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Predicting psychological factors affecting regular physical activity in hypertensive patients: Application of health action process approach model

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Abstract

Aim: The aim of this study was to determine the factors affecting the behaviour of regular physical activity in patients with hypertension using the health action process approach (HAPA) model.

Design: This cross-sectional study was conducted on 176 hypertension patients, in Astaneh-e-Ashrafiyeh, Guilan, Iran, 2018–2019.

Methods: Data collection tools included demographic characteristics, medical history, the short form of International Physical Activity Questionnaire (IPAQ) and scales related to the HAPA model. The data were analysed using chi-square, independent *t* test, one-way ANOVA, Pearson's correlation coefficient and path analysis on AMOS, version 23.0.

Results: Action self-efficacy ($\beta = 0.59$), outcome expectancy ($\beta = 0.20$) and risk perception ($\beta = 0.18$) had a statistically significant effect on intention. Moreover, the path coefficient between intention ($\beta = 0.35$) and coping self-efficacy ($\beta = 0.29$) with physical activity was statistically significant. The results revealed that HAPA constructs were able to describe 45% of the variance in intention and 31% of the variance in physical activity behaviour.

Conclusion: The HAPA model is a useful framework for describing the factors affecting physical activity in hypertension patients.

KEYWORDS

HAPA Model, hypertension, physical activity, risk perception, self-efficacy

1 | INTRODUCTION

Physical activity is defined as any movement produced by the body's musculoskeletal system, which ultimately leads to increased energy consumption. Despite the frequent use of the word "exercise" instead of physical activity, it should be noted that exercise as a sub-branch of physical activity is a set of planned, structured, repetitive and purposeful movements performed with the goal of physical fit in mind (Dasso, 2019). Regular participation in moderate-to-severe physical activity and limiting sedentary lifestyle play a highly important role in reducing health outcomes in children, youth and adults (Carson et al., 2016). According to the World Health Organization (WHO), physical inactivity is the fourth leading cause of death, accounting for 3.2 million deaths annually (WHO, 2009). In return, the results of various studies over the past two decades display that exercise and fitness diminish the relative risk of death by 20%–35%, especially deaths caused by cardiovascular disease (Myers et al., 2004; Golbidi & Laher, 2013). In addition, regular physical activity is helpful in regulating body weight and strengthening the cardiovascular system. Regardless of the abundant potential physical, psychological and cognitive benefits of physical activity, nearly 80% of adolescents (13–15 years old) do not have enough physical activity, and more than 60% of children engage in sedentary behaviours for more than 2 hr a day (Hallal et al., 2012). A sedentary lifestyle involves risky manners that would influence on diseases such as arterial occlusion and heart disease, with affecting on life expectancy. Moreover, low physical activity is reported to be a risk factor for high blood pressure (Kementerian Kesehatan RI, 2018).

With regard to WHO report (2009), 1.13 billion people worldwide are suffering from hypertension (Wijeratne et al., 2018), and it is estimated that at least 60% of adults will have hypertension by 2025 (Mills et al., 2020). Additionally, studies indicate an increasing prevalence of hypertension in developing countries including Iran (Akbari et al., 2017). For example, the prevalence of hypertension in major Iranian cities such as Tabriz, Tehran and Shiraz was reported as 20.8%, 22% and 25.8%, respectively (Mirzaei et al., 2016).

Hypertension is the strongest contributing factor for cardiovascular disease, stroke and renal dysfunction (Saeed et al., 2020). Furthermore, 50% of ischaemic heart disease and 25% of cardiovascular diseases are attributable to hypertension (Perumareddi, 2019). Lifestyle changes along with major risk factors such as unhealthy eating habits, alcohol consumption, smoking, stress, obesity and overweight, and inactivity have a considerable impact on developing the prevalence of hypertension (Liesenborghs et al., 2020). Physical activity as an alternative non-pharmacological strategy plays an effectual role in accelerating the healing process and preventing the complications associated with hypertension. Individuals with obesity, overweight and insufficient physical activity have almost twice the risk of cardiovascular disease than those with normal weight and regular physical activity. Moreover, orderly physical activity decline the risk of coronary artery disease and stroke (Pescatello et al., 2019).

Physical activity is a complex behaviour influenced by wide variety of psychosocial causes, and therefore, it is not easy to change. However, if one succeeds in altering it, maintaining and continuing regular physical activity will be difficult. Understanding the psychological factors involved in the motivations and decisions of patients with hypertension to engage in unhealthy behaviours is an undeniable necessity before designing interventions. Identifying these components as a guide could lead to choosing the most effective techniques to change those psychological factors that are strongly related to physical activity (Hagger & Hardcastle, 2014; Michie & Johnston, 2012). In this regard, applying theoretical framework would provide a guide on how to develop and implement interventions, identify the momentous changeable key constructs and also allow for more accurate measurement of interventions' impact (Knǎuper et al., 2012). Moreover, after confirming the causal relationships proposed in the theories, a map can be prepared for effective future interventions (Conner & Sparks, 2005).

