

Teaching general practitioners to activate older patients: The intervening role of changes in perceived communication skills

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ABSTRACT

Objective: This report examined whether a change in the perceived communication behaviour (PeCoBe) of general practitioners (GPs) influenced the effect of the Promoting Active Aging (PRACTA) intervention on activation of older patients as perceived by GPs.

Methods: Pre- and post-intervention questionnaires were filled out by 225 GPs, who were assigned to three groups, e-learning, pdf-article, and control. GPs self-reported their communication behaviour and their perceptions of the attitudes of older patients toward treatment and health.

Results: Participation in the e-learning intervention showed an increase in the PeCoBe of GPs, while reading the pdf-article resulted in a decrease of such behaviours. An increase in the PeCoBe of GPs was positively related to an increase in their perception of an active attitude among older patients. The indirect effects observed for e-learning and pdf-article interventions had opposite directions. **Conclusion:** Both types of PRACTA intervention exerted an impact on GPs' perception of the attitudes of older patients, and change in PeCoBe of GPs could be considered as a mechanism driving this effect. **Practical implications:** The methods based on a combination of knowledge delivery and modelling of communication skills are strongly recommended forms of teaching for GPs on how to communicate with and activate seniors.

1. Introduction

The promotion of activity among the elderly is currently a priority challenge, due to the ageing of the population [1]. It is crucial in maintaining a healthy, independent and active life-style for as long as possible [2]. Recently, there has been an increase in the number of interventions promoting active aging among seniors [3,4]; however, little effort has been made to enhance the competency of doctors with regard to the activation of seniors [5], and in monitoring their perception to such interventions.

The World Health Organization (WHO) recommends promoting active ageing, with general practitioners (GPs) playing a central role [6]. To effectively activate seniors, beyond knowledge promoting

good health behaviours at all ages, proper communication skills that are sensitive to the age of the patients seem necessary.

Through practicing such competences, GPs may contribute to enhancing seniors' active attitude toward treatment and health (ATH). According to the multi-component concept of ATH [7,8], it encompasses the following aspects: cognitive, emotional-positive, emotional-negative, motivational, and sense of self-efficacy. Seniors who understand their health situation can adequately respond emotionally to health challenges, reducing negative emotions and strengthening positive emotions. They are also motivated and have a sense of self-efficacy regarding the treatment process and health behaviour changes, and may be described as having an active ATH.

1.1. The role of GPs' communication skills

The benefits of good doctor-patient communication encompass better recovery from illness, daily functioning, and psychological

adjustment [9,10], a lower number of tests and referrals and a decrease in the length of hospital stays [11]. Insufficient communication may result in unnecessary suffering for the patient, and is one of the reasons for adverse events [12].

Effective clinician–patient communication should not only encompass information collection by the doctor, but also create a good interpersonal relationship, facilitating an exchange of information and including the patient in decision making [13]. Specifically, appropriate techniques of asking questions and active listening allows for passing of information consistent with a patient’s individual needs [14]. Good doctor-patient communication has the potential to reduce a patient’s negative emotions, such as hopelessness [15], and to induce positive emotions, such as satisfaction [16]. The above elements, together with the patient’s active participation in the medical encounter, enhance a patient’s motivation to medical compliance. More frequent patient-provider communication predicts different aspects of medication self-efficacy, defined as a patient’s confidence that they can perform medication-related behaviours [17]. Thus, good doctor-patient communication may contribute to enhancing a patient’s ATH.

However, doctors are often not equipped with comprehensive knowledge on older patients’ activation, nor do they have the necessary communication skills [18]. Hence, training designed to

stimulate better recognition of expectations, that involves patient-centered communication and enhances active ATH in senior patients is in high demand.

1.2. PRACTA intervention for GPs to activate older patients

The Promoting Active Aging (PRACTA) intervention was designed to enhance the competency of GPs in communication with and activation of seniors. Based on reports on the benefits of traditional and computer-based methods of teaching [19–21], we developed two forms of intervention, the e-learning course and the pdf-article. E-learning was a multimedia program aimed at presenting knowledge with specific practical solutions, and modelling communication with seniors and enhancing their activation skills (knowledge + modelling). Its specificity relied on diversity of engagement-provoking methods, focusing on problem solving modelling, with techniques and guidelines on how to use them. The pdf-article was a digitised text presenting knowledge, with a general description of recommended solutions (knowledge only). The content of the intervention was based on theories of successful aging [22], attitude towards health [7], patient-centered communication [23], health behaviour change [24] and social support [25]. Table 1 shows its structure and the scope with specific methods used in e-learning.

