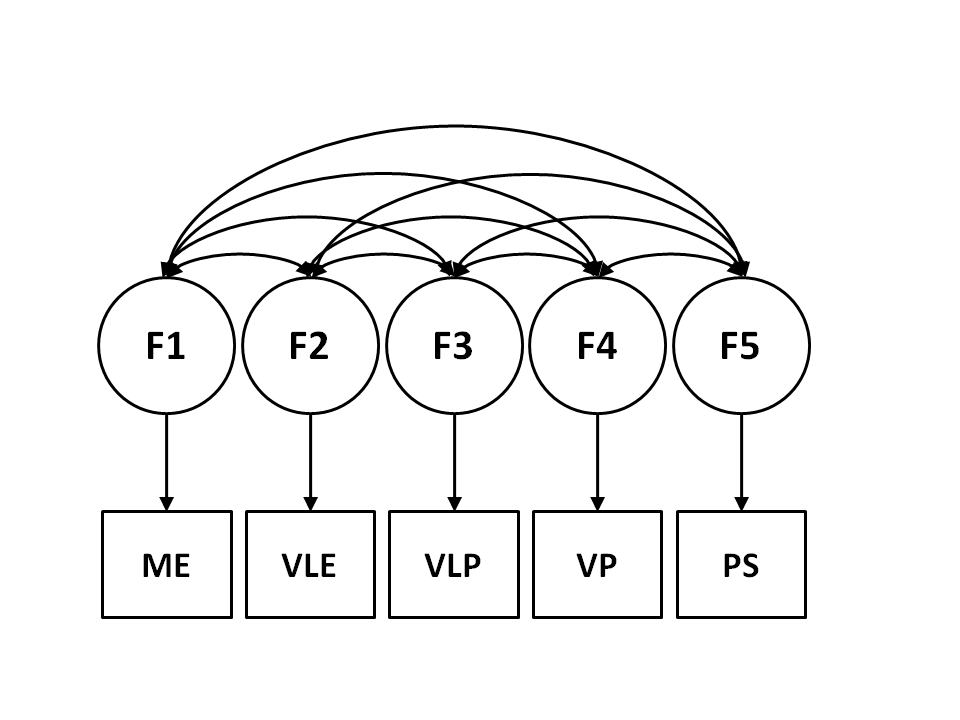
***Participants***

A total of 230 Dutch Bachelor degree nursing students participated in the study. The nursing students (mean age 23.7, sd = 7.0) had prior clinical workplace experience of one period (n = 80), two periods (n = 86) or three periods (n = 64). Each period consists of 22 weeks. Based on these two feedback channels, items were then reformulated. Of the initial 35 items in the questionnaire, 13 items were eliminated because they had factor loadings lower than .40 on the target factor. Participants were approached by e-mail. All participants completed the newly developed sources of self-efficacy inventory (digitally assessed). Participation was voluntary and written informed consent was obtained prior to the study.

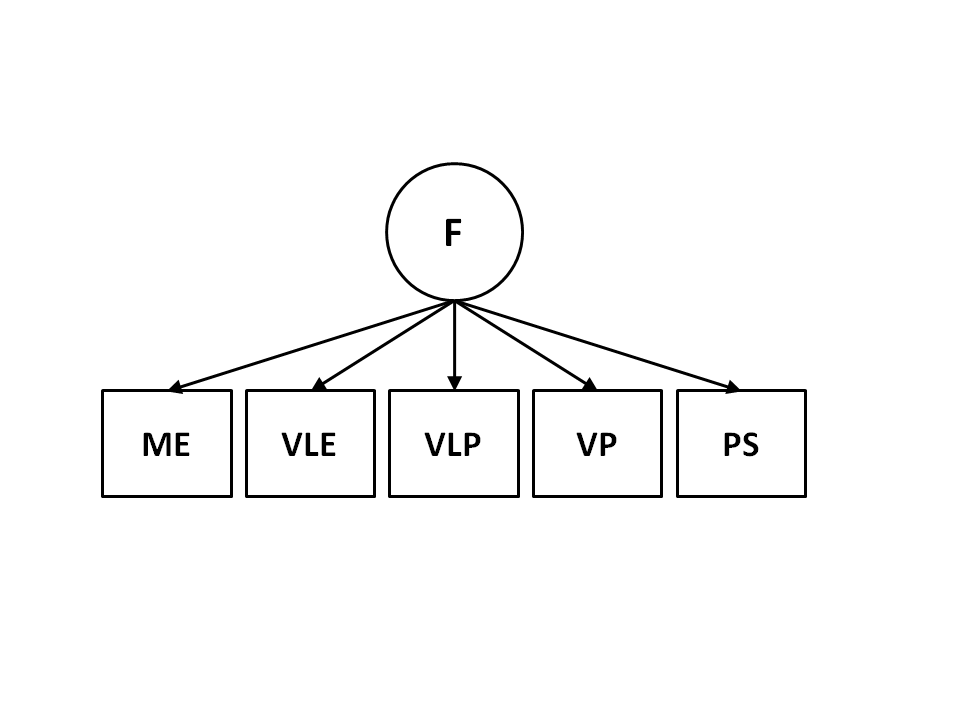
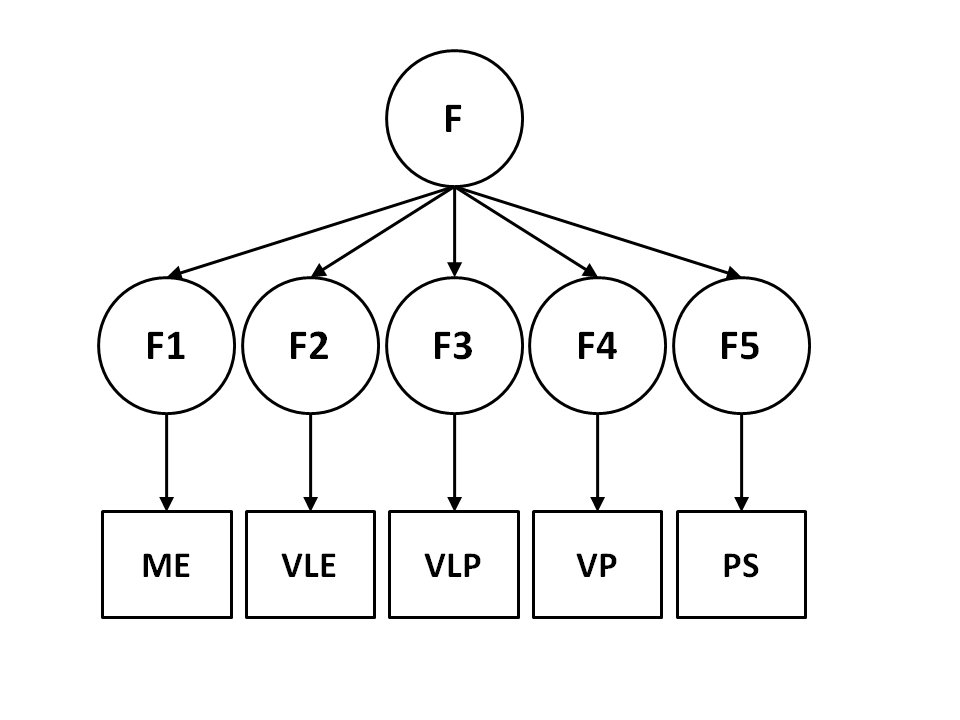
***Analysis***

In a first stage, the alternative theoretical conceptualizations of sources of self-efficacy were formalized in a series of measurement models. This series of measurement models was compared by means of confirmatory factor analysis (CFA) with respect to their fit to the data gathered using the newly developed SOSI (sources of self-efficacy inventory). The following four rival measurement models were considered (figure 1): (i) a 5-factor simple structure CFA corresponding to the inventory blueprint in Table 1, (ii) the traditional 4-factor simple structure CFA in which the two types of vicarious experiences (VLE and VLP) are seen as a single source, instead of as two different factors, (iii) a hierarchical alternative to the previously mentioned 5-factor CFA, with one common second-order factor on top to represent an overarching source construct, and (iv) a simple one-factor model.

*Figure 1. Alternative theoretical conceptualizations for sources of self-efficacy.*



(i) 5-factor simple structure (blueprint model) (ii) 4-factor simple structure (Bandura)



(iii) Higher-order factor model (iv) Unidimensional 1-factor model

*Note. Circles represent latent factors and squares manifest variables. Each set of items is represented by only one square and error terms are omitted to allow for a parsimonious representation.*

Whereas the first two models emphasize the differentiation among sources of self-efficacy, the latter two models stress their common denominator. In a second stage, the construct validity of the established general self-efficacy scale (GSE) was verified by means of confirmatory factor analysis. In a third stage, the best measurement model for sources of self-efficacy was linked to the measurement model for GSE by means of structural equation modeling. The latent regression type of model allowed us to explore the differential contribution of the sources of self-efficacy as measured by our measurement instrument, to self-efficacy as measured by GSE.

All models were specified starting from the covariance matrix and were fitted using maximum likelihood. Model fit was evaluated based upon commonly recommended goodness-of-fit indices (Hu & Bentler, 1999), including the χ2 of the model fit, the Root Mean Square Error of approximation (RMSEA), the Tucker-Lewis Index (TLI), the Standardized Root Mean Square Residual (SRMR), and the Bayesian Information Criterion (BIC).

