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Research Article

Factors affecting older persons' adherence to prescription drugs in Israel

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Abstract Despite the significance of patients' adherence to prescription drug treatments, it is estimated that > 30% of the drugs that are prescribed to older persons are not self-administered in accordance with the instructions. This research examines which factors affect the adherence to prescription drugs of older Israelis and tests whether the Theory of Planned Behavior (TPB) can explain their adherence. In this cross-sectional survey design, a reliable and valid structured questionnaire, based on the TPB, was administered to a convenience sample of 207 independent older persons who were taking prescription drugs. One-fifth of the sample reported that they did not adhere to their medication regime. The older persons' self-reported adherence to treatment was related to the quantity of drugs that they were required to take and to whether or not they received the support of a primary caregiver. The more confidence that the older persons had in their physician's level of professionalism, the greater their self-reported adherence to the prescription drugs. Behavioral beliefs, behavioral attitudes, perceived behavioral control, and subjective norms were related to the older persons' intention to self-administer medication. We conclude that nurses have an important responsibility in assessing the medication-taking behaviors of older adults.

Key words adherence, medication, older persons, prescription drugs, Theory of Planned Behavior.

INTRODUCTION

In Israel, life expectancy had reached 82.5 years for women and 78.8 years for men by 2007. As a group, persons aged ≥ 65 years are highly likely to suffer from multiple diseases and frequently administer three or more types of medicine daily. Eighty-six percent of those aged ≥ 65 years have reported the use of physician-prescribed medication (Israel Central Bureau of Statistics, 2008). Patient adherence is an important measure of treatment success.

According to Sabate (2003: 3), the World Health Organization defined adherence as "... the extent to which a person's behaviour (taking medication) corresponds with the agreed recommendations of a health care provider." This study defines adherence as the behaviors of procuring the medication, administering the correct drug at the proper dosage and time and by the correct route, and continuing to take the medication for as long as necessary.

The efficient treatment of chronic illness is contingent on patients' adherence to the instructions of medical practitioners. However, despite the significance of adherence to prescription drugs, it is estimated that > 30% of physician-prescribed drugs are not administered according to the instructions. In these cases, the drugs do not produce their maximal therapeutic effect and the patients' health does not improve and even could deteriorate. Estimates indicate that 125,000 deaths occur annually in the USA due to non-adherence to medication (Kane *et al*., 2003). According to estimates, 2400 persons die each year in Israel due to the incorrect use of medication (Lutzky, 2009).

Aside from the harm that is caused to individual patients, the entire healthcare system is affected by this waste of resources (Martin *et al*., 2005; Osterberg & Blaschke, 2005). The exacerbation of illness due to the irregular use of prescription drugs leads to many avoidable emergency room visits and hospitalizations. Thus, the annual financial costs to the healthcare system of non-adherence to medicinal treatment in the USA are estimated at $US100 million (Lehane & McCarthy, 2008).

LITERATURE REVIEW

The research literature cites various factors that affect older persons' adherence to medication and the patient–caregiver relationship is one of the significant factors. Adherence rates have been found to be nearly threefold higher in primary care relationships that are characterized by very high levels of trust, coupled with physicians' thorough knowledge of the patient. In fact, the trust that is accorded to physicians by their patients has been found to far exceed many other variables in its impact on patients' satisfaction with their care (Osterberg & Blaschke, 2005). Patients who

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feel that they have an open line of communication with their physician and who are encouraged by the physician to become involved in self-treatment tend to display more consistent drug adherence. In addition, when physicians and patients concur regarding the patient's degree of involvement, there is a rise in adherence (Martin *et al*., 2005). Patients who are confident of their primary physician's professionalism and knowledge display higher drug adherence despite concerns about the medication's potential side-effects (Chia *et al*., 2006).

Another factor that affects drug adherence is the drug regime. When the treatment regime is complicated and/or requires a change of lifestyle, the lack of adherence can reach 70%. Studies have revealed that treatment adherence diminishes when the patients are required to change their lifestyle in order to self-administer medication frequently throughout the day. The rates of adherence drop to < 20% when the patients must administer >13 drugs daily (Goff *et al*., 2007). The rates of adherence and the reasons for non-adherence are likely to differ according to the specific medication and conditions. The predictors of non-adherence to medication include specific states of disease, such as cardiovascular illnesses and depression (Martin *et al*., 2005).