Table 1
The structure and scope of the PRACTA intervention with methods used in e-learning.

Subjects	Methods used in e-learning
Module 1: Process of active aging and importance of active attitude towards health	
Specific communicational aspects: Aims of communication focused on activating the elderly	
1 Active and successful aging	Presentation guided by a user ^a + quiz ^b Mini-lecture + quiz
2 Opportunities for resource allocation in the elderly	Presentation in a form of interview Case study + quiz
3 Criteria of active attitude towards health	Case study + quiz Mini-lecture
Module 2: Doctors' beliefs on seniors' abilities and expectations	
Specific communicational aspects: Barriers in communication with the elderly	
1 ABC model and seniors' activity	A game + self-assessment + quiz
2 Stereotypes about the elderly and manifestation of ageism	Presentation guided by a user + quiz Case study + quiz
3 Seniors' expectations in GP office	Presentation guided by a user + quiz Mini-lecture + quiz
Module 3: Importance of doctor-patient rapport for senior patients and health outcomes	
Specific communicational aspects: Types and scope of information, rules of dialog, techniques of active listening, nonverbal communication, “emotions first” protocol	
1 Types of GP-senior rapport	Case studies Presentation guided by a user + quiz
2 Techniques and rules of communication	Animated cartoon + quiz Presentation guided by a user + quiz
3 Strategies for dealing with emotional seniors' needs	Mini-lecture + quiz A video ^c demonstrating new skills
Module 4: Psychological rules and skills for promoting active attitudes towards health	
Specific communicational aspects: Technique of intent formulation, “good plan” technique, “If you cannot, what then?” technique, working with a scale technique, normalization, costs-benefits analysis	
1 Models of health behaviour change	A puzzle Mini-lecture + quiz
2 Techniques – higher level of senior's motivation	A video demonstrating new skills Analysis of techniques + quiz
3 Techniques – lower level of senior's motivation	A video demonstrating new skills Analysis of techniques + quiz
Module 5: Quality of life and providing support for senior patients	
Specific communicational aspects: Adoption of presented techniques in activating seniors to their quality of life improvement	
1 Aspects of quality of life	Presentation guided by a user + quiz Mini-lecture + quiz
2 GPs' role in improving seniors' quality of life	A video demonstrating new skills Analysis of techniques + quiz
3 GPs as a source of social support for seniors	Presentation guided by a user + quiz Animated cartoon + quiz

Legend:

^a it was assumed that the user decided on the order of subjects' selection.

^b quiz assumed repetition of knowledge or a technique previously presented; its completion allowed the participant to receive a trophy, which served as a mnemonic and an award in the game.

^c each video presented an 8–10 min GP-senior conversation, and was recorded for the purpose of serving the project.

To make transfer of learned skills to clinical practice more effective, studies are recommended to assess not only a patient's objective and subjective outcomes, but also the physician outcomes, their acquired skills and subjectively perceived effects [26]. The study presented here focuses on the PRACTA intervention effects as subjectively perceived by GPs. The PRACTA effects as perceived by seniors have been reported previously [27].

1.3. The present research

The aim was to study whether a change in GPs' perceived communication behaviours (PeCoBe) was one of the mechanisms driving the effect of the type of PRACTA intervention on GPs' perception of seniors' ATH (Fig. 1). The main effects of PRACTA intervention had been presented elsewhere [8]. Here we concentrate only on studying the potential intervening mechanisms.

The model in Fig. 1 presents a causal sequence in which an independent variable (X, type of intervention) affects an outcome variable (Y, change in GPs' perception of ATH of seniors), directly and indirectly through an intervening variable (M, change in GPs' PeCoBe) [28]. The type of intervention is postulated to affect a change in GPs' PeCoBe (path a), and this results in a change in seniors' ATH as perceived by GPs (path b). The indirect effect (the product of a and b) represents the mechanism by which variable X transmits its effect on variable Y. We can distinguish the total effect of variable X on Y (path c) and the direct effect of variable X on Y after controlling for variable M (path c') [28]. It is possible to find that an indirect effect is significant even when there is no evidence for a significant total effect [29].