**Results**

***Measurement model of the sources of self-efficacy survey***

The correlation matrix and descriptive statistics of the 22 indicators used to operationalize sources of self-efficacy are presented in Table 2. Within-source subset correlations are relatively large and positive. Between-source subset correlations are small and negative for source 5 (physiological symptoms; PS), though some larger positive correlations occur among source 1 (mastery experiences: ME), 2 (vicarious learning experts: VLE), and 4 (verbal persuasion: VP) indicators.

*Table 2. Correlation Matrix and Descriptive Statistics of the Sources of Self-Efficacy indicators.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | .52 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | .32 | .40 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | .31 | .19 | .29 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | .54 | .41 | .48 | .47 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | .12 | .18 | .34 | .12 | .28 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 | .15 | .26 | .42 | .29 | .40 | .63 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 | .17 | .30 | .51 | .30 | .39 | .46 | .52 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 9 | .18 | .20 | .39 | .38 | .38 | .51 | .53 | .45 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10 | -.10 | -.08 | -.08 | .05 | -.11 | .07 | .08 | -.05 | .05 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |
| 11 | .00 | .05 | .04 | .13 | .00 | .12 | .06 | .05 | .14 | .57 | 1 |  |  |  |  |  |  |  |  |  |  |  |
| 12 | -.02 | .00 | .06 | .15 | .01 | .17 | .20 | .07 | .19 | .43 | .49 | 1 |  |  |  |  |  |  |  |  |  |  |
| 13 | -.10 | .03 | .08 | .02 | -.09 | .23 | .22 | .05 | .24 | .32 | .32 | .38 | 1 |  |  |  |  |  |  |  |  |  |
| 14 | .19 | .21 | .31 | .29 | .30 | .17 | .33 | .19 | .23 | .07 | .09 | .17 | .06 | 1 |  |  |  |  |  |  |  |  |
| 15 | .18 | .20 | .33 | .30 | .35 | .29 | .41 | .36 | .35 | -.05 | -.02 | .06 | .07 | .43 | 1 |  |  |  |  |  |  |  |
| 16 | .15 | .08 | .19 | .23 | .17 | .29 | .29 | .21 | .18 | .18 | .32 | .26 | .31 | .19 | .18 | 1 |  |  |  |  |  |  |
| 17 | .23 | .13 | .36 | .32 | .34 | .17 | .32 | .34 | .12 | .11 | .09 | .08 | -.04 | .23 | .31 | .18 | 1 |  |  |  |  |  |
| 18 | -.14 | -.07 | -.03 | .04 | -.05 | .10 | .06 | -.05 | .09 | .17 | .09 | -.01 | .30 | .17 | .07 | .05 | -.14 | 1 |  |  |  |  |
| 19 | -.24 | -.15 | -.08 | -.12 | -.15 | .11 | .00 | -.09 | .07 | .12 | .09 | .02 | .34 | .05 | .05 | .14 | -.20 | .45 | 1 |  |  |  |
| 20 | -.21 | -.13 | -.09 | -.07 | -.19 | .00 | -.09 | -.20 | .05 | .09 | .04 | -.06 | .30 | .01 | -.03 | .10 | -.25 | .51 | .49 | 1 |  |  |
| 21 | -.12 | -.11 | .01 | .12 | .01 | .16 | .11 | .05 | .19 | .22 | .23 | .11 | .30 | .10 | .09 | .17 | .02 | .53 | .40 | .45 | 1 |  |
| 22 | -.21 | -.16 | -.12 | -.03 | -.15 | .07 | .02 | -.11 | .11 | .15 | .15 | .06 | .32 | -.01 | -.03 | .11 | -.04 | .47 | .47 | .46 | .63 | 1 |
| M | 4.53 | 4.08 | 4.30 | 4.40 | 4.30 | 3.85 | 4.09 | 3.96 | 4.17 | 2.98 | 3.56 | 3.42 | 3.39 | 3.93 | 4.21 | 3.76 | 3.89 | 3.19 | 2.25 | 2.70 | 3.35 | 2.68 |
| SD | .65 | .94 | .82 | .68 | .71 | .90 | .76 | 1.06 | .86 | 1.02 | .96 | .98 | 1.11 | .69 | .66 | .90 | .81 | 1.10 | 1.10 | 1.23 | 1.07 | 1.21 |

*Note. Indicators 1 to 5 reflect source1 (ME), indicators 6 to 9 reflect source2 (VLE), indicators 10 to 13 reflect source3 (VLP), indicators 14 to 17 reflect source4 (VP), and indicators 18 to 22 reflect source5 (PS).*

Table 3 offers a summary of the model comparison results. The Δχ2 likelihood ratio test for model comparison and other model fit statistics all point to the five-factor model as the preferred measurement model for the sources of self-efficacy inventory. The BIC is the lowest of the series of rival models, RMSEA and SRMR are below or near the rule of thumb of .08, and the Δχ2 likelihood ratio test of equal fit with the slightly less complex alternative models is rejected each time. Notice that the TLI is below the .90 criterion, although it should be kept in mind that the TLI depends on the average size of the correlations in the data, as it compares the model against a null model. Given a low average correlation among indicators of .16, the TLI will by definition be lower than the recommended threshold.

*Table 3. Model Comparison for Rival Measurement Models of the Sources of Self-Efficacy inventory.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model | χ2 | df | TLI | RMSEA | SRMR | BIC | Δχ2 |
| 5-factor unrestricted | 450 | 199 | .82 | .07 | .09 | 12163 | . |
| 4-factor Bandura | 645 | 203 | .69 | .10 | .11 | 12336 | 195\*\* |
| 1-factor | 1139 | 209 | .37 | .14 | .15 | 12798 | 689\*\* |
| 5-factor with  second-order factor | 484 | 204 | .81 | .08 | .10 | 12170 | 34\*\* |

*Note. \*\* p < .0001; Δχ2 likelihood ratio test against the unrestricted 5-factor model.*

These model comparison results imply that the proposed 5-source differentiation is favored over the 4-source alternative, providing evidence for the further differentiation of the vicarious experiences into peer-based and expert-based factors for the developed inventory. As expected, the one-dimensional model clearly does not fit the data well, which is consistent with a differential view on sources of self-efficacy instead of a simple unitary perspective. The hierarchical model alternative shows an acceptable fit following the RMSEA and SRMR, yet following the Δχ2 and BIC it does not show an equally good fit with the data as the unrestricted 5-factor model. The relatively good fit of the hierarchical alternative does point to the fact that some source factors, though not all, have relatively high intercorrelations.

The factor loadings and interfactor correlations for the chosen unrestricted 5-factor model for the sources of self-efficacy inventory are shown in Table 4. The good fit of this CFA model also shows in the substantial factor loadings of the indicators that are all equal to or above .40. The source factors 1(ME), 2(VLE), and 4 (VP) show moderately strong positive correlations among each other, whereas source 5(PS) is relatively independent of the other source factors.

*Table 4. Five-Factor Measurement Model of the Sources of Self-Efficacy inventory.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factor loadings β | | | | | |
| Indicator | Source1ME | Source2 VLE | Source3VLP | Source4 VP | Source5 PS |
| X1 | .63 |  |  |  |  |
| X2 | .56 |  |  |  |  |
| X3 | .64 |  |  |  |  |
| X4 | .53 |  |  |  |  |
| X5 | .80 |  |  |  |  |
| X6 |  | .73 |  |  |  |
| X7 |  | .83 |  |  |  |
| X8 |  | .65 |  |  |  |
| X9 |  | .68 |  |  |  |
| X10 |  |  | .71 |  |  |
| X11 |  |  | .74 |  |  |
| X12 |  |  | .65 |  |  |
| X13 |  |  | .51 |  |  |
| X14 |  |  |  | .55 |  |
| X15 |  |  |  | .63 |  |
| X16 |  |  |  | .40 |  |
| X17 |  |  |  | .49 |  |
| X18 |  |  |  |  | .69 |
| X19 |  |  |  |  | .63 |
| X20 |  |  |  |  | .65 |
| X21 |  |  |  |  | .76 |
| X22 |  |  |  |  | .76 |
|  | | | | | |
| Factor Intercorrelations ρ | | | | | |
| Source1:ME | 1 | .62\*\* | -.02\*\* | .73\*\* | -.20\*\* |
| Source2:VLE |  | 1 | .22\*\* | .72\*\* | .08\*\* |
| Source3:VLP |  |  | 1 | .23\*\* | .30\*\* |
| Source4:VP |  |  |  | 1 | .06\*\* |
| Source5:PS |  |  |  |  | 1 |

*Note. \* p < .05; \*\* p < .001;*

*Average correlation among indicators of different factors: .11;*

*Average correlation among indicators of the same factor: .39, .52, .42, .26, and .49, for the five sources respectively.*

***Measurement model of the general self-efficacy scale***

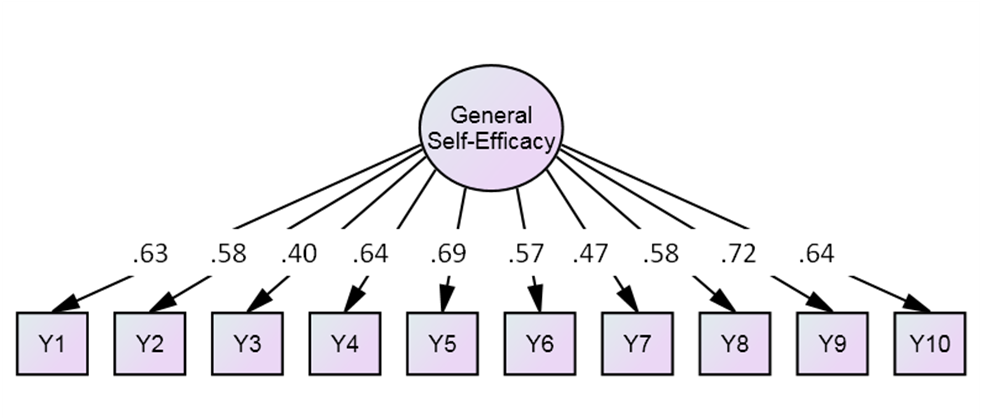
The correlation matrix and descriptive statistics of the 10 indicators used to operationalize self-efficacy are presented in Table 5.