Previous research has examined the efficiency of prominent theoretical frameworks for predicting the physical activity behaviour in individuals with disease or disability, which includes the theory of planned behaviour (Bao et al., 2020), health belief model (Mo, Chong, Mak, Wong, & Lau, 2026), social cognitive theory (Elizabeth Morghen & Robert, 2020), trans-theoretical model (Romain & Abdel-Baki, 2017) and protection motivation theory (Plotnikoff et al., 2010). Given the results of such studies, good guidelines have been provided for designing interventions related to improving physical activity, with highlighting two issues: first, the importance of identifying factors that affect intention, and second, filling the gap between intention and behaviour.

Reviewing the studies that have used the health action process approach (HAPA) displays that the motivational phase of the HAPA is the best predictor of intention, and also, planning is a statistically significant mediator between intention and behaviour. Therefore, the current study was conducted with two objectives: (a) to identify the determinants of physical activity behaviour in patients with hypertension and (b) to examine the relationships between constructs specified in the HAPA model.

One of the effective models for understanding the psychological factors influencing healthy behaviour and designing educational interventions is HAPA model that is able to predict a wide range of health behaviours including physical activity. Introducing by Schwarzer (2008), the HAPA model is rooted in Bandura's social cognitive theory (SCT). The basic assumption of the HAPA model is that "individuals have to go through two motivational and voluntary stages to accept and practice a particular behavior." In the motivational phase, three factors influence behavioural intention: risk perception, outcome expectancy and action self-efficacy. Subsequently and after this stage, individuals prepare themselves for acceptance of certain behaviours and related decisions. In other word, with forming the behavioural intention, the individuals enter a voluntary phase consisting of action planning, coping planning, coping self-efficacy and recovery self-efficacy (Zhang et al., 2019).

The HAPA model has been applied in prediction and designation of different educational interventions across a range of health behaviours. In addition, the HAPA model has been used to determine and predict physical activity in different groups. Steca et al. (2015) reported that HAPA model constructs are able to predict physical activity behaviour in a sample of hypertensive patients (Steca et al., 2017). Moreover, Parschau et al. (2014) confirmed the efficacy of the HAPA model in identifying factors affecting physical activity behaviour in a sample of obese adults (Parschau et al., 2014).

Characterizing the major psychosocial variables impacting health behaviours is a crucial step before designing targeted educational interventions (Ryan et al., 2008). For this reason, identifying the most important physiologically relevant factors influencing regular physical activity in patients with hypertension is the first phase of randomized controlled trials (RCT) to control hypertension and its associated consequences. Therefore, given the increasing prevalence of hypertension in Iran, its serious and widespread consequences, statistically significant correlations between physical activity and reduction in complications of hypertension, and the efficacy of the HAPA model in predicting factors affecting physical activity, the present study aimed to apply the HAPA model to predict factors affecting regular physical activity behaviour in patients with hypertension in Astaneh-ye-Ashrafiyeh city in 2018–2019.

More specifically, we considered that the data would fit the model well. This hypothesis was suggested based on the results of previous studies related to the HAPA model. In addition, it was assumed that the model would support direct relationships between motivational phase predictors (i.e. risk perceptions, outcome expectancies and task self-efficacy) and behavioural intention.

2 | METHODS

This study was a descriptive cross-sectional study conducted in Astaneh-ye-Ashrafiyeh between September 2018–February 2019. Astaneh-ye-Ashrafiyeh is a city with a population of approximately 250,000 located in the centre of Guilan province and the southern border of the Caspian Sea.

2.1 | Statistical population and sampling process

The statistical population consisted of all patients with hypertension who referred to healthcare centres in Astaneh-ye-Ashrafiyeh for regular care. The sample size was calculated using Cochran's sample size formula and considering the desired values as follows:

N (the total number of patients) = 400.

Z = 1.96.

Sampling error or $d = 0.05$.

The estimated proportion or $p = .20$.

$$n=\frac{Nz^2Pq}{Nd^2+z^2pq}=\frac{400\times1.96^2\times0.20\times0.80}{400\times0.05^2+1.96^2\times0.20\times0.80}\approx152.$$

Finally, 176 patients were selected to participate in the study, with regard to the 15% dropout.

As for the first step, a list of all patients with medical records at healthcare centres was prepared. Selection of the attendees was based on a random number table prepared with purposive sampling method. After identifying the volunteer patients, the objectives of study were explained to them by telephone, and the participants were asked to set a specific date for completing the questionnaire based on a timeline proposed by the research team. The inclusion criteria included informed and voluntary consent, a history of high blood pressure diagnosis for at least 1 year or more, lack of physical illness or mental disorders, and reading and writing literacy. Moreover, patients with primary hypertension and receiving medication regimens of angiotensin-converting enzyme (ACE inhibitors), angiotensin blockers and beta-blockers were excluded from the study.

