

Key Concepts : Self-efficacy, Self-care, Diabetes mellitus, Meta-analysis

## Self-Efficacy as a Predictor of Self-Care in Persons with Diabetes Mellitus: Meta-Analysis\*

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### ABSTRACT

Diabetes mellitus, a universal and prevalent chronic disease, is projected to be one of the most formidable worldwide health problems in the 21st century. For those living with diabetes, there is a need for self-care skills to manage a complex medical regimen. Self-efficacy which refers to one's belief in his/her capability to monitor and perform the daily activities required to manage diabetes has been found to be related to self-care.

The concept of self-efficacy comes from social cognitive theory which maintains that cognitive mechanisms mediate the performance of behavior. The literature cites several research studies which show a strong relationship between self-efficacy and self-care behavior.

Meta-analysis is a technique that enables systematic review and quantitative integration of the results from multiple primary studies that are relevant to a particular research question. Therefore, this study was done using meta-analysis to quantitatively integrate the results of independent research studies to obtain numerical estimates of the overall effect of a self-efficacy with diabetic patient on self-care behaviors.

The research proceeded in three stages : 1) literature search and retrieval of studies in which self-efficacy was related to self-care, 2) coding, and 3) calculation of mean effect size and data analysis. Seventeen studies which met the research criteria included study population of adults with diabetes, measures of self-care and measures of self-efficacy as a predictive variable. Computation of effect size was done on DSTAT which is a statistical computer program specifically designed for meta-analysis.

To determine the effect of self-efficacy on self-care practice homogeneity tests were conducted. Pooled effect size estimates, to determine the best subvariable for composite variables, metabolic control variables and component of self-efficacy and self-care, indicated that the effect of self-efficacy composite on self-care composite was moderate to large. The weighted mean effect size of self-efficacy composite and self-care composite were +.76 and the confidence interval was from +.66 to +.86 with the number of subjects being 1,545. The total for this meta-analysis result showed that the weighted mean effect sizes ranged from +.70 to +1.81 which indicates a large effect. But since reliabilities of the instruments in the primary studies were low or not stated, caution must be applied in unconditionally

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accepting the results from these effect sizes.

Meta-analysis is a useful tool for clarifying the status of knowledge development and guiding decision making about future research and this study confirmed that there is a relationship between self-efficacy and self-care in patients with diabetes. It, thus, provides support for nurses to promote self-efficacy in their patients.

While most of the studies included in this meta-analysis used social cognitive theory as a framework for the study, some studies use Fishbein & Ajzen's attitude model as a model for active self-care. Future research is needed to more fully define the concept of self-care and to determine what it is that makes patients feel competent in their self-care activities.

The results of this study showed that self-efficacy can promote self-care. Future research is needed with experimental design to determine nursing interventions that will increase self-efficacy.

## I. INTRODUCTION

Diabetes mellitus is a universal and prevalent chronic disease, is projected to be one of the most formidable worldwide health problems in the 21st century. It is estimated that there are one hundred million people in the world (Krall, 1986).

Diabetes poses many demands on the individual. To maintain a stable state of health, it is important to follow a health behavior regimen that includes meal planning, testing glucose levels regularly, exercising and taking oral medications and/or insulin (Skelly, Marshall, Haughey, Davis & Dunford, 1995). However, the day-to-day control of diabetes depends upon the individual's self-care behavior. In order to improve self-care behavior, it is important to identify variables that affect the person's ability to maintain the treatment.

The social cognitive approach has been suggested as a potentially useful guide for designing strategies that will help people cope with the requirements of a regimen when behavior change is important (Glasgow & McCaul, 1982).

The significance of self-efficacy theory for diabetes care has been noted by a number of researchers (Crabtree, 1986; Glasgow & McCaul, 1982; Grossman, Brink & Hauser, 1987; Hockmeyer, 1993; Kingery & Glasgow, 1989;

McCaul, Glasgow & Shafer, 1987; Strecher, DeVillis, Becker & Rosenstock, 1986).