In this study, the independent variable was multicategorical with three levels, e-learning, pdf-article and control conditions. Owing to the adoption of specific group codes, the analysis allowed for simultaneous testing of hypotheses regarding e-learning (E-L) and the pdf-article (A) relative to the control condition [30]. Thus, it yielded two a -coefficients (effects of X on M), two c' -coefficients (direct effects of X on Y), two products representing the indirect effects, two c -total effects (the sum of direct and indirect effects) for each study condition, and a single b -coefficient estimating the effect of M on Y while equating the groups on average on X.

We hypothesised that the e-learning intervention would lead to an increase in GPs' PeCoBe, and that this improvement would contribute to an increase in GPs' perception of seniors' understanding of health issues, their level of positive emotions, motivation, sense of self-efficacy, and a decrease in their negative emotions. The above relationships were anticipated to be weaker or absent for the pdf-article intervention.

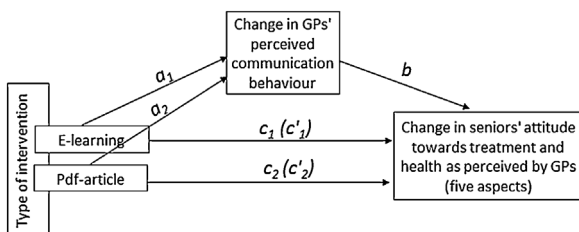


Fig. 1. Conceptual model of the relationships tested in the study. The legend: a_1 – the path representing the effect of an e-learning on change in GPs' PeCoBe; a_2 – the path representing the effect of a pdf-article on change in GPs' PeCoBe; b – the path representing the effect of change in GPs' PeCoBe on change in older patients' attitude as perceived by GPs; c_1 – total effect of an e-learning on change in older patients' attitude as perceived by GPs; c_2 – total effect of a pdf-article on change in older patients' attitude as perceived by GPs; c'_1 – direct effect of an e-learning on change in older patients' attitude as perceived by GPs; c'_2 – direct effect of a pdf-article on change in older patients' attitude as perceived by GPs.

2. Methods

2.1. Procedure

The study was based on longitudinal data collected from GPs for 2013–2015, within the PRACTA project (www.practa.wum.edu.pl). It consisted of GPs' baseline examination (Time 1), implementation of an intervention (three months) and GPs' follow-up examination (Time 2, a month after the intervention). Data was collected in 151 (20%) of the 767 invited primary health care facilities, having a contract with the National Health Fund and located in central Poland.

The inclusion criteria for GPs were: delivering primary care and signing written consent to participate in all parts of the project. Out of 996 invited GPs, 503 (50.5%) agreed to participate in the Time 1 assessment. After Time 1, the facilities were randomly assigned to three groups, e-learning, pdf-article and control. Out of the 503 GPs, 396 (78%) took part in the Time 2 examination; however, not all of them agreed to participate in the intervention. A flow chart of GPs' participation is given in supplementary Fig. S1.

The final study sample consisted of 225 GPs: 42 in the e-learning intervention (gained points in at least one test, 70% completed all parts); 89 in the pdf-article intervention (reporting their advance in reading the article, 74% had read more than $\frac{3}{4}$ of the text); and 94 in the control group (participants of Time 1 and Time 2 surveys without an intervention).

The doctors were interviewed by professional interviewers who had been trained on project-specific requirements for the standardization of assessments. The procedure guaranteed the depersonalised nature of the data collection. Approval for the study was obtained from the Bioethics Committee of the Medical University of Warsaw (Ref. no KB/10/2014).

2.2. Characteristics of participants

Table 2 presents descriptive statistics for each study group.

The GP groups did not differ in age, gender, marital status, job seniority, the proportion of older patients consulted last year, type of specialization and level of training in geriatrics; however there were differences in respect to some features of the facilities. Doctors in the e-learning group more frequently worked in facilities located in Warsaw, privately owned facilities and facilities with the lowest average number of patients assigned to a single doctor.

2.3. Implementation of the PRACTA intervention

Both forms of PRACTA intervention included five modules, which were identically themed and ordered (as presented in Table 1); however, they differed in range, volume and methods of presenting knowledge and skills.