Patients completed the questionnaire at the hospital training site for approximately 40 min. One researcher was present at the site with the aim of ensuring the precise completion of questionnaire, resolving ambiguities and appreciating patients for participating in the research. The questionnaires were designed anonymously, and patients were assured that all information would remain confidential.

2.2 | Instrument and data gathering tools

The data collection tools in the current study were as follows:

A *The demographic characteristics and medical history* of patients included age, gender, education, economic status, body mass index (BMI), duration of disease (year), and systolic and diastolic blood pressure.

B *Risk Perception* was measured using a 3-item, 7-point Likert-type scale ranging from 1 (very unlikely)–7 (very likely). This scale was used to measure the major consequences of physical activity and its effect on hypertension. The scale was designed according to the study of Steca et al. (2017) and based on recommendations of Schwartzer (Schwarzer, 2016). Sample question for the scale was as follows: “Without regular physical activity, how likely they are to develop cardiovascular diseases, stroke, and renal dysfunction over the next year.” Items were averaged to form an overall measure, and the scale was scored as the higher scores reflected higher risk perception. Cronbach's α ($\alpha = 0.87$) and test–retest coefficient at two-week interval ($r = 0.81$) confirmed the internal consistency and reliability of the scale.

C *Action self-efficacy* was assessed using a 3-item scale. Given the conditions of the disease, how much are they able to have physical activity based on the recommendations? Sample questions of this scale were as follows: “(1) How much they can be physically active once a week; (2) How much they can be physically active at least 5 times a week for 30 min?” The items scored using a 4-point Likert scale, ranging from 1 (not true at all)–4 (extremely true). The total score ranged between 3–12, where higher scores indicated greater action self-efficacy. This scale referred to Steca et al. (2017) study, based on Schwartz's recommendations (Schwarzer, 2016). The internal consistency and reliability of this scale were evaluated and confirmed in the current study, being 0.87 and 0.90, respectively.

D *Positive Outcome expectancy*: A 10-item scale was used to evaluate outcome expectancy. Patients were asked to respond items using a 4-point Likert scale ranging from 1 (not at all true)–4 (completely true). All items had the stem: “If I have regular physical activity…” followed by positive consequences “…then it would be good for my blood pressure”, “…then I will do something good for my health and my fitness." The psychometric properties of this scale have been well established in previous studies (Caudroit et al., 2011; Hattar et al., 2016; Steca et al., 2017). In addition, the reliability and internal consistency of this scale were confirmed by test–retest of r = 0.78 and Cronbach's α 0.81, in the present study.

E *Behavioural Intention*: A 3-item scale with 5-point Likert response options ranging from 1 (completely disagree)–5 (completely agree) was used to assess this construct, namely "I intend to exercise 30 min or more on at least 5 days a week." The psychometric properties of the behavioural intention scale have been validated (Caudroit et al., 2011; Hattar et al., 2016; Stecaet al., 2017). Moreover, Cronbach's α coefficient (α = 0.88) and test–retest coefficient (r = 0.90) confirmed the internal consistency and reliability of the scale, respectively.

F *Planning Scale*: This scale is comprised of two subscales including action planning and coping planning. Items were rated on a 4-point Likert scale ranging from 1 (strongly disagree)–4 (strongly agree). The action planning subscale consisted of 5 items. An example of the items used was as follows: "I have a detailed plan for when I'm going to exercise/ where I'm going to exercise." The mean scores of the responses were used to calculate the total score of the action planning subscale. The internal consistency and reliability of the action planning subscale were confirmed by Cronbach's α coefficient (α = 0.85) and test–retest coefficient (r = 0.83), respectively. Also, the Coping Planning subscale was assessed with 4 items. The root of the items on this subscale was "If something is bothering me about my physical activity, I have a detailed plan for dealing with it." In addition to confirming the validity and reliability of this subscale in previous studies (Caudroit et al., 2011; Hattar et al., 2016; Steca et al., 2017), its psychometric properties were validated in the pilot study (r = 0.79, α = 0.82).

G *Coping Self-Efficacy*: This construct was measured according to previous studies with an 11-item scale (Hattar et al., 2016; Steca et al., 2017). The root of the questions on this scale was "I'm sure I can have regular physical activity even if…". Patients responded to the item based on the apparent obstacles to regular physical activity, that is, "I can't see the signs and effects of physical activity quickly and urgently"; "I'm tired"; "Nobody encourages me to do it." The sentences were answered with a 4-point Likert scale ranging from 1 (strongly disagree)–4 (strongly agree). Finally, the mean of the responses was calculated as the total score of coping self-efficacy. In addition to confirming the psychometric properties of this scale in previous studies (Hattar et al., 2016; Steca et al., 2017), internal consistency and reliability of the coping self-efficacy scale were also confirmed in the present study (r = 0.76, α = 0.79).