Research synthesis has been shown to improve generalization over single studies. Matt & Cook (1994) suggested that the potential benefit of research synthesis is that estimates of relationships may be less biased than those reported in individual studies.

Brown (1988, 1990a, 1992) and Padgett, Mumford, Hynes & Carter (1988) conducted meta-analysis that synthesized the effects of diabetes education on outcomes in persons with diabetes. Diabetes education had a moderate to large effect on knowledge, small to moderate effect on self-care behaviors and HbA1c (Brown, 1990a).

Although much quality work and scholarly writing about diabetes care has been accomplished in recent years, there has been no research synthesis of the effects of self-efficacy on the self-care behaviors of persons with diabetes. Therefore this study was done to quantitatively integrate the results of independent research studies in order to obtain numerical estimates of the overall correlation of self-efficacy with self-care behaviors in persons with diabetes.

For this general purpose the specific aims were

1. to describe the literature on self-efficacy as

related to self care in people with diabetes, and

2. to determine the effect of self-efficacy on the self-care practices of diet, exercise, medication management, glucose testing and metabolic control.

## II. LITERATURE REVIEW

### 1. Self Efficacy and Self Care

The concept of self-efficacy is derived from social cognitive theory which provides a framework for studying the psychosocial factors associated with chronic illness behavior (Bandura, 1982).

Social cognitive theory maintains that all processes of psychological change operate through the individual sense of personal mastery or efficacy and that self-efficacy, therefore, is a cognitive mechanism that mediates the performance of a behavior (Bandura, 1986). Self-efficacy is a person's judgement of his or her ability to cope effectively in a particular situation. The judgements of efficacy are not generalized feelings of success or control, but rather they are specific to certain behaviors and settings (Cervone & Peake, 1986).

The utility of self-efficacy in predicting sustained behavior change across a range of problem areas is supported by noting the results of studies on alcohol abuse (Sitharthan & Kavanagh, 1990), smoking (Condiotte & Lichtenstein, 1981 ; Kavanagh, Pirece, LO & Shelley, 1993), obesity (Clark, Abrams, Niaura, Eaton, Rossi, 1991) and depression (Kavanagh & Wilson, 1989; McClendon, 1996; Yusef & Kavanagh, 1990). Self-efficacy judgements reflect the individual's belief about his or her ability to successfully maintain their behavior change even in the face of the situational challenges that may occur in the follow-up period (Bandura, 1982; O'Leary, 1985).

The literature shows that self-efficacy, or a

sense of 'I can do' has a significant effect on health behavior (Bandura, 1982, O'Leary, 1985, Stretcher et al, 1986). A strong relationship has been found between diabetes self-efficacy and self-care behaviors (Crabtree, 1986; Gu, 1992, 1994; Hockmeyer, 1990; Hurly, 1988; Hurly and Shea, 1992; Kingery & Glasgow, 1989; Padgett, 1991; Uzoma & Feldman, 1989). The stronger an individual's perceived self-efficacy the more vigorous and persistent are his/her efforts.

The diabetes self-efficacy scales that represent the specific behaviors of general management of regimen, diet, exercise, glucose testing and injection of insulin (or taking oral agents) were successful predictors of related self-care activities.

Self-care is usually defined as including those behaviors of monitoring, planning, and carrying out the self-care behavior.

### 2. Meta-analysis

Meta-analysis is defined by Glass (1976), its primary developer, as the statistical analysis of the results from a large collection of individual studies for the purpose of integrating the findings. It is a technique that enables systematic review and quantitative integration of the results from multiple primary studies that are relevant to a particular research question. It is a useful tool for clarifying the status of knowledge development and for guiding decision making about future research, theory development and/or practice (Reynolds, Timmerman, Anderson & Stevenson, 1992).