E-learning was designed as a game in which participants chose their character and completed specific tasks within each module/mission. It adopted various forms of knowledge presentation (mini-lecture, animated cartoon, case study and video), with additional activities for the participants (presentation guided by a user, game, quiz and testing new skills in simulated situations). Each module took about one hour and ended with a final test. It was possible to stop and resume an incomplete module at any time prior to completion of the final test and saving the scores.

The pdf-article intervention was text divided into small sections, structured visually with simple pictures and figures. All the presented information had a form of a summary or transformation of e-learning content. Each pdf-article module had a length of three A4 pages.

Table 2
Descriptive statistics of the study groups.

Characteristic	E-learning (n = 42)	Pdf-article (n = 89)	Control (n = 94)	Test of differences (p)
Age / M (SD)	49.56 (11.56)	49.44 (11.35)	50.39 (13.16)	$F_{2,218} = .15 (.86)$
Gender / n (%)				
Female	36 (85.7)	62 (69.7)	62 (66)	$\chi^2_2 = 5.67 (.06)$
Male	6 (14.3)	27 (30.3)	32 (34)	
Marital status / n (%)				
Single	4 (9.5)	12 (13.5)	8 (8.5)	$\chi^2_4 = 3.16 (.79)$
Married	33 (78.6)	65 (73)	77 (81.9)	
Divorced/Widowed	5 (11.9)	12 (13.5)	9 (9.6)	
Job seniority/ M (SD)	23.90 (12.13)	23.57 (11.99)	23.87 (13.15)	$F_{2,220} = .02 (.98)$
Proportion of older patients last year / n (%)				
<50%	22 (52)	46 (52)	43 (46)	$\chi^2_4 = 3.21 (.72)$
50%-75%	16 (38)	36 (40)	40 (43)	
>75%	4 (10)	7 (8)	11 (12)	
Specialization / n (%)				
Internal/family medicine only	30 (74)	60 (73)	70 (84)	$\chi^2_4 = 10.05;.09$
2 specializations	9 (22)	13 (16)	9 (11)	
Others	2 (4)	10 (12)	5 (6)	
Training in geriatrics / n (%)				
None	28 (67)	49(55)	49 (52)	$\chi^2_4 = 6.56 (.16)$
Single	12 (29)	30 (34)	27 (29)	
Multiple	2 (5)	10 (11)	18 (13)	
Facility location (number of inhabitants) / n (%)				
Less than 100 000	13 (35.1)	27 (33.3)	26 (39.1)	$\chi^2_4 = 27.37 (.001)$
More than 100 000	3 (8.1)	27 (33.3)	42 (45.7)	
Capital	21 (56.8)	27 (33.3)	14 (15.2)	
Organizational form of facility / n (%)				
State owned	14 (36.8)	53 (59.6)	65 (69.1)	$\chi^2_2 = 11.74 (.003)$
Privately owned	24 (63.2)	36 (40.4)	29 (30.9)	
Average number of patients per GP in facility/ M (SD)	1444 (425)	1681 (672)	1754 (791)	$B-F_{2,215} = 3.33 (.04)$

B-F, Brown-Forsythe correction (the assumption of variance homogeneity for ANOVA was not met).

2.4. Measurement

The tools were designed and validated within a pilot study, with analysis of convergence and evaluation of internal consistency with discriminating power of items in a group of 69 GPs. PeCoBe of GPs was assessed with the PRACTA Communication Scale-Doctors (PRACTA-CS-D). It consisted of 26 items determining the communication behaviours of GPs, e.g.: *During a visit of elderly patients I . . . make sure I understood them correctly*. Doctors rated the frequency of each behaviour on a 7-point Likert scale (1 - very seldom, 7 - very frequent). The global score was calculated as a mean value of all the item scores and ranged between 1 and 7. The higher the score, the greater the frequency of communication behaviour declared by the GP. The reliability coefficients of global scores before and after the intervention were 0.94 and 0.95, respectively.

GP perception of seniors' attitude to their health was evaluated by two questionnaires, the PRACTA Attitude Toward Treatment and Health Scale-Doctors (PRACTA-ATH-D) [31] and the PRACTA Self-Efficacy Scale-Doctors (PRACTA-SE-D).