The face validity and content validity of the HAPA-related scales were evaluated by quantitative and qualitative methods. For this purpose, a ten-member expert's panel evaluated the face validity of the questionnaires qualitatively. The cardiologist, internal surgical nurse, health education specialist, psychologist and general practitioner were panel members. Expert panel assessed the level of difficulty, the amount of appropriateness, ambiguity of phrases and semantic incompatibility of words. Then, the face validity of the questionnaire was confirmed qualitatively by making minor changes in accordance with the opinions of the expert panel. Subsequently, the impact score of each question was calculated to determine the face validity quantitatively. First, a 2-point Likert scale was considered for all questions related to the HAPA model such as "Completely disagree (1), disagree (2), no idea (3), agree (4) and completely agree (5)." Second, the scales were given to 10 participants in order to measure the quantitative validity. Finally, quantitative face validity was calculated using the formula of the item effect method as follows: "Impact score = frequency (%) × Importance." Furthermore, in order to evaluate the content validity qualitatively, 4 general practitioners were asked to express their opinions about issues such as compliance with grammar by carefully examining the questions related to HAPA model. In order to investigate the content validity qualitatively, 4 general practitioners and 2 nurses evaluated the issues in the HAPA-related scales that were included grammar compliance, use of appropriate words, importance of items and placement of items in their proper place. After making corrections in HAPA-related scales, the content validity ratio (CVR) and content validity index (CVI) were used in order to determine the content validity quantitatively. The value of these two indicators (CVI and CVR) was reported to be higher than 7 for all scales associated with the HAPA model, which confirmed the content validity. Finally, the validated version of the scales was completed in two weeks by 15 participants and the test–retest coefficient was used to assess the reliability and Cronbach's alpha coefficient to determine the internal consistency of the scales. All participants in the pilot study were selected from the main population using random sampling and were barred from participating in the main study.

A *International Physical Activity Questionnaire (IPAQ)*: The amount of physical activity was self-reported using a shortened version of the IPAQ. The questionnaire consisted of 7 questions assessing the level of physical activity of a person in the past week. In this questionnaire, MET values for walking, average physical activity and intense physical activity were computed as 3.3, 4 and 8, respectively. Moreover, to calculate the total amount of physical activity per week, the amount of walking (day × minute × MET) or moderate physical activity (day × minute × MET) and intense physical activity (day × minute × MET) were aggregated in the past week. The IPAQ questionnaire is standard, with confirming its validity and reliability by Vasheghani-Farahani et al. (2011), after translating the tool into Persian.

2.3 | Ethic considerations

The present study has been approved by the Ethics Committee of Qazvin University of Medical Sciences (IR.QUMS.REC.1397.280). Also, in order to adhere to the research ethics, patients were emphasized that participation in the study was voluntary and unwillingness to engage in research will not have an impact on receiving routine care. Additionally, the questionnaires were anonymous, with all information being kept confidential by the research team.

2.4 | Data analysis and statistical tests

After completing the questionnaires by the patients participating in the study, the data were entered into SPSS, Version 24.0. Data normality was confirmed according to Kolmogorov–Smirnov test. Then, they were subjected to chi-square test, independent and paired *t* tests, one-way ANOVA and Pearson's correlation coefficient.

Moreover, path analysis using AMOS 23.0 was used to evaluate the causal relationships and determine the major factors affecting physical activity in patients with hypertension participating in the study. In other words, path analysis was performed using maximum-likelihood estimation (MLS) to investigate the relationship between HAPA model-related constructs and physical activity behaviour in hypertensive patients. Also, the following indices were used to assess the fit of the model: χ^2/df, normal fit index (NFI), comparative fitness index (CFI) and root mean square error of approximation (RMSEA). If the amount of the χ^2/df was <2, the CFI and NFI indexes were more than 0.90, the value of the RMSEA index was <0.06, and the model would have an acceptable fit (Gunzler et al., 2013). The significance level in the present study was considered <0.05.

3 | RESULTS

The findings in Table 1 show the demographic characteristics and information about the medical history of patients with high blood pressure participating in the study. The mean age of the patients was 49.54 ± 8.60 years, and the mean body mass index was 27.38 ± 4.30. Also, roughly 41% of the participants had primary education, and 87.5% were married. Economically, 66% of the attendees were medium.

Table 2 compares the mean and standard deviation scores of the HAPA model constructs between male and female patients in relation to physical activity behaviour (independent *t* test). The results showed that there was no statistically significant difference between the patients of the two groups in terms of the HAPA model constructs.