*Table 5*. *Correlation Matrix and Descriptive Statistics of the General Self-Efficacy indicators.*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Y | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 1 |  |  |  |  |  |  |  |  |  |
| 2 | .41 | 1 |  |  |  |  |  |  |  |  |
| 3 | .33 | .29 | 1 |  |  |  |  |  |  |  |
| 4 | .39 | .27 | .29 | 1 |  |  |  |  |  |  |
| 5 | .41 | .33 | .24 | .52 | 1 |  |  |  |  |  |
| 6 | .51 | .34 | .18 | .31 | .41 | 1 |  |  |  |  |
| 7 | .21 | .30 | .10 | .31 | .40 | .22 | 1 |  |  |  |
| 8 | .35 | .34 | .23 | .35 | .40 | .29 | .39 | 1 |  |  |
| 9 | .40 | .39 | .25 | .50 | .51 | .37 | .33 | .46 | 1 |  |
| 10 | .42 | .48 | .28 | .40 | .37 | .37 | .23 | .31 | .51 | 1 |
| M | 3.77 | 3.07 | 3.48 | 3.77 | 3.65 | 4.11 | 3.62 | 3.43 | 3.53 | 3.71 |
| SD | .79 | .84 | .96 | .79 | .75 | .58 | .85 | .80 | .76 | .84 |

One can observe a series of positive correlations which is consistent with the theoretical one-factormodel. The average correlation between indicators is .35. Figure 2 provides a graphical representation of the one-factor CFA model results. As expected, given that it is an established scale, model fit results are good, with substantive factor loadings of .40 or larger for all indicators, and RMSEA and SRMR below common rules of thumb of .08 and .10, and TLI above .90.

*Figure 2*. *Standardized Path Diagram for the Confirmatory Factor Analysis of the General Self Efficacy scale.*



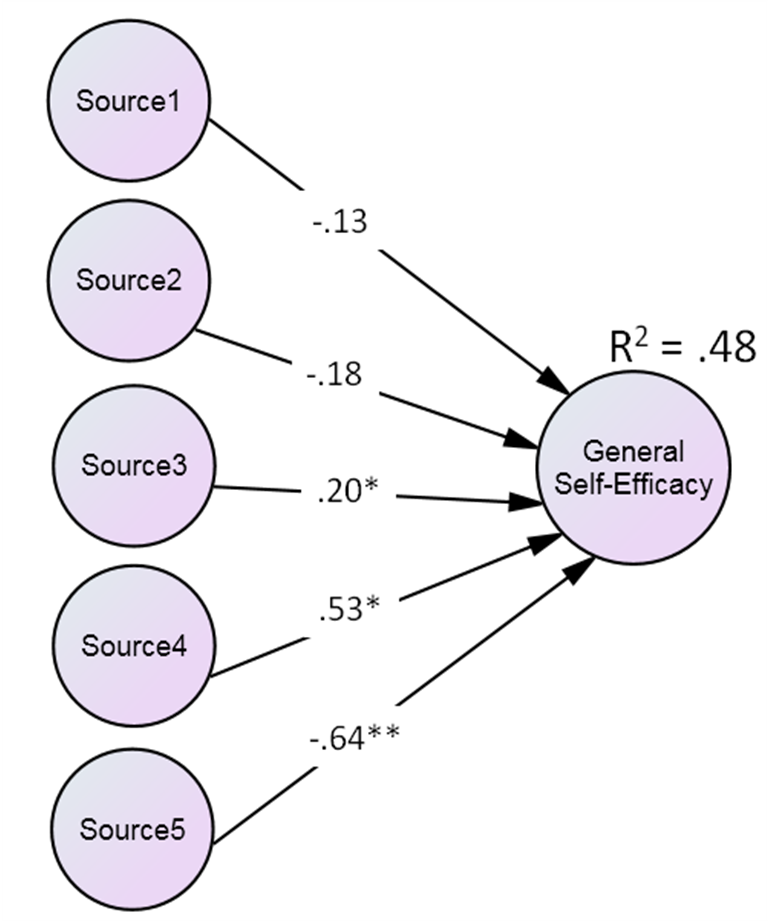
*Note. Model fit: χ2 (35) = 78.62; TLI = .92; RMSEA = .07; SRMR = .05;*

*Average correlation among indicators: .35; For reasons of clarity, error terms of the 10 indicators are omitted in the graphical representation*

***Structural model linking the sources of self-efficacy to general self-efficacy***

Given that sources of self-efficacy are assumed to naturally and directly connect to self-efficacy, the full structural equation model (SEM) that we investigated connected the two measurement models by letting the 5 latent source factors predict the GSE-factor. Figure 3 summarizes this structural latent regression part of the SEM. This type of model is sometimes called a MIMIC model, in which (in our case) general self-efficacy is reflected by multiple indicators (MI; i.e. the 10 GSE items) and by multiple causes (MiC; i.e., the 5 latent source factors, which are in turn defined by the item pool of 22 source items). Simple correlations show that of the 5 source factors, source 1 (ME) and 4 (VP, positive) and source 5 (PS, negative) are significantly correlated to GSE. Furthermore, the regression results indicate that 48% of variance can be explained in GSE by the 5 source factors. This result underlines the importance of the sources in the self-efficacy framework. Source 4 (VP, positive) and source 5 (PS) are the most prominent predictors of GSE. Notice that, given information on the other 4 sources, source 1 (ME) does not contribute anything further to the explanation of GSE. This is a side effect of the large overlap of this source with source 2 (VLE) and source 4 (VP); intercorrelations of .6 and .7 (see Table 4). An opposite story holds for source 3 (vicarious learning peers: VLP), which on its own is not strongly related to GSE, though it can significantly contribute to the explanation of GSE when controlling for the other source factors.

*Figure 3*. *Standardized Path Diagram connecting the five Sources of Self-Efficacy factors to the General Self-Efficacy factor.*



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Source | Standardized  regression  coefficient β | Z | p | Simple  Correlation  ρ | Z | p |
| Source1:ME | -.13 | -0.70 | .484 | .28 | 3.72 | <.001 |
| Source2:VLE | -.18 | -1.26 | .209 | .12 | 1.59 | .111 |
| Source3:VLP | .20 | 2.24 | .025 | .10 | 1.29 | .199 |
| Source4:VP | .53 | 2.13 | .033 | .33 | 3.85 | <.001 |
| Source5:PS | -.64 | -5.40 | <.001 | -.54 | -9.06 | <.001 |

General Self-Efficacy: R2 = .48

*Note. For reasons of clarity, only the structural relations between the latent factors (cf., circles) are presented, whereas indicators of the latent factors, interfactor correlations and error terms are omitted in the graphical representation. Details on the measurement parts of the full structural equation model can be found in Table 4 and Figure 1*

**Discussion**

The aim of this study was to validate a newly developed nurses’ self-efficacy sources inventory and to examine the differential impact of sources of self-efficacy. The newly developed inventory showed a good fit. We found a differentiation between expert-based and peer-based vicarious experiences. Based on the results of this study, a five-source model was favored over the traditional four-source model. We provided evidence that support the idea that nursing students use different vicarious sources in the formation of self-efficacy beliefs. This is in line with earlier research findings (Bong & Skaalvik, 2003; Baeten et al., 2010). Nursing students not only learn by watching experienced colleagues in action: they also learn by watching and evaluating performances of peers.

A limitation of this study is the variety of clinical learning environments in which participants acted. Participants were asked to reflect on sources they use in the formation of self-efficacy beliefs. It is possible that some respondents did not interact with fellow students during clinical placement. Therefore, the clinical learning environment in which they were placed, acted as their frame of reference. Another issue regarding context is the effect of the type of the clinical setting. For example, working in a general hospital or in mental health care might make a difference. We did not investigate possible effects of these contextual factors. A further limitation of this study is that in the development of the sources of self-efficacy inventory, we did not use input of clinical practice nurses. We used a panel of students and experienced lecturers (familiar with clinical learning in nursing practice) to reflect on the items. Using practice nurses who guide nursing students, may have contributed to content validity of the inventory. We suggest that in the further validation process of the newly developed inventory, practice nurses should participate.