In order to investigate the rationale leading to the decision to adhere to medical treatment, several studies have been conducted, based on a leading cognitive model identified in the literature, the Theory of Planned Behavior (TPB) (Ajzen, 1991). The TPB aims to explain how individuals reach decisions to carry out or avoid certain behaviors. According to the TPB, behaviors that are under volitional control are the result of intention, which is determined by three factors: the attitude towards the behavior, subjective norms, and perceived behavioral control. A person's attitude towards a behavior is, in turn, determined by: (i) the belief that a given outcome will occur if he or she carries out the behavior; and (ii) the evaluation of the outcome of carrying out the behavior. Subjective norms are determined by individuals' belief about what particular salient individuals want them to do and their motivation to comply with these referents. Perceived behavioral control is based on the beliefs about the perceived ease or difficulty of carrying out the behavior (Ajzen, 1991).

The TPB has been used to identify the cognitive antecedents of a range of health-related behaviors but there have been relatively few tests of this model as pertaining to adherence to medication. The TPB has been found to support (Russell *et al*., 2003) and contradict (Lowry *et al*., 2005) the hypothesis that the model's constructs explain adherence to medication.

AIM OF THE STUDY

In light of the ambiguity regarding the prediction capacity of this theoretical model, the aim of the current study was to clarify which factors affect the adherence of older persons in Israel to prescription drugs and to test the ability of the TPB to explain self-reported adherence.

METHODS

Participants

A cross-sectional survey design was used for this study, with a convenience sample of 250 older persons who were aged ≥ 65 years and who were living independently in central Israel. The volunteers were recruited at synagogues and senior centers. All the participants met the following inclusion criteria: Israeli, aged ≥ 65 years, living in the community, able to communicate verbally in Hebrew or Russian, able to read and write in Hebrew or Russian, and able to provide their own consent to participate.

Instrument

The study's instrument was developed by the researchers, based on the TPB according to the levels that were suggested by Ajzen (2002). It was reviewed by an internal panel of six nurses from the field of geriatrics and community care and three educators for face validity and content validity. The researchers developed a new instrument because there was no existing instrument that related to all the examined topics. The instrument consisted of 71 items, the answers to which were ranked on a multiquestion, Likert-type scale. The dependent variable was self-reported adherence to prescription drugs. This was operationalized with six items that examined the participants' past and present behavior regarding medication administration. The responses were given on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree"); for example, "Sometimes, I skip prescribed medicine doses" and "Sometimes, I take medicine at different times than those prescribed."

The independent variables were:

1 Demographic details: this part included five items that examined the personal demographic background of the research population (sex, age, place of birth, year of immigration, and education).

2 Sources of support: this part included two items. The first part referred to the chronically ill patient's place of residence and the second part related to the identity of the persons who were assisting him or her.

3 Level of functioning: this topic was examined by two items, the first of which asked the participants to evaluate their level of functioning on a scale that ranged from 1 ("independent") to 4 ("needs full assistance"), while the second item asked the participants to evaluate their level of health on a scale that ranged from 1 ("excellent") to 4 ("very bad").

4 Medical diagnoses: this topic was examined by seven items, the first of which asked the participants to state whether or not they had a specific medical diagnosis through a dichotomous answer: 1 ("no") or 2 ("yes"). Another item enabled the participants to freely note other medical diagnoses, while the other five items checked whether or not the participants had problems with vision, hearing, and shaky hands, as well as blindness and deafness, through a dichotomous answer: 1 ("no") or 2 ("yes").

5 Belief in the quality of medical care: this topic was examined by one item on a scale that ranged from 1 ("I have no trust at all") to 5 ("I have a great deal of trust").
6 Behavioral beliefs: 12 items examined the participants' beliefs about the positive and negative effects of taking medication; for example: "Taking prescription drugs prevents unnecessary medical complications." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").
7 Normative beliefs: three items examined the participants' perception of their significant others and the pressure that was applied by them on the issue of medication; for example: "My children think that I should take all the medication prescribed for me." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").
8 Subjective norms: three items examined the participants' perception of the beliefs of their significant others; for example: "My children's beliefs regarding taking medication are very important to me." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").
9 Behavioral attitudes: eight items examined the participants' positive or negative overall opinion of administering medication; for example: "My medicine protects me and prevents exacerbation of illnesses." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").
10 Perceived behavioral control: 20 items examined the participants' opinions about the factors that might delay or facilitate the carrying out of the behavior; for example: "If the physician would involve me in determining my medical treatment, I would be more compliant with the treatment." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").
11 Intention to adhere to prescription drugs: three items examined the participants' intention to self-administer prescription drugs; for example: "I intend to take all the medication prescribed by my physician." The items were answered on a scale that ranged from 1 ("completely disagree") to 4 ("completely agree").