The comparison of physical activity amongst patients with hypertension in terms of gender is given in Table 3. With regard to the results of independent *t* test, no statistically significant difference was observed between male and female patients in terms of the total score of physical activity and its different levels.

The results of the chi-square test indicated that there was a statistically significant relationship between gender and level of physical activity behaviour ($p < .001$; Table 4). To be more specific, the percentage of female patients with low physical activity level (69.47%) was statistically significantly higher than male patients (56.79%) with the same level activity ($p < .001$).

Findings related to Pearson's correlation coefficients indicated a statistically significant and positive correlation between physical activity behaviour and HAPA model structures (Table 5). The correlation coefficients between behavioural intention ($r = 0.057$, $p < .01$), coping efficacy ($r = 0.49$, $p < .01$), action self-efficacy ($r = 0.46$, $p > .001$) and the outcome expectancy ($r = 0.043$, $p < .01$) with physical activity were positive and statistically significant. Besides, correlation coefficients between action self-efficacy ($r = 0.62$, $p = .001$), planning ($r = 0.45$, $p = .01$) and outcome expectancy ($r = 0.39$, $p = .001$) with behavioural intention were positive and statistically significant. Referring to these findings, there were positive and statistically significant correlation coefficients between behavioural intention and HAPA constructs. Moreover, the highest correlation coefficient was reported between behavioural intention and action self-efficacy ($r = 0.62$, $p = .01$), while the lowest was observed between behavioural intention and coping self-efficacy ($r = 0.19$, $p = .001$).

TABLE 1 Demographic characteristics and background characteristics of patients with hypertension participating in the study ($N = 176$)

Variables	Categories	Mean	Standard deviation
Age (year)		49.54	8.63
Weight (Kg)		73.25	10.82
Height (cm)		166.4	9.41
Body mass index		27.38	4.30
Disease duration (month)		51.23	28.2
Blood pressure (mmHg)	Systolic	126.44	6.65
	Diastolic	78.5	5.92
Variables	**Categories**	**Frequency**	**Percentage**
Education	Elementary	72	40.91
	Middle school	50	28.41
	High school	29	16.48
	University	25	14.2
Gender	Male	81	46.02
	Female	95	53.98
Marital status	Married	154	87.5
	Single	7	3.98
	Other	15	8.52
Economic status	Very week	22	12.50
	Week	25	14.20
	Medium	116	65.91
	Good	13	7.39
Job status	Unemployed	14	7.96
	Retired	9	5.12
	Freelance job	10	5.68
	Employee	21	11.93
	Farmer	69	39.2
	Housewife	53	30.11

TABLE 2 Mean and standard deviation of HAPA model constructs in relation to physical activity behaviour in patients with hypertension participating in research in terms of gender

HAPA constructs	Score range	Patients		Sig level
		Male	Female	
Risk perception	3–21	14.25 ± 3.72	16.54 ± 4.11	0.118
Outcome expectancy	10–40	20.43 ± 5.17	21.80 ± 6.33	0.206
Action self-efficacy	3–12	7.16 ± 2.51	7.42 ± 2.38	0.393
Behavioural Intention	3–15	9.66 ± 2.84	10.14 ± 2.93	0.160
Action plan	5–25	14.19 ± 4.48	16.07 ± 5.11	0.495
Coping plan	4–20	10.83 ± 3.51	10.74 ± 3.67	0.119
Planning	9–45	23.44 ± 5.26	22.83 ± 6.12	0.203
Coping self-efficacy	11–44	26.35 ± 7.60	28.08 ± 8.12	0.365

Figure 1 displays the path analysis and regression coefficients Hallal et al. (2012), Kementerian Kesehatan RI (2018), Hagger & Hardcastle (2014), Michie & Johnston (2012), Knäuper et al. (2012), Conner & Sparks (2005), Bao et al. (2020), Mo et al. (2026), Elizabeth Morghen & Robert (2020), Romain & Abdel-Baki (2017), Plotnikoff et al. (2010), Schwarzer (2008), Steca et al. (2015) and Hattar, Pal, & Hagger (2016) results between HAPA model constructs and physical activity behaviour in patients with hypertension. Before performing path analysis, all latent variables were subjected to confirmatory factor analysis (CFA). The standardized factor loading was statistically significant for all indicators in latent variables ($p < .05$), and all loaded factors were greater than 0.60. Factor loading for action self-efficacy with a range between 0.62–0.85, risk perception between 0.79–0.87, outcome expectancy between 0.67–0.87, behavioural intention between 0.76–0.92 and coping self-efficacy between 0.75–0.87 were confirmed. Also, all fit indexes were acceptable, and the results of the CFA confirmed the fit of the model (RMSEA = 0.053, NFI = 0.93, CFI = 0.94, GFI = 0.95). Finally, the fit indexes revealed that the model fits well with the available data and the HAPA model constructs are able to predict 31% of variance in physical activity behaviour and 45% of variance in behavioural intention in patients with hypertension.

Path coefficients relating to behavioural intention showed that action self-efficacy ($\beta = 0.59$, $p < .01$), outcome expectancy ($\beta = 0.20$, $p < .01$) and risk perception ($\beta = 0.18$, $p < .01$) statistically significantly affect the intention to perform regular physical activity. Amongst the 3 constructs that influence on behavioural intention, action self-efficacy has the strongest path coefficient, and these constructs could describe 45% of the variance in behavioural intention. In addition, behavioural intention ($\beta = 0.22$, $p < .05$) and coping self-efficacy ($\beta = 0.63$, $p < .01$) are able to statistically significantly explain 41% of the variance of the planning construct.

The path coefficient between behavioural intention and physical activity ($\beta = 0.35$, $p < .05$) along with path coefficient between coping self-efficacy and physical activity ($\beta = 0.29$, $p < .01$) was statistically significant, and these two constructs were able to describe the 31% variance of physical activity behaviour. Along with the mentioned results, it is worth mentioning that the path coefficient between planning construct and physical activity was not statistically significant. However, the path coefficient between coping self-efficacy and planning as a logical proxy can indirectly explain the variance of physical activity to a large extent.

4 | DISCUSSION

The aim of the present study was to determine the factors influencing regular physical activity behaviour based on HAPA model in patients with hypertension in Astaneh-ye-Ashrafiyeh in 2018–2019. From a public health perspective, it is important to accurately identify and understand the social and psychological factors impressing the regular physical activity in patients with hypertension. Overall, the results of the present study revealed a statistically significant correlation between HAPA model constructs and physical activity behaviour in patients with hypertension. Moreover, action self-efficacy, outcome expectancy and risk perception were able to predict 45% of the variance of behavioural intention, with behavioural intention and coping self-efficacy describing 31% of the variance in physical activity behaviour in participating patients with high blood pressure. In other words, the majority of HAPA-related relationships and assumptions were confirmed in this study, which is consistent with the results of previous studies aimed at examining the relationship between HAPA's psychological structural structures and physical activity behaviour (Berli et al., 2014; Caudroit et al., 2011; Hattar et al., 2016; Parschau et al., 2014; Steca et al., 2017). Therefore, at first glance, our results emphasized the usefulness of the HAPA model and its effectiveness in predicting the physical activity behaviour in patients with hypertension. However, the detailed results of this study can be discussed in several following sections:

The first important finding of the present study was statistically significant correlations between behavioural intention to perform regular physical activity with action self-efficacy, planning, outcome expectancy and risk perception, which was in line with the results of Hattar, Pal, & Hagger (2016).

TABLE 3 Comparison of mean and standard deviation of physical activity in hypertension patients participating in research in terms of gender

Physical activity	Male patients	Female patients	Sig level
Low	326.45 ± 254.16	08.31 ± 226.84	0.136
Medium	1,472.42 ± 625.3	1,364.53 ± 734.6	0.159
Sever	3,506.22 ± 583.5	3,347.59 ± 611.48	0.238
Total score	947.34 ± 481.75	886.75 ± 454.32	0.229

TABLE 4 Comparison of the relationship between different levels of physical activity in patients with high blood pressure with gender

Physical activity	Male patients (N = 81)		Female patients (N = 95)		
MET-min/week	Frequency	Percentage	Frequency	Percentage	Sig level
Low and sedentary	46	56.79	66	69.47	$\chi^2 = 24.63$, $df = 2$, $p < .001$
Medium	22	27.16	19	20	
Sever	13	16.05	10	10.53	

TABLE 5 Pearson's correlation coefficient between HAPA model constructs and means of physical activity behaviour in patients with hypertension

Variables	1	2	3	4	5	6	7	8	9
1. Age	1								
2. BMI	0.19*	1							
3. Action self-efficacy	−0.38*	0.10	1						
4. Outcome expectancy	−0.11	0.134	0.41*	1					
5. Risk perception	−0.10	−0.17	0.21*	0.50*	1				
6. Intention	−0.15	0.09	0.62*	0.39*	0.31*	1			
7. Coping self-efficacy	−0.25*	−0.11	0.37*	0.27*	0.19*	0.29*	1		
8. Planning	−0.20*	−0.07	0.42*	0.33*	0.25*	0.45*	0.59*	1	
9. Physical activity	−0.09	−0.16	0.46*	0.25*	0.20*	0.57*	0.49*	0.43*	1

*$p < .05$, **$p < .01$, ***$p < .001$.