Linking the five-source model to the GSE showed that 48% of variance could be explained. Looking into the specific sources showed that verbal persuasion and physiological arousal are the most prominent predictors of GSE. This is in contrast to Bandura’s (1997) suggestion that mastery experiences are the main source of self-efficacy beliefs. It is possible that students use and need verbal persuasion and physiological symptoms to process their experiences (as main feedback channels). In that case, they depend more on these sources in building self-efficacy than they do on mastery experiences. In other words, they need the help of an experienced nurse to reflect on their performance. Note that experiences are inevitable in the forming of self-efficacy beliefs. It may be the case, that students who lack experience will rely more on other sources such as verbal persuasion. This is in line with results of earlier research (Milner, 2002; Tschannen-Moran & Johnson, 2011; Gloudemans, Schalk & Reynaert, 2012). In our experience, guiding the evaluation of nursing students’ performance is a major contributing factor in clinical learning environments. Research findings by Gloudemans et al., (2012) show that scores on self-efficacy measurements among Bachelor degree nursing students in powerful clinical learning environments are significantly higher than those of students in regular learning environments. This was especially so during the first period of clinical placement (out of three in total). Further research on how the amount of clinical experience relates to the use of sources of self-efficacy might yield more detailed insight into this matter.

Based on the results of this study, we suggest that nursing students derive their self-efficacy beliefs from five sources. The effect of peer-based vicarious learning on self-efficacy beliefs turned out to be significant. In many clinical learning units, just a few students work and learn together. Increasing the number of students working together is a precondition for them to benefit from a peer-based vicarious experience source. Placing a substantial number of nursing students on one ward, especially when of a comparable level, enhances the utility of peer-based sources. This has implications for the design of clinical learning environments. To date, experienced nurses act as role models for nursing students. This may diminish the self-efficacy beliefs of nursing students, particularly at the beginning of their program. Using fellow students to evaluate one’s own performance can strengthen self-efficacy beliefs. Note that information derived from different sources has more impact on the formation of self-efficacy perceptions than just one source. This is known as the summation rule (Bandura, 1997; Styn & Mynhardt, 2006). Research on sources of teacher self-efficacy has shown that sources reinforce each other (Klassen et al, 2011). As mentioned in the results section, the minor contribution of mastery experiences in explaining GSE is probably due to an overlap of this source with other sources.

Given the variety of clinical environments in which the participants of this study work and learn, a general self-efficacy scale was used. It is stated by Judge, Erez and Bono (1998) that generalized self-efficacy represents individuals' perception of their ability to perform across a variety of situations. Self-efficacy is not only of a task-specific nature, but can also be identified at a more general level of functioning. However, according to some authors (Lenz & Shortridge-Bagget, 2002; Salanova, Peiró & Schaufeli, 2002) self-efficacy beliefs are strongly related to context, highly task-oriented, and therefore cannot be measured using a general scale. It is stated by Compeau, Gravill, Haggerty and Kelley (2006) that contextual/external factors have an effect on self-efficacy. Taking context into consideration might yield further insight into the relationship between sources of self-efficacy and self-efficacy beliefs. In this study, the aim was to validate a general five-source model for nursing self-efficacy. We therefore did not include specific clinical learning environment characteristics.

We suggest that further research can take contextual elements (such as number of staff and students) into consideration.

Future research could achieve a further optimization of the item pool/inventory and/or measurement model. The results of this study suggest that the ME, VLE and VP sources more or less share a common denominator, given the fairly strong correlation between these sources. Further research, for example an intervention design into the key sources of self-efficacy, might result in a more detailed and precise formulation of items.

**Conclusions and implications**

The results of this study support the idea that there is a differential basis for sources of self-efficacy, in which a five-source model is favored over a traditional four-source model. We showed that differentiation of the vicarious experience sources into a peer- and expert based sources reflects better how nursing students develop self-efficacy beliefs. We suggest that better understanding of how sources of self-efficacy relate to learning in a clinical learning environment has implications for nursing education programs. A better use of sources present in clinical learning environments, especially the use of a peer-based source, can stimulate students’ professional development and hence positively influence their performance (Townsend & Scanlan, 2011). This is in line with the finding by Warne et al. (2010), that individually tailored mentorship contributes to nursing students’ professional development. They argue that mentoring combined with working with patients are core elements of professional development in nursing. Given our results that students do differentiate in the use of self-efficacy sources, we consider it useful to pay attention to the use of peer-based vicarious learning in nursing programs.

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**Chapter 7**

**The relationship between critical thinking skills and self-efficacy beliefs in mental health nurses**

**ABSTRACT**

**Background**. In the Netherlands, the distinction between Bachelor degree and diploma nursing educational levels remains unclear. The added value of Bachelor degree nurses and how they develop professionally after graduation are subject to debate.

**Objectives** The aim of this study is to investigatewhether Bachelor degree nurses have higher critical thinking skills than diploma nurses do and whether there is a positive relationship between higher critical thinking skills and self- efficacy beliefs. Outcomes might provide instruments that are helpful in positioning of nursing levels in education and practice.

**Participants** Questionnaire data were used of a sample of 95 registered mental health staff nurses (62 diploma nurses and 33 Bachelor degree nurses).

**Methods**. First, ANOVA was performed to test whether the two groups were comparable with respect to elements of work experience. Second, t-tests were conducted to compare the two groups of nurses on self-efficacy, perceived performance and critical thinking outcomes. Third, relationships between the studies variables were investigated. Finally, structural equation modelling using AMOS was applied to test the relationships.

**Results**. The hypothesis that Bachelor degree nurses are better critical thinkers than diploma nurses was supported (*p* < 0.01). Years in function turned out to be positively related to self-efficacy beliefs (*p* < 0.01). No significant relation was found between the level of education and self-efficacy beliefs.

**Conclusions** The results of this study support career development and facilitate more efficient positioning of nursing levels.

**Key words:** critical thinking, self-efficacy, nursing, organisation, educational level

**INTRODUCTION**

**Background of the study**

This article examines the effect of cognitive abilities, here defined as critical thinking skills. The aims of this study are to investigate whether Bachelor degree nurses in mental healthcare in the Netherlands possess higher critical thinking skills than diploma nurses do, and to examine whether these skills are positively related to self-efficacy and perceived performance. If the latter is the case, then this would provide additional outcomes that can be used to assess (Bachelor degree) nursing competences, to develop ways of supporting the development of these competences, and to help position Bachelor degree and diploma nurses in mental health nursing. In the last decade, the positioning of these nursing levels is subject to debate in the Netherlands (Beckers & Nijhuis, 2005; VBOC, 2006; V&VN, 2012). Earlier research results from Den Boer and Hövels (2003) as well as Taminiau and Den Boer (2004) showed that too many Bachelor degree nurses operate at a diploma nursing level. Although in recent years, no new research has been published on this topic, opinions did not change (V&VN, 2012). Differentiation of nursing levels in practice is still poor, even though Bachelor degree nursing programmes differ considerably from diploma nurse programmes. This is based on the assumption that Bachelor degree nurses are better critical thinkers. Howenstein, Bilodeau, Brogna and Good (1996) provided evidence for this assumption: they found that the relationship between educational level and critical thinking skills was significant.

To date, it is known that critical thinking is essential to nursing education (Redding, 2001; American Association of Colleges of Nursing, 2005; McMullen & McMullen, 2009; Romeo, 2010) as well as nursing practice (Facione & Facione, 1996; Kuiper et al., 2010). Critical thinking skills are essential because of the increasing complexity of care demands for nurses in general healthcare (GGZ Nederland, 2010; Kaddoura, 2010). To deal with these demands nurses need to feel confident (Kaddoura, 2010). They have to evaluate their performance as a means of assessing their competencies. Evaluating oneself as being capable of fulfilling tasks in accordance with professional standards requires critical thinking skills such as reflective and analytical skills. This process is known as self-evaluation: the forming of perceptions and feelings about self-worth or competences (Judge, Bono & Locke, 2000; Steyn & Mynhardt, 2006). Bandura (1997) introduced the self-efficacy concept, which encompasses self-evaluation. Bandura states that an individual forms self-efficacy beliefs based on information derived from different sources (1989; 1997). The better an individual’s thinking skills, the better this person can evaluate himself, which is expected to positively influence self-efficacy. This has implications for (continuing) education in nursing practice and staff development. Nurses need to learn how to apply critical thinking skills to assess their own competences. Research often focuses on the relationship between critical thinking skills and clinical decision making. Focusing on the relationship between critical thinking skills and self-efficacy beliefs will help give direction to the professional development of (newly graduated) diploma degree and Bachelor degree nurses.

**Critical Thinking**

There are various definitions of critical thinking (Brunt, 2005; Moon 2008; Romeo, 2010). The dominant perspective in literature is on the cognitive component. Several authors (Facione & Facione, 1996; Fisher, 2001; Simpson & Courtney, 2002; Wilkinson 2008; Cormier, Pickett-Hauber & Whyte, 2010) state that a fundamental set of cognitive abilities is indispensable to critical thinking. For example, Wilkinson (2008 p53) defines cognitive abilities as: *"intellectual activities executed within complex processes of thinking such as conducting critical analysis, solving problems and making decisions".* This is in line with Moon's (2008 p33) definition of critical thinking : *“the assessment of what might be called evidence, in order to make a judgment”.*

In international literature about nursing and nursing education, there is a lot of interest in the concept of critical thinking (Kuiper & Pesut, 2004). Several studies have been conducted to identify critical thinking as a factor in nursing. For example, Stewart and Dempsey (2005) investigated the relationship between critical thinking and nursing diagnoses, and Lee, Chan and Philips (2006) reviewed literature on the subject. A number of studies investigating critical thinking in nursing have been conducted in the context of nursing education (Fero, Witsberger, Wesmiller, Zullo, & Hoffman, 2009). However, Romeo (2010) states that there is a lack of quantitative studies that use critical thinking skills as an independent variable. Other studies have been conducted using samples of registered nurses, but research on graduate critical thinking skills of nurses is less extensive and fairly dated. For example, Howenstein et al. (1996) assessed nurses’ critical thinking skills and found age and experience as not being significant, but educational level as being significant. Worldwide, health care institutions and educational institutions are familiar with the concept of critical thinking. Nursing education programmes recognize the importance of developing critical thinking skills (Brunt, 2005; McMullen & McMullen, 2009; Cormier et al., 2010). It is therefore a frequently measured outcome, widely used for several purposes (Redding, 2001). In this study, the focus is on the mediating role of critical thinking skills in evaluating one’s performance.