The instrument was tested on 10 older persons without subsequent revisions. Two expert nurses in the field then examined the content items. The questionnaire was translated into Russian and then translated back into Hebrew. The internal consistency of all the items was sufficient, with a Cronbach's alpha of 0.649–0.858.

Ethical issues and data collection

Permission to conduct the research was granted by the Pat Matthews Academic School Ethics Committee. Following the approval of the study, the questionnaire was administered by the researchers to 250 older persons who were residing independently in central Israel. Only 207 questionnaires were fully completed; thus, the response rate was 84%. Informed written consent was obtained from the participants. Each participant received an instruction sheet together with the questionnaire. This instruction sheet included explanations of the research topic and assured the participants that the questionnaire was completely anonymous. The respondents self-completed the questionnaire, which took 20 min on average. The study was conducted between January and April 2010.

Data analysis

The data analysis was carried out with the Statistical Package for Social Sciences (SPSS-PC-15; SPSS: An IBM Company, Chicago, IL, USA). Descriptive statistics were used to depict the demographic characteristics of the sample and the responses to the TPB and its subscales. The mean and standard deviation (SD) of the responses were calculated. Pearson's correlations, the χ^2-test, and the linear regression forward approach were used to determine the correlation between the research variables.

RESULTS

Participants' demographics

Ninety-seven (47%) participants were male and 110 (53%) were female. The age distribution was as follows: 57 (27.5%) were aged 65–74 years, 102 (49.3%) were aged 75–84 years, and 48 (23.2%) were aged $\geq$ 85 years. Regarding the country of origin, 109 (52.9%) were born in the former Soviet Union and 98 (47.1%) were born in Israel and other countries. More than 130 (62.8%) had a secondary or tertiary education, while 78 (37.7%) lived on their own and the other 129 (62.3%) lived with a relative. All the participants who needed significant assistance or who could not function without assistance lived with a caregiver and/or relative. One-hundred-and-forty-four (69.8%) were assisted by a relative in their daily life, while 62 (30.2%) received no assistance. Regarding the assistance that was needed, 83 (40.1%) defined themselves as independent, 65 (31.4%) needed some assistance, 48 (23.2%) needed a lot of assistance, and 11 (5.3%) could not function without assistance.

Participants' state of health

One-hundred-and-twenty-eight (62.2%) participants defined their state of health as fair and 49 (23.7%) defined their state of health as unsatisfactory. The illnesses that affected the participants were: cardiac illnesses (113, 54.6%), joint illnesses (116, 56.3%), diabetes (69, 33.2%), digestive illnesses (105, 51%), mental illnesses (31, 14.9%), and hypertension (133, 64.3%). One-hundred-and-twenty-seven (61.2%) participants reported visual difficulties, 12 (5.9%) reported blindness, 98 (47.3%) reported hearing difficulties, 10 (5%) reported deafness, and 66 (31.9%) reported shaky hands. No correlation was found in this study between the participants' background illnesses and their functional problems and adherence to medical treatment. No gender difference was found in relation to their adherence to medical treatment.

Administering medication

One-hundred-and-thirty-six (65.7%) participants regularly took more than five medications. Most of them (161, 78.0%)

Table 1. Adherence to medication at different levels of functioning ($n = 207$)

Degree of independence†	N (%)	Mean (SD)	*P*-value
Independent	83 (40.0)	1.1 (0.3)	0.01
Needs some assistance	65 (31.4)	1.2 (0.5)	
Needs a lot of assistance	48 (23.2)	1.5 (0.5)	
Needs full assistance	11 (5.3)	2.6 (0.5)	

†Level of functioning was ranked on a scale that ranged from 1 ("independent") to 4 ("needs full assistance").

Table 2. Model variables ($n = 207$)

Variable	Median	Range	Mean	SD
Behavioral beliefs	3.1	2.8	3.0	0.59
Behavioral attitudes	2.7	3.0	3.0	0.53
Normative beliefs	3.0	3.0	2.7	0.80
Subjective norms	3.0	3.0	2.8	0.80
Behavioral intentions	3.1	3.0	3.0	0.90
Perceived behavioral control	2.0	2.0	2.1	0.40
Behavior	1.3	2.0	1.4	0.50

Responses were ranked on a Likert scale that ranged from 1 ("completely disagree") to 4 ("completely agree").

attested that they self-administered all the medicines that were prescribed to them. However, 37 (17.9%) reported that they took only some of the prescribed medications and eight (4.1%) reported that they did not take any of their prescribed medications. Fifty-five (22%) participants administered medications at different times than those prescribed, while 37 (18%) took other medications that had not been prescribed by the physician. Thirty-one (15%) participants skipped doses and 25 (10%) administered higher doses than prescribed.