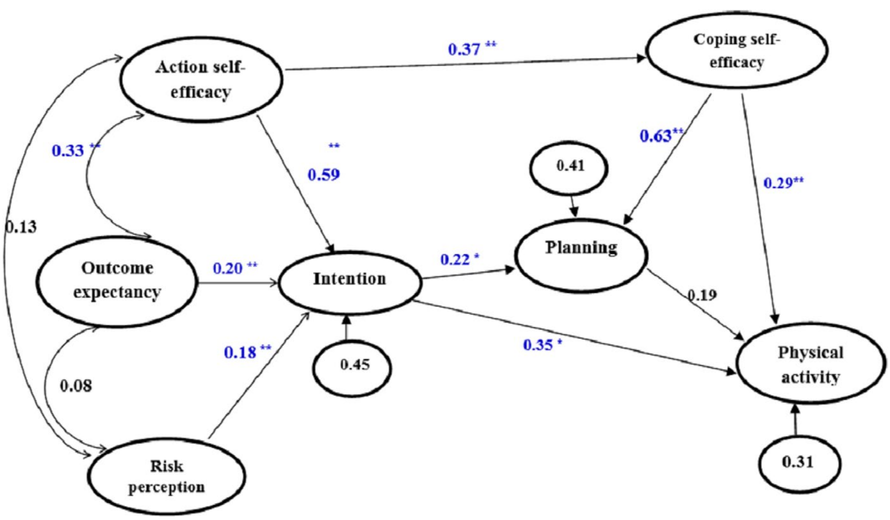

FIGURE 1 Path analysis coefficients between HAPA model constructs and physical activity behaviour in patients with hypertension (N = 176). ($\chi 2$ (176) = 12.43, p = .13, $\chi 2/df$ = 1.53, CFI = 0.95, GFI = 0.93, NFI = 0.92, RMSEA = 0.06). Note: *p < .05, *p < .01

In addition, the path coefficients demonstrated a statistically significant effect of risk perception, outcome expectancy and action self-efficacy on behavioural intention, along with a statistically significant impact of behavioural intention and coping self-efficacy on physical activity behaviour. This was consistent with most previous studies (Caudroit et al., 2011; Namadian et al., 2016;

Scholz et al., 2009). For example, in a study conducted by Scholz et al. (2009), it was indicated that the regression coefficients between action self-efficacy and behavioural intention and outcome expectancy and behavioural intention are statistically significant. Self-efficacy, a specific ability to perform a desired behaviour, is a major factor influencing behaviour (Cataldo et al., 2013). After intention formation, a person enters the voluntary phase. In addition to encouraging physical activity in hypertensive patients, the task of health professionals is to help patients discover the psychological, social and environmental barriers associated with regular physical activity. After detecting obstacles via a variety of techniques such as brainstorming, healthcare professionals should use planning strategies and goal setting techniques in order to solve problems based on individual potentials. Recovery self-efficacy has been linked to patients' failure experiences, and relying on the use of verbal encouragement and feedback mechanisms provides the ground for patients to regain control after failure and return to regular physical activity plan.

From a theoretical perspective in the HAPA model, action self-efficacy predicts intention, while maintenance self-efficacy foresees behaviour. Accordingly, it could be deduced that the findings of current study were consistent with this theoretical assumption of the HAPA model. In all patients with high levels of self-efficacy, this construct affects behaviour both directly and indirectly through planning (Keller et al., 2016). Planning and perceived control are considered near predictor of behaviour and are related to the concept of self-regulatory feedback. Therefore, in order to return patients to the cycle of regular physical activity, it is imperative to apply self-regulatory and planning strategies (Sweet et al., 2014). Some examples of these strategies are intensify and strengthen the patient's attention to physical activity by sending reminders or being warned via statistically significant others, prevent distractions by careful planning and personal commitment to it, resistance to temptations and identification of negative stimuli and overcoming them, and finally managing unpleasant emotions such as ineffectiveness of physical activity and wasting time, with emphasis on the benefits and positive consequences of regular physical activity including controlling disease complications and improving quality of life.

The impact of outcome expectancy on behavioural intention was another finding of the present study. Outcome expectancy refers to the perceived positive and negative outcomes from a person's participation in health behaviours. The more beneficial the results and the less the negative consequences, the more likely the person would intend to engage in the behaviour (Li et al., 2015). Therefore, outcome expectancy in patients with high blood pressure for performing regular physical activity is based on this judgement that if this behaviour would ultimately benefit them (Williams et al., 2005). Therefore, the task of healthcare professionals is to clarify and discuss the social and physical consequences associated with physical activity. Also, since outcome expectancy is a multidimensional constructs that includes self-assessment (e.g. sensational and emotional reflections), patients who report higher levels of physical activity are more likely to have higher social and emotional expectancies (Arbour-Nicitopoulos et al., 2017). In other words, patients' realistic estimates of social motivations and the social and emotional consequences of regular physical activity would make them more involved in this behaviour. Thus, experts must highlight the consequences of self-assessment of physical activity (e.g. reducing fatigue, stress and anxiety), physical consequences (e.g. speed of movement and muscle strength) and social consequences (e.g. accompanying with other people, getting more engaged in social activities, receiving positive feedback from family and job supporting networks) in order to strengthen and improve the outcome expectancy.

Another important finding of current study was a positive and statistically significant path coefficient between risk perception and behavioural intention, which was similar to results of prior research (Arbour-Nicitopoulos et al., 2017; Chiu et al., 2011). Perceived risk refers to a person's beliefs about the possibility of experiencing a health problem, which is a major issue in health psychology (Soureti et al., 2013). Besides, risk perception is a momentous motivating factor for adopting health behaviours' perception in most behaviour change models such as health belief model (HBM), protection motivation theory (PMT) and extended parallel process model (EPPM) (Wilson et al., 2019). Patients with high blood pressure are far more likely to be exposed to health-threatening factors than healthy people. So, they are probably more motivated to protect their health. Since these patients are more susceptible to certain diseases and health consequences, they are more likely to engage in physical activity. The consequence of physical changes and the greater likelihood of disease incidence in middle-aged and older people would increase perceived sensitivity and vulnerability (Hoseini et al., 2014). Therefore, it is obvious that these people as compared with younger ones have a more favourable attitude towards preventive behaviours to reduce health risks, and consequently would have a stronger intention to take precautionary measures.

The present study was one of the limited one's that used the theoretical framework of HAPA model to explain the factors affecting the physical activity behaviour in patients with high blood pressure. Our findings supported the usefulness of the HAPA model, showing that 45% of variance in physical activity intention is described by motivational phase factors and HAPA constructs in volitional phase are able to explain 31% of the variance in physical activity behaviour.

Therefore, the results of the path analysis according to fit indexes indicate the fit of the data with the default HAPA model. This result was in accordance with those of Parschau et al. (2014) who displayed that 30% of intention variance and 18% of physical activity variance are explained by the HAPA model, Barg et al. (2012) who indicated that 57% and 15% of the variance of intention and physical activity behaviour are explained by the HAPA model, and Caudroit et al. (2011) who demonstrated that motivational phase constructs predict 48% of variance of intention, with voluntary phase constructs predicting 39% of the variance of physical activity behaviour. By comparing the described variance of the present study with prior ones, it can be concluded that the amount of variance in physical activity behaviour described by the model in our study (32%) is approximately in the range of variance described with the HAPA model in previous studies (17%–32%). Hence, the amount of variance in the physical activity behaviour anticipated by the HAPA model in the current study could emphasize the importance and effectiveness of the HAPA model in explaining the factors affecting physical activity in patients with hypertension. It is also worth noting that the difference in predictive variance compared with some studies may be due to factors such as socio-cultural discrepancies and distinct psychological characteristics of patients participating in the study, the inevitable bias associated with the self-report method to complete the questionnaires and the nature of cross-sectional investigations. In addition, the results of path analysis are strongly influenced by sample size.

Despite the strengths of the current study in terms of applying the HAPA model as an efficient motivational model and determining psychological variables affecting a specific behaviour instead of complex behaviours such as healthy eating, it also needs to be reviewed in relation to a number of limitations. First, given that this research was a cross-sectional study, it is not possible to make a definitive decision about causal relationships between variables. Longitudinal research is therefore recommended for further analysing of the causal relationships and the effectiveness of constructs. Second, data collection was self-reporting, which is associated with bias. Although the accuracy of the data collected by self-report method has been confirmed in studies, other data collection methods such as clinical examinations and observations should be used to increase the validity of the results if possible. Third, the use of statistical methods such as path analysis requires a large sample size; however, due to cost constraints and the total number of volunteer patients, the sample size was low in the present study. Hence, increasing sample size and selecting samples from several geographical-cultural areas are suggested in order to enhance the validity of the results if possible. Another limitation of the present study was the lack of distinction between the coping plan and action plan in path analysis. In the current research due to the small sample size, using these two constructs separately in path analysis caused the model not to fit. Therefore, caution should be exercised when comparing research results with other studies because the fitted model in this study does not match the original model.

5 | CONCLUSION

The present study revealed that the psychological variables associated with the HAPA model could adequately explain the physical activity behaviour in patients with hypertension. The findings also provided evidence for the statistically significant effect of constructs such as action self-efficacy, coping self-efficacy, risk perception and outcome expectancy on intention and physical activity behaviour. Thus, the use of the HAPA model with special attention to the contribution of these constructs in explaining physical activity behaviour and designing interventions to improve regular exercise in patients with hypertension is recommended.

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CONFLICT OF INTEREST

None of the authors would like to report a conflict of interest.

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