**Self-efficacy and perceived performance**

Self-efficacy is the belief in one’s competence to tackle difficult or novel tasks and to cope with adversity in specific demanding situations. Self-efficacy makes a difference in how people feel, think, and act. People with high levels of self-efficacy choose to perform more challenging tasks. They set themselves higher goals and stick to them (Zulkosky, 2009). Bandura (1997) stated that self-efficacy is the belief in one's capabilities to organize and execute the courses of action required to produce given attainments. Those with high self-efficacy beliefs want to overcome difficult situations instead of avoiding them (McLaughlin, Moutray & Muldoon, 2008). Increasing self-efficacy enhances the sense of self-control and helps one to perform at a higher level (Bandura & Locke, 2003).

According to Bandura (1997), there are four sources of information that serve as the basis for assessing one's level of self-efficacy: performance accomplishments, vicarious experiences, verbal persuasion and emotional and physiological arousal. It is common practice in nursing (education) practice to use the above mentioned sources to enhance self-efficacy. For example the use of verbal persuasion: Providing feedback and support (convincing the other that he is capable of fulfilling a certain task) at an individual level in learning situations (McConville & Lane, 2006).

Self-efficacy beliefs relates highly to performance (Dunlap, 2005; Kuiper, Murdock & Grant, 2010): an increase in self-efficacy beliefs leads to an improvement of performances. Hence, performances can be considered as a (partially) result of self-efficacy beliefs. This result or outcome measure, more specific, how one evaluates and rates its own performance, is known as perceived performance. Perceived performance is often used as a self-reported measure of competence or performance. Brady Germain and Cummings (2010) for example, used perceived performance as a measure to illustrate nurses' self-ratings.

**The relationship between critical thinking and self-efficacy**

Positive correlations between the level of critical thinking and the level of self-efficacy are expected. In order to evaluate one’s own level of self-efficacy, one has to use cognitive skills such as analytical and reflective skills (Kuiper et al., 2010). The better the cognitive ability, the more accurate the judgement of one’s ability to accomplish tasks will be (Chen et al., 2001; Cormier et al., 2010). According to Bandura (1989), one of the core competences of self-efficacy is being able to predict occurrences and to decide how to deal with them. He sees this as a major function of thinking. Truxillo, Seitz and Bauer (2008) define cognitive ability as the ability to process complex information, which is an important factor in assessing one's performance.

The information that is processed comes from the sources mentioned above (Bandura, 1997). The summation rule, a so-called integration rule (Steyn & Mynhardt, 2006) can be applied here. When using the summation rule one uses more than one source. The underlying idea is that using information coming from two sources, for example, will have a greater influence on the formation of self-efficacy perceptions than just one.

Hence, integrating information from various sources is crucial in the formation of self-efficacy beliefs. One would expect that the better an individual succeeds in integrating the information coming from various sources, the better this person is able to define his or her level of self-efficacy. For example, Truxillo et al. (2008) found a positive relationship between the self-assessment on test performances and the level of meta-cognitive skills: the higher these skills, the more accurate the judgement of own performance. McLaughlin et al*.* (2008) also found a positive relationship between self-efficacy and academic performance. However, the question is if solely the level of cognitive ability skills, i.e. critical thinking skills, is positively related to self-efficacy levels. Based on Bandura's rule of performance accomplishments, one might expect experienced nurses to show higher levels of self-efficacy beliefs. This should be so especially if they have spent a substantial period of time working in the same work environment. Benner's theoretical concepts would support this. According to Benner (1984), a nurse at the expert level knows instinctively what to do when confronted with certain situations. It is likely that experience in the field of nursing leads to a higher level of self-efficacy. However, nurses with a Bachelor’s degree are believed to use higher levels of cognitive skills: in higher education nursing programmes students for example learn how to analyse situations, reflect on their performance, evaluate interventions and make clinical judgements. In other words, they learn how to develop meta-cognitive skills known as critical thinking skills. This helps them cope with difficult, more complex and unexpected situations. They show initiative in learning how to deal with these kinds of situations, and thereby increase their level of self-efficacy. As McLaughlin et al. (2008) stated: they make an effort to overcome difficult situations.

Critical thinking skills

HBO (Bachelor degree)

Self- efficacy beliefs

Experience

Perceived performance

Years in function

*Figure 1. Model relationship educational level, critical thinking and self efficacy*.

Figure 1 illustrates the theoretical model. Higher level critical thinking skills are expected to occur among Bachelor degree nurses. Based on Bandura's theory of the formation of self-efficacy beliefs (1997) and the role of cognitive ability in this process (Chen et al, 2001, McLaughlin et al., 2008; Truxillo et al., 2008; Cormier et al., 2010), these cognitive abilities will function as a mediating variable and will show positive correlations with self-efficacy beliefs and perceived performance. In the model it is also expected that years of experience in the field and years in function positively correlate with self-efficacy beliefs and perceived performance (Lenz & Shortridge-Bagget, 2002; Marshburn, Engelk, & Swanson, 2009). However, higher critical thinking skills combined with experience and years in function as a staff nurse are expected to lead to higher self-efficacy beliefs and higher scores on perceived performance.

**The aims of the research**

The aim of this study is to investigate whether Bachelor degree nurses show higher critical thinking skills than diploma nurses and whether there is a positive relationship between these skills and levels of self-efficacy and perceived performance. This leads to the following hypotheses:

1. nurses with a Bachelor degree show higher scores on critical thinking abilities than diploma nurses do;
2. critical thinking skills mediate the relationship between levels of education and self-efficacy beliefs.

**METHODS**

**Recruitment of participants**

Management staff members (department heads) were asked to provide access to nursing staff. A total of 300 nurses were approached to participate in this study. Ethical approval was obtained via heads of department. No patients or patient information was involved in this study. Participation was voluntarily and based on informed consent. The inclusion criteria were: participants are registered nurses (diploma nurses or Bachelor degree nurses), and are employed as a staff nurse in a mental health care institution in a clinical setting in the Netherlands. Mental health organisations in different parts of the Netherlands were approached and head of departments and wards were asked if their entire nursing staff could participate. This was done to avoid over- or underrepresentation of Bachelor degree or diploma nurses. A questionnaire survey design was adopted.

**Data collection**

Data collection took place in group sessions between September 2009 and May 2010. An introductory talk explained the purpose of the research, followed by verbal instructions. Every part of the questionnaire contained a written instruction. The researcher was present during the planned 1.5 hour sessions and was available to answer questions about the procedure. The questionnaires were collected at the end of the sessions, but if respondents were unable to finish during the group session, they were asked to return their questionnaire by regular mail. Anonymity was guaranteed: respondents were not asked to fill in their name.

**Instruments**

Critical thinking skills were measured using the Dutch version of the Watson Glaser Critical Thinking Appraisal (WGCTA). The WGCTA is a commonly used instrument to measure critical thinking skills (Worrel & Profetto-McGrath, 2007). The Dutch version was first released in 1999 and revised in 2006 (Harcourt, 2007). The internal consistency of this revised and translated version (KR20: .81, split-half reliability: .71) appears to be good (Harcourt, 2007). The WGTCA is divided into five subscales: assumptions, deductions, interpretations, evaluations and conclusions. In each subscale, short cases are presented along with 12 hypotheses. On the scales of assumptions, deductions and interpretations, answers are "yes" or "no". Evaluations are scored giving an opinion on the strength of the arguments: "strong" or "weak". Conclusions are scored on a 5-item Likert type scale, ranging from "true" to "not true". The maximum score on the WGCTA is 60 (12 items per scale) and the minimum is 0. To provide detailed insight into relations between the variables, scores on the WGCTA as well as scores on its subscales are reported.

Self-efficacy was measured using a general self-efficacy scale and a perceived performance scale. Both scales were developed especially for this study. Reliability of the Self-Efficacy and the Perceived Performance scales was respectively Cronbach's Alpha's 0.605 and 0.730.

The self-efficacy scale consists of four items which are derived from the Generalized Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). The items are as follows: 1, "Whatever happens at work, I can usually handle it"; 2, "When I am confronted with a problem at work, I can usually find several different solutions"; 3,"I can remain calm when confronted with difficulties in my job because I can rely on my skills"; 4, "I can perform without making mistakes". Perceived Performance was measured using five items. Respondents were asked how well they performed as follows: "In the past week, how well would you say that you: 1, made decisions; 2, made efforts; 3, achieved your goals; 4, showed initiative; 5, assumed responsibility.