The one-way ANOVA found a significant difference ($f\,[3, 203] = 3.2$, $P < 0.05$) between the degree of independence and the participant's adherence to prescription drugs. As indicated in Table 1, the level of adherence was higher among the participants who required full assistance with daily functioning.

Regarding the theory constructs (see Table 2), the results showed that the participants had positive behavioral beliefs and attitudes regarding adherence to prescription drugs (mean = 3.0, SD = 0.59 and mean = 3.0, SD = 0.53, respectively). For example, 128 participants (62%) believed that taking medication prevented medical complications, 163 (79%) asserted that their state of health depended on taking medication, and 157 (76%) thought that medication protected them by preventing an exacerbation of the disease. The normative beliefs and subjective norms were found to be positive, in that the participants claimed that their physician (142, 68.6%), spouse (137, 66%), and children (118, 57%) encouraged them to take their medications. However, most of the participants attributed a greater significance to the physician's recommendations (172, 83%). The behavioral intention to administer medications in the future was high (mean = 3.0, SD = 0.9) but, in practice, self-reported adherence to medications was found to be lower (mean = 1.4, SD = 0.5).

The participants' perceived behavioral control regarding adherence to prescription drugs was on an intermediate level (mean = 2.1, SD = 0.4). The factors that, in the participants' opinion, could increase their control of taking prescription drugs are presented as follows in descending order: an immediate improvement in their state of health (161, 78%), the physician's inclusion of the participants in determining the medical treatment program (153, 74%), confidence in the physician's professionalism (118, 57%), and taking few drugs (120, 58%). A modest positive correlation ($r = 0.62$, $P < 0.01$) was found between the older persons' confidence in their physician's professionalism and their self-reported adherence to medication: the more confidence that the participants had in their physician's professionalism, the greater their self-reported adherence to prescription drugs. The education level of the participants did not affect their confidence in speaking with physicians.

Regarding the Pearson's correlations between the theory constructs (Table 3), correlations were found among all the theory constructs, aside from the normative beliefs. Of all the model variables, those with the highest positive power were perceived behavioral control ($r = 0.62$, $P < 0.01$) and behavioral beliefs ($r = 0.37$, $P < 0.01$).

All the variables that were found to be significant in the univariate analysis subsequently were included in a linear regression model in order to examine the relative impact of the variables in explaining the older persons' adherence to medication. Table 4 indicates that behavioral beliefs and attitudes and beliefs regarding perceived behavioral control were predictors of the behavior of self-administering medication. Thus, the participants who held positive beliefs and attitudes towards self-administering prescription drugs and who felt that they had a high degree of perceived behavioral control over their ability to self-administer prescription drugs displayed a higher level of adherence to the administration of prescription drugs. Based on the linear regression, these constructs predicted 38% of the self-reported adherence to the administration of prescription drugs among the older persons.

DISCUSSION

The purpose of this study was to examine which factors affect the self-reported adherence of older persons in Israel to prescription drugs and whether or not Ajzen's (1991) TBP succeeds in explaining self-reported adherence to this behavior. The results showed that self-reported adherence to medication was higher in this study than in many previous studies (Carey & Cryan, 2003; Lutzky, 2009): 78% of the older persons reported full adherence to their prescribed drugs. The high level of adherence was related to the need to take fewer medications, as found by Goff *et al*. (2007) and Williams *et al*. (2008), who showed that the number of daily medications that their participants had to take could have a

Table 3. Pearson's correlations for the Theory of Planned Behavior constructs

Variable	Behavioral attitudes	Normative beliefs	Subjective norms	Perceived behavioral control	Behavioral intentions	Behavior
Behavioral beliefs	0.39**	0.18**	0.37**	0.40**	0.22**	0.37**
Behavioral attitudes	–	0.11*	0.30**	0.17*	0.16*	0.24*
Normative beliefs	–	–	0.51**	0.13	0.02	0.03
Subjective norms	–	–	–	0.02*	0.07*	0.17*
Perceived behavioral control	–	–	–	–	0.42**	0.62**
Behavioral intentions	–	–	–	–	–	0.25**

*$P < 0.05$, **$P < 0.01$.