PRACTA-ATH-D included 16 items which formed four subscales reflecting four aspects of attitude: cognitive (6 items), emotional-positive (3 items), emotional-negative (3 items) and motivational (4 items). Each item started with: *Usually, senior patients (65+) after a visit at my office . . .* followed by statements indicating seniors' ATH, e.g. *understand the nature and causes of their ailments*. The response values were from 1 - *definitely not* to 7 - *definitely yes*. Each subscale score was calculated as a mean value of the given subscale scores ranging from 1 to 7. Higher scores indicated a more active attitude in all aspects, except for the negative emotions. Reliability coefficients of the PRACTA-ATH-D scores ranged from 0.88 to 0.93 before the intervention, and from 0.88 to 0.94 after the intervention.

PRACTA-SE-D was a unidimensional scale with three items, built identically to PRACTA-ATH-D, but measuring GPs' perception of seniors' self-efficacy related to health behaviour changes (e.g. *think they can influence the way they will feel in the future*). Its reliability coefficients at Time 1 and Time 2 equaled 0.90.

2.5. Statistical analysis

All the analyses were performed with adoption of indexes of change. They were calculated for each study variable as a Time 2 - Time 1 difference, with the indexes above zero indicating an increase in GPs' ratings and those below zero indicating a decrease in these ratings.

To estimate the direct and indirect effects when the independent variable was multicategorical, a regression-based path analysis approach was adopted, as proposed by Hayes and Preacher [28,30], together with the PROCESS macro (available at www.processmacro.org). PROCESS used a bootstrapping procedure which was recommended when there were asymmetries and other forms of non-normality in the sampling distribution of the statistic, especially in small- and moderately-sized samples [32]. Table 3 presents the rules of coding of the independent variable categories [30].

In the analysis, 5,000 bootstrap resamples and 95% confidence intervals (CI) were used. All the statistical analyses were conducted using SPSS 23 software.

3. Results

Table 4 presents the descriptive statistics of the studied variables in the form of indexes of change. The descriptive statistics of the study variables at Time 1 and Time 2 for each group are given in supplementary Table S1.

Table 3
Coding rules for the independent variable.

The aim of coding	Indicator coding	Condition code	Coding system
To compare differences in effects of e-learning and pdf-article relative to the control group (C) /reference group		E-learning condition (E-L group code)	E-L = 1, A = 0, C = 0
		Pdf-article condition (A group code)	E-L = 0, A = 1, C = 0
To compare the effects of e-learning versus the pdf-article	Contrast coding	Contrast code	C = 0, E-L = -0.5, A = 0.5

Table 4
Descriptive statistics of studied variables for e-learning, pdf-article and control groups.

Index of change	E-learning group (n = 42)	Pdf-article group (n = 89)	Control group (n = 94)	All (n = 225)
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Communication skills	0.19 (0.83)	-0.44 (0.75)	-0.09 (0.73)	-0.17 (0.79)
ATH – cognitive aspect	0.27 (1.07)	-0.13 (1.14)	-0.10 (0.94)	-0.05 (1.05)
ATH – positive emotions	0.19 (0.95)	-0.20 (0.97)	-0.17 (0.95)	-0.11 (0.97)
ATH – negative emotions	-0.53 (1.75)	-0.05 (1.86)	-0.23 (1.86)	-0.21 (1.84)
ATH – motivational aspect	0.35 (1.15)	-0.17 (1.09)	-0.18 (1.05)	-0.07 (1.09)
ATH – self-efficacy	0.35 (1.08)	0.01 (1.23)	-0.05 (1.01)	0.04 (1.12)

ATH, seniors' attitude toward treatment and health as perceived by GPs.

The model presented in Fig. 1 was tested independently for each outcome variable (five aspects of seniors' ATH). Table 5 shows estimated coefficients established for all five models. The results regarding each model include B coefficients and standard errors (SE) with 95% CI for paths *a*, *c*, *c'* and indirect effects estimated for e-learning (E-L) and pdf-article (A) conditions (based on indicator coding) and for path *b*. Additionally, results comparing the indirect effects between study conditions based on contrast coding (CON) are presented.