All items were scored on a 5-point Likert-scale (1=strongly disagree, 5=strongly agree).

Participants were also asked to fill in the following items: highest level of education, age, years of experience as a nurse, and years in present position. The latter item was included because a relatively new job or position might influence self-efficacy beliefs. For example, a nurse can be an expert in providing critical care for the elderly; a transition to a different field of nursing, for example child care, could then imply a lower level of mastery and hence influence his or her self-efficacy beliefs.

**Data analysis**

The data were analysed using SPSS version 17.0. First, ANOVA was performed to test whether the two groups were comparable with respect to work experience. T-tests were conducted to investigate relationships between the two nursing levels and self-efficacy, perceived performance and critical thinking skills. Next, Pearson’s correlations between all the variables of the study were calculated. To test the model as illustrated in Figure 1, structural equation modelling using AMOS was applied.

**RESULTS**

A total of 95 participants (29 male, 66 female) completed a set of tests and questionnaires. Their mean age was 36.78 (sd= 11.97), ranging from 21 years to 59 years. Their mean years of experience in the field of nursing was 12.66 (sd= 10.88), ranging from 1 year to 39 years. Sixty-two nurses had completed a nursing course at the intermediate vocational level (MBO) while 33 nurses held a Bachelor degree in nursing (HBO). A power analysis was performed which showed that the sample was higher than the minimal number required. We performed ANOVA to compare the Bachelor degree nurses group with the diploma nurses group. Table 1 shows that there is no significant difference between the two groups regarding years of experience, years in function and date of diploma.

*Table 1: Anova, means and significance between and within groups (n =95)*

*Sum of Squares df Mean Square F Sig.*

Years of Experience Between Groups 94.907 1 94.907 0.799 0.374

Within Groups 11042.225 93 118.734

Total 11137.132 94

Years in Function Between Groups 65.020 1 65.020 0.978 0.325

Within Groups 6182.506 93 66.479

Total 6247.526 94

Date of Diploma Between Groups 88806.040 1 88806.040 1.161 0.284

Within Groups 7116492.845 93 76521.428

Total 7205298.884 94

Table 2 lists the mean scores, standard deviations and t-values of the two groups included in the study (diploma and Bachelor degree nurses) on critical thinking, self-efficacy and perceived performance.

*Table 2. Group statistics and t-values for scores on critical thinking (Watson Glaser subscales and overall), self-efficacy and perceived performance.*

*N Range Mean SD Std. Error Mean t p*

WG Assumptions MBO\* 62 4-12 7.92 2.098 0.266 -4.893 0.000

HBO\*\* 33 5-12 9.76 1.521 0.265

WG Deductions MBO 62 5-12 8.55 2.038 0.259 -2.398 0,019

HBO 33 6-12 9.48 1.679 0.292

WG Interpretations MBO 62 3-12 8.97 1.679 0.213 -1.910 0,060

HBO 33 7-12 9.61 1.478 0.257

WG Evaluations MBO 62 2-12 8.79 2.219 0.282 0.715 0,477

HBO 33 6-12 9.09 1.792 0.312

WG Conclusions MBO 62 2-12 5.92 2.106 0.267 -2,531 0,014

HBO 33 4-11 7.09 2.170 0.378

WG Overall MBO 62 25-60 40.15 6.412 0.814 -3,770 0,000

HBO 33 36-56 45.03 5.791 1.008

Self-Efficacy MBO 62 3.25-4.75 3.9839 .41209 0.05234 -1,287 0,204

HBO 33 3.25-4.75 4.1212 .53444 0.09303

Perc. Performance MBO 62 3.2-5.0 4.1968 .41842 0.05314 -1,062 0,292

HBO 33 3.2-4.8 4.2970 .44755 0.07791

*\*MBO=group diploma nurses, \*\*HBO=group bachelor degree nurses*

Table 3 illustrates Pearson's correlations between the variables included in this study. We examined relationships between educational level, years of experience, years in function, critical thinking, self-efficacy and perceived performance. The correlation between level of education (MBO/HBO) and overall scores on the WGCTA is significant (*r* = .354; *p* = .000), as are the correlations between level of education and scores on the following WGCTA subscales: "Assumptions" (*r* = .419; *p* = .000), "Deductions" (*r* = . 228, *p* = .026) and "Conclusions" (*r* = .256; *p* = .012). Correlations between level of education and scores on the WGCTA subscales "Interpretations" (*r* = .187; *p* = .069) and "Evaluations" (*r* = .069; *p* = .504) turned out to not be significant.

*Table 3: Pearson correlations of the study variables (n = 95)*

1 2 3 4 5 6 7 8 9 10

1.Years of experience

*Pearson's correlation*

2. Years in function

*Pearson's correlation* 0.617\*\*

3. MBO/HBO (educ. level)

*Pearson's correlation* -0.092 -0.102

4. WG Assumptions

*Pearson's correlation* -0.010 0.001 0.419\*\*

5. WG Deductions

*Pearson's correlation* 0.056 -0.052 0.228\* 0.332\*\*

6. WG Interpretations

*Pearson's correlation* 0.099 -0.017 0.187 0.217\* 0.333\*\*

7. WG Evaluations

*Pearson's correlation* 0.044 -0.074 0.069 0.277\*\* 0.341\*\* 0.238\*

8.WG Conclusions

*Pearson's correlation* 0.161 0.035 0.256\* 0.318\*\* 0.331\*\* 0.405\*\* 0.183

9. WG Overall

*Pearson's correlation* 0.106 -0.031 0.354\*\* 0.664\*\* 0.703\*\* 0.625\*\* 0.624\*\* 0.690\*\*

10. Self-Efficacy

*Pearson's correlation* 0.277\*\* 0.297\*\* 0.143 0.119 0.128 0.020 -0.041 0.232\* 0.145

11. Perceived Performance

*Pearson's correlation* 0.136 0.064 0.112 0.129 -0.003 -0.006 -0.061 0.107 0.055 0.321\*\*

*\*\*P < 0.01; \*P < 0.05; Pearson Correlations are reported at the diagonal*

A significant relationship between level of critical thinking and scores on self-efficacy only was found at the WGCTA subscale "conclusions" (*r* = .232; *p* = .023).

The variables of years of experience and years in function are positively correlated to scores on the Self-Efficacy scale (respectively *r* = .277; *p* = .007 and *r* = .297; *p* = .003).

As Table 3 shows, results do not entirely fit the model as presented in Figure 1 .Structural equation modelling, using AMOS, showed that the model as a whole (with correlated errors) had a good fit with the data (Chi Square = 9.44; df = 41; p = .80; Goodness of Fit = .98; Adjusted Goodness of Fit = .93; Root Mean Square Error of Estimation = .00). Figure 2 shows the significant relationships between education and critical thinking abilities and the factors that are associated with self-efficacy.

HBO (Bachelor degree)

Self-efficacy beliefs

Years in function

WG-assumptions

WG-evaluations

WG-interpretations

WG-deductions

WG-conclusions

*Figure 2. Significant relationships educational level, critical thinking and self efficacy*

**DISCUSSION**

This study sought to examine the hypothesis stating that nurses with a Bachelor degree show higher scores on critical thinking abilities and that these abilities mediate levels of self-efficacy. More precisely, Bachelor degree nurses are expected to be more accurate in evaluating information on which levels of self-efficacy are based. Hence, it is expected that they undertake targeted action to become more competent when they fail and that they gain confidence when they succeed. It is expected that this will lead to higher levels of self-efficacy beliefs, as presented in our theoretical model (Figure 1). The results of this study provide evidence for the hypothesis that Bachelor degree nurses have higher critical thinking abilities. This study did not provide evidence for the hypothesis that higher critical thinking abilities are positively related to self-efficacy beliefs. As illustrated in Figure 2, only the WGCTA subscale "conclusions" relate positively to self-efficacy. It is not clear why other subscales do not show a positive relationship. Further testing of the model shows that there is no significant difference in scores on self-efficacy and perceived performance between Bachelor degree and diploma nurses. Other variables, such as years in function, seem to have greater influence on self-efficacy beliefs than solely critical thinking abilities do. We expected that the combination of higher critical thinking skills and years of experience/years in function would show positive correlations with self-efficacy beliefs. However, no significant differences were found between the two groups in mean years of experience and years in function. Although all respondents were staff nurses, differences in for example workplace culture could bias the results of this study. White (2009) conducted a concept analysis on self-confidence. She states that the building of confidence also relies on collegial support or self-encouragement. Hence, contextual and personal characteristics could act as factors in the formation of self-efficacy beliefs. This study did not include a detailed description of work place characteristics.

As mentioned above, results of this study show higher critical thinking skills among Bachelor degree nurses. This is consistent with earlier research findings (Beeken, 1997; Howenstein et al., 1996). Research focusing on the development of critical thinking skills after graduation could provide more detailed insight into the relationship between educational levels and scores on critical thinking. Specific strategies to help develop and evaluate essential critical thinking skills are necessary (Fero et al*.*, 2009).