Whereas the large and increasing volume of literature has stimulated examination of the narrative review process, meta-analysis techniques are intended to provide more precision in the synthesis of prior research.

The first article in the nursing literature about the meta-analytic technique was published in nursing research in 1982 (O'Flynn,

1982). However, the application of meta-analysis, although topically broad, has not been used extensively in nursing (Smith & Stullenbarger, 1991), and further, nurse investigators have used it almost exclusively for experimental research. In addition, there has been an emphasis on use of the effect size index(d) rather than correlational index(r) (Reynolds et al, 1992). But meta-analysis of correlational studies may be more suitable (Reynolds et al, 1992) in providing an introductory overview of there meta-analytic approaches to data analysis of descriptive research using the correlational index(r).

Research findings are used to create an 'effect size' for each study, or element of each study, of interest to the reviewer. Effect sizes are simply standardized estimates of the size of the relationship among the variables of interest. Summarization of the effectiveness of an intervention might employ an effect size such as d, the mean of the experimental group less the mean of the control group divided by a pooled variance estimate (Holden, 1991).

Some meta-analysts have suggested that only superior studies should be included in research synthesis but it is often very difficult to identify the quality of the research (Brown, 1991). Glass, McGraw & Smith(1981) stated that "Many weak studies can add up to strong conclusion" By pooling a group of studies and thus increasing sample size, increased power could be found to compensate to some of the methodological flaws (Brown, 1991).

Using meta-analysis technique described below, this research sought to determine the strength of the relationship between self-efficacy and self-care behavior.

### III. RESEARCH METHOD

The research proceeded in three stages: 1) literature search and retrieval; 2) coding and 3) calculation of mean effect sizes and data analysis.

#### 1. Literature search and retrieval (Sampling procedures)

The initial search for pertinent papers used MEDLINE, the Cumulated Index to Nursing and Allied Health Literature(CINAHL), Psychic Info, ERIC and Dissertation Abstract computer-based procedures, applying three key-words: diabetes mellitus, self-efficacy and self-care. The Korean Nurses Association Bibliography in Seoul was also a valuable resource.

Manual searches of the bibliographies of all retrieved studies and of key review articles were conducted to complement the computerized methods. The period of 1982 to 1998 was chosen for two reasons: (1) most self-efficacy concept research based on the work of Bandura was conducted during this time, and (2) the CINAHL computerized database search techniques were available as of 1982. Further, Grossman et al(1987) suggest that evidence of an association between self-efficacy and self care in diabetes has only recent appeared in the literature.

When searches were completed, potential studies were evaluated using the following inclusion criteria for each study:

- (1) a population of person with diabetes, primarily adults
- (2) a measure of the self care, adherence, and compliance with HbA1c as the criterion
- (3) a measure of the self-efficacy as the predictive variable
- (4) a simple correlation between self-efficacy and at least one self-care measure

The literature search identified 57 documents on correlation with self-efficacy and self-care in persons with Diabetes mellitus. Primary sources that were doctoral dissertation were obtained from the inter-library loan but one doctoral dissertation (Prendergast, 1993) and one thesis (French, 1997) were eliminated as the primary sources were not obtainable. Fourteen studies

were eliminated either because the subjects were not adults or the correlational data were not clearly defined. An additional 24 studies were eliminated because they did not meet the criteria of relevance and acceptability for inclusion. The final sample consisted of 17 studies that involved a total 1,694 subjects.

## 2. Coding procedures

Studies meeting the inclusion criteria were coded according to a coding sheet, which is described under method, and code book which defined the coding process. The coding system facilitated the conceptualization of the research domain and made it possible to produce the statistical summary. Furthermore, in this meta-analysis, the characteristics of the various studies were coded and examined as potential explanations for different results across the studies.

### Method

Characteristics that were coded included:

- (1) characteristics of the publication, authors, subjects and methodological characteristics (instrument reliability, outcome measures and correlational data) and
- (2) quality of study based upon the work of Brown and Hedges(1994).

For the code book used in this study, see Table 1, quality was based on 1) selection and specification of study sample: for example: code 3=random population sample, 2) specification of illness or condition: for example: code 3=replicable sample criteria stated with inclusion/exclusion criteria, and 3) reliabilities of instruments: code 3=if all instruments have reported reliabilities equal to, or above, .80. A total quality score was obtained by summing the ratings given for each of these criteria. Study quality score, a continuous variable,

ranged from 4-8 out of a total possible score of 9 points.

A detailed code book defined the coding process for each of the 206 variables. Selection of coding variables was determined by two factors: 1) preliminary review of sample of studies, and 2) suggestions by published experts on meta analysis.

## 3. Calculation of mean effect sizes and data analysis

Actual computation of effect sizes was done using DSTAT which is a statistical computer program developed by Johnson(1989) specifically designed for meta-analysis. However, Brown, Upchurch, Anding, Winter, Ramirez (1996) obtained effect sizes from two statistical program(SPSS & DSTAT) and when the effect sizes were compared, they were determined to be identical. Homogeneity analysis, when appropriate, was conducted using DSTAT. Significant testing was based on the research purposes of an obtained weighted-effect size which was significantly different. For all analysis, statistical significance was set at  $p<.05$ .

A template facilitated calculation of effect size from studies which separated findings in  $\gamma$ , number in sample and exact p value. Also study effect sizes were weighted by sample size and study precision, using procedures recommended by Hedges and Olkins(1985).

A homogeneity test is a test of treatment by studying interaction using a chi-square distribution. When the homogeneity test was significant, indicating heterogeneity, outliers were identified by examining residuals, removing outliers one at a time and re-running the homogeneity test on the remaining studies. As soon as a non-significant homogeneity statistic was achieved, effect sizes from remaining studies were pooled to provide a weighted mean effect size.

<Table 1> Characteristics of Sample

Characteristics of the publication	No.	%
Journal	12	70.6
Book	1	5.9
Dissertation	4	23.5
Publication Year		
1986-1989	5	29.4
1990-1994	8	47.1
1995-1998	4	23.5
Characteristics of the Author(s)		
Professional Affiliation of First Author		
Nurse	11	64.7
Psychologist	2	11.8
Health educator	1	5.9
Other	1	5.9
Not specified	2	11.7
Qualifications of First Author		
Academic doctorate(Ph D)	7	41.2
Professional doctorate(MD,DDS,Dr.PH,DSN)	4	23.5
Master's degree	3	17.8
Not specified	3	17.7
Supported grant		
Yes	5	29.4
Not specified	12	70.6
Characteristics of the Subjects		
Range of mean age of subjects in years		
30-39	2	11.8
40-49	3	17.6
50-59	2	11.8
60-69	3	17.6
Not specified	7	41.2
Range of mean duration of diabetes in years		
5-10	5	29.4
11-14	4	23.5
15-	3	17.7
Not specified	5	29.4
Type of diabetes		
All type 1	1	5.9
All type 2	9	52.9
Mixed sample	5	29.4
Not specified	2	11.8

&lt;Table 1&gt; continue

Characteristics of the Subjects	No.	%
Diabetes treatment regime		
Insulin	6	35.3
Hypoglycemic agents	1	5.9
Combination of all types of treatment	8	47.1
Not specified	2	11.7
Percent of subjects that were female(%)		
-49	5	29.4
50-59	7	41.2
60-69	4	23.5
100	1	5.9
Economic status of subjects		
Indigent or below poverty level	1	5.9
Predominantly low income	1	5.9
Predominantly middle income	2	11.8
All middle income or above	2	11.7
Not specified	11	64.7
Educational level of subjects		
Some high school	5	29.4
High school graduates	2	11.8
Some college	6	35.3
Not specified	4	23.5
Score of study quality		
Selection and specification of the study sample(score)		
0: Grab sample or single clinic not otherwise specified	0	0.0
1: Single clinic/adequate demographics	9	52.9
2: Inadequate demographics or random to group only	3	17.7
3: Random, >3hospitals, describe age, gender, race	5	29.4
Specification of illness or condition(score)		
0: No diagnosis stated	0	0.0
1: Only diagnostic criteria stated	1	5.9
2: Diagnostic criteria stated	0	5.9
3: Replicable diagnostic criteria with inclusion/exclusion criteria	16	94.1
Reliabilities of instruments(score)		
0: Reliabilities <.70 or not stated	4	23.5
1: Reliabilities for majority of instruments >.70	8	47.11
2: Reliabilities for all instruments >.70	5	29.4
3: Reliabilities for all instruments >.80	0	0.0
Total	17	100.0

<Table 2> Instrument Reliability

Cronbach's $\alpha$		Not specified	.50-.59	.60-.69	.70-.79	.80-.89	.90-
		No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)
Reliability of Self-Efficacy	Composite	4(23.5)	-		4(23.5)	7(41.2)	2(11.8)
	Diet	12(70.6)	-	1(5.9)	4(23.5)		
	Exercise	15(88.2)	-	2(11.8)			
	Medication	11(64.6)	1(5.9)	2(11.8)	3(17.7)		
	General management	11(64.6)	1(5.9)	3(17.7)		2(11.8)	
	Glucose testing	17(100.0)					
Reliability of Self-Care	Composite	6(35.3)	2(11.7)	1(5.9)	2(11.8)	1(6.3)	4(23.5)
	Diet	10(58.8)			2(11.8)	4(23.5)	1(5.9)
	Exercise	14(82.3)			1(5.9)	2(11.8)	
	Medication	11(64.7)	1(5.9)		3(17.6)	2(11.8)	
	General management	12(70.6)				4(23.5)	1(5.9)
	Glucose testing	16(94.1)			1(5.9)		

## IV. RESULTS

### 1. Description of the sample of studies

The studies included in the meta-analysis, arranged in alphabetical order by first author. Characteristics of the 17 studies (listed in Appendix I ) include information about author(s) and date, research setting, self-efficacy and self-care measures. Most of the studies(n=13, 76.4%) were conducted by one or two authors and all studies except one were carried out in an OPD setting, usually associated with a teaching and research hospital.

Characteristics of samples included in this analysis are shown Table 1.

The majority of studies were published journal articles (70.6%) but 23.5% were from unpublished sources, primarily doctoral dissertations. The year of publication for 17 studies ranged from 1986-1998.

Most studies(n=11, 64.7%) were conducted by nurses, with most of the primary authors

being doctorally prepared(n=11, 64.7%), and three holding master degrees. Over one-half of studies, 52.9%, targeted only type 2 patients, 29.4% included both type 1 and type 2 subjects.

Economic status and educational level of subjects were inconsistently reported across studies and in the majority studies were not specified at all.

In cases where a composition component for self-efficacy and self-care was reported, the reliability for each component, that is, diet, exercise, medication, general management and glucose testing were very rarely stated, and the reliability of the self-efficacy component was lower than that of the self-care component.

The quality of the research studies was measured by items on the coding sheet. Scoring of research quality for this study sample showed that out of a possible score of 9 quality points, the mean total quality score was 5.71 and the range from 4 to 8. The selection and specification for quality of the study sample was



&lt;Table 3&gt; Pooled Effect Size Estimates for Relationships between Self-Efficacy and Self-Care

Variables	No. of Studies Removed/ Remaining**	No. of Sub- jects	Weighted Effect Size (SD)	95% Confidence Interval	Statistical Signi- ficance
• Composite Variables					
Self-Efficacy Composite/ Self-Care Composite	6/14	1545	+0.76(0.15)	+0.66 to +0.86	<0.0001
Self-Efficacy Composite/ Self-Care Diet Combined	5/10	1116	+0.84(0.16)	+0.70 to +0.97	<0.0001
Self-Efficacy Composite/ Self-Care Diet	1/5	532	+1.38(0.18)	+1.23 to +1.52	<0.0001
Self-Efficacy Composite/ Self-Care Exercise Combined	2/6	704	+1.01(0.23)	+0.88 to +1.14	<0.0001
Self-Efficacy Composite/ Self-Care Exercise	1/4	471	+1.04(0.27)	+0.90 to +1.19	<0.0001
Self-Efficacy Composite/ *Self-Care Medication Combined	4/8	652	+1.81(0.26)	+1.63 to +1.99	<0.0001
Self-Efficacy Composite/ Self-Care Medication	2/4	329	+0.79(0.27)	+0.58 to +1.00	<0.0001
Self-Efficacy Composite/ Self-Care Glucose Testing	0/4	290	+1.13(0.25)	+0.95 to +1.31	<0.0001
• Metabolic Control Variable					
Self-Efficacy Composite/HbA1c	2/7	991	-0.58(0.08)	-0.69 to -0.46	<0.0001
Self-Care Composite/HbA1c	3/6	799	-0.79(0.05)	-0.95 to -0.63	<0.0001
• Components of Self-Efficacy and Self-Care					
Self-Efficacy diet/ Self-Care diet	3/6	629	+0.70(0.21)	+0.55 to +0.85	<0.0001
Self-Efficacy Exercise/ Self-Care Exercise	1/3	325	+0.85(0.07)	+0.66 to +1.04	<0.0001
Self-Efficacy Insulin Administration/ Self-Care Insulin Administration	0/4	338	+1.79(0.28)	+1.61 to +1.97	<0.0001
Self-Efficacy General Management /Self-Care General Management	1/4	458	+0.93(0.24)	+0.77 to +1.09	<0.0001

\* Self-Care Medication Combined (Insulin+Hypoglycemic Agent)

\*\* This column lists the number of studies remaining after homogeneity was achieved with the number of outliers removed to achieve a homogenous group of effect size estimates.

one (low) for 52.9% of the studies and three (high) for 29.4% (see, Table 1). There were no studies that scored three on reliability of instruments. This fact means that the score for the reliability of instruments was relatively low.

As presented in table 2 reported reliability of the instruments, the self-efficacy composite reliability reports were given in 76.5% of the studies, and 41.2% reported Cronbach's  $\alpha = 0.8 \sim 0.89$ .

## 2. Determining the effect of self-efficacy on self-care practice

Table 3 presents the effect-size estimates with a 95% confidence interval for self-efficacy and self care correlational studies. To determine the effect of self-efficacy on self care practice homogeneity tests were conducted.

Pooled effect size estimates were used to determine the best subvariable for the following: composite variables, metabolic control variables and components of self-efficacy and self-care. The composite variable was measured as given in the primary studies or constructed by pooling the effect size estimate for the components. Fourteen studies were accepted as a result of the test of homogeneity for the composite variable. Six outliers were removed to achieve a homogeneous group of effect size estimates.

Since the study focused on correlational relationship as opposed to testing of effectiveness of self-efficacy, the correlation coefficient  $r$  was employed as the effect size estimate.

Analysis of 14 studies of 1,545 diabetic patients revealed a mean effect size of  $+0.76$  with a 95% confidence interval of  $+0.66$  to  $+0.86$ , which signals a moderate effect (Cohen's 1977 guideline for interpreting effect sizes are:  $0.2$ =small effect,  $0.5$ =medium effect and  $0.8$ =large effect).

Of the composite variables self-efficacy

composite / self-care medication combined yielded the largest weighted mean effect size,  $+1.81$ , with a 95% confidence interval of  $1.63$  to  $1.99$  and self-efficacy composite / self care medication yielded the smallest weighted mean effect size,  $+0.79$ , with a 95% confidence interval of  $0.58$  to  $1.00$ .

The variable combined means the composite variable plus the component variable, for example: self-efficacy composite self care diet combined calculated the component of self-efficacy composite / self care diet plus the component of self-efficacy diet / self care diet.

Although small sample sizes are not considered problematic in conducting homogeneity tests (as long as there are three or more studies in the homogeneity sample: Hedges & Olkins, 1985), this situation posed a methodological problem for correlational analyses of the relationships between the study characteristics and the effect sizes for the subvariable groups. Consequently these relationships were not explored here.

Metabolic control variables measured more direct outcomes such as glycosylated hemoglobin (HbA<sub>1c</sub>). Self-care composite/HbA<sub>1c</sub> yielded a larger effect size ( $d = -0.79$ ) than self efficacy composite / HbA<sub>1c</sub> ( $d = -0.58$ ).

Table 3 shows that each component of perceived self-efficacy and diabetic self care including those related to diet, exercise, insulin administration and general management.

The weighted mean effect size for the components of self-efficacy and self-care ranged from  $0.70$  to  $1.79$ . These data indicate that the effect of each component of self-efficacy on each component of self care was moderate to large. Most weighted effect size estimates were in the large range, self-efficacy insulin administration / self care insulin administration yielding the largest ( $d = 1.79$ ).

## V. DISCUSSION

As the number of smaller studies investi-

gating the relationship between self-efficacy and self-care in patients with diabetes is steadily increasing, the purpose of this pilot study was to determine the feasibility of using data derived from a synthesis of several research studies to test the relationship between self-efficacy and self-care.

Looking at the sample it is important to note, that five studies were conducted using a sample of mixed types of patients with diabetes (NIDDM and IDDM). Because individuals with NIDDM are generally older and less acutely ill when diagnosed, the psychosocial factors that influence their adherence to the medical regimen and their participation in self-care practices may be different from factors associated with adolescents who are more likely to have IDDM. Therefore, results of studies using patients with NIDDM are not readily generalizable to other groups of individuals with diabetics (Skelly et al, 1995). Of the five mixed samples, two differentiated patients with NIDDM and with IDDM, while others used only adults as their sample. This meta-analysis did not include data on adolescents.

Subject characteristics such as economic status, educational level and race were rarely described, thus hindering the search for association. Brown(1990)b suggested that validity threats such as lack of instrument reliability and validity, lack of hypotheses / research questions, large sample attrition rates, questionable sampling methods, and vague descriptions of sampling and treatment methods, were found fairly consistently in many of the studies.

Brown(1991) stress the importance of measuring research quality of primary studies in meta-analyses. Therefore the quality of the research studies was measured by using the items, study sample, specification of illness, reliabilities of instruments. The total possible score was 9 points, but the item on selection and specification of the study sample was low

because most of the 17 studies selected a convenience study sample from one hospital and did not describe the race or socioeconomic status of the subjects. The item on reliability of instruments was also low, as reliabilities of the instruments used to measure the components of self-care and self-efficacy were not stated. All of the studies, except one, described inclusion or exclusion criteria of the study sample thoroughly which meant that for the item of specification of illness, the scores were relatively high. Eleven studies had, as the first author, a person with a doctoral degree which was considered a strength for these studies.

This meta-analysis study of 17 research articles found that the instrument reliabilities were relatively low and even reliabilities for the components of self-efficacy and self-care (diet, exercise, medication, general management & glucose testing) were not specified in many of the 17 studies.

Although the number of items and scale points of instruments were different, most of 17 studies measured the self-efficacy concept using the theoretical framework of Bandura's social cognitive theory. But the studies of Weerdt, Visser, Kok and Veen(1990) and Wolffenbuttel, Drossaert and Visser(1993) used Fishbein and Ajzen on attitude behavior model as a model for active self care.

As presented in Table 3, the findings indicated that perceived self-efficacy composite was the most effective predictor of self-care medication combined, which means, the higher the belief in one's ability to accomplish a task of self-medication, the higher level of the self-care behaviors associated with management of insulin administration and taking of medication in the daily management of diabetes. These results suggest that in order to improve self-care behaviors in patients with diabetes, nurses should work to increase the level of self-efficacy.

Several studies support the results of this

meta-analysis, Gu(1992) conducted a study in which Bandura's concept was applied to health related behavior for diabetic patients in the first trial in Korea. She commented that the self-efficacy was found to be a more potent predictor of self-care behavior than health belief in ambulatory diabetic patients. This results is similar to those found by Hurly(1988) and Hockmeyer(1990). Recently a study was conducted to investigate whether exercise therapy applied in an efficacy expectation promoting program based on the self-efficacy theory of Bandura would increase self-efficacy for type 2 diabetes patients(Kim, 1998).

Padget et al.(1988) conducted meta-analysis of the effect of educational and psychosocial interventions on management of diabetes mellitus. A total of 417 effect sizes were calculated from the first post-intervention assessments of 93 studies, for an effect size of +0.51, with a 95% confidence interval of  $\pm 0.11$ .

Holden(1991) used 56 articles for meta analysis of the relationship of self-efficacy appraisals to subsequent health related outcomes. The criterion variables of these studies were dental behavior, smoking, pain tolerance, weight loss, recovery from MI, excessive alcohol consumption, and hypertension treatment compliance. In the case of the overall across study weighted mean effect size, the estimates were .2581. He suggested that, in considering the meaning of the across study mean effect size, the critic might invoke 'the apples & oranges' problem. Glass et al(1981) commented that, "it is illogical to compare different studies, that is studies done with different measuring technique, different types of persons and the like"(p. 218).

This meta-analysis addressed this primary criticism of meta-analysis(Glass et al, 1981) by following specified procedures intended to maximize reliability and validity. Sampling bias was reduced by retrieving all published and

unpublished studies using both computer and manual strategies.

Brown(1990)a conducted meta-analysis for the effects of educational interventions in diabetics care. This study results showed that the weighted mean effect sizes (0.49 and 1.05) for the knowledge variable indicated that diabetes education had a moderate to large effect on improving patient knowledge, depending on how knowledge variables were measured. This finding is consistent with previous meta-analysis on patient education (Brown, 1988).

The results of this meta-analysis study in which weighted mean effect sizes range from +0.70 to 1.81, were higher than Brown's (1990)a work. This may be an indication that this meta-analysis yielded relationships with more specific variables. But since reliabilities of the instruments in the sample studies were low or not stated, caution must be applied in unconditionally accepting the results from these effect sizes.

In Korea four studies of meta-analysis were found: Lim,1997: nursing interventions effectiveness for pain management: 21 studies, Lee et al, 1992: nursing interventions on anxiety and/or stress: 68 studies, Lim & Hong, 1997: oncology nursing research: 25 studies, Oh & Seo, 1996: effects of arthritis exercise programs: 28 studies). Their weighted mean effect sizes varied.

This meta analysis has produced positive findings and beginning guidelines for diabetic care nurses. That the author directly coded and computed effect sizes estimates for all studies is one limitation of the study. The other is, that the study did not analyze interaction effects because of small sample size. But important findings have been identified regarding the effect of self-efficacy on self-care.

Further studies on the effectiveness of diabetes patients self-care needs to increase feelings of self-efficacy are needed. Trends in

data are more important than any individual statistical result and the trend of the data from this study clearly shows the effect of self-efficacy on self-care practice.

The results of this study showed that self-efficacy can promote self-care. Future research is needed with experimental design to determine nursing interventions that will increase self-efficacy.

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<Appendix 1>: Studies included in meta-analysis

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