There were significant relationships between the type of intervention and changes in the PeCoBe of GPs in relation to the control group. GPs in the e-learning group demonstrated an increase in PeCoBe, greater by 0.28 than in the control group, whereas there was a drop by 0.35 in the pdf-article group (path *a*).

Holding the study conditions constant, the change in the PeCoBe of GPs was positively related to changes in all aspects of seniors' ATH as perceived by GPs, except for negative emotions. These associations ranged from 0.32 in the case of the cognitive aspects to 0.66 in the case of the motivational aspects (path *b*). The greater was the change in the PeCoBe of GPs, the larger the increase in GPs' perception of seniors' activation in four aspects of ATH.

Regarding GPs' perception of cognitive, motivational and self-efficacy aspects of seniors' ATH, the intervening effects of change in GPs' PeCoBe were significant for both types of intervention; however, these effects had opposite directions. Relative to the control group, GPs participating in e-learning showed a 0.09 unit increase in their perception of seniors' cognitive aspect of ATH, while those participating in the pdf-article intervention showed a 0.11 unit decrease. The analysis based on contrast coding found that the indirect effects of both interventions were statistically different. E-learning yielded a change in GPs' perception of seniors' cognitive aspect of ATH (resulting from a change in GPs' PeCoBe) that was 0.2 units greater relative to the pdf-article intervention.

In the e-learning group, the increase in GPs' perception of seniors' motivation was 0.19 units greater than in the control group, whereas it was 0.23 units lower in the pdf-article group. Therefore, GPs in the e-learning group demonstrated a change in the perception of seniors' motivation that was 0.42 units greater than in the pdf-article group.

GPs in the e-learning group showed a 0.12 unit greater perception of seniors' self-efficacy than in the control group,

whereas for those in the pdf-article group it was 0.15 units smaller. Therefore, the indirect effect in the e-learning group was greater by 0.27 units than in the pdf-group.

For GPs' perception of seniors' positive emotions, a significant indirect effect through a change in GPs' PeCoBe occurred only in the pdf-article group. Relative to the control group, GPs in this group demonstrated a change in seniors' positive emotions that was 0.19 units smaller. Contrast coding analysis showed that the pdf-article intervention yielded a change in GPs' perception of seniors' positive emotions that was 0.33 units smaller relative to the e-learning intervention.

Although the relationship between the change in the PeCoBe of GPs and their perception of seniors' negative emotions was not statistically significant, we found a significant negative indirect effect through a decrease in GPs' PeCoBe in the pdf-article group.

Except for the model concerning GPs' perception of seniors' negative emotions, the inclusion of the change in GPs' PeCoBe in the models yielded an increment in the percentage of explained variance of the outcome variables. The changes were as follows: cognitive aspect, from $R^2 = 0.02$; $p = 0.10$ to $R^2 = 0.07$; $p < 0.001$; positive emotions, from $R^2 = 0.02$; $p = 0.07$ to $R^2 = 0.20$; $p < 0.001$; motivational aspect, from $R^2 = 0.03$; $p = 0.02$ to $R^2 = 0.24$; $p < 0.001$; self-efficacy, from $R^2 = 0.02$; $p = 0.14$ to $R^2 = 0.10$; $p < 0.001$; and negative emotions, from $R^2 = 0.01$; $p = 0.36$ to $R^2 = 0.02$; $p = 0.14$.

4. Discussion and conclusion

4.1. Discussion

This study assessed whether changes in the PeCoBe of GPs affected the relationship between the type of PRACTA intervention and changes in GPs' perception of seniors' ATH.

Firstly, GPs from the e-learning group, in comparison to GPs who read the pdf-article, reported a higher frequency of recommended communication behaviours than they declared before the intervention. Therefore, e-learning modelling communication skills yielded desirable outcomes, at least as reported by GPs. This finding was in line with reports documenting positive outcomes of e-learning with regard to health care professionals' knowledge and performance [20,33]. However, the results of the current study regarding the pdf-article intervention were in

Table 5
 Estimated model coefficients - change in GPs' PeCoBe as an intervening variable between type of PRACTA intervention and five aspects of seniors' ATH as perceived by GPs (significant effects in bold).