An issue in this study is whether participants might over- or underestimate their capabilities, based on their beliefs. Can individuals estimate accurately what it takes to fulfil a certain task to professional standards? Truxillo et al. (2008) found that those with higher thinking skills showed a more accurate estimate of their performance. According to Facione (1990), ideal critical thinking characteristics are for example fair-mindedness in evaluations, diligence in seeking relevant information, and reasonableness in the selection of criteria. It might be possible that those with higher (critical) thinking skills set higher standards or are more demanding. Hence, those with higher critical thinking skills might underestimate their capabilities based on their self-efficacy beliefs. Conversely, it might be so that those with lower thinking skills overestimate their capabilities based on their self-efficacy beliefs. Dunn, Elsom and Cross (2007) refer to evidence supporting this kind of relationship. Another issue is the complexity of tasks. The more complex a task is, the greater the demand on behaviour and information processing will be (Chen et al., 2001). The question is whether nurses with a Bachelor degree generally attend to more multidimensional and complex tasks than diploma nurses do. In mental health care in the Netherlands, it is known that the allocation of duties to Bachelor degree nurses and diploma nurses is poorly differentiated (Van der Windt, Calsbeek, Talma, & Hingstman, 2003; VBOC, 2006; V&VN, 2012). In many cases, it is not made explicit how educational levels should relate to domains and tasks of nursing. It is therefore quite possible that a Bachelor degree nurse does the same as a diploma nurse and vice versa. This could explain the weak relationship between level of education and scores on self-efficacy beliefs.

The relatively low response rate could be due to circumstances: nurses work different shifts, participation was time consuming, and it did not always suit their busy schedules. A number of participants did not manage to complete the questionnaire within the time of the meeting. They could return their questionnaire by regular mail. Unfortunately, not all respondents returned their questionnaire.

Although some authors (e.g. Kuiper & Pesut, 2004) claim that there is no evidence that critical thinking outcomes can be explained solely by scores on standardised test such as the WGCTA, it is one of the few validated and tested instruments available in the Netherlands to measure critical thinking abilities.

**CONCLUSIONS**

The present study shows that there is a positive relationship between educational level and the level of critical thinking. This corroborates previous findings that higher nursing educational programmes contribute to the development of critical thinking abilities and therefore can be learned. Our findings show that self-efficacy beliefs are related to work experience rather than to educational level. Further research should be performed to determine the role of critical thinking skills in the formation of self-efficacy beliefs. It should specifically be investigated how higher critical thinking skills, combined with experience, can lead to higher self-efficacy beliefs.

We believe that insight into the relationship between critical thinking skills and self-efficacy beliefs supports staff development. This has implications for professional development in nursing. To date, critical thinking skills are often linked to clinical decision making. Learning how to apply these skills to determine self-efficacy can yield vital information. It is helpful to know how nurses rate their performance, and on what grounds. If such evaluations are made accurately, they can provide a solid basis for career competence. Training programmes can then be developed and applied to guide individual and professional development, facilitating the development of competences and the differentiation of tasks. This can contribute significantly to positioning diploma and Bachelor degree nurses in the Netherlands and elsewhere.

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**Chapter 8**

**General conclusion and discussion**

***Introduction***

The aim of this study was to explore the roles of critical thinking skills and self-efficacy beliefs in nursing education and practice. The research questions derived from this aim were:

* What is the effect of educational programmes and strategies on the development of critical thinking skills in nursing education?
* How can critical thinking contribute to the differentiation between nursing levels?
* How do nursing students form self-efficacy beliefs?
* What are the effects of learning environments on the formation of self-efficacy beliefs?
* Is there a relationship between critical thinking skills and self-efficacy beliefs?

In this final chapter, the main results and conclusions are presented and methodological issues are addressed. Following this, implications for practice are discussed and suggestions for further research are proposed.

***Results of the study***

*What is the effect of educational programmes and strategies on the development of critical thinking skills in nursing education?*

In order to investigate the effect of educational programmes and strategies on critical thinking skills in nursing education, we conducted a literature review. The findings from this review are mixed. In examining 14 studies on educational programmes, we found that evidence is inconclusive: both increases and declines in scores on critical thinking skills are reported and the results do not conclusively support the idea that educational nursing programmes can lead to higher scores on critical thinking assessments. This is in line with research conducted during the last decade (Adams, 1999; Staib, 2003; Banning, 2006; Spelic et al., 2001; Zygmont & Schaefer, 2006). We suggest that although all the studies we included are of a quantitative nature and use standardised instruments, differences in design may explain the variation in results. Many of the studies used relatively small sample sizes and lack a detailed description of the research population. Variables such as entry level, prior experience, cultural factors and age are also reported to affect critical thinking skills. Further to this, the timeframe over which some studies took place was relatively short. This is recognised and reported by the authors. Based on our literature review, we suggest that the following variables can affect the scores for critical thinking assessments: the time needed to develop critical thinking skills, prior experience, age, entry level and cultural factors.

In reviewing educational strategies, we only found relatively conclusive evidence for problem‑based learning (PBL) positively affecting critical thinking. In four out of five studies examined, the use of PBL led to an increase in the scores on critical thinking skills. In the fifth study, mixed results were found (both increases and declines after comparing teaching strategies).

*How can critical thinking contribute to the differentiation between nursing levels?*

In Chapter 3 of this study, we presented various definitions of critical thinking skills and showed that despite the wide variation, the cognitive perspective on critical thinking is the dominant one. We showed that there is an emphasis on the development of critical thinking in nursing education. This is outlined by discussing the effects of developments within society and nursing practice, and the relevance of critical thinking skills in the fields of nursing education and practice. When examining professional and educational nursing profiles, it is apparent that critical thinking skills are an integral part of them. This is especially so in Bachelor degree nursing educational profiles (Focusgroep, 2007). However, in reviewing literature on the distinction between Bachelor degree and diploma degree nursing levels, we found that there is a lack of sound scientific evidence on the subject. We have suggested critical thinking as a factor offering an opportunity to differentiate between the two nursing levels. We suggest that critical thinking can be considered as a meta-competency. We argue that Bachelor degree nurses are better critical thinkers than diploma nurses are, and that they possess the competences needed to address present and future issues and developments in nursing.

In Chapter 4, we built on the results and suggestions presented in Chapter 3. In this theoretical chapter, we introduced frameworks that are helpful in explaining and understanding the use of critical thinking skills. We presented different orientations on how critical thinking skills are addressed and we showed that Bachelor degree nursing profiles rely on different cognitive modes. In designing new nursing programmes and interventions, an analytical mode rather than an intuitive one is applied. These types of roles and competences reflect the distinction made in educational and professional nursing profiles. We argue therefore that the model developed by Benner (1984) does not cover the entire field of nursing at the Bachelor degree level. Hammond (1997) and Eraut (2000) provide models to describe Bachelor degree competences on another level. At this level, critical thinking skills are made explicit. We conclude that the models of Benner, Hammond and Eraut are complementary.

*How do nursing students form self-efficacy beliefs?*

In Chapter 5, we showed that Bachelor degree nursing students differ in the use of sources in forming self-efficacy beliefs. Bandura’s concept of self‑efficacy (1997) has been extensively researched and functions as a basis for studying the formation of self-efficacy beliefs. More specifically, we examined the four sources identified by Bandura (1997) as those on which self‑efficacy beliefs are built. Based on research and suggestions by several authors (Lent et al., 1996; Palmer, 2006) we investigated whether Bachelor degree nursing students use a peer‑based vicarious source in addition to the traditional four sources. In the validation process, we first converted an existing “teacher sources of self-efficacy” instrument into one dealing with student nurses, making it context-specific. Secondly, content and face validity were tested using feedback from a panel of nursing students and a panel of experienced nurse educators. All the nursing students reflecting on the items had prior clinical experience (work-based learning). Next, confirmative factor analysis was conducted, which resulted in a five‑factor, 22‑item “sources of self‑efficacy” inventory, with factor loadings all equal to or above 0.40. Finally, further testing showed that the five‑factor model was favoured over the traditional four‑factor model. This finding supports evidence that Bachelor degree nursing students differentiate between peer-based and expert-based vicarious experiences. We suggest that this newly‑developed model can be helpful in the construction of learning environments. Making sources of self-efficacy explicit in practice offers nursing students opportunities to build solid self-efficacy beliefs. It would be of interest to examine the extent to which the number of peers present in clinical learning environments affects the use of sources of self-efficacy beliefs. However, the influence of the context in which nursing students learn during clinical practice (such as the presence of peers) was not part of this study.

*What are the effects of learning environments on the formation of self-efficacy beliefs?*

In addressing this research question, we compared the effect of nursing internships in regular clinical workplaces with internships in powerful clinical learning environments. We described and illustrated the elements of powerful learning environments and showed how they differ from regular clinical learning environments. Despite the contextual differences between powerful learning environments, they show common characteristics and we used the criteria as described by Simons (1999) to illustrate these. To investigate the effects of the different learning environments, we conducted an experiment with a pre-test post-test design. We showed that both powerful and regular learning environments contribute to the development of self‑efficacy beliefs. However, comparing outcomes on the General Self-Efficacy Scale (Schwarzer & Jerusalem, 1999) at pre-test and post-test within groups reveals that interns in a powerful learning environment scored significantly better on more items of the GSE than those in a regular environment. We also found that the effect of a powerful learning environment on scores on the General Self-Efficacy Scale was greatest in the group of interns who were in their first clinical learning period (out of three periods during the entire programme). We suggest that presence of sources for self-efficacy as described by Bandura (1997) and the presence of peers within powerful clinical learning environments contribute to the findings.