Table 4. Linear regression to examine the research model regarding the actual administration of medications

Variable	*B*	SE *B*	β	*P*-value
Behavioral beliefs	1.472	0.325	–0.210	0.000
Behavioral attitudes	0.320	0.060	–0.046	0.005
Subjective norms	–0.076	0.041	–0.120	0.100
Behavioral intentions	–0.025	0.033	–0.048	0.170
Perceived behavioral control	0.498	0.081	0.431	0.010

$R^2 = 0.38$.

significant effect on changes in their daily schedule. Thus, the level of adherence dropped to < 20% when the participants had to administer > 13 medications daily (Goff *et al*., 2007; Williams *et al*., 2008).

The results indicated a significant modest correlation between behavioral beliefs and attitudes and the intention to administer medication. A possible explanation might be related to the importance of self-perception as affecting adherence to long-term medical treatment. When patients hold beliefs regarding certain components of their treatment, they will try to behave according to their beliefs and their adherence will be affected accordingly. For example, persons with diabetes mellitus who believed that physical activity and maintaining proper nutrition were sufficient to keep the disease balanced were disinclined to adhere to the recommended medication and focused only on maintaining proper nutrition and physical activity (Sanchez-Sosa, 2002).

Significant moderate correlations were found between the subjective norms (namely, the patient's beliefs) and what others think about the behavior that the patient must adopt in regard to prescription medications. However, the hypothesis regarding the impact of normative beliefs was disconfirmed and no correlation was found. Nonetheless, subjective norms do increase the impact of social considerations on persons' decisions regarding medication and the most important person who affects adherence to prescription drugs is the physician. Similar findings were presented in a study by Martin *et al*. (2005), who showed that the patients who felt more able to openly communicate with their physician and who were encouraged by the physician to become involved in their self-treatment were more inclined to persevere in their medical treatment. The present results also indicated a moderate positive correlation between the patients' confidence in the physician's professional ability and their adherence to the medication that was prescribed by this physician. Thus, the more confident that the patients felt about their physician's professionalism, the higher their adherence to prescription drugs. Findings supporting this claim are evident in a study by Chia *et al*. (2006), who found that when the patients felt confident in their primary physician's professionalism and knowledge, they were more inclined to adhere to treatment despite their concerns of the medication's side-effects.

The results showed a significant positive correlation between the perceived behavioral control over administering medication and the self-reported adherence to prescription drugs. The patients who had difficulty with their perceived behavioral control of medication administration, such as a difficulty with splitting tablets, buying medication, and opening packages, had more difficulty in adhering to the medication regime. However, when the older persons had a low level of independence but were cared for by significant others, their level of adherence rose.

This study indicated that the caregivers who were involved in the administration of medication were significantly associated with better self-reported drug adherence by the older persons. These results were consistent with other studies that showed that the help of caregivers facilitated drug adherence and stability and that the support of a family caregiver was strongly correlated with patients' drug adherence level (Barat *et al*., 2001; Gatti *et al*., 2009).

Limitations of the study

This study presents a cross-sectional picture of self-reported medication adherence. Cross-sectional studies suffer from an inability to determine true causal relationships and the stability of these relationships over time. A key limitation of the study is the use of self-report to measure medication adherence. Another limitation is the fact that the TPB gives little attention to the origin of beliefs and how these beliefs can influence other behaviors. The TPB largely depends on rational processes and does not allow explicitly for the impacts of emotions or religious beliefs on behavior, which might be

relevant for other illnesses. A limitation of the instrument was that it was lengthy and thus unwieldy for use with older persons.

Implications for practice and further research

Nurses have an important responsibility for assessing the medication-taking behaviors of older adults. In practice, nurses should assess older persons' religious beliefs in their impact on adherence to medication. In their role as providers of information, nurses should instruct older persons regarding the prescribed medication and its efficiency. Nurses are also in a unique position to teach older adults how to communicate with prescribing practitioners by role-modeling good communication techniques and encouraging the older adults and their caregivers to be informed medication consumers, thus reinforcing the patients' trust in their caregivers. Finally, nurses should appraise whether older persons have difficulty in administering their medication due to their health condition and should teach them techniques that will make it easier to take medication, particularly in the case of patients who have no supporting family member. In regard to further research, it is recommended that nurses should examine the different perceptions of the various cultures within Israeli society and their effect on adherence to prescription medications.

CONCLUSIONS

The results of this study support the validity and utility of the model for explaining older persons' adherence to medication. Older persons who hold positive beliefs and attitudes towards adhering to medication and whose self-perception is that taking medication is a behavior that they control will demonstrate higher adherence to medication. In addition, older persons who require daily assistance and have a primary caregiver who is in charge of their medication will demonstrate higher adherence. Older persons who have a highly trusting relationship with their physician and a small number of medications will have higher adherence to their medication regime.

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