Type	Path <i>a</i>		Path <i>c</i>		Path <i>c'</i>		Path <i>b</i>	
	B(SE)	95%CI	B(SE)	95% CI	B(SE)	95%CI	B(SE)	95%CI
Outcome: Cognitive aspect of ATH								
E-L	.28*(.14)	.001-.55	.37 (.19)	-.01-.75	.28(.19)	-.09-.65	.32** (.09)	.14-.50
A	-.35*(.11)	-.57(-.13)	-.03 (.15)	-.33-.27	.09(.15)	-.22-.39		
Indirect effects (B(SE) 95%CI): EL: .09 (.06) .002-.23 ; A: -.11 (.05) -.23(-.04) ; CON: -.20 (.08) -.38(-.07)								
Outcome: Positive emotions aspect of ATH								
E-L	.28*(.14)	.001-.55	.36*(.18)	.01-.71	.21(.16)	-.11-.53	.53*** (.08)	.38-.69
A	-.35*(.11)	-.57(-.13)	-.02(.14)	-.30-.25	.16(.13)	-.09-.42		
Indirect effects (B(SE) 95%CI): E-L: .15 (.08) -.001-.32; A: -.19 (.06) -.33(-.08) ; CON: -.33 (.09) -.54(-.18)								
Outcome: Negative emotions aspect of ATH								
E-L	.28*(.14)	.001-.55	-.31(.34)	-.98-.35	-.39(.34)	-1.07-.28	.30 (.16)	-.02-.61
A	-.35*(.11)	-.57(-.13)	.18(.27)	-.35-.71	.29(.28)	-.25-.83		
Indirect effects (B(SE) 95%CI): E-L: .08 (.06) -.002-.25; A: -.10 (.07) -.29(-.01) ; CON: -.19 (.11) -.44-.01								
Outcome: Motivational aspect of ATH								
E-L	.28*(.14)	.001-.55	.53*(.20)	.13-.92	.34(.18)	-.01-.69	.66*** (.09)	.49-.82
A	-.35*(.11)	-.57(-.13)	.007(.16)	-.31-.32	.23(.14)	-.04-.52		
Indirect effects (B(SE) 95%CI): E-L: .19 (.10) .002-.40 ; A: -.23 (.08) -.41(-.09) ; CON: -.42 (.08) -.66(-.22)								
Outcome: self-efficacy aspect of ATH								
E-L	.28*(.14)	.001-.55	.41(.21)	-.01-.81	.28(.20)	-.10-.68	.43*** (.09)	.24-.61
A	-.35*(.11)	-.57(-.13)	.05(.16)	-.27-.38	.21(.16)	-.11-.53		
Indirect effects (B(SE) 95%CI): E-L: .12 (.07) .004-.30 ; A: -.15 (.06) -.29(-.06) ; CON: -.27 (.08) -.47(-.11)								

E-L, e-learning group code; A, pdf-article group code; CON, comparison of the effects of e-learning versus the pdf-article based on contrast coding; path *a*, path between type of intervention and the change in GPs' PeCoBe; path *c*, total effect of the type of intervention on the outcome variable; path *c'*, direct effect of the type of intervention on the outcome variable; path *b*, path between the change in GPs' PeCoBe and the outcome variable; B point estimates of indirect effects were considered significant if zero was not included in the interval (95% CI).

contrast to studies confirming the effectiveness of traditional learning [34]. Unlike for e-learning, the inferior results with the pdf-article intervention might have been due to it being designed to present the kinds of actions needed to activate seniors; however, without instructions on how to implement them. A further analysis is needed to identify what specific elements of the pdf-article were responsible for this somewhat surprising effect.

Secondly, the increase in GPs' PeCoBe was positively related to the increase in GPs' perception of nearly all dimensions of seniors' ATH. A number of previous studies have confirmed the beneficial outcomes of good doctor-patient communication for different aspects of patients functioning [10,17]. This current study complemented them with results regarding GPs' perception of seniors' active ATH. The exception was the subscale of negative emotions, which was probably due to the fact that the intervention was based mainly on a positive psychology approach [35], and might not have focused enough on the recognition of negative emotions.