*Is there a relationship between critical thinking skills and self-efficacy beliefs?*

As discussed in Chapter 1 of this study, a positive and reciprocal relationship between the level of critical thinking and self-efficacy beliefs is expected, as critical thinking skills are thought to be helpful in the formation of self-efficacy beliefs (Bandura, 1997). The better a person’s critical thinking skills, such as analysing and reasoning, the better their judgement of their performance. Hence, better use of the sources of self-efficacy is expected (Bandura, 1997). With regard to the reciprocity, self‑efficacy beliefs enhance cognitive abilities (Bandura, 1993; Zulkosky, 2009). We have shown that Bachelor degree nurses are better at critical thinking than diploma degree nurses. This survey was conducted among mental health nurses working in six different care institutions in the Netherlands. As a group, Bachelor degree nurses scored significantly higher on the Watson Glaser Critical Thinking Assessment tool (p > 0.05). Investigating whether these higher scores are positively related to scores for self‑efficacy produced a non-significant result. Age and experience, however, were positively related to self-efficacy outcomes. Earlier research (Benner, 1984) has shown that experience is intrinsic to forming self-efficacy beliefs.

***Methodological considerations***

In this study, we used standardised tests to assess critical thinking skills and their development. In reviewing the literature on factors influencing critical thinking skills, we only included studies that used three standardised tests (the WGCTA, CCTST and CCTDI). In assessing critical thinking skills among mental health nurses, the WGCTA was used. However, there is some criticism of the use of such standardised tests. Brunt (2005) states that these types of tests do not entirely reflect critical thinking in professional nursing practice. Others have pointed out that critical thinking is context-dependent and therefore cannot be measured using context‑independent instruments (Kuiper & Pesut, 2004). Stone et al. recognise that critical thinking skills are “a facility that generalises across disciplines” (Stone et al., 2001, p. 66). They found that the skills and traits underlying the framework for the general CCTST and CCTDI measurements are relevant for nursing practice. They also conclude that as well as being a general facility, critical thinking may have a subject matter specific component. Ten Dam and Volman (2004) acknowledge that general principles of critical thinking transcend specific subjects and are therefore more widely applicable. We understand the call for a nursing‑specific critical thinking assessment tool and note that the use of general instruments is criticised in particular because critical thinking is regarded as a means to delivering good patient care. It is often confused with clinical decision making or clinical judgement. In defining critical thinking, we propose that it can be seen as a meta-competence. A meta-competence enables the use of other, lower order competences (Dries et al., 2008). Within this cognitive perspective, specific nursing competences applied in practice are controlled by meta-competences. From this point of view, we believe that context‑independent assessment tools such as the WGCTA are applicable when assessing critical thinking skills in nursing.

To date, however, there is no worldwide, generally applicable and validated nursing‑specific assessment tool that encompasses generalised factors as well as content specific components. There are nursing‑specific assessment tools to hand, but these are not frequently applied. Further to this, there are various reports of studies using qualitative measurements of critical thinking skills. However, in conducting our review on studies concerning the development of critical thinking skills, the results are hard to interpret due to the variation in designs and the failure to describe the measurements used. This is in line with earlier research findings (Staib, 2003). In assessing the critical thinking skills of mental health nurses in the Netherlands, the only validated and standardised test available in the Dutch language was the WGCTA.

We have contributed to the discussion on the distinction between nursing levels in the Netherlands. Addressing this issue, we have introduced critical thinking as a means to differentiate between the two levels and have contributed theoretical frameworks. We do not provide empirical evidence for the possible uses and applications. Based on earlier research we have discussed the possibilities, but this has been limited to theoretical discussion.

In our research on how Bachelor degree nursing students form self-efficacy beliefs, we were unable to identify all the contextual factors that might influence the results. The clinical learning environments in which participants worked and learned are numerous and diverse. Participants fulfilled internships in over seventy health care organisations, in various wards and units. We can say in general that students differ in terms of the sources they use in forming self-efficacy beliefs. However, we do not know the exact impact of contextual factors on the formation of these beliefs.

In comparing the development of self-efficacy beliefs of nursing students in regular clinical learning environments to that of nursing students in powerful clinical learning environments, we did not assess the prior experience of individual participants. It is known that self-efficacy beliefs build over time (Bandura, 1997). We could not precisely assess factors that might have influenced scores on the General Self Efficacy Scale, as some factors, such as prior education or summer or part-time jobs in healthcare, were not part of this study. Another shortcoming of the study is that we were unable to perform paired t-tests. This would have yielded more detailed information.

***Conclusions***

This study shows that critical thinking and self-efficacy, in general, are useful concepts in nursing. The following conclusions are drawn:

* Critical thinking is a core element of nursing and nursing education.
* Based on a literature review, we found that results of studies investigating the effect of teaching strategies and educational programmes on the development of critical thinking skills are mixed. In general, we found that evidence on this subject is inconclusive. In addition, factors such as age and experience contribute to the development of critical thinking skills.
* We have provided evidence that Bachelor degree nurses are better critical thinkers than diploma degree nurses. The study was conducted among mental health nurses and therefore caution is dictated regarding the generalisation of these results.
* The newly‑developed instrument for measuring self-efficacy in nursing education proved to be reliable and valid. Based on Bandura’s theory on the sources of self-efficacy, we have presented sound evidence for a differentiation of the vicarious source into expert‑based and peer‑based sources. This may contribute to a better use of the sources of self-efficacy and may be helpful in the construction of (clinical) learning environments.
* The exact relationship between self-efficacy and critical thinking skills remains unclear. Our study does not support the idea that there is a positive relationship between scores on self‑efficacy and critical thinking scores. Age and experience are, however, factors that are positively related to self-efficacy results.

***Implications for practice***

In this study, we suggest that critical thinking can be understood as a meta-competence: critical thinking acts as an enabling condition (Dries et al., 2008). From this viewpoint, critical thinking skills are essential to the processes of (clinical) reasoning and decision making, which have become core elements in nursing practice and education (Edwards, 2007; Marchigiano et al., 2011). Attention has to be paid to teaching strategies and methods that enhance critical thinking skills. In the screening of nursing curricula, criteria must be applied that reflect critical thinking skills. Based on the results of this study, methods based on problem‑based learning are preferable.

We have provided further evidence that Bachelor degree nurses have better critical thinking skills than diploma nurses do, and this must be taken into consideration when considering the differentiation of tasks. Greater complexity of care requires higher critical thinking skills (Van der Velden et al., 2011). To date, tasks in nursing are poorly differentiated in the Netherlands ( VenVN, 2012). Healthcare institutions are confronted with an increase in complexity of care (Van der Velden et al., 2011), which makes the need to differentiate more prominent.

This study offers a new perspective on the application of sources of self-efficacy in (clinical) nursing education. The newly‑developed measurement can be used to evaluate clinical learning environments with regard to the presence and quality of sources of self-efficacy, and results can be used for the (further) development of clinical learning environments. In particular, the distinction between expert and peer‑based vicarious sources has implications for clinical learning workplaces: there must be opportunities to work and learn together with peers. To date, a substantial number of clinical learning workplaces do not meet this criterion. The application of sources explicitly in educational settings stimulates self-regulated learning and therefore might lead to better clinical performance by nursing students.

***Recommendations for further research***

*Defining and measuring critical thinking*

We suggest that research on the development of critical thinking skills in nursing education should begin with a clear definition of the concept of critical thinking. In our literature review, we came across varied and numerous definitions, and concepts such as clinical reasoning and clinical decision making are frequently used as synonyms for critical thinking skills. Further operationalisation of critical thinking skills offers opportunities to compare and evaluate research findings on this topic. We found that the cognitive perspective on critical thinking is dominant, and within this perspective there is reasonable consensus on the core elements of critical thinking. At the same time, however, we observed an on-going discussion as to whether critical thinking in nursing can only be addressed from a cognitive point of view. Other perspectives include affective and/or emotional components. Consensus on the definition of critical thinking in nursing offers opportunities to develop a measurement that reflects its nature, as comments on frequently‑used measurements for assessing critical thinking suggest that they do not fully reflect the nursing domain (Adams, 1999; Simpson & Courtney, 2002; Brunt, 2005; Worrel & Profetto-McGrath, 2006; Romeo, 2010).

In determining whether critical thinking skills can be enhanced by educational strategies and programmes, we suggest the application of experimental designs of a longitudinal nature. We found that a considerable number of studies on this subject took place over a relatively short period of time, yet it is suggested that it takes time to develop critical thinking skills (Daly, 2001; Brown et al., 2001; Profetto-McGrath, 2003).

*Sources of self-efficacy in nursing education*

It would be worthwhile to further validate the newly‑developed “sources of self-efficacy scale” in nursing education. In this study, a relatively small sample size was used and replication of the study using a large sample size would contribute to the validity of the instrument.

Furthermore, we suggest research on how the explicit use of sources of self-efficacy in (clinical) learning environments contributes to students’ performance outcomes. We can now measure self‑efficacy, but it would be interesting to investigate how this relates to, for example, test results.

*The relationship between critical thinking and self-efficacy*

In this study, we did not find a positive relationship between self‑efficacy beliefs and scores on critical thinking skills. We found that age and experience are positively related to self-efficacy beliefs and that educational level is positively related to critical thinking. Further research on the relationship between critical thinking skills and self-efficacy beliefs could provide more insight into how these concepts are related. In relevant literature, a reciprocal relationship is suggested (Edwards, 2003).

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