Thirdly, through a change in GPs' PeCoBe, the e-learning intervention positively influenced GPs' perception of seniors' ATH, whereas the pdf-article affected it negatively. Therefore, the indirect effects of e-learning and the pdf-article on changes in GPs' PeCoBe were also of a different nature. Specifically, e-learning promoted an increase of GPs' PeCoBe, which contributed to an increase in GPs' perception of three aspects of seniors' ATH. This effect might have resulted from real changes in seniors' behaviour as an outcome of the positive spiral of events, encompassing better GPs' communication, a change in seniors' behaviour and a change in GPs' perception of seniors' activation. Alternatively, it might have resulted from changes in GPs' overall perception of seniors, as they were familiarised with case studies and stories of seniors participating in videos. To resolve these doubts, several steps could be undertaken: seniors' activation could be evaluated by the seniors themselves (the results confirming significant changes observed by seniors are given in [27]); GPs' and seniors' perception of change could be compared (planned as a next stage of the PRACTA study); video-based communication assessment could be adopted [36]; or other aspects of GPs' self-evaluation (value

hierarchy) could be measured to explain (possibly as mediating variables) specific changes in GPs' perception of seniors [37].

Next, we hypothesised that the indirect effects of e-learning would be present in relation to all aspects of GPs' perception of seniors' ATH; however, there were no such effect regarding seniors' positive and negative emotions. As seniors' emotional functioning might be determined by a variety of factors, more advanced psychological interventions might be necessary to achieve its modification.

The indirect effects of the pdf-article on GPs' perception of all aspects of seniors' ATH were negative. This might be a consequence of GPs' critical evaluation of their communication with seniors, combined with an increased awareness of the discrepancy between potential seniors' activation and the level of their actual activation identified by GPs at the end of the visits. The exception was the effect showing a decrease in seniors' negative emotions in the aftermath of an improvement in the PeCoBe of GPs. This result might be in line with expectations; however, in light of the other effects of the pdf-intervention it was very difficult to explain. In the case of all ATH aspects, we observed a rise (although insignificant) of direct effects (*c'*) relative to the total effects (*c*) of the pdf-intervention after inclusion of changes in GPs' PeCoBe. This might suggest that these indirect effects were suppressive in nature [38]. Delivering knowledge without training or demonstration might be a possible reason for such a result. In addition, the selection of information included in the pdf-article might have been insufficient. Ultimately, the pdf-article effects might be temporary, representing stages in a longer and more complex process of change. All the above hypotheses warrant further research.

This study had some limitations. There was some selection bias, resulting from low participation rates among facilities and GPs. The study benefited from randomization of the facilities; however, the participation of GPs working in them was voluntary. Perhaps more emphasis should have been placed on the value of the training, its credibility and association with the Medical University of Warsaw and the Polish Chamber of Physicians, and its documented contribution to GPs' professional development [39]. The GPs' drop-out between the start of the study and the follow-up

examination could have led to an attrition bias. Too little control over the contents (selection of relevant parts according to individual experience and preferences) and a lack of interaction with other learners and tutors [39] or the option to create a virtual community of practice [40] could have contributed to the 30% loss of e-learning participants. Therefore, the group participating in the study probably consisted of GPs more interested in geriatrics and/or their own professional development. Additionally, the study groups had a relatively small sample size and they were uneven in number of participants. For future studies, it would be crucial to recognise the reasons for poor participation rates, and engage facility management and GPs. Self-reported outcomes also risk bias resulting from social desirability and expectations about the effect of the intervention. In our study this impact might have been minimal, as direction of change was different in each of the intervention groups. In considering the processes responsible for the effects of the PRACTA intervention, future studies should include other variables, as the multiple mediation model could reveal more complex mechanisms [41].

4.2. Conclusions

The study confirmed that both types of PRACTA intervention exerted an impact on GPs' perception of seniors' ATH, and change in GPs' PeCoBe could be considered as a mechanism driving this effect. The indirect effects observed for the e-learning and pdf-article interventions went in opposite directions, resulting from their different influence on changes in GPs' PeCoBe. Regardless of the type of intervention, the increase in GPs' PeCoBe was positively related to an increase in GPs' perception of the cognitive aspects of seniors' ATH, their positive emotions, motivation and self-efficacy.

4.3. Practical implications

The methods based on a combination of knowledge delivery and communication skills modelling are strongly recommended forms for teaching GPs on how to communicate with seniors and activate them to good health behaviours. However, additional efforts should be made to increase involvement and participation by GPs and facility management in developing and using such methods.

Conflict of interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.pec.2019.04.020